Macroprudential Policies in a Low Interest-Rate Environment

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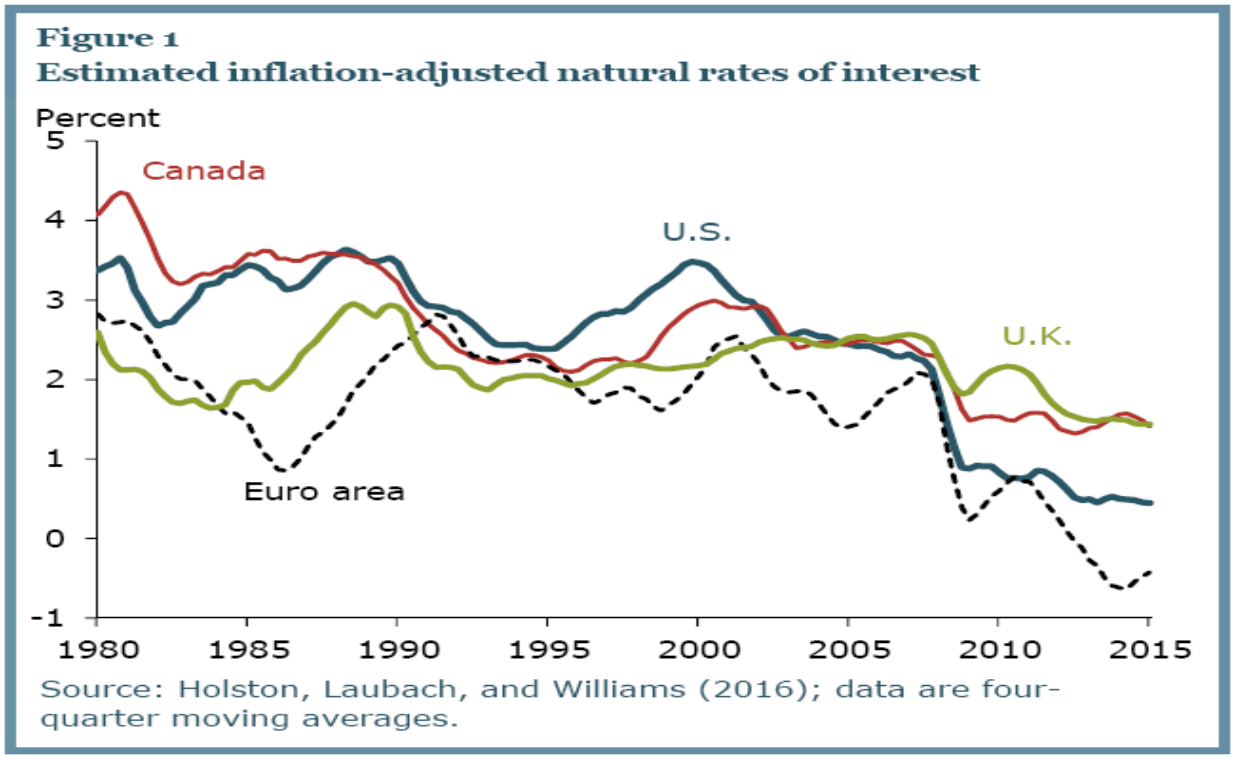
Introduction

- In the post GFC world, there are new challenges to the conduct of macro-financial stabilization policies
- One of the major changes in this new environment is a significant decline in the neutral interest rate



The low neutral interest rate

- The neutral rate is the interest rate consistent with full employment, trend growth, and stable prices
- Low neutral rates limit the scope of conventional monetary policy in stimulating the economy, bound by the ZLB
- Low interest rates raise concerns about financial imbalances and risks to financial stability

This paper argues

- In a low interest-rate environment, the case for using macroprudential policies becomes even stronger
  - Greater financial instability due to low interest rates calls for macroprudential policies to contain financial risks.
  - Macropru may also be one of the natural candidates to complement monetary policy in those times in which the conventional instrument of monetary policy is restricted.

In this paper

- We construct a simple DSGE model to capture the key elements of the interaction between monetary and macropru policies in the low interest rate environment.
- Using the model, we answer the following research question:
  - Without an active macroprudential policy, what are the consequences of a falling interest rate for business and financial cycles?
  - Can macroprudential policy contribute to both financial and macroeconomic stability in the low interest-rate environment?

