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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

  - Low neutral rates limit the scope of conventional monetary policy in stabilizing the economy, especially when it hits the ZLB

 - Low interest rates raise concerns about financial imbalances and risks to financial stability

The neutral/natural rate of interest

- The neutral rate is the interest rate consistent with full employment, trend growth, and stable prices
- An economy in this state presumably would not need to be stimulated or slowed by monetary policy

Evidence

Figure 1
Estimated inflation-adjusted natural rates of interest

Percent

Canada

U.S.

U.K.

Euro area
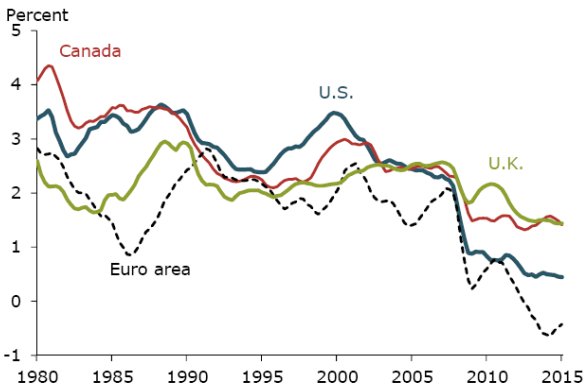
Source: Holston, Laubach, and Williams (2016); data are four-quarter moving averages.

Macroprudential Policy in a Low Interest-Rate Environment

- 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 instrument of the central bank is restricted

Research Questions

- Without an active role for macroprudential policy, what are the consequences of a steady-state interest rate falling from 4% to 2% for business and financial cycles?

- Can macroprudential policy contribute to both financial and macroeconomic stability in the low interest-rate environment?

Overview of the model

- DSGE with collateral constraints on borrowers and an occasionally binding ZLB for the interest rate
    - Monetary policy in the model is described by a standard Taylor rule, which is subject to an occasionally binding ZLB
- Macroprudential policy is characterized by a rule on the loan-to-value ratio (LTV) that responds to credit and output
- We calibrate the model to match a low interest-rate environment by setting the steady-state interest rate equal to 2%
- We solve the model using the "occbin" toolkit proposed by Guerrieri and Iacoviello (2015)

Summary

- 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.
- The representative firm converts household labor into the final good
- The central bank follows a Taylor rule for the setting of the interest rate, which is constrained by a lower bound
- The macroprudential regulator uses the LTV as an instrument for macroprudential policy.

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:

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

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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:

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

A_t represents technology and it follows the following autoregressive process:

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

Solving the firm's problem we can obtain 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 occasionally binding ZLB

- Standard solution methods for DSGE models did not take into account the possibility of having the interest rate constrained at the ZLB
- Even absent of large shocks, we have seen, in many economies across the world, interest rates hitting their lower bounds
- We consider an occasionally binding ZLB and use the solution method proposed by Guerrieri and Iacoviello (2015): "occbin"
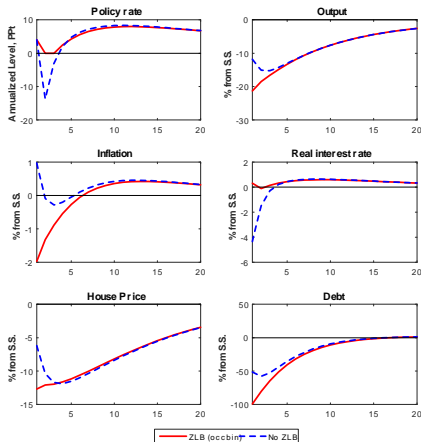
Model dynamics with occbin (1)

Figure: Impulse responses to a negative productivity shock

Model dynamics with occbin (2)

- With occasionally binding constraints for the interest rate, the policy rate reaches the zero lower bound and stays there for a couple of periods before converging to the Taylor rule interest rate

- The non-constrained interest rate, however, becomes negative.

- Both output and inflation respond in a much stronger manner in the world in which the interest rate is constrained.

  - The negative impact of the productivity shock is amplified by the collateral channel of borrowers, even without a ZLB.
  - When the interest rate is restricted by the ZLB, the latter provides an additional amplification of the shock: 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 collateral effect on the real economy.

