Discussion of

The Optimal Inflation Target and the Natural Rate of Interest

by

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The views expressed here are my own and do not necessarily reflect those of the Federal Reserve Bank of New York or any other part of the Federal Reserve System
Outline of the discussion

- Brief recap of the paper
- Empirical motivation: the persistent decline of $r^*$
- Where the paper fits in the literature
- The relevant graphs and their message
- Cautionary notes on the results
What the paper does

- Asks two questions about the optimal inflation target in a low interest rate environment
  - Does a lower $r^*$ imply a higher optimal inflation target $\pi^*$?
  - Does the source of the decline in $r^*$ matter?

- Analyzes these questions in an estimated DSGE model
  - With nominal rigidities
    - To create costs of having non-zero trend inflation
  - With a ZLB constraint on the interest rate
    - To provide benefits from having a non-zero trend inflation

- Conducts the analysis for the U.S. and the Euro Area (EA) economies
Its main takeaways

- There is a negative relationship between $r^*$ and optimal inflation target $\pi^*$
  - 1% decline in $r^*$ should be accommodated by a 0.9% increase in the inflation target
  - Surprisingly robust result across parameters variations & countries
  - There is a range of $\pi^*$ corresponding to each $r^*$
- The source of variation in $r^*$ matters only moderately

- US and EA economies have some differences
  - There appears to be higher tolerance for $\pi^*$ in the US

- Allowing for the uncertainty surrounding parameters estimates and the value of $r^*$ implies a higher optimal inflation target for any (low) $r^*$
Evidence of $r^*$ decline in the U.S.

**Figure 1.** The Range of Existing $r^*$ Estimates, 1986–2016

Sources: Laubach and Williams (2003); Kiley (2015); Lubik and Matthes (2015); Johanssen and Mertens (2016); Holston, Laubach, and Williams (2016); Crump, Eusepi, and Moench (2017); Christensen and Rudebusch (2017).

From: J. C. Williams, discussion of Del Negro et al, BPEA 2017
Further recent evidence on $r^*$

Figure 1. The Low-Frequency Component of $r^*_t$ in the VAR and DSGE Models, 1960–2016

Source: Authors’ calculations.
a. For each trend, the dashed line is the posterior median, and the shaded area shows the 68 percent posterior coverage interval for the estimate of the low-frequency component.

From: Del Negro et al. BPEA 2017
Evidence that the decline in $r^*$ is global

Source: Holston, Laubach & Williams (2017).

Note: Shading shows NBER recessions.
..... partly associated with trend growth decline

Source: Holston, Laubach & Williams (2017)

Note: Shading shows NBER recessions.
... also to increased demand for safety and liquidity

Real rate and convenience yield trends in the U.S.

From: Del Negro et al., BPEA 2017.
A persistently low r* raises frequency of the ZLB

Source: Haver Analytics.

Note: Shading shows NBER recessions.
The paper framework

- State of the art New Keynesian model
- Features
  - Calvo-style sticky prices with imperfect indexation to trend inflation
  - Calvo-style sticky wages with partial indexation to trend inflation and technical progress
  - Non-linear policy rule accounts for the ZLB
  - Solution method allows for occasionally binding ZLB constraint
  - Losses are evaluated via a model consistent welfare function
- Model is log-linearized around a non zero-inflation steady state
- And estimated with Bayesian methods for the 1985Q1-2008Q3 period (approximately Great Moderation)
Related literature

- Paper relates closely to the literature on inflation target and the ZLB

- Directly builds on recent New Keynesian literature that accounts for the costs of non-zero steady state inflation and for its potential benefits in a low interest rate environment

- Closely related
  - Coibion et al (CGW, 2012): same motivating question, similar NK model less sticky wages, plus more policy inertia; calibrated rather than estimated
  - Dordal-i-Carreras et al (2016): using the same model framework of the above, study variations of optimal target under more realistic distribution of the shocks
  - Kiley and Roberts (2017): explore adjustments to monetary policy in a low interest rate worlds that require temporary higher target
Novel features of the paper

- Focuses directly on the relationship between the equilibrium real interest rate $r^*$ and the optimal inflation target $\pi^*$
  - Evaluates to what extent an increase in the optimal inflation target is \textit{needed} to accommodate a decline in $r^*$ and therefore avoid an increase in the probability of hitting the ZLB

- Uses Bayesian estimation rather than calibration of the model parameters
  - Allows to evaluate the effect of parameter uncertainty

- Extend the analysis of optimal inflation target and its relation with $r^*$ to the US and EA economies

\textbf{Very relevant topic!}
The log-linear approximation around positive trend inflation makes apparent the costs of trend inflation in the model:

- Higher inflation leads to more price dispersion, causing less efficient resource allocation.
- Higher inflation makes pricing decisions more forward-looking, and inflation more volatile.
- These costs may not be fully accounted for in the way the welfare function is approximated (compare to Coibion et al).

