Discussion of: "Optimal Inflation for the U.S." by Roberto Billi

Robert J. Tetlow

Federal Reserve Board

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What I will be talking about:

- My take on the motivation for the paper
- Summarize a few points from the paper
- Ask some questions about the results and the modeling assumptions behind those results
- Explore the applicability of the results: does *prescriptive nature* of the title fit?

In the end keep this in mind: *this is a good paper*.

Motivation I : the US

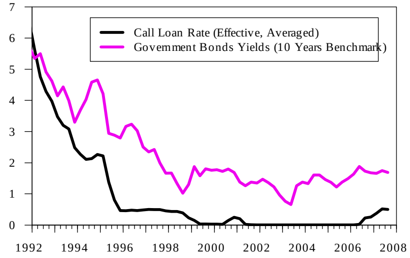
"As you know, core prices by many measures have increased very slowly over the last six months. With price inflation already at a low level, substantial further disinflation would be an unwelcome development...",

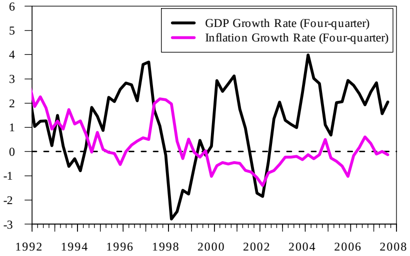
–Alan Greenspan before the House Committee on Financial Services, April 30, 2003

"[W]e face new challenges in maintaining price stability, specifically to prevent inflation from falling too low...[T]here is an especially pernicious, albeit remote, scenario in which inflation turns negative...engendering a corrosive deflationary spiral...it is incumbent on a central bank to anticipate any contingency, however remote, if significant economic costs could be associated with that contingency."

–Alan Greenspan before the House Committee on Financial Services, July 15, 2003

Motivation II : Japan





The paper in a nutshell

What Roberto is doing:

- Take a very standard *linearized* NKB model in which a target rate of inflation of zero would be optimal, and...
    - Impose the ZLB constraint and recompute the optimal policy
    - Do it again, in a world of *model uncertainty* using the tools of *robust control theory.*

Some literature

A very incomplete selection includes:

The ZLB and policy:

- Reifschneider and Williams (2000), McCallum (2000), Svensson (2001), Kimura et al. (2002), Jung et al. (2005), Wolman (2005), Adam and Billi (2007), others.

Robust control:

- Hansen and Sargent (2008), Giannoni (2002), Onatski (2001), Tetlow and von zur Muehlen (2001, 2007), Walsh (2004), Woodford (2006).

Computational literature:

- Smolyak (1963), Hartman and Stampacchia (1966), Judd (1998) book, Christiano and Fisher (2000), others.

The punchlines

The paper carries the following punchlines:

1. ZLB has *few consequences* for the choice of the inflation target: $\pi^* \approx 0$.
2. The ZLB has *very small consequences* for welfare (0.0036 percent of steady-state consumption).
3. This basic finding is remarkably robust to alternative parameterizations

Very standard NKB model

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

$$x_t = E_t x_{t+1} - \phi(i_t - E_t\pi_{t+1} - r_t^n) \tag{2}$$

$$u_t = \rho_u u_{t-1} + \sigma_{\epsilon r}\epsilon_t \tag{3}$$

$$r_t^n = (1-\rho_r) r_{ss} + \rho_r r_{t-1}^n + \sigma_{\varepsilon r}\varepsilon_t \tag{4}$$

$$i_t \geq 0 \ \ \forall \ t \tag{5}$$

$$L = \sum_{t=0}^{\infty} \beta^t [(\pi_t - \gamma\pi_{t-1})^2 + \lambda x_t^2] \tag{6}$$

The computational issues

- Up to the ZLB, the model is linear and small
- The ZLB introduces an occasionally binding constraint to the problem. See, e.g., Christiano-Fisher (2000) *JEDC*
- This means that the monetary authority must form expectations over future states conditional on the probability of the constraint being binding
- Hence the use of the numerical sequential Gaussian quadrature solution method.

The ZLB constraint binds a lot....but makes surprisingly little difference

Table 1

Optimal Inflation Rates and Frequencies of ZLB

shocks ->	baseline		1.5*baseline	memo:
	with ZLB	w/o ZLB	with ZLB	data*
π^*	0.17	0	0.69	2.5
$\sigma(\pi)$	1.9	2.1	2.8	2.3
$pr(i \leq 0)$	**27**	37	62	0
$\Delta(\mu)$	0.0036	0	0.0223	n/a

* U.S. GDP price inflation, quarterly at annual rates, 1984-2006.

- Even in extreme calibrations the representative agent wouldn't pay squat to avoid the ZLB. Why?

A. Questions about calibration

1. *The steady-state real interest rate*
   - r_{ss} is set to 3.5 percent–high! Taylor (1993) set it (arbitrarily) at 2.
   - Persistence of shocks to the equilibrium real rate is pretty low, $\rho_r = 0.8$.
   - An alternative calibration in Table 4 shows $\pi^* = 0.61$, $pr(i \leq) = 69$ and $\Delta(\mu) = 0.0127$ in this case.

B. Gripes

1. *Implementability of the optimal policy*
    - The optimal policy is a so-called *targeting rule*, that is, an Euler equation. Implementability is an issue.
    - There is a short footnote that says implementability is "a difficult issue" that is relegated to "future research". Why?.
2. *Decomposition of the optimal policy*
    - The optimal policy contains at least two parts: (1) *the positive target rate of inflation*, and (2) a *non-linear response function*.
    - Reifschneider and Williams (2000) emphasize non-linearity of policy as the ZLB gets more conditionally likely.
    - Others emphasize the minimization of the unconditional likelihood of the constraint binding by setting $\pi^* > 0$.
    - The two are confabulated here. It would be nice to do the decomposition.

C. Monetary policy design as a Hollywood movie

1. *There is drama...but the good guy always wins*
   - The model and computational methods push rational expectations pretty hard.
   - Whither *determinacy*? Are we in an extended Taylor rule world a la Davig and Leeper (2007), Farmer, Waggoner and Zha (2007)?
   - It appears as though the ZLB is never an *absorbing state*. A happy ending is assured!
2. *What if this were a French film?*
   - There would be some foreboding of doom, existential angst.
   - As in Cogley and Sargent's papers, agents would worry more profoundly about avoid the ZLB state.

At the junction of economics and computation

1. *Gaussian quadrature problems*
    - Work well when the function to be approximated is differentiable, less well with hard constraint problems like this one.
    - Based on a "matching moments" problem wherein it is assumed that a well-behaved steady state obtains.
    - An alternative would have been to do MCMC simulation.
2. *Error detection probabilities*
    - Make sense when 'errors' are a frequently observed thing, as they are in the model but not in practice.
    - May be too crude a tool when decision makers are asked to identify rarely occurring errors indicating misspecification.

Summing up

- This is a good paper addressing an important issue
- The results are interesting–and surprising!
- Swallowing the *prescriptive* story requires a certain "willful suspension of disbelief".