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.
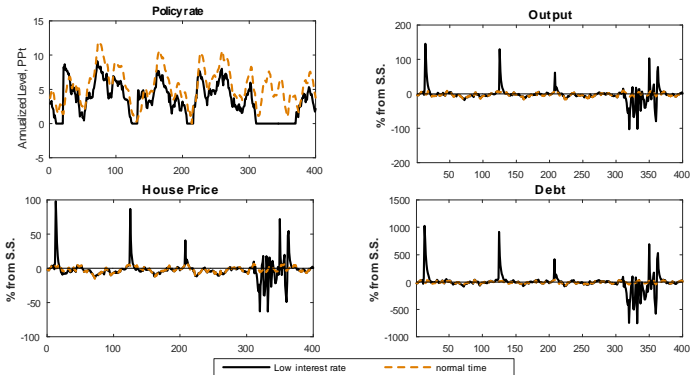
Simulations

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

Simulations (2)

- In "normal times" the economy never hits the ZLB, while in the "low interest-rate" setting, the constraint binds several times and for extensive periods.
  - Monetary policy becomes less effective, because it loses its ability to further stimulate the economy.
- In "normal times" the economy is less volatile than 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.

How can macroprudential policy help?

- 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
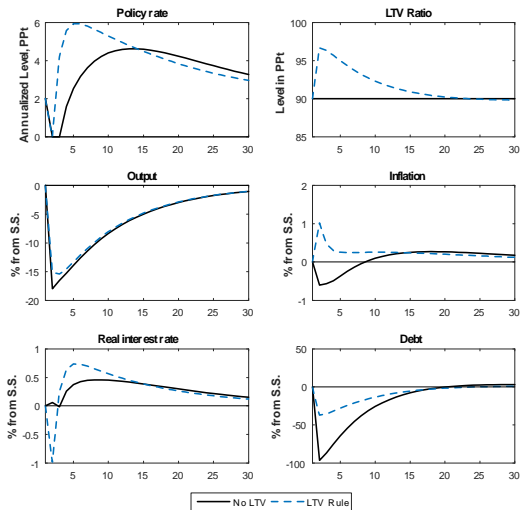
Simulations (1)

- We first compare the impulse responses of the model with and without an active LTV rule, taking the monetary policy rule as given

- 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.

Simulations (2)

Simulations (3)

- 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 the 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:

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

- Searching over a grid of parameters, the solution of this problem is represented by the following expression:

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

The rule as a complement for monetary policy

- As a first approach, we consider a rule in which the macroprudential regulator only responds to credit deviations from the steady state, that is, we impose $\phi_y = 0$

- Then, we extend the rule to allow the macroprudential instrument to also respond to output.

  - When the economy reaches the ZLB, monetary policy loses its effectiveness to stabilize the economy
  - Thus, we study whether macroprudential policies could be used as a complement to monetary policy for macroeconomic stabilization.

Results

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

LTV rule with credit

- When we introduce an active LTV rule responding to credit only, financial stability is improved dramatically without compromising macroeconomic stability

  - In normal times, the macroprudential policy delivers a much lower variability of credit and it also helps with macroeconomic stability
  - In the 2% interest-rate world, however, the optimized LTV rule has to respond to credit more aggressively, and it dampens mostly the volatility of credit,

- When monetary policy is restricted by the occasionally binding ZLB, purely credit-focused macroprudential policy might be less helpful for the real economy

  - This finding points to a more active role for macroprudential policy in stabilizing the real economy.

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Extended LTV rule

- In normal times, since monetary policy already does its job properly, there is no need for the LTV rule to respond to output directly
  - The so-called "Tinbergen principle" applies

- When the economy is closer to the ZLB, however, 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 (1)

- We build a DSGE model in which interest rates are permanently low and monetary policy is constrained by the ZLB
- We study the implementation of macroprudential policies, represented by an LTV rule
- In particular we answer the following research questions:
  - Are macroprudential policies more relevant in a low interest-rate environment?
  - Can macroprudential policies complement monetary policy when the latter binds at the ZLB occasionally?

Conclusion (2)

- We find that when interest rates are persistently low, the ZLB occurs frequently, 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.

- We find that in a low interest-rate environment, macroprudential policies need to be more aggressive in responding to credit.

- Furthermore, when the LTV is allowed to respond to output, it will respond to output more strongly than to credit

  - Macroprudential policies can act as a complement to monetary policy.