Average Inflation Forecast Targeting

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Motivation

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- In 2020, the Federal Reserve adopted **average inflation targeting** (AIT) as part of its long-run monetary strategy framework
    * Rationale: AIT can mitigate the effects of the zero lower bound (ZLB) in a context of low real natural rate of interest

- An important aspect of this new and more flexible target is its **averaging window**
    * Most of the theoretical models of AIT have focused on purely *backward-looking* strategies, i.e. past deviations from target (history dependence)
    * However, policymakers often highlight that monetary policy is *forward looking*

- Our **average inflation *forecast* targeting** (AIFT) strategy aims to bridge the gap between theory and practice

What we do and found so far

- We take an out-of-the-self **three equation New Keynesian model** that incorporates the **zero lower bound** (ZLB) constraint to study the welfare effects of different average inflation targeting strategies
    * Note: in this economy monetary policy does not operate through a lag, a common argument in favor of forward looking rules.
- We analyze **welfare** and **stabilization** performance of our AIFT rule, under which the central bank aims to stabilize an **average over *past and expected future* inflation rates**
- We find that in terms of macroeconomic stabilization
    * AIFT is better than inflation targeting
    * More importantly, it is also similar, and in some cases better, than the purely backward-looking version of AIT
    * Thus, it can be **desirable** that monetary policy is both **history dependent** and **forward looking**

The Model

An Economy with only a Demand Shock

NK model w/ the ZLB constraint: the private sector

- Time is discrete and the horizon is infinite: $t = 0, \dots, \infty$.
- There are *identical households* that consume and supply labor in a perfectly competitive labor market.
- The *intermediate-producing firms* operate under monopolistic competition and are subject to price rigidities.
- Thus, **aggregate private sector behavior** can be described by the following two equations:
  * The Euler Equation

$$y_t = \mathbb{E}_t y_{t+1} - \sigma \left(i_t - \mathbb{E}_t \pi_{t+1} - r_t^n \right) \tag{1}$$

  * The Phillips Curve

$$\pi_t = \kappa y_t + \beta \mathbb{E} \pi_{t+1} \tag{2}$$

NK model w/ the ZLB constraint: the Central Bank

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- The Central Bank operates according to a simple interest-rate feedback rule which reacts to the natural interest rate and an average inflation.

- We define period t average inflation as follows:

$$\hat{\pi}_t = \pi_t + (1 - \omega)\hat{\pi}_{t-1} \tag{3}$$

  where $\omega \in [0, 1]$. Note that when $\omega = 1$ monetary policy follows a standard inflation targeting strategy, while when $\omega = 0$ the monetary authority aims to stabilize the price level.

- The two alternative policy rules have the following form:

  * **Average Inflation Targeting** (AIT) as in Budianto et al. (2020)

$$i_t = \max\left\{0, r_t^n + \phi_\pi \hat{\pi}_t\right\} \tag{4}$$

  * **Average Inflation Forecast Targeting** (AIFT)

$$i_t = \max\left\{0, r_t^n + \phi_\pi \mathbb{E}_t \hat{\pi}_{t+1}\right\} \tag{5}$$

A Measure of Social Welfare

- Society's welfare is represented by a second-order approximation to the representative household's expected lifetime utility

$$V_t = u(\pi_t, y_t) + \beta \mathbb{E}_t V_{t+1} \tag{6}$$

where

$$u(\pi_t, y_t) = -\frac{1}{2}\left(\pi^2 + \lambda y^2\right) \tag{7}$$

- To have a meaningful measure of social welfare, we express it in terms of the perpetual consumption transfer that would make a household indifferent between the deterministic and the stochastic worlds:

$$W \equiv (1-\beta)\frac{\theta}{\kappa}\left(\sigma^{-1} + \eta\right)\mathbb{E}\,V \tag{8}$$

where the expectation is taken over the unconditional distribution of r_t^n.

PARAMETRIZATION

Standard Parameter Values

- We take the parameter values from Budianto et. al (2020)

Parameter	Value	Description
β	0.9901	Subjective discount factor
σ	2.0	Intertemporal elasticity of substitution
η	0.47	Inverse labor supply elasticity
θ	10	Price elasticity of demand
α	0.8106	Share of firms per period keeping prices unchanged
ϕ_π	2.0	Taylor coef. on average inflation
ρ_r	0.85	Persistence of the natural real rate process
σ_r	0.4	Standard deviation the natural real rate process

- These parameters imply a welfare weight on output $\lambda = \kappa/\theta = 0.00079$ and a slope of the Phillips curve $\kappa = \frac{(1-\alpha)(1-\beta\alpha)}{\alpha(1+\eta\theta)}\left(\sigma^{-1} + \eta\right) = 0.0079$

Results

Welfare

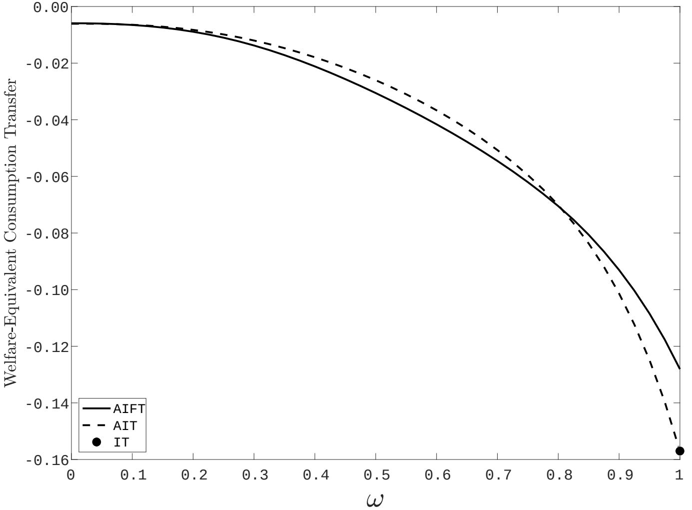
How AIT & AIFT perform at different values of ω?

- The model described above has two policy parameters (ϕ_π, ω). Thus, we have a continuum of monetary policy strategies on the (ϕ_π, ω) space.

- Since we are interested on how the new AIFT rule compares to AIT at different levels of history dependence, we fix ϕ_π and look over ω.

- We find that:
  - First, the the **optimal value of** ω, i.e. the value that maximizes society's welfare as defined in equation (8), is **almost identical** in both specifications.
  - Second, the two rules perform **equally well at different levels of history dependence**, with AIFT doing slightly better for large values of ω.

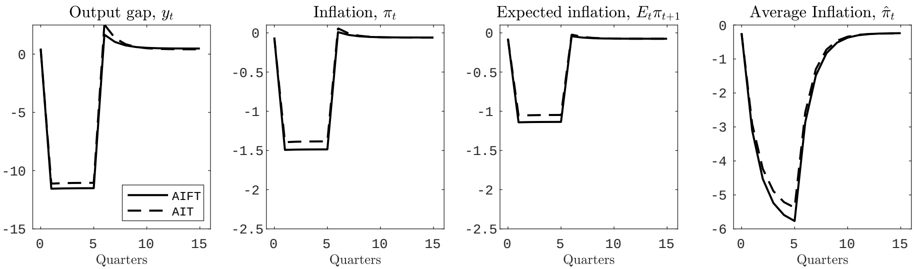
Welfare Effects of AIT & AIFT



Liquidity Trap Scenario

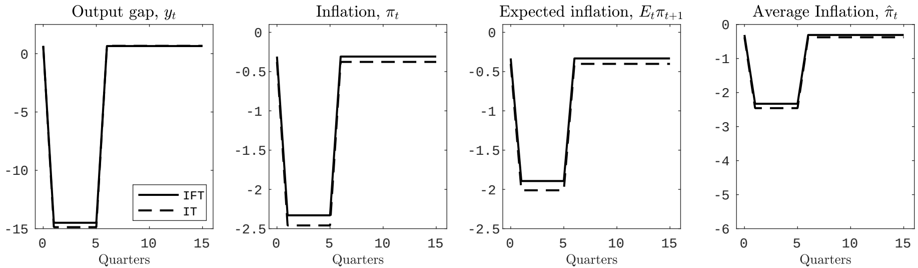
Average Inflation (Forecast) Targeting

- Assume the economy is in the steady state.
- Then, at time 0 there is a natural real rate shock that pushes it to negative territory.
- It stays there for six quarters. Thereafter, jumps back to its steady state level.



Inflation (Forecast) Targeting

- We repeat our liquidity trap experiment in absence of history dependence
- Shed some light on the old debate about inflation vs. inflation forecast targeting (Bernanke and Woodford, 1997; Svensson, 1997)



Supply & Demand Shocks

Cost-Push & interest Rate Shocks

An Augmented NK Phillips Curve

- We extend the analysis to an economy that is subject to both **natural real rate shocks** and **cost-push shocks**. This implies that the NK Phillips curve is given by:

$$\pi_t = \kappa y_t + \beta \mathbb{E} \pi_{t+1} + u_t \tag{9}$$

where

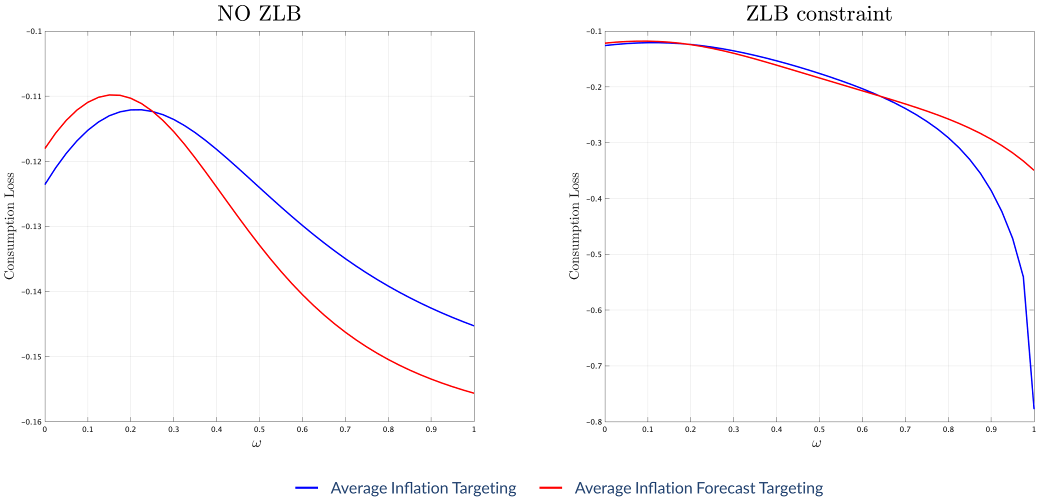
$$u_t = \rho_u u_{t-1} + \sigma_u \varepsilon_t^u \tag{10}$$

- We set $\rho_u = 0.3$ and $\sigma_u = 0.1$.

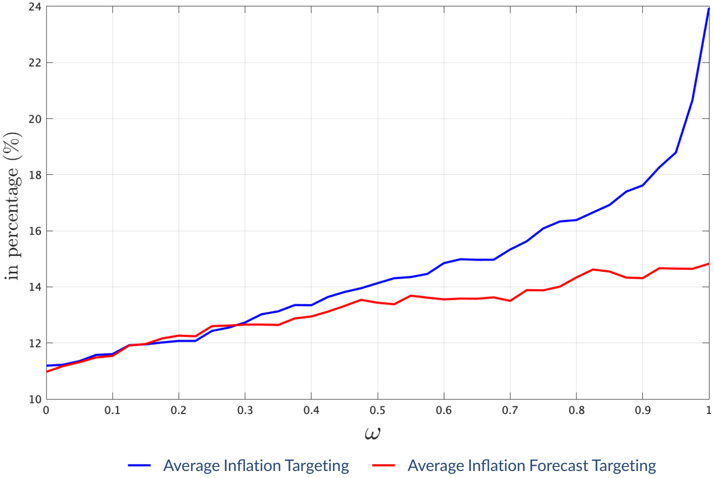
- The introduction of this type of shocks introduces an additional complication for the conduct of monetary policy since the **central bank cannot achieve full stabilization of output and inflation even in the absence of the ZLB constraint.**

- Thus, unlike before, we also solve our model with and without the ZLB.