Benefits of reducing the incidence of ZLB episodes:

- Harder to quantify, as loss depends on the frequency and duration of ZLB episodes:
  - Both are endogenously determined in the model.
  - But depend on model parameters and shocks that are derived from estimates covering a very particular period.
Parameters that matter for later analysis

- Higher trend growth rate $\mu_z$ in EA, but similar $\rho$
  - Implies higher equilibrium interest rate in EA: $r^* = \rho + \mu_z$
  - Disagrees with HLW estimates of trend growth and $r^*$

- Higher steady state inflation in EA

- Higher degree of indexation to past inflation in US vs EA
  - Helps mitigate the distortions of steady state inflation
  - Implies higher tolerance for higher inflation target

- Shocks fairly similar, but US risk-premium shocks have higher variance
Welfare functions and ZLB probabilities: US and EA

(a) US

(b) EA

![Graphs showing welfare functions and ZLB probabilities for US and EA.](image-url)
To note

- Asymmetry
  - Welfare declines rapidly when steady state inflation is low and more slowly at higher target inflation levels
    - What determines the asymmetry?
  - Narrow range of optimal target
    - Indicates slightly higher optimal target in the US (and more sensitive to the choice of posterior mean, mode and median)
  - The probability of hitting the zero bound declines in the inflation target, with steeper trade-off in the EA
Effect of $r^*$ on $\pi^*$ and the frequency of ZLB: the US

At low $r^*$ optimal $\pi^*$ must increase *almost* one-to-one;
At high $r^*$, a small deflation is optimal to accommodate increases in $r^*$ due to high productivity growth.

At low $r^*$, optimal inflation target can’t prevent some increase in ZLB probability.
At low $r^*$ optimal $\pi^*$ must increase *almost* one-to-one – similar to the US

At high $r^*$, a larger deflation is optimal to accommodate increases in $r^*$ due to high productivity growth (to reduce real wages)

At low $r^*$, optimal inflation target doesn’t prevent a significant increase in ZLB probability
A decline of 1% in $r^*$ that is not accommodated by an increase in the inflation target raises the probability of hitting the zero bound

- In the US, from 5.8% to 11%
- In the EA, from below 10% to 16%
Cautionary notes on the results

- For reasonable drops in $r^*$ optimal inflation target is never too high
  - Doesn’t reach the 4% level sometimes advocated in policy commentaries

- Does the model overestimate the costs of inflation?
  - Calvo-style pricing generates large cross-sectional dispersion for any given level of trend inflation $\rightarrow$ probably emphasizes trend inflation costs
    - Recent research has labeled these costs as ‘elusive’ (Nakamura et al, 2016)
  - The optimal rate of inflation may well be higher under alternative pricing models (Coibion et al 2012, Blanco 2016)
Cautionary notes on the results, cont.

- Does the model underestimate the incidence and duration of ZLB?
  - Using data for the Great Moderation period to calibrate or estimate parameters tends to deliver low frequency of ZLB episodes (and likely low duration)
    - Noted by Chung et al (2012) using the FRB/US
  - Recent research (Dordal-i-Carrera et al) points out that
    - Typical ZLB episodes are infrequent but can be long lasting
    - The representation of the shock processes typically used in macro models has difficulty in generating these features
    - A regime-switching representation for the shocks appear more suited to generate realistic ZLB episodes
The optimal inflation target is sensitive to the form of the policy rule

- Taylor-type rules are poor form of policy when the ZLB hits because they commit to a purely forward-looking policy: when the constraint no longer binds, policy is assumed to be conducted as if it would have been as if no ZLB had occurred

  - The economy would perform better under policy rules that respond to cumulative deviations of output and inflation from their targets (Reifschneider-Williams 2000, Eggertsson-Woodford 2003)

  - These are akin to price-level target rules → take into account misses due to the ZLB, raise the expected path of inflation

  - Essence of forward guidance policy adopted by several central banks

- Forward guidance as well as balance sheet policy have arguably been effective tools to mitigate the costs of the US long ZLB episode

- Failing to consider alternative tools leads to overestimate the need to raise the target level of inflation
Few quibbles

- Estimation
  - Why cover only the Great Moderation period?
    - Also, wouldn’t it be better to differentiate US and EA on the estimation period?
    - Why the few calibrated parameters the same across the two areas?

- Data used in estimation are only GDP, GDP deflator, wages and short-term interest rate (effective FFR (US) and Euribor 3-mo (EA))
  - Why not other observables like C, N?
To conclude

- Estimates of $r^*$ for the US and many other countries point to a decline in the equilibrium real rate $r^*$
  - If lower $r^*$ is a ‘new normal’ raising the inflation target is one of the policy options to reduce the incidence of ZLB episodes
- This paper asks what is the *optimal* inflation target needed to accommodate a permanent decline in the equilibrium real rate
- The analysis is conducted in a rich NK DSGE model with occasionally binding ZLB constraint, estimated for the US and EA economies
  - The analysis is rigorous and the framework promising
  - The results on the optimal inflation target are however strongly dependent on the features of the model

➢ I’m looking forward to see more work on this topic!
References

- Chung, H., JP. Laforte, D. Reifschneider, and J.C. Williams. 2012. “Have We Underestimated the Likelihood and Severity of Zero Lower Bound Events?” *Journal of Money, Credit and Banking* 44 (Supplement 1).


- William, J.C. Williams, discussion of Del Negro et al, BPEA 2017