Summary of findings

- We find that, in a low interest-rate environment, the binding ZLB occurs frequently, leading to greater macroeconomic volatility and financial instability
  - more volatile economy calls for additional policy tools to contain financial and macroeconomic risks.
- We find that in a low interest-rate environment, macroprudential policies need to be more aggressive in responding to credit.
- In terms of minimizing central bank's loss function, it is also desirable to let LTV respond to output directly.
  - Macroprudential policies complements to monetary policy and becomes a macroeconomic stability tool.

The Model

Overview of the model

- The economy features patient and impatient households (savers and borrowers)
  - Households work and consume both consumption goods and housing
  - Borrowers are credit constrained and need collateral to obtain loans (Iacoviello, 2005)
- The representative firm converts household labor into the final good.
- Macroprudential policy is characterized by a rule on the loan-to-value ratio (LTV) that responds to credit and output.
- Monetary policy in the model is described by a standard Taylor rule, which is subject to an occasionally binding ZLB.
- We solve the model using the "occbin" toolkit proposed by Guerrieri and Iacoviello (2015)

Savers

Savers maximize their utility function by choosing consumption, housing and labor hours:

$$\max_{C_{s,t},H_{s,t},N_{s,t}} E_0 \sum_{t=0}^{\infty} \beta_s^t \left[\log C_{s,t} + j \log H_{s,t} - \frac{(N_{s,t})^{\eta}}{\eta} \right],$$

subject to the following budget constraint:

$$C_{s,t} + b_t + q_t \left(H_{s,t} - H_{s,t-1} \right) = \frac{R_{t-1} b_{t-1}}{\pi_t} + w_{s,t} N_{s,t} + F_t$$

Borrowers

Borrowers solve the following optimization problem:

$$\max_{C_{b,t},H_{b,t},N_{b,t}} E_0 \sum_{t=0}^{\infty} \beta_b^t \left[\log C_{b,t} + j \log H_{b,t} - \frac{(N_{b,t})^{\eta}}{\eta} \right]$$

where $\beta_b \in (0,1)$ is the discount factor for the borrower ($\beta_b < \beta_s$), subject to the following budget and collateral constraints:

$$C_{b,t} + \frac{R_{t-1} b_{t-1}}{\pi_t} + q_t \left(H_{b,t} - H_{b,t-1} \right) = b_t + W_{b,t} N_{b,t}$$

$$E_t \frac{R_t}{\pi_{t+1}} b_t = k_t E_t q_{t+1} H_{b,t}$$

Firms

The intermediate goods market is monopolistically competitive:

$$Y_t(z) = A_t N_{s,t}(z)^{\alpha} N_{b,t}(z)^{(1-\alpha)}$$

A_t represents technology and it follows the following autoregressive process:

$$\log(A_t) = \rho_A \log(A_{t-1}) + u_{At}$$

Firms set prices à la Calvo (1983), and this gives rise to a standard forward-looking New Keynesian Phillips curve:

$$\widehat{\pi}_t = \beta E_t \widehat{\pi}_{t+1} - \psi \widehat{x}_t + u_{\pi t}$$

Equilibrium

The market clearing conditions are as follows:

$$Y_t = C_{s,t} + C_{b,t}$$

The total supply of housing is fixed and it is normalized to unity:

$$H_{s,t} + H_{b,t} = 1$$

Monetary Policy

We consider a standard Taylor rule which responds to inflation and output, with interest-rate smoothing:

$$R_t^{TR} = \left(R_{t-1}^{TR}\right)^{\rho} \left((\pi_t)^{\left(1+\phi_\pi^R\right)} \left(\frac{Y_t}{Y}\right)^{\phi_y^R} R \right)^{1-\rho}$$

We impose a ZLB constraint on the interest rate so that it cannot reach negative values:

$$R_t = \max\left(R_t^{TR}, 1\right)$$

Macroprudential Policy

A macroprudential rule for the LTV:

$$k_t = k_{SS} \left(\frac{b_t}{b} \right)^{-\phi_b} \left(\frac{Y_t}{Y} \right)^{-\phi_y},$$

extended to include an output term.

