The Zero Lower Bound
ECON 30020: Intermediate Macroeconomics

Prof. Eric Sims
University of Notre Dame

Fall 2016
The Zero Lower Bound

- The most important development for monetary policy in the US and other developed countries in the last decade is the zero lower bound (ZLB)
- Refers to the fact that nominal interest rates cannot go negative
  - Several central banks have recently experimented with negative nominal interest rates
  - There must be a limit to how negative interest rates can go
- What is relevant for the economy is not so much that the nominal interest rate is zero, but rather that (i) it cannot be lowered further and (ii) it cannot be lowered in response to adverse demand shocks
- This is potentially very costly and can be difficult to escape. Japan has been at the ZLB for two decades now
- Sometimes called a “liquidity trap”
The LM Curve

- The ZLB means there is a lower bound on the real interest rate of $-\pi_{t+1}^e$. Introduces a kink into the LM curve.
The AD Curve

- The AD curve becomes completely vertical when the ZLB binds
The Ineffectiveness of Monetary Policy at the ZLB

- Changes in the money supply (sufficiently small so as to not change whether or not it binds) do not affect AD
- Monetary policy is rendered ineffective

\[ r_t \]
\[ Y_t \]
\[-\pi_{t+1} \]
\[ IS \]
\[ LM(M_{2,t}, P_{0,t}) \]
\[ LM(M_{1,t}, P_{0,t}) \]
\[ LM(M_{0,t}, P_{0,t}) \]
\[ M_{1,t} > M_{0,t} > M_{2,t} \]
IS Shocks Have Bigger Effects on $Y_t$ at the ZLB

This is because $r_t$ cannot react to partially offset them.
Why is the ZLB Costly?

Central bankers are afraid of the ZLB

Why? Ignoring stabilization policy and nominal rigidities, a zero nominal interest rate is often optimal (Friedman Rule)

Two principal reasons:
1. Normal stabilization policy is not available. Negative demand shocks are much more costly than otherwise
2. Things could get worse. The transition from SR to MR can make the ZLB worse over time. “Deflationary spiral”
MR Dynamics: $Y_t < Y_t^f$ and ZLB Binds

Price adjustment will *not* close the gap
Deflationary Expectations

- What we will tend to observe is prices falling but the output gap not closing if the ZLB binds.
- What if agents begin to expect falling prices?
- We’ve thought of $\pi_{t+1}^e$ as exogenous, but what if a binding ZLB causes agents to begin to expect prices to continue falling (i.e. $\pi_{t+1}^e$ to fall)?
- This will drive up the real interest rate, reducing demand, and making the output gap bigger.
Deflationary Spiral

\[ r_{t} \]

\[ r_{0,t} = r_{1,t} = -\pi_{0,t+1} \]

\[ r_{2,t} = -\pi_{2,t+1} \]

\[ \pi_{0,t+1} \]

\[ Y_{t} \]

\[ P_{t} \]

\[ P_{0,t} \]

\[ P_{1,t} \]

\[ Y_{2,t} \]

\[ Y_{0,t} = Y_{1,t} \]

\[ Y_{0,t} \]

\[ Y_{f} \]

\[ Y_{t} \]

\[ IS \]

\[ LM \]

\[ LM' \]

\[ AD' \]

\[ AD \]

\[ AD' \]

\[ AS \]

\[ AS' \]

0 subscript: original equilibrium

1 subscript: post-price adjustment equilibrium

2 subscript: post-inflation expectation adjustment equilibrium

f superscript: hypothetical flexible price output

Demand side dynamics with expectations of falling inflation

Original ZLB equilibrium

Hypothetical flexible price AS

Sticky Price AS dynamics

Demand side dynamics with expectations of falling inflation
Japanese Experience

Inflation, consumer prices for Japan

Percent

Constant GDP per capita for Japan

Natural Log of (2010 U.S. Dollars)
Fiscal Policy at the ZLB

- As noted above, IS shocks have bigger effects on output at the ZLB because there is no counteracting movement in the real interest rate.
- Fiscal policy shocks (increases in $G_t$ or reductions in taxes if there is no Ricardian Equivalence) are IS shocks.
- Hence, these will have bigger effects on output at the ZLB – there will be no “crowding out”.
- Many (though not all) economists think fiscal expansion makes sense at the ZLB.
Increase in $G_t$ at the ZLB

$r_t = r_{1,t} = -\pi_{t+1}$

$0$ subscript: original equilibrium
$1$ subscript: post-shock equilibrium
nb superscript: hypothetical no ZLB
Escaping the ZLB

- To escape the ZLB, need to either (1) engage in sufficiently large fiscal expansion (see above) or (2) engineer higher (rather than lower) inflation expectations.
- Higher expected inflation lowers the current real interest rate given a fixed nominal rate.
- How to engineer higher inflation expectations?
  - Promise loose monetary policy in the period after the ZLB has ended ("forward guidance").
  - Engage in non-standard open market operations, buying risky private sector debt or longer maturity government debt ("quantitative easing").
  - Central bank credibility is critical to escape the ZLB.
Inflation Expectations

\[ r_{0,t} = -\pi_{0,t+1} \]

Original equilibrium, binding ZLB

Sufficiently large increase in expected inflation such that ZLB no longer binds

\[ -\pi_{1,t+1} \]
How to Avoid the ZLB

- The ZLB is costly and hence to be avoided
- How to set policy *outside* of the ZLB to avoid hitting it?
- Simple solution: higher average inflation rate in MR
- This will mean that the nominal rate fluctuates about a higher average level, meaning less likely to hit the ZLB
- But this (i) moves you further away from Friedman Rule and (ii) may impose other costs ("shoeleather")
- Coibion, Gorodnichenko, and Wieland (2012): optