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Price level targeting, the zero lower bound on the interest rate and imperfect credibility

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Motivation

- During the recent financial crisis, the nominal policy rates of some economies hit their effective lower bound.
- These recent developments have lead to re-examination of current monetary policy frameworks.
- Are there policy frameworks that can yield price stability and at the same time be flexible enough to deal with the ZLB?

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Motivation

- Price level targeting (PLT) has emerged as a potentially superior monetary regime than inflation targeting (IT).

- PLT can better manage inflation expectations. Why? See graph.

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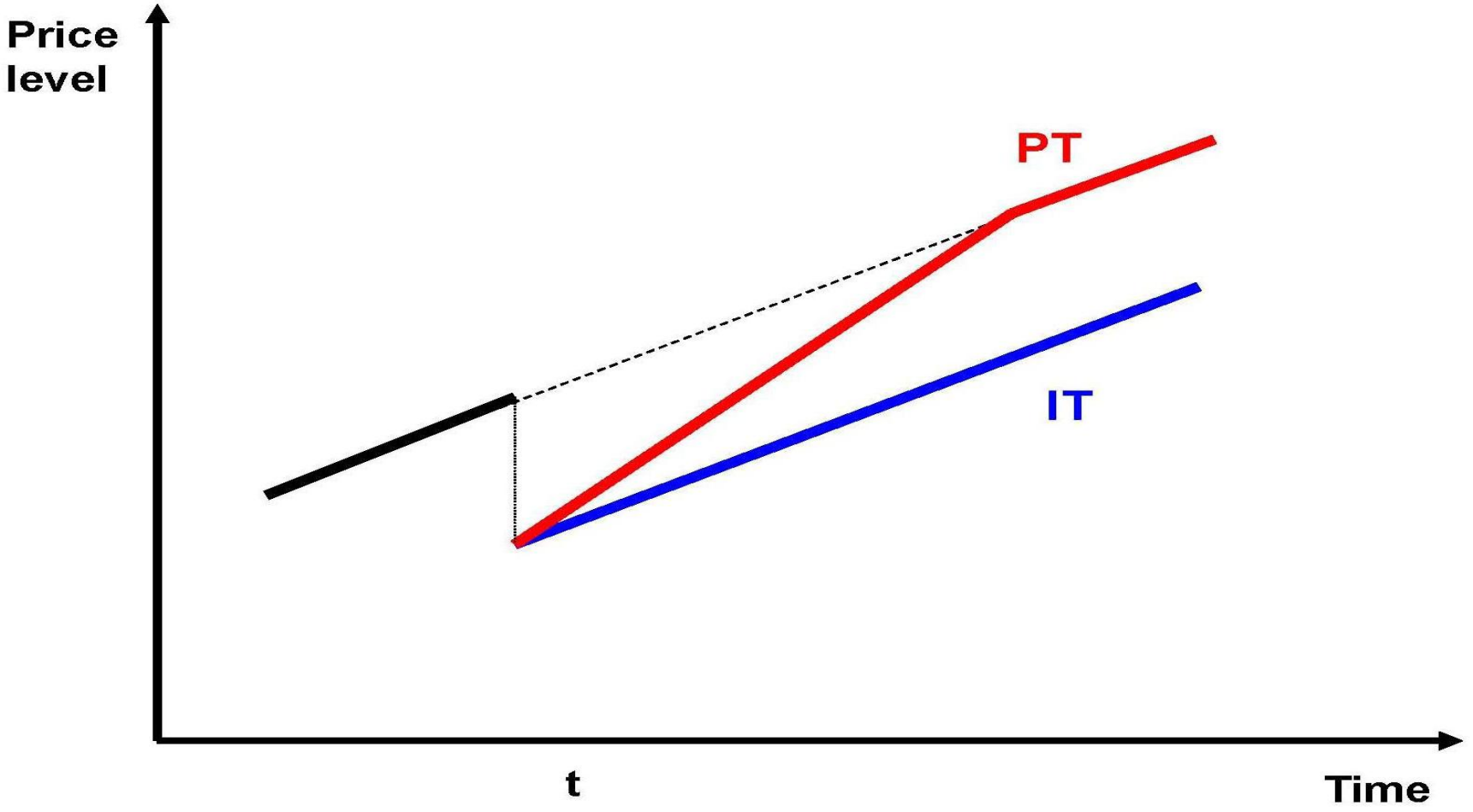
Motivation



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Motivation

- Why is ability to manage inflation expectations useful against the ZLB?
  1) If necessary, PLT can generate lower real rates than IT at the ZLB by affecting more inflation expectations.
  2) PLT reduces the likelihood of hitting the ZLB.

- Fisher equation:

$$r_t = i_t - E_t \pi_{t+1}$$

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Motivation

- However, there is a crucial assumption underlying the effectiveness of PLT: **credibility**.

- Walsh (2010): experience with IT regimes was that they were not fully credible since their adoption.

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What we do

- We analyze whether a transition from IT to PLT is welfare improving when:
  a) The ZLB is occasionally binding, and
  b) Agents take time to fully adopt PLT in forming expectations.

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Main findings

1) PLT offers significantly better performance than IT against ZLB:
   i) The frequency of hitting the ZLB under PLT is 3 times smaller than under IT.
   ii) When stuck at the ZLB, PLT engineers one-period ahead inflation expectations that are above target xx percent of the time. In contrast, at the ZLB, IT never generates inflation expectations above target.
2) 37 percent of the welfare gains of a fully credible PLT result from its superior ability to deal with ZLB.
3) The long run benefits of PLT are offset very slowly by the transition costs associated with imperfect credibility.

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Plan of the talk

1. The model: core structure
2. Modeling IT and PLT
3. Calibration
4. Welfare gains of switching from IT to PLT: perfect credibility
5. Introducing imperfect credibility
6. Welfare gains of switching from IT to PLT: imperfect credibility
7. Concluding remarks

1. The model: core structure

- Aggregate supply:

$$\pi_t = \beta E_t(\pi_{t+1}) + \kappa x_t + u_t$$

with

$$\kappa = \frac{(1-\alpha)(1-\alpha\beta)}{\alpha}\frac{\sigma^{-1}+\omega}{1+\omega\theta}$$

- Aggregate demand:

$$x_t = E_t(x_{t+1}) - \sigma(i_t - r^* - E_t(\pi_{t+1})) + g_t$$

- Cost push shock:

$$u_t = \rho_u u_{t-1} + \varepsilon_t^u$$

1. The model: core structure

- Natural real rate shock:

$$g_t = \rho_g g_{t-1} + \varepsilon_t^g$$

2. Modeling IT and PLT

- IT and PLT regimes are modeled following Vestin (2006).
- Objectives of monetary policy are delegated by the government to the central bank in the form of loss period functions.
- IT:

$$\widetilde{L}_t^{IT} = \pi_t^2 + \lambda^{IT} x_t^2$$

- PLT:

$$\widetilde{L}_t^{PLT} = p_t^2 + \lambda^{PLT} x_t^2$$

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2. Modeling IT and PLT

- Central bank minimizes the delegated expected loss under discretion, i.e.

$$E_t \sum_{i=0}^{\infty} \beta^i \tilde{L}^J_{t+i}$$

subject to:

a) Core structure of the model

b) $i_t \geq 0$

3. Calibration

Parameter	Economic interpretation	Assigned value
β	quarterly discount factor	0.99
σ	real rate elasticity of output	6.25
α	probability of a firm not changing its price	0.66
θ	price elasticity of demand	7.66
ω	elasticity of firms'real marginal costs	0.47
κ	slope of the Phillips curve	0.024
ρ_u	AR-coefficient mark-up shocks	0
ρ_g	AR-coefficient real rate shocks	0.8
σ_u	s.d. mark-up shock innovations (quarterly %)	0.154
σ_g	s.d. real rate shock innovations (quarterly %)	1.524

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4. Welfare gains of switching from IT to PLT: Perfect credibility case

	No ZLB		ZLB	
	IT	PLT	IT	PLT
$\sigma_\pi \quad (in\ \%)$	0.13	0.11	0.14	0.11
$\sigma_x \quad (in\ \%)$	1.01	1.03	1.16	1.06
$\sigma_i \quad (in\ \%)$	0.436	0.404	0.443	0.404
Losses $\quad (in\ \%)$	0.0226	0.0176	0.0258	0.0180
$Pr(i_t = 0)$	–	–	0.027	0.007
$Pr(E_t \pi_{t+1} > 0 \mid i_t = 0)$	–	–	0.000	0.367

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5. Introducing imperfect credibility

- Policy maker switches from IT to PLT at time 0.
- Private agents doubt that the central bank will be implementing PLT in the foreseeable future.
- When forming expectations, agents assign a probability ϕ_t that the central bank will implement PLT.
- Expectations for inflation and output gap are given by:

$$E_t(\pi_{t+1}) = \phi_t E_t(\pi_{t+1}|PLT) + (1-\phi_t)E_t(\pi_{t+1}|IT)$$

and

$$E_t(x_{t+1}) = \phi_t E_t(x_{t+1}|PLT) + (1-\phi_t)E_t(x_{t+1}|IT)$$

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5. Introducing imperfect credibility

- ϕ_t evolves as a Markov chain over two states {0,1}
- Transition matrix:

$$\Sigma = \begin{bmatrix} p & 1-p \\ 0 & 1 \end{bmatrix}$$

- $\tau = \frac{1}{1-p}$ is the expected time taken to transit to full credibility state.

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6. Welfare gains: Imperfect credibility case

- Initial conditions: steady state.

	IT	PLT			
T $(in\ quarters)$		0	21	48	51
Losses $(in\ \%)$	0.0258	0.0180	0.0214	0.0258	0.0263

- Adverse initial conditions: state variables at time 0 such that inflation, output gap and interest rate are below SS.

	IT	PLT			
T $(in\ quarters)$		0	21	33	51
Losses $(in\ \%)$	0.0300	0.0192	0.0281	0.0300	0.0335

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Concluding Remarks

- We have evaluated whether a transition from IT to PLT is welfare improving when:
  a) The ZLB on the interest rate is occasionally binding, and
  b) Agents take time to fully believe the adoption of PLT.

- Accounting for the ZLB makes PLT more attractive.

- The long run benefits of PLT are offset very slowly by the transition costs associated with imperfect credibility.