Discussion
“Global Dynamics at the Zero Lower Bound”

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April 2014

The opinions expressed in this discussion are those of the author and do not reflect the views of the Federal Reserve Bank of Kansas City or the Federal Reserve System.
Global Dynamics at the Zero Lower Bound

Very interesting and well-executed paper

**Contribution:** Rigorous modeling of a zero lower bound economy

Effects of recent downturn lasting longer than expected

Rigorous modeling is key first step to explaining recent outcomes
Why can technological improvements be contractionary?

Aggregate demand curve has **positive** slope at zero lower bound

Use linearized AS-AD model to build intuition

\[
\pi_t = \beta E_t \pi_{t+1} + \psi_y y_t - (1 - \eta) \psi z_t - \psi a_t
\]

\[
y_t = E_t y_{t+1} - \left( (r_t - r) - E_t \pi_{t+1} \right) + (1 - \rho_a) a_t
\]

\[
r_t = \max \left( 0, r + \phi_\pi \pi_t + \phi_y y_t \right)
\]
Aggregate Demand Away From Zero Lower Bound

\[
(1 + \phi_y + \frac{\psi_y}{\beta}) y_t = E_t y_{t+1} - \left( \phi_\pi - \frac{1}{\beta} \right) \pi_t + \text{(Shocks)}
\]

Declines in \( \pi_t \) offset with lower real rates which raises \( Y_t \)
Technology Shock Away From Zero Lower Bound

\[
\left(1 + \phi_y + \frac{\psi_y}{\beta}\right) y_t = E_t y_{t+1} - \left(\phi_\pi - \frac{1}{\beta}\right) \pi_t + \text{(Shocks)}
\]

Higher technology lowers \(\pi_t\) & raises \(Y_t\) with policy accommodation
Aggregate Demand At Zero Lower Bound

\[
\left(1 + \frac{\psi y}{\beta}\right) y_t = E_t y_{t+1} + \frac{1}{\beta} \pi_t + (\text{Shocks})
\]

Declines in \(\pi_t\) cannot be initially offset which raises real rates
Technology Shock At Zero Lower Bound

\[ \left(1 + \frac{\psi_y}{\beta}\right) y_t = E_t y_{t+1} + \frac{1}{\beta} \pi_t + \text{(Shocks)} \]

Higher technology can cause larger disinflation & output losses
Discussion: Focus on Expectations About Future

\[
\left(1 + \frac{\psi_y}{\beta}\right) y_t = E_t y_{t+1} + \frac{1}{\beta} \pi_t + \text{(Shocks)}
\]

Expectations about future crucial in determining effects of shocks.
Assumptions About Zero Lower Bound Duration

Assume preference shock is constant in impulse responses
⇒ Agents expect zero lower bound exit within 1-2 periods

Economy surprised by zero lower bound duration every period

Comment: What is the “right” zero lower bound scenario?
Unexpected Long Zero Lower Bound Episode

- Output
- Inflation
- Nominal Interest Rate
- Real Interest Rate
- Preference Shock
- Technology

Gavin et al (2014) Unexpected ZLB Length
Expected Long Zero Lower Bound Episode

Gavin et al (2014)

Unexpected ZLB Length

Large AR(1) Shock

Expected ZLB Length
Central Bank Responds to Output Gap

Output

Inflation

Nominal Interest Rate

Real Interest Rate

Preference Shock

Technology
Central Bank Responds to Steady State Output

Output

Inflation

Nominal Interest Rate

Real Interest Rate

Preference Shock

Technology

Output Gap

Steady State Output
Output Gap Response - Longer Zero Lower Bound Episode

Output

Inflation

Nominal Interest Rate

Real Interest Rate

Preference Shock

Technology

Output Gap

Steady State Output

Output Gap Longer ZLB Episode
Expectations About Current Zero Lower Bound Duration

Gust, Lopez-Salído, and Smith (2013)
Model-implied (Red) & Futures Markets (Gray)

Figure 8: The Expected Path of Nominal Interest Rates
Percent
Expectations as of 2009:Q1
Financial Market Federal Funds Rate Expectations

2009 2010 2011 2012 2013 2014
0 1 2 3 4 5 6

Percent
Expectations as of 2010:Q2

2009 2010 2011 2012 2013 2014
0 1 2 3 4 5 6

Expected duration increased markedly with “late-2014” language
Comments

Use an alternative zero lower bound scenario

1. Use expectations from data at a given point
2. Use “average” scenario from model simulations
3. Show robustness under variety of scenarios

Decomposing differences between linear & nonlinear model

1. Role of quadratic adjustment costs
2. Precautionary labor supply
   - Away from zero lower bound
   - Additional downside risk implied by the zero lower bound

Solve linear with nonlinear costs or nonlinear with quadratic utility

Very nice and well-executed paper
Additional Details
Precautionary Labor Supply

\[ W_t \]
\[ N_t \]
\[ LD(K_t, Z_t) \]
\[ LS(\lambda_t) \]

\[ LD(K_t, Z_t, \mu_t) \]
\[ LS(\lambda_t \uparrow) \]
Precautionary Labor Supply Without Capital

$W_t$

$L^S(\lambda_t)$

$L^D(\mu_t)$

$L^D(\mu_t\uparrow)$