Inflation versus price-level targeting with heuristics switching and a zero lower bound on nominal interest rates

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Motivation

- The Financial Crisis has led to a resurgence of interest in expectations formation. Under heuristics switching, agents choose between simple forecasting rules which are subject to a 'fitness test' (Brock and Hommes, 1997).
- However, little is known about the merits of alternative monetary policies in this context. I therefore compare inflation targeting (IT) and price-level targeting (PT). *Zero lower bound* is included. So is a banking sector.
- PT is known to perform well under RE, but is it a good idea once cognitive limitations are taken into account?

Model

Behavioral macro model (De Grauwe and Macchiarelli, 2015):

$$y_t = a_1 \widetilde{E}_t y_{t+1} + (1-a_1) y_{t-1} + a_2 (i_t - \widetilde{E}_t \pi_{t+1}) + \varepsilon_t$$

$$\pi_t = b_1 \widetilde{E}_t \pi_{t+1} + (1-b_1) \pi_{t-1} + b_2 y_t + \eta_t$$

where

$$\widetilde{E}_t y_{t+1} = \alpha^y_{f,t} \widetilde{E}^f_t y_{t+1} + (1-\alpha^y_{f,t}) \widetilde{E}^e_t y_{t+1}$$

$$\widetilde{E}_t \pi_{t+1} = \alpha^\pi_{f,t} \widetilde{E}^f_t \pi_{t+1} + (1-\alpha^\pi_{f,t}) \widetilde{E}^e_t \pi_{t+1}$$

- Fundamentalists:

$$\widetilde{E}^f_t y_{t+1} = y^* \quad \text{and} \quad \widetilde{E}^f_t \pi_{t+1} = \pi^* \quad (\text{here } y^* = \pi^* = 0)$$

- Extrapolators:

$$\widetilde{E}^e_t y_{t+1} = y_{t-1} \quad \text{and} \quad \widetilde{E}^e_t \pi_{t+1} = \pi_{t-1}$$

- Proportions of each type determined by a 'fitness test':

$$\alpha^z_{f,t} = \frac{\exp(\gamma U^z_{f,t})}{\exp(\gamma U^z_{f,t}) + \exp(\gamma U^z_{e,t})} \quad \text{for } z = y, \pi$$

$$\text{and} \quad U^z_{j,t} = -\sum_{k=0}^{\infty} p^k (1-p)[z_{t-k-1} - \widetilde{E}^j_{t-k-2} z_{t-k-1}]^2 \quad \text{for } j = e, f$$

- Under PT, Phillips curve is written in terms of the *price level* and agents make price level forecasts.
- Interest rate follows IT or PT Taylor rule (no smoothing)
- Extended model with 'financial accelerator' (BGG, 1999). Output gap negatively related to interest rate spread.

Solution

1. Sub. for $i_t = i^* + \theta_\pi \pi_t + \theta_y y_t$ in IS curve. Solve the dynamic system:

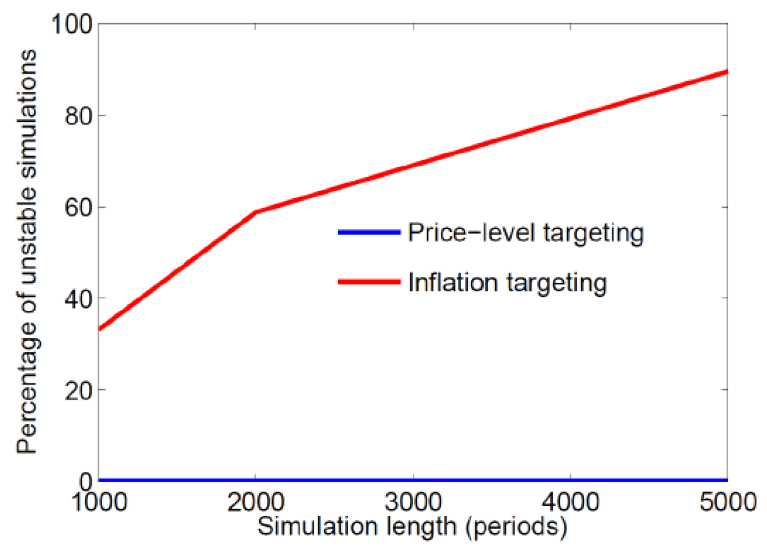
$$A_1 \begin{bmatrix} \pi_t \\ y_t \end{bmatrix} = A_2 \begin{bmatrix} \widetilde{E}_t \pi_{t+1} \\ \widetilde{E}_t y_{t+1} \end{bmatrix} + A_3 \begin{bmatrix} \pi_{t-1} \\ y_{t-1} \end{bmatrix} + A_4 \begin{bmatrix} \eta_t \\ \varepsilon_t \end{bmatrix}$$

2. Calculate $i_t = i^* + \theta_\pi \pi_t + \theta_y y_t$.
3. If $i_t \geq 0$, accept π_t, y_t. If $i_t < 0$, reject π_t, y_t. Set $i_t = 0$ and solve resulting system in π_t, y_t.

