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The macroprudential toolkit: Effectiveness and interactions

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Disclaimer

The views expressed in this presentation are solely those of the authors and should not be taken to represent the views of the Bank of England or any of its Policy Committees.

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Introduction and motivation

Introduction and motivation

- In response to the Global Financial Crisis, many countries have started to use macroprudential policy
- We have seen a multitude of different macroprudential policy tools brought into use
- But do we need them all?
- That is, suppose we have (counter-cyclical) capital requirements, why tackle the mortgage market separately?
- And which tool(s): loan-to-value constraints, affordability constraints and/or loan-to-income constraints?

Introduction and motivation

- Answering this question requires clear objective
- In the United Kingdom, the Bank of England's objective is *to protect and enhance the stability of the financial system of the United Kingdom*
- It does this through its Financial Policy Committee (FPC), which *identifies, monitors and takes action to remove or reduce systemic risks with a view to protecting and enhancing the resilience of the UK financial system*

Introduction and motivation

- In its recommendations, the Committee has talked more specifically about increasing the resilience of lenders and the resilience of borrowers …
- … and suggested using a capital-based instrument and/or LTV constraints to deal with financial system resilience and LTI/DSR constraints to deal with borrower resilience
- See the June 2014 *Financial Stability Report* for more on this

Introduction and motivation

- Our goal is to look at the macroprudential toolkit within a DSGE model to see how these tools affect macroeconomic variables over the cycle …
- … and how they interact with each other
- Specifically, we first develop a DSGE model with financial frictions to which we can add three macroprudential policies:
  - Capital requirements on banks
  - Loan-to-value limits on mortgage lending
  - Affordability limits on mortgage lending

Introduction and motivation

We then use the model to examine:

- How capital requirements help deal with financial frictions and financial shocks
- How the housing market tools affect the response of the real economy to housing market shocks and how they interact with each other
- The extent to which these macroprudential policies help or hinder monetary policy
- Whether these policies help to raise welfare in this model

Roadmap

- Introduction and motivation
- Literature
- Model
- Results
- Conclusions

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Literature

Literature

- Iacoviello (2005, 2015) now the ‘standard’ DSGE model of the housing market and mortgages
- Gertler and Kiyotaki (2015) model the spread as resulting from an information friction between depositors and the banks
- Gertler and Karadi (2015) put this approach to modelling banks into an otherwise standard DSGE model

Literature

- Rubio and Carrasco-Gallego (2015) use an ‘optimal simple rules’ approach to look at the interaction of LTV limits and monetary policy
- Ferrero et al. (2018) look at optimal macroprudential policy in a similar model to us and find that countercyclical LTV limits can help monetary policy avoid the zero lower bound
- But neither of these papers have affordability constraints nor look at the interaction between instruments

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Model

Model

- Two types of households – patient and impatient – who get utility out of consumption, housing and leisure. Impatient households borrow subject to one or other of two constraints :
  - A maximum loan-to-value ratio on mortgage borrowing
  - An ‘affordability’ test on mortgage interest payments set by Macroprudential policy makers
- In future work, we intend to put these constraints on borrowing at the same time
  - But note, only one or the other will bind at any point in time

Model

- Firms subject to costs of adjusting prices
- We also impose that firms have to borrow from banks to finance working capital
- Banks lend to households and firms and are subject to two constraints:
  - A maximum leverage ratio set by macroprudential policy makers
  - Gertler-Karadi frictions – depositors have to incentivise bankers to keep their bank open as an ongoing concern rather than ‘run away’ with its assets

Model: Patient households

Maximise

$$E_0 \sum_{t=0}^{\infty} \beta_P^t \left(ln(c_{j,t}) + jA_{H,t} lnH_{j,t} - \frac{1}{1+\xi} h_{j,t}^{1+\xi} \right)$$

Subject to

$$D_{i,t} + Q_t H_{i,t} = Q_t H_{i,t-1} + R_{t-1} D_{i,t-1} + W_{P,t} h_{i,t} + \Pi_t - P_t c_{i,t} - P_t T_P - \tau_H Q_t H_{i,t}$$

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Model: Impatient households

Maximise

$$E_0 \sum_{t=0}^{\infty} \beta_I^t \left(ln(c_{j,t}) + jA_{H,t} lnH_{j,t} - \frac{1}{1+\xi} h_{j,t}^{1+\xi} \right)$$

Subject to $$L_{j,t} = Q_t(H_{j,t} - H_{j,t-1}) + R_{L,t-1} L_{j,t-1} - W_{I,t} h_{j,t} + P_t c_{j,t} - P_t T_I$$

$$L_{j,t} \leq \rho_L L_{j,t-1} + (1-\rho_L) \frac{DSRW_{I,t} h_{I,t}}{R_{L,t} - 1 + stress}$$

$$L_{j,t} \leq \rho_L L_{j,t-1} + (1-\rho_L) LTVH_{it} E_t Q_{t+1}$$

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Model: Firms

Maximise

$$\sum_{t=0}^{\infty} \frac{\beta_P^t}{P_t c_{P,t}} \left(\begin{array}{c} (1+\tau_f) P_{j,t} y_{j,t} - W_{P,t} h_{P,j,t} - W_{I,t} h_{I,j,t} \\ + L_{j,t} - R_{L,t-1} L_{j,t-1} + n A_{n,t} - \frac{\chi}{2} \left(\frac{P_{j,t}}{P_{j,t-1}} - 1 \right)^2 P_t y_t \end{array} \right)$$

Subject to

$$y_{j,t} = A_{z,t} h_{P,j,t}^{(1-\sigma)} h_{I,j,t}^{\sigma}$$

$$L_{j.t} = W_{P,t} h_{P,j,t} + W_{I,t} h_{I,j,t}$$

$$y_{j,t} = \left(\frac{P_t}{P_{j,t}} \right)^{\varepsilon} y_t$$

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Model: Banks

For a surviving bank, net worth evolves as:

$$n_{j,t} = R_{L,t-1}L_{j,t-1}(1+\tau_b) - nA_{n,t} - R_{t-1}D_{j,t-1} - \left(\frac{\phi_b}{\varphi_{max}-\varphi_{j,t}} - \frac{\phi_b}{\varphi_{max}-\bar{\varphi}}\right)n_{j,t-1}$$

Net worth will equal assets less liabilities (deposits)

$$n_{j,t} = L_{j,t} - D_{j,t}$$

So, aggregate net worth in the banking sector evolves according to:

$$n_t = \zeta\left(R_{L,t-1}L_{t-1}(1+\tau_b) - nA_{n,t} - R_{t-1}D_{t-1} - \left(\frac{\phi_b}{\varphi_{max}-\varphi_t} - \frac{\phi_b}{\varphi_{max}-\varphi}\right)n_{t-1}\right) + (1-\zeta)P_t\nu$$

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Model: Banks

The Banks' problem can be written in Bellman equation form as:

Maximise

$$\psi_t = \beta_H E_t \left(\frac{P_t}{P_{t+1}} \frac{c_{H,t}}{c_{H,t+1}} (1 - \zeta + \zeta \psi_{t+1}) \left(\left(R_{L,t}(1 + \tau_b) - R_t \right) \varphi_t + R_t - \left(\frac{\phi_b}{\varphi_{max} - \varphi_t} - \frac{\phi_b}{\varphi_{max} - \varphi} \right) - \frac{n}{n_t} A_{n,t+1} \right) \right)$$

Subject to: $\psi_t \geq \theta \varphi_t$

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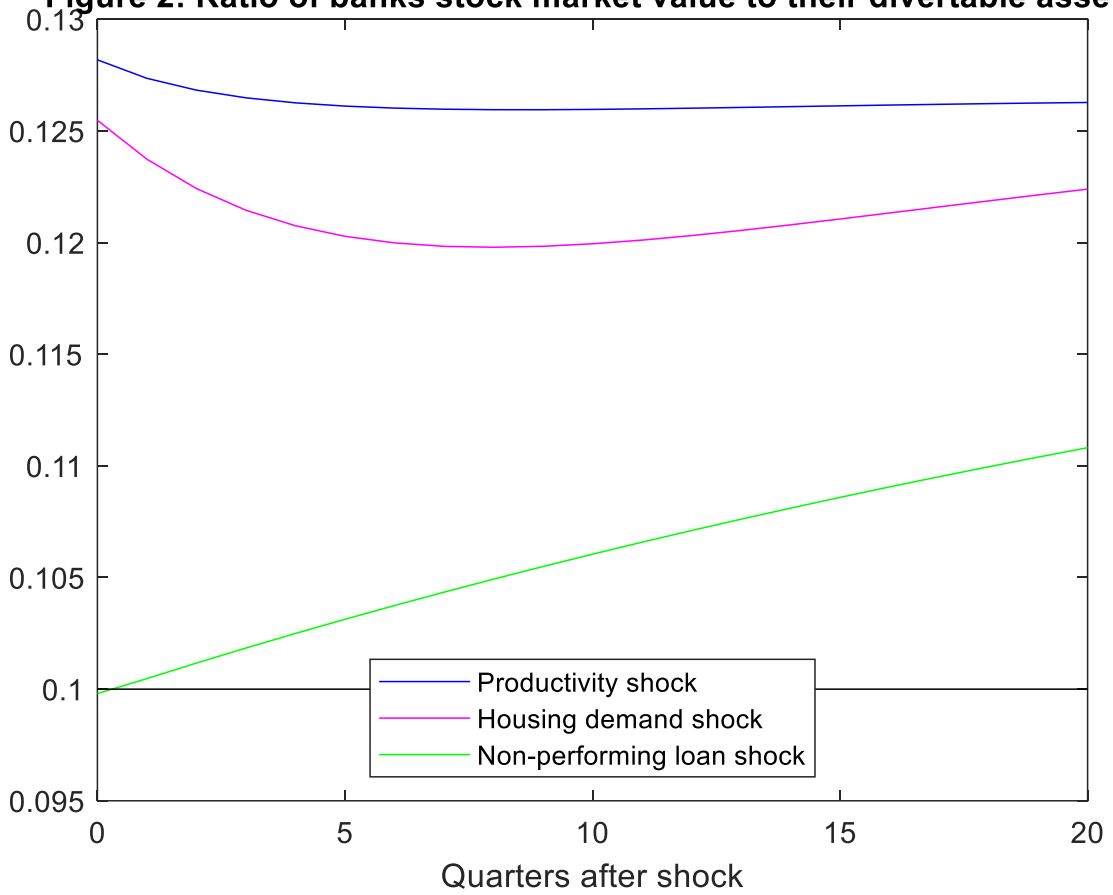
Results

Results

- Capital requirements neutralise the ‘diversion of funds’ friction

Figure 2: Ratio of banks stock market value to their divertable assets



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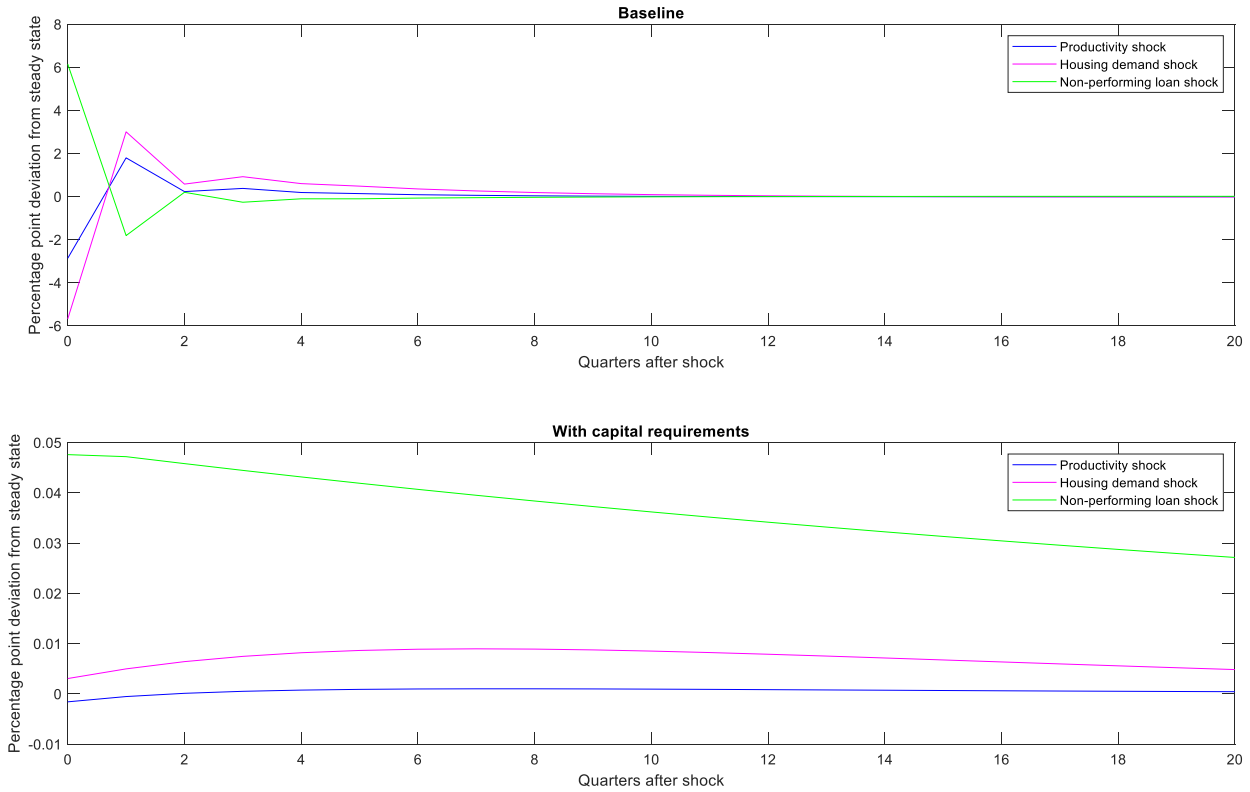
Results

- Capital requirements neutralise the effects of shocks on the lending spread

Response of the lending spread to shocks



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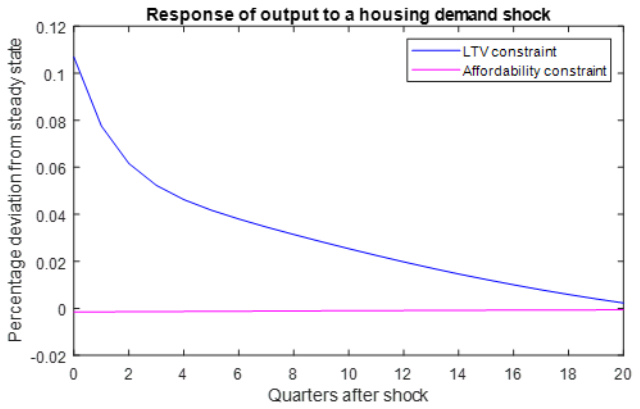
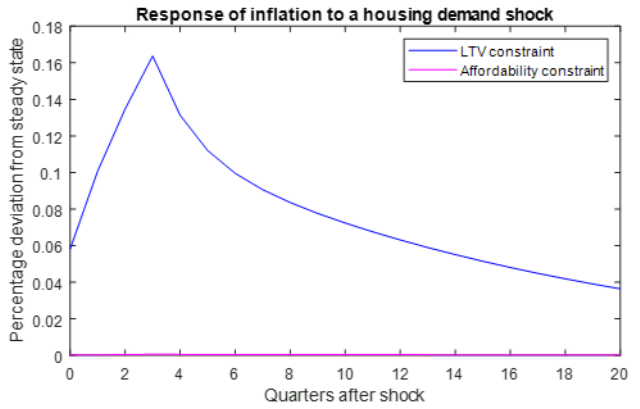
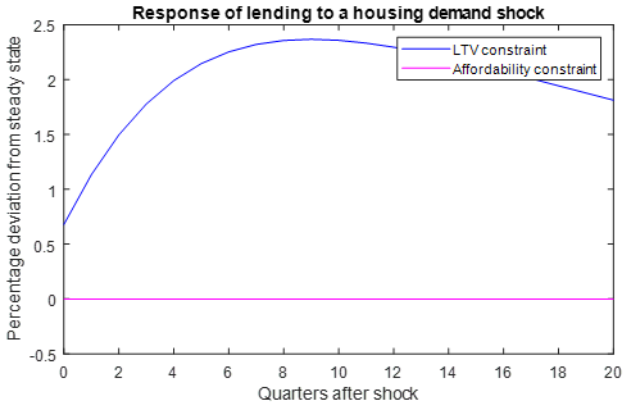
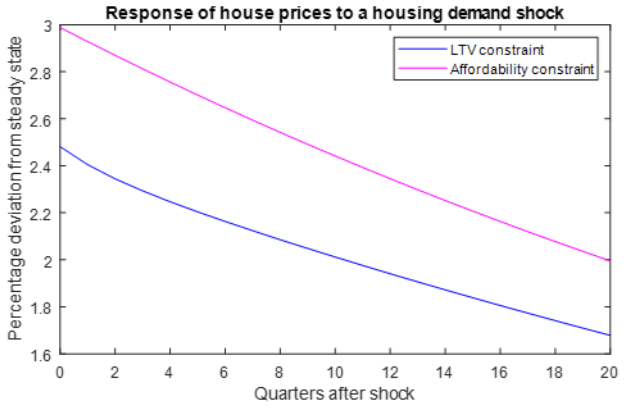
Results