Calibration

Parameter Values		
β_s	0.99/0.995	Discount Factor for Savers
β_b	0.98/0.985	Discount Factor for Borrowers
j	0.1	Weight of Housing in Utility Function
η	2	Parameter associated with labor elasticity
k_{SS}	0.9	Loan-to-value ratio
α	0.64	Labor share for Savers
X	1.2	Steady-state markup
θ	0.75	Probability of not changing prices
ρ	0	Smoothing parameter in Taylor rule
ϕ_π^R	0.5	Inflation parameter in Taylor rule
ϕ_y^R	0.5	Output parameter in Taylor rule

The Occbin Solution

The occasionally binding ZLB

- Standard solution methods for DSGE models did not take into account the possibility of an occasionally binding ZLB
- Solving an occasionally binding constraint can be technically challenging, we use the solution method proposed by Guerrieri and Iacoviello (2015): the "occbin" toolbox.
- Occbin tool box implements a piecewise-linear approximation to DSGE models with two regimes.
- A "guess-and-verify" algorithm is used to solve for the rational expectations solution for unknown durations of each regime.
  - The duration of binding regime is endogenous to policy actions.

Model dynamics with occbin

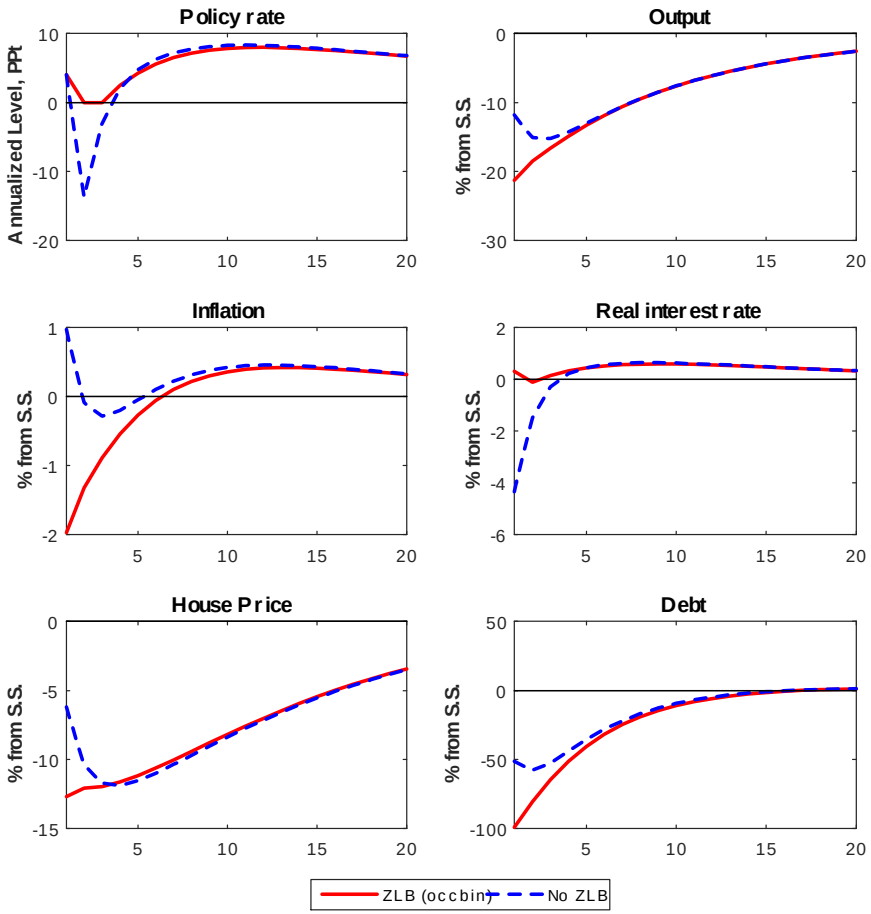


Figure: Impulse responses to a negative productivity shock

Summary

- Two propagation mechanisms at work:
  - *Collateral constraint channel:* The negative impact of the productivity shock is amplified by the collateral channel of borrowers, even without a ZLB.
  - *ZLB channel:*The combination of deflation and the binding ZLB of the nominal interest rate pushes up the real cost of borrowing, which further depresses house prices and credit, triggering the second round collateral effect on the real economy.