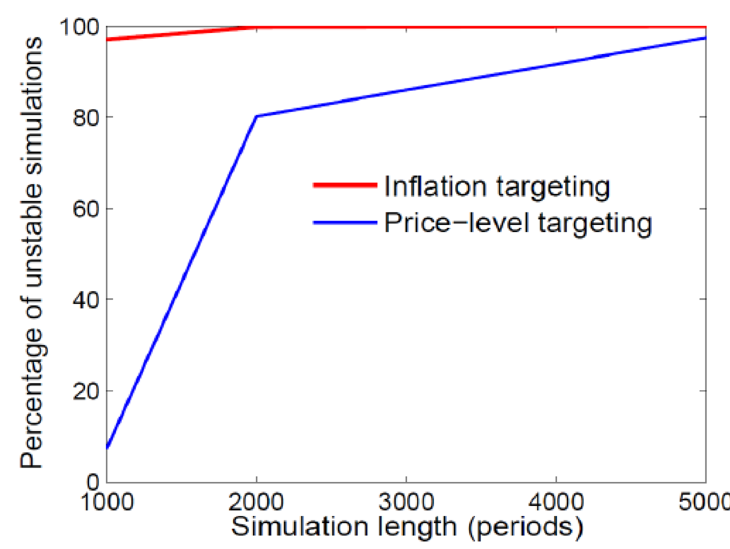
Results

Zero lower bound leads to *instability* problems:

(a) Baseline model

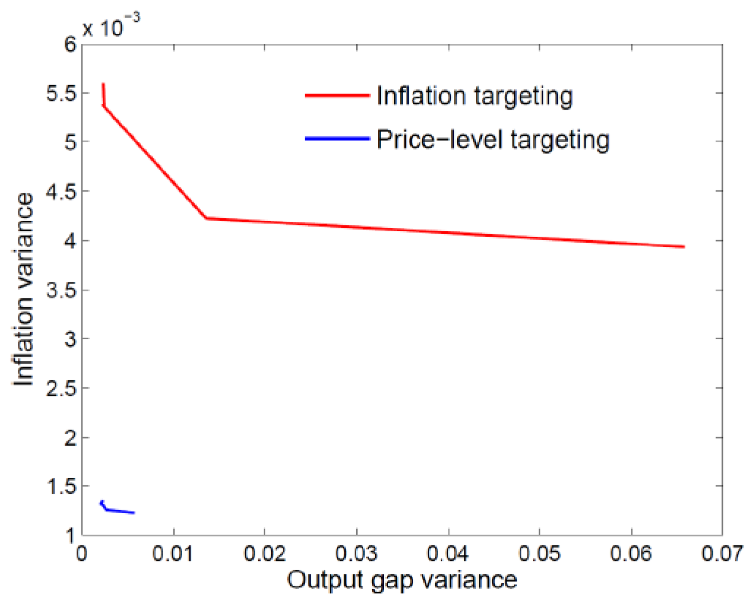


(b) Model with banks

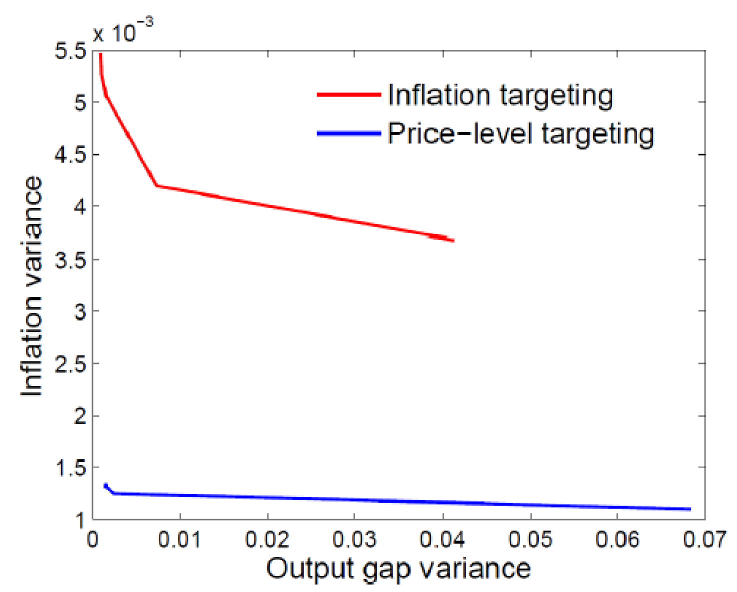


To avoid instability, 'fiscal bailout' after 5 periods at ZLB.
With optimal rule coefs, big fall in inflation volatility under PT:

