The Conduct of LTV Policy under Inflationary Shocks

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Introduction

- The current inflationary environment poses a new challenge to the conduct of macro-stabilization policies
  - Inflationary shocks push up inflation and trigger intense monetary tightening =>high interest rate and inflation raise the concern on borrowers' financial resilience
  - Many advanced economies have tightened their macroprudential policies (ESRB database) =>This could further amplify the negative effect of inflationary shocks on growth
- Inflationary shock triggers responses from MP and MaP if they follow their conventional mandates separately => this may generate sub-optimal outcomes

Motivation

- Since the 2008 Global Financial Crisis, macroprudential policies have been at the forefront of the economic policy-making against risks of financial instability.
- There has been a debate about coordinating goals and implementations of MaP and MP.
- Up to now, however, two policies have been largely perceived as distinct and separate policies, with different objectives and different instruments (see e.g. Svensson, 2012)

What we do

- Research question: How monetary and macroprudential policies should interact in the light of an inflationary environment?
  - Use a standard DSGE model with a collateral constraint (Iacoviello, 2005)
  - Study the interaction between MP and MaP under cost-push shocks.
  - Show trade-offs faced by policy-makers and how collateral constraints change them
  - Assess optimal rules for LTV coordinating with monetary policy

Key findings (trade-offs)

- The collateral constraint creates new trade-offs between macro and financial stability (additional to the monetary policy trade-off between inflation and output under supply shocks => Taylor Curve)
- Tightness of collateral constraints affects both trade-offs in different ways => Loosening LTV eases the trade-off between inflation and output, but it comes at the cost of a worsened trade-off between inflation and financial stability
- As a result, the optimal policy mix calls for a coordination between LTV and monetary policy

Key findings (policy coordination)

- Under a non-coordination regime, regardless of the monetary policy stance, macroprudential policy chooses a strong response to housing cycles
  - Borrowers have to pay higher interest rates to their debts
  - Borrowers face a tougher borrowing condition => tighter LTV makes them more difficult to smooth consumption and access housing services
- Under a coordination regime, macroprudential policy is set with the reflection of the stance of monetary policy
  - This leads to an overall weaker response to housing cycles when monetary policy is fighting inflation

Inflation shocks

- Inflation shocks are important for future transactions in the economy and have implications for monetary policy
  - It is a fact that under cost-push shocks, monetary policy encounters difficulties in stabilizing output and inflation at the same time
  - Trade-offs in policy become apparent and give rise to the use of other policies acting as a complement to monetary policy, for instance macroprudential policy
  - The use of these measures may have brought some extra risks to financial stability.

Related Literature

- Our paper is closely related to the literature that studies the interaction between LTV limits or rules and monetary policy
  - Angelini et al. (2012) consider optimal monetary and macroprudential policy rule, using both the LTV and the capital requirement as a tool
  - Rubio and Carrasco-Gallego (2014) and Lambertini et al. (2013) study the interaction between LTV rules and monetary policy
  - Rubio and Yao (2020) focus on LTV and monetary policy interaction in the context of the Zero Lower Bound (ZLB)
  - Ferrero et al (2024) study the optimal design of an LTV policy and its implications for monetary policy, accounting for an effective lower bound on the nominal interest rate and an upper bound for the LTV

Main Contribution

- Our paper contributes to this literature studying the issue in an inflationary environment, in which the monetary policy trade-offs are emphasized.

The model: 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

Savers

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

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

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:

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

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:

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

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

Macroprudential Policy

- k is a proxy for the LTV ratio
- This could potentially represent an instrument for macroprudential policy
  - Discretionary changes in the LTV
  - LTV could follow a countercyclical Taylor-type rule

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:

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

where u_{At} represents a technology shock

The Phillips Curve

Solving the firm's problem we can obtain a standard forward-looking New Keynesian Phillips curve:

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

where $u_{\pi t}$ represents a cost-push (inflation) shock

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:

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

Welfare-based Loss Function

- We use welfare-based loss function to evaluate optimal policy (Rubio and Yao, 2020)
- A linear-quadratic approximation of the utility function and equilibrium conditions yields:

$$W_0 \simeq -\frac{1}{2} E_0 \sum_{t=0}^{\infty} \beta_s^t \left[\widetilde{y}_t^2 + \lambda_\pi \pi_t^2 + \lambda_c \widetilde{c}_t^2 + \lambda_h \widetilde{h}_t^2 \right],$$

- The first two terms reflect the two distortions associated with price rigidity and monopolistic competition.
- The last two arise from the heterogeneity between the two types of agents in terms of their access to finance (collateral constraint)

Calibration

Parameter Values		
β_s	0.99	Discount Factor for Savers
β_b	0.98	Discount Factor for Borrowers
j	0.2	Weight of Housing in Utility Function
η	2	Parameter associated with labor elasticity
k_{SS}	0.8	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	0.8	Smoothing parameter in Taylor rule
ϕ_π^R	0.5	Inflation parameter in Taylor rule
ϕ_y^R	0.25	Output parameter in Taylor rule

Role of the Collateral Constraints in propagating shocks (Demand)

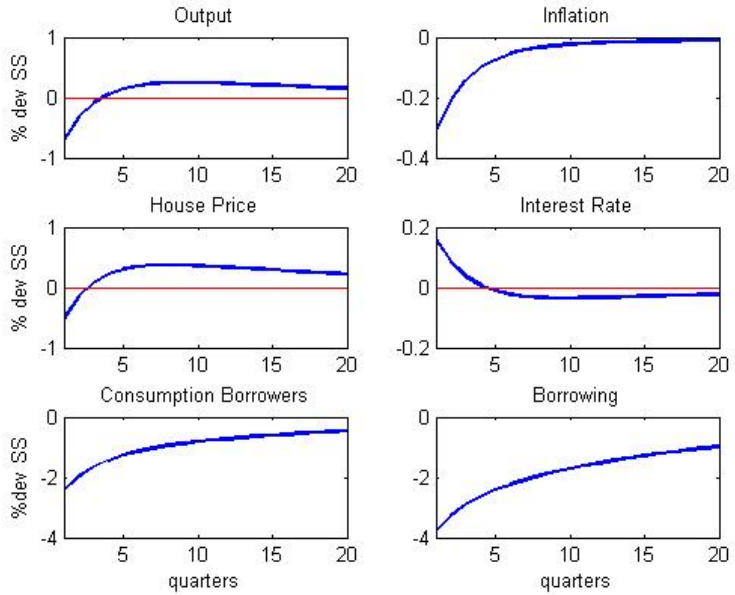


Figure: Impulse responses to Monetary Policy Shock

Dynamics: Demand (monetary policy) Shock

- Following a negative demand shock, the economy contracts (both output and inflation go down)
- House prices decrease and collateral constraints lead to sharp decline in borrowers' consumption
- The collateral effect reinforces the initial negative effect of demand shocks on inflation.

Role of the Collateral Constraints in propagating shocks (Supply)

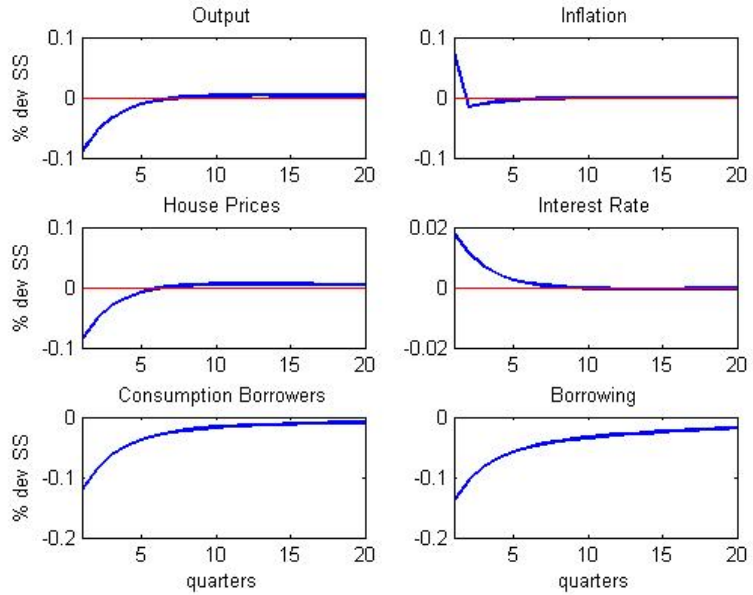


Figure: Impulse responses to Cost-Push Shock

Dynamics: Cost-push Shock

- A positive cost-push shock pushes up inflation, but depresses output
- The economy contracts and housing demand goes down, pushing house prices down
- Through collateral constraints, borrowers' consumption contracts
- The collateral channel offset at least partially the initial effect of the cost-push shock on inflation

The Taylor Curve explained

- Taylor (1979) pointed out that a central bank faces a trade-off between the volatility of the output gap and volatility of inflation, which has become known as the Taylor curve (TC).
- The TC can be seen as a "second-order" Phillips curve faced by monetary policy
- The trade-off is particularly relevant in the presence of cost-push shocks since a central bank cannot simultaneously reduce the variance of output and inflation.
- TC depicts the policy frontier in which monetary policy operates

The policy frontiers

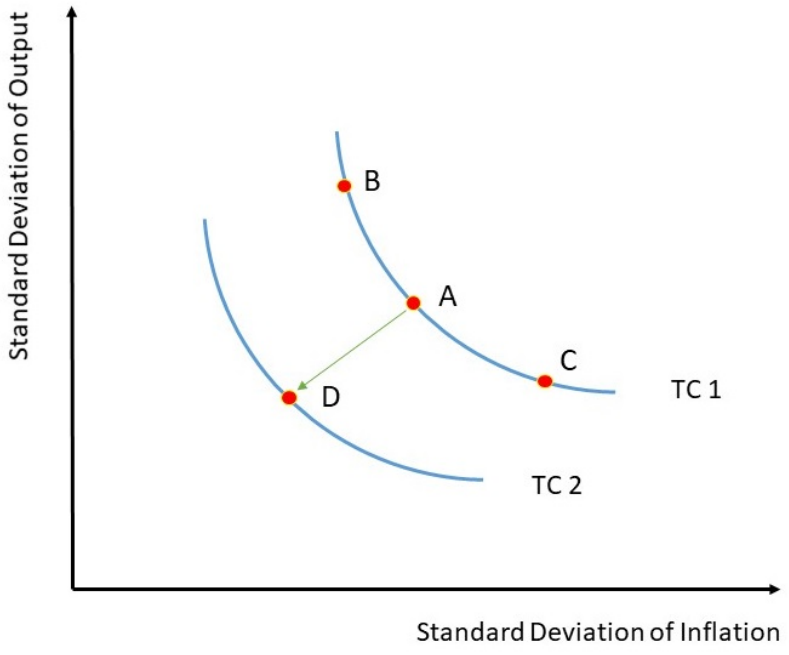


Figure: Policy Frontier for Monetary Policy

The frontiers explained

- A Central Bank operating efficiently would be on the Taylor curve (the smallest variance of in‡ation obtainable for any given variance of the output gap)
- An efficient central bank that weights price stability quite heavily will operate on its Taylor curve at a point such as A
- A change in policymakers'preferences towards output stability will necessitate a movement towards a point such as B
- Point C represents suboptimal monetary policy
- A change in regime, implying more efficient monetary policy, could result in an inward shift of the Taylor curve to T2

Trade-offs in the presence of collateral constraints

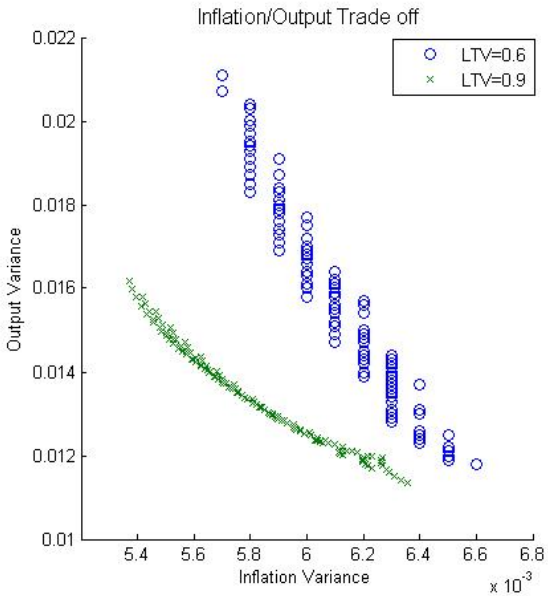
- Under a collateral constraint, the policy frontier becomes more complex:
  - The position of the traditional trade-off can be affected by the tightness of the collateral constraint
  - New dimensions of trade-offs arises too $=>$ As welfare-based loss function implies additional variables (housing and consumption gaps becomes relevant for optimal policy)

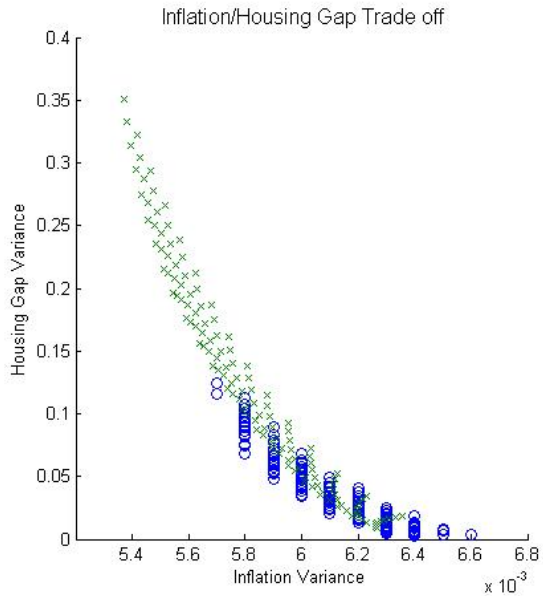
Standard Deviations

Simulated Standard Deviations			
LTV	0.7	0.8	0.9
Output	11.78	11.56	11.25
Inflation	7.90	7.85	7.72
Consumption Gap	0.97	1.15	1.54
Housing Gap	1.72	2.09	2.83

Notes: Numbers expressed in the table are in percentage points (%)

Monetary Policy Trade-offs under collateral constraints





Should LTV policy be coordinated with monetary policy?

- Under a collateral constraint, MaP and MP interact in the presence of inflation shocks
- A loose LTV can help stabilize output without creating more inflation (through the collateral channel)
- However, it also makes the new TC steeper, worsening the new trade-off between inflation and the housing gap between borrowers and savers.
- Both trade-offs capture the key channel through which monetary and LTV policy interact.

Optimal simple rules for the LTV

- We study how an LTV rule should be used in conjunction with monetary policy under an inflationary shock
- Assess the optimal simple rule for LTV, under both coordinated and non-coordinated regime with MP
- We assume that the macroprudential authority chooses the optimal response to house cycles using the LTV, taking monetary policy as given

Optimized LTV rule

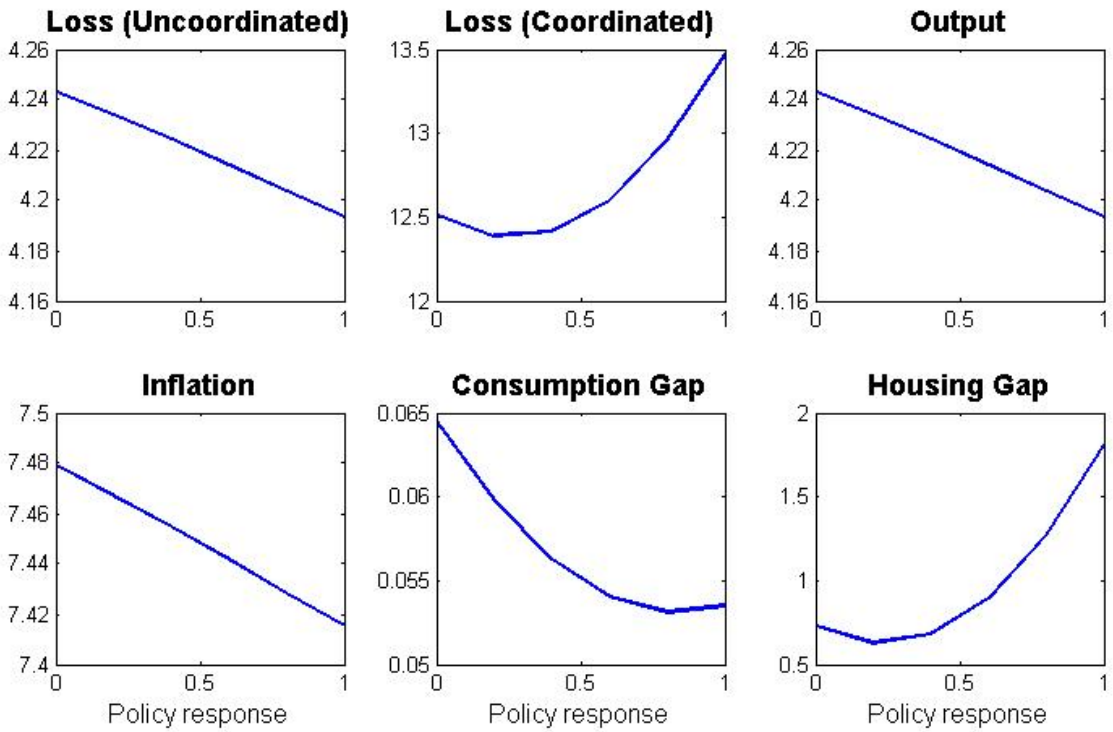


Figure: Optimized LTV rule under monetary policy stance

Figure explained

- In this figure, we present different panels corresponding to losses and variabilities for the optimized LTV rule, for a continuum of different values of the inflation coefficient in the Taylor rule
- When the LTV coefficient increases both inflation and output volatility go down, but the volatility of the housing gap goes up
- Intuitively, tightening LTV policy will increasingly restrict borrowers from buying houses and therefore larger housing inequality prevails
- This figure illustrates the trade-off faced by macroprudential policy under inflationary shocks - economic volatility and inequality

Standard Deviations

Simulated SD. under different policy rules							
		ϕ_{MP}	**0.5**	**1**	**1.5**	**2**	**2.5**
Non-coordination Regime		ϕ^*_{LTV}	1	1	1	1	1
	Variance	**Output**	3.68	4.19	4.64	5.11	5.59
		Inflation	0.52	0.47	0.43	0.39	0.35
		Consumption Gap	0.56	0.52	0.62	0.74	0.89
		Housing Gap	18.1	23.5	30.4	37.7	45.1
	Welfare Loss		13.4	13.5	13.8	14.2	14.8
Coordination Regime		ϕ^*_{LTV}	0.4	0.2	0.2	0	0
	Variance	**Output**	3.73	4.23	4.68	5.15	5.65
		Inflation	0.52	0.47	0.43	0.39	0.35
		Consumption Gap	0.58	0.58	0.66	0.80	0.92
		Housing Gap	8.04	8.15	8.22	8.01	7.60
	Welfare Loss		12.7	12.4	12.2	12.0	11.9

Notes: Numbers expressed in the table are in percentage points (%).

Table explained

- We report the simulated variance of macro variables and the welfare loss, for a certain stance of monetary policy against inflation
- We call it "Non-coordination regime", in the upper panel, where the macroprudential policy is narrowly focused on stabilising house prices.
- In the "Coordination regime", the LTV rule is optimised by minimising the welfare-based loss function, in which macroprudential policy also takes the economic inequality

Summary of Results

- Under the "Non-coordination regime", macroprudential policy is set independently from monetary policy
- Regardless of the monetary policy stance against inflation, macroprudential policy chooses the strongest response to house prices
- The "Coordination regime" leads to an overall weaker response to house prices

Conclusions

- This paper studies LTV policy as a macroprudential tool and its interactions with monetary policy, under an inflationary environment
- The combination of inflation shocks and collateral constraints creates new trade-offs
- This environment calls for coordination between MaP and MP
  - Under a cost-push shock, policy coordination improves welfare-based losses, compared to a non-coordination regime
  - Best outcome lies where monetary policy is set to fight inflation but macroprudential policy accommodates for borrowers who are facing higher interest rates imposed by tightened monetary policy