- Affordability constraint insulates the real economy from a housing market shock









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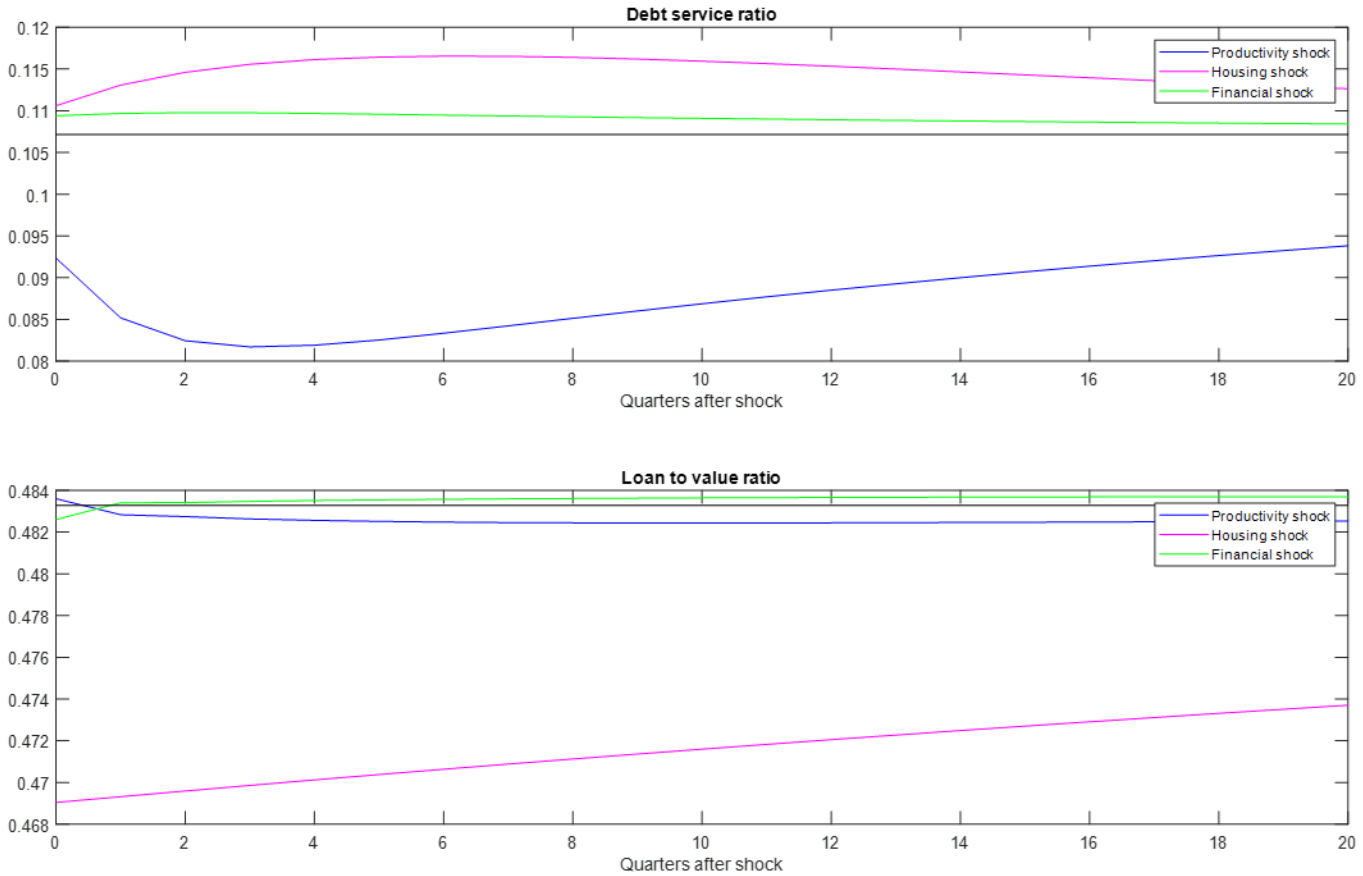
Results

- Affordability constraint ensures that loan-to-value doesn't respond much to shocks and vice versa



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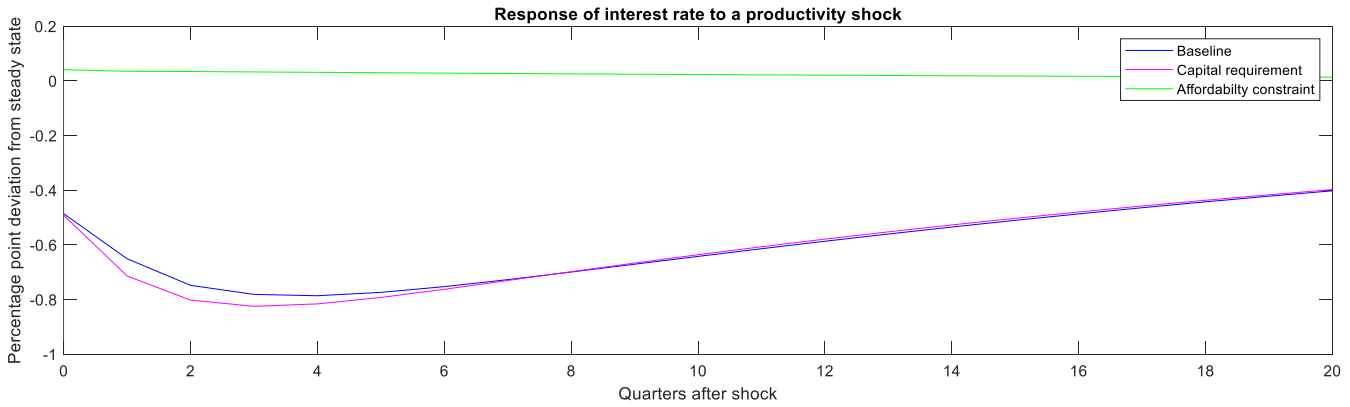
Results

- With macroprudential policy in place, monetary policy responds less to shocks



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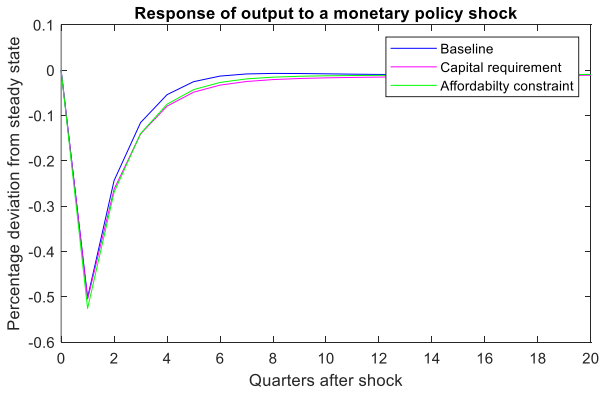
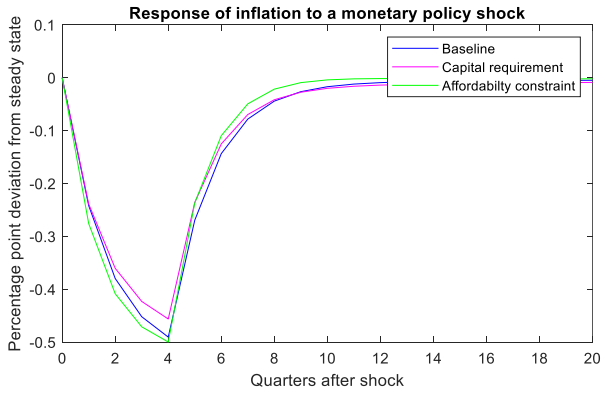
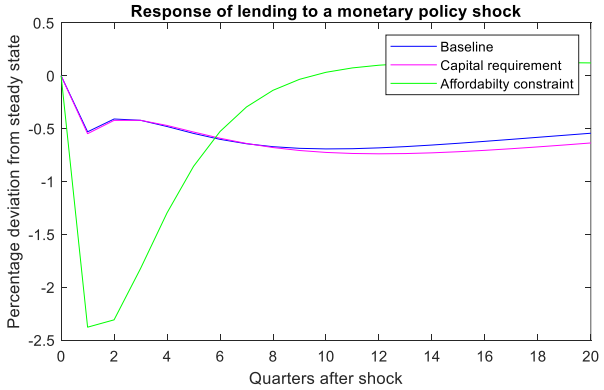
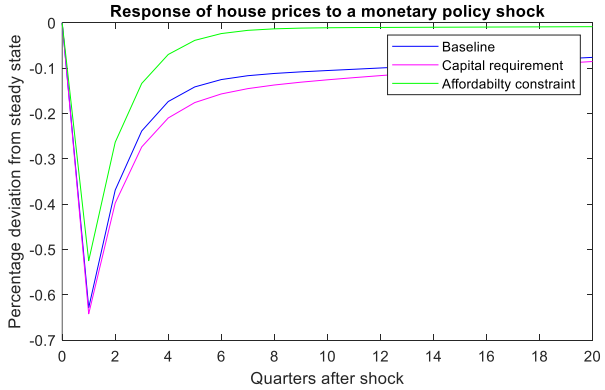
Results

- Response of lending and house prices to monetary policy depends on whether LTV or affordability constraints are in place









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Welfare implications

Welfare implications

- Set taxes and subsidies so as to ensure an efficient and symmetric steady state
- Take a quadratic approximation of the weighted sum of the two utility functions
- Welfare in this model depends on the volatilities of:
  - Output
  - Inflation
  - Consumption gap
  - Housing gap
- Given our calibration: $\mathcal{L} \approx \hat{y}_t^{\,2} + 20.8481\pi_t^2 + 0.0607\tilde{c}_t^{\,2} + 0.0094\widetilde{H}_t^{\,2}$

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Results

	σ_{GDP}	σ_{π}	σ_{cgap}	σ_{Hgap}	L
Baseline model	2.92%	3.30pp	3.96%	11.78%	0.0239
Adding capital requirements	2.90%	3.31pp	3.50%	10.69%	0.0239
Adding affordability constraint	0.35%	0.27pp	0.64%	1.56%	0.0002

- Introduction of capital requirements barely affects welfare
- Introduction of affordability constraint greatly increases welfare as it reduces the volatility of everything by roughly a factor of 10!

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Conclusions

Conclusions

- Capital requirements neutralise the effect of the financial friction
- Capital requirements neutralise the effect of financial shocks on the lending spread and hence the real economy
- Affordability constraints neutralise the effect of housing demand shocks on lending and the real economy
- Affordability constraint ensures that loan-to-value ratios do not respond much to shocks and vice versa

Conclusions

- With macroprudential policy in place, monetary policy responds less to shocks
- Response of lending and house prices to monetary policy depends on whether LTV or affordability constraints are in place
- In our model, affordability constraints lead to a large increase in welfare
  - NB This comes from leaning against the financial cycle; the welfare gains from making borrowers and lenders more resilient are not captured

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Any questions?

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