(a) Baseline model

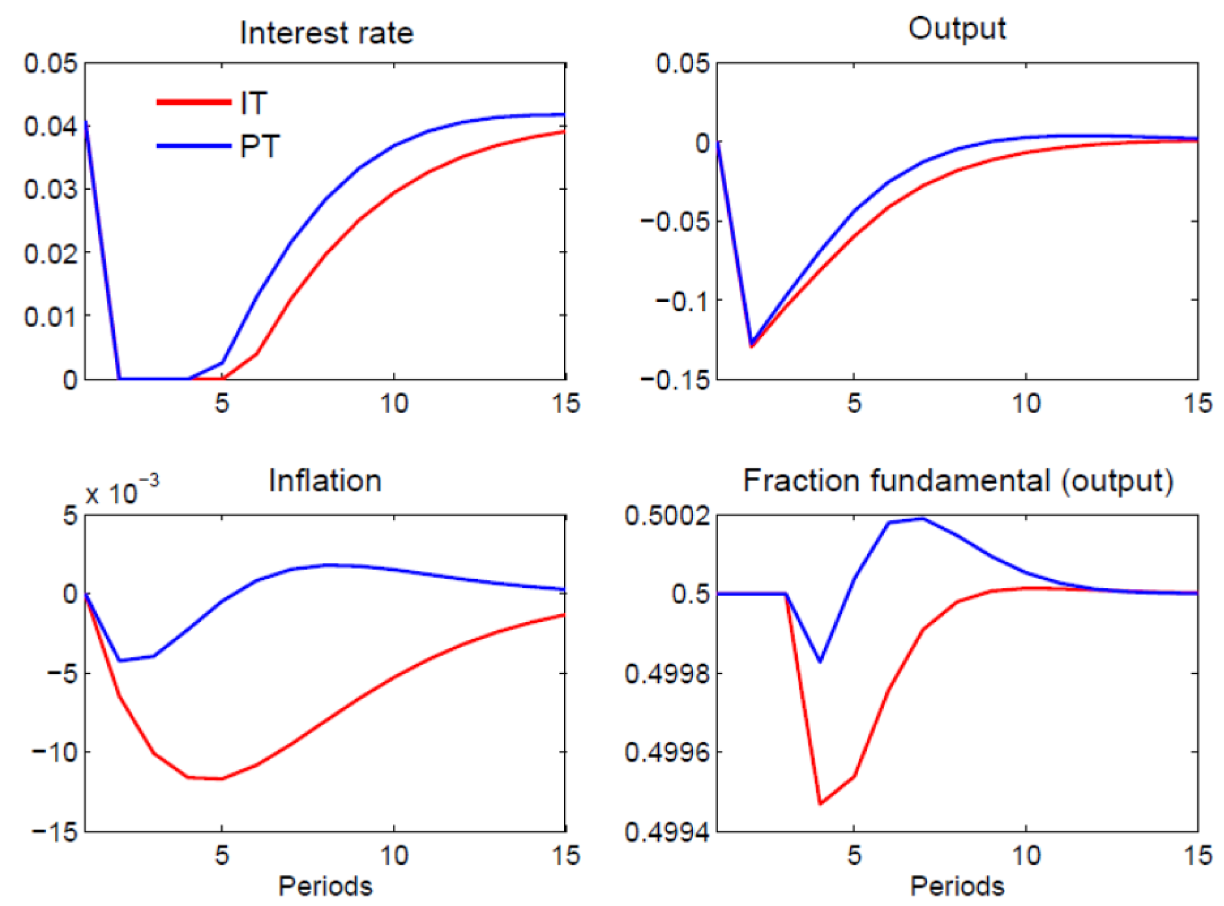


(b) Model with banks



Results cont'd

Impulse responses:
(large –ve demand shock, optimal rule coefs)



- PT escapes lower bound sooner than IT
- Under PT inflation is stabilized, which helps output to recover faster
- Stabilization also occurs through switching to fundamental forecasting rule under PT

Conclusions

- Zero lower bound leads to instability problems which are more severe under IT than PT
- With fiscal bailouts to prevent instability, PT lowers inflation volatility relative to IT
- Contrary to conventional wisdom, PT may outperform IT under non-rational expectations

References

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Brock, W. and Hommes, C. 1997. A rational route to randomness. *Econometrica.*

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