Policy Analysis

A low interest-rate environment

- The decline in the long-term interest rate, especially in the post-crisis period, may have implications both for financial stability and the implementation of monetary policy.
- We explore the consequences of a low steady-state interest rate, when an occasionally binding ZLB is explicitly considered
  - We simulate our model with the same productivity shock process under two levels of steady-state interest rates (4% and 2%)
  - Given the same size of shocks, we show that, in a low interest-rate environment, the interest rate is more likely to hit the ZLB and the economy is more volatile than the economy with a high interest rate.

Simulations of high vs. low interest rate environment

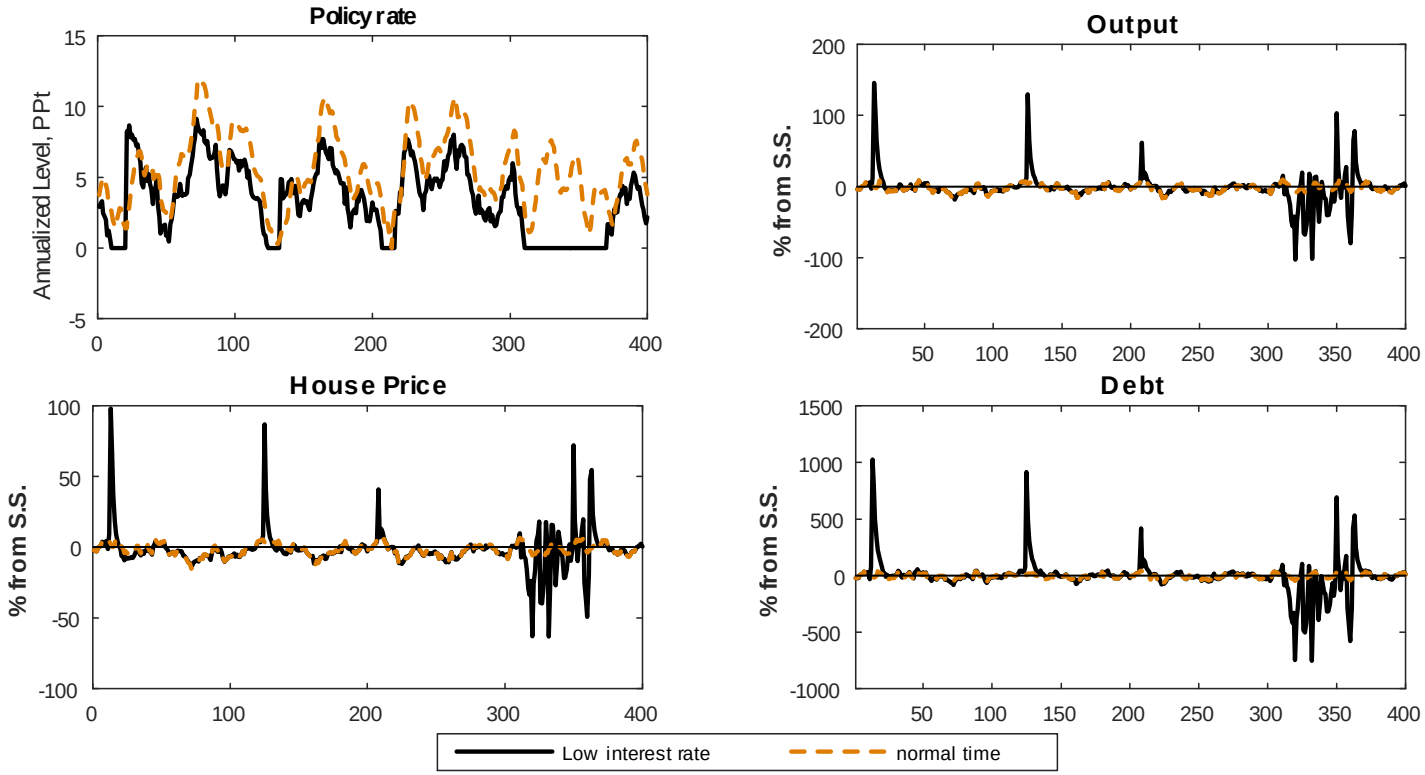


Figure: Simulated economy for productivity shocks. "Normal times" (4% SS interest rate) vs. "Low interest rate" (2% SS interest rate).