Consumption Loss at Different Values of ω



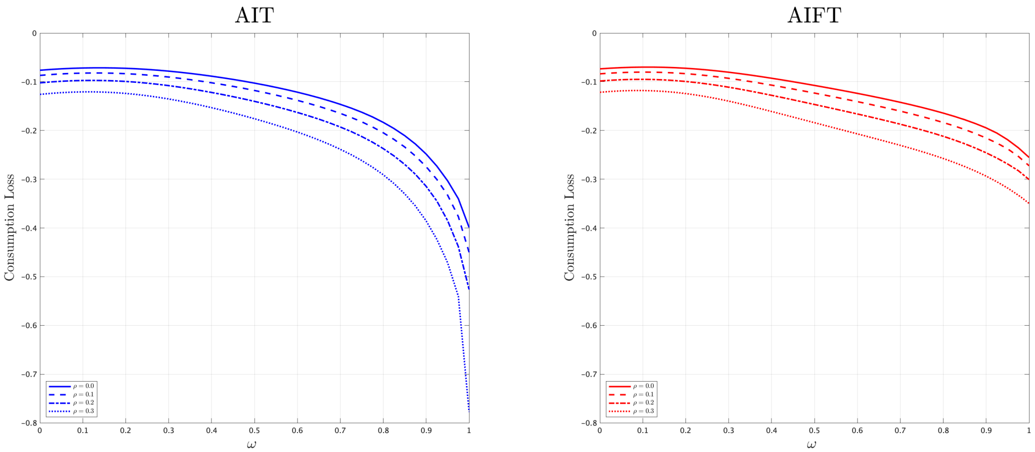
Zero Lower Bound Frequency



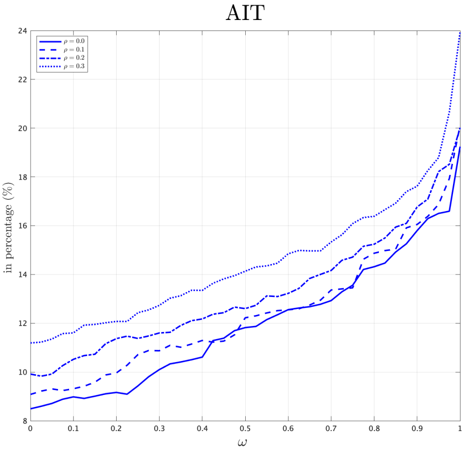
The Role of ρ_u

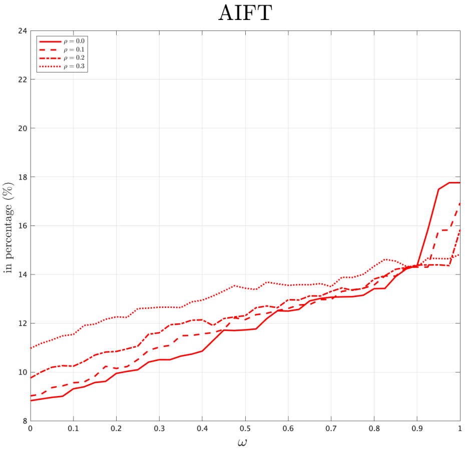
The Persistence of the Cost Push Shock

The larger ρ_u, the larger the benefits from AIFT



The larger ρ_u, the higher the freq. of hitting the ZLB





Robustness Checks

A Purely Forward Looking Rule

Do expectations beyond t+1 matter?

- Our proposed average inflation forecast targeting rule only responds to next period inflation expectations. What about $t+2$, $t+3$, $\ldots$?

- To assess its importance, we look at the following forward-looking rules:

$$i_t = \max\{0, r_t^n + \phi_\pi \tilde{\pi}_t\} \tag{11}$$

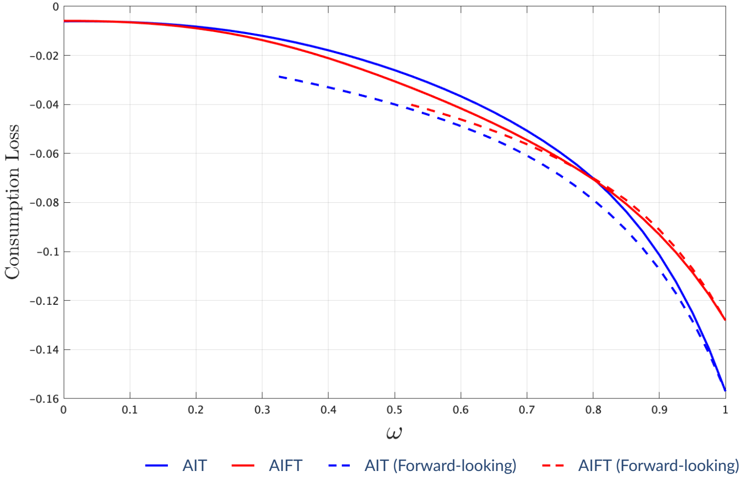
$$i_t = \max\{0, r_t^n + \phi_\pi \mathbb{E}_t \tilde{\pi}_{t+1}\} \tag{12}$$

where $\tilde{\pi}_t = \pi_t + (1-\chi)\mathbb{E}_t \tilde{\pi}_{t+1}$

- Note that if one iterates π_t forward, one can observe that this rule is purely forward looking. When $\chi = 0$ and the CB behaves as in (11), it is the case that $\tilde{\pi}_t \equiv \mathbb{E}_t p_\infty - p_{t-1}$. On the other hand, (12) implies $\mathbb{E}_t \tilde{\pi}_t \equiv \mathbb{E}_t p_\infty - p_t$.
  * We do not have price targeting here.

- We look at these new rule within the context of our one-shock economy.

Only $t + 1$ really matters!



Output Gap Response

A rule that also responds to output gap

- Now we enlarge the AIT and AIFT rules by forcing the CB to also respond to the output gap.
- The new monetary policy rule under AIT is:

$$i_t = \max\{0, r_t^n + \phi_\pi \hat{\pi}_t + \phi_y y_t\} \tag{13}$$

while under AIFT is:

$$i_t = \max\{0, r_t^n + \phi_\pi \mathbb{E}_t \hat{\pi}_{t+1} + \phi_y y_t\} \tag{14}$$

- We set $\phi_y = 0.2/4$. Ideally, we would have like to set $\phi_y = 0.5/4$ but the algorithm did not converged.
- We look at the performance of these new rules in the one shock economy.

Welfare decreasing & equal implications for AIFT

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