Summary

- Given the same size of shocks, the "low interest-rate" economy is more frequently bound by the ZLB.
  - Monetary policy becomes less effective in stimulating the economy against negative shocks.
- Due to the channels we discussed before, the economy becomes more volatile in a "low interest-rate" environment.
  - Amplified financial cycles
  - More volatile macroeconomy.
- Economies with financial frictions and low interest rates are particularly vulnerable when the conventional monetary policy is subject to the ZLB constraint
  - This circumstance calls for the need of other policies to stabilize the economy.

What can macroprudential policy do in the low interest rate environment?

- A natural candidate that could help monetary policy in this situation is macroprudential policy.
- In a low interest-rate world, the case for using macroprudential policies is even stronger:
  - It can be used to deal with financial instability, which is an important problem in this case
  - It can act as a complement to monetary policy when it hits the ZLB to stabilize the real economy

An active macroprudential rule

- We first compare the case with and without a countercyclical macroprudential rule.
- As a starting point, we study a simple LTV rule that responds only to credit:

$$k_t = k_{SS} \left(\frac{b_t}{b} \right)^{-\phi_b},$$

where we tentatively set the reaction parameter ϕ_b to 0.2.

IRFs with and without an active macropru policy

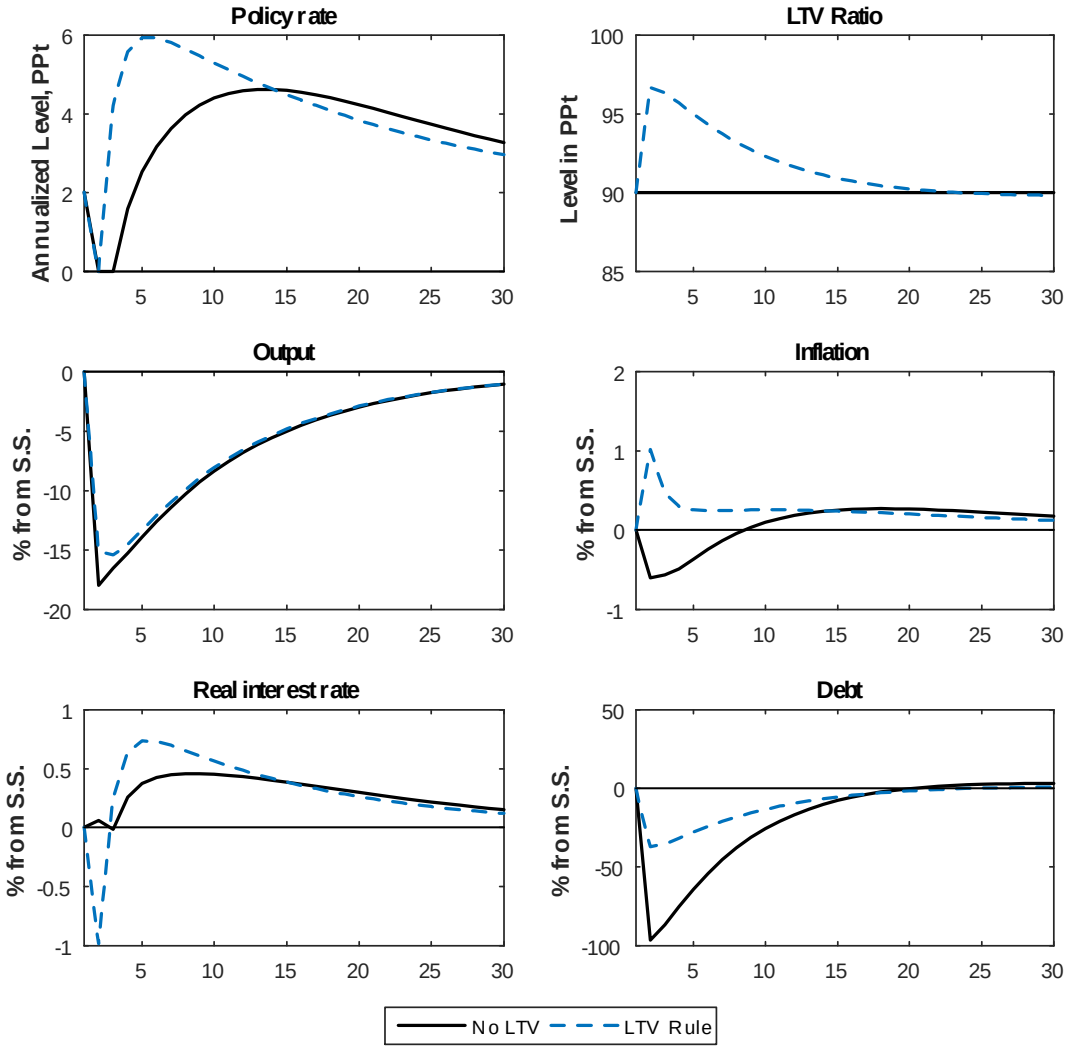


Figure: The effect of an active LTV rule with ZLB

Summary

- Without an active LTV policy, the interest rate immediately drops to the ZLB and stays there for a few periods
  - The economy suffers a deep recession, where both output and inflation fall
  - The effect of a negative productivity shock is amplified by the collateral channel and the rising real interest rate due to the binding ZLB
- When a countercyclical LTV rule can be used to help the economy, it relaxes the LTV by about 10 percentage points.
  - The provision of credit is supported by the LTV loosening
  - Inflation increases instead of falling, which lifts the interest rate out of the ZLB more quickly
  - The real interest rate falls, providing the real economy with the kind of support that would have been achieved by monetary policy

Optimal simple rules for LTV

- We assess the optimal combination of parameters in the LTV rule, which minimizes a loss function of the macroprudential authority, taking monetary policy as given
- We assume that the macroprudential authority cares about the variability of credit, as a proxy for financial stability, and the variability of the instrument:

$$L = \Lambda \sigma_b^2 + \sigma_{LTV}^2$$

- A macroprudential rule for the LTV:

$$k_t = k_{SS} \left(\frac{b_t}{b} \right)^{-\phi_b} \left(\frac{Y_t}{Y} \right)^{-\phi_y},$$

- Searching over a grid of parameters to minimize the loss function:

$$\left(\phi_b^*, \phi_y^* \right) = \arg\min L \left(\phi_b, \phi_y \right)$$

Results

Optimized Parameters					
	ϕ_b^*	ϕ_y^*	σ_b^2	σ_y^2	Loss
Benchmark (No LTV)					
High interest rate	-	-	31.16	2.4	1.2899
Low interest rate	-	-	85.46	8.11	4.3749
LTV Rule with Credit					
High interest rate	0.55	-	3.85	1.93	0.1699
Low interest rate	0.69	-	11.51	6.76	0.8347
Extended LTV Rule					
High interest rate	0.55	0	3.85	1.93	0.1699
Low interest rate	0.11	0.8	9.46	5.13	0.5905

Summary

- When we introduce an active LTV rule responding to credit only, financial stability is improved dramatically without compromising macroeconomic stability
- This is particularly true in the low interest rate environment.
- When the economy is closer to the ZLB, the optimized rule responds more strongly to output than to credit
  - Monetary policy is often constrained by the binding ZLB
  - In this case, macroprudential policy has to lend a helping hand to monetary policy, to assist macroeconomic stabilization
  - As a result, the whole economy improves in terms of the volatilities in both the macroeconomic and the financial sector

Conclusion

Conclusion

- We use a DSGE model to study the implications of financial frictions and an occasionally binding ZLB for macro stabilization policies.
- We find that, when interest rates are low, the ZLB limits effectiveness of monetary policy, leading to greater macroeconomic volatility and financial instability
- In this context, the economy calls for the use of active macroprudential policies to contain financial stability and to act as a complement to the less effective monetary policy.
- Our finding is purely theoretical based, though. In reality, there are many difficulties with regard to implementing macroprudential policy.
- Interesting future research: optimal policy mix under an occasionally binding ZLB, distributional effects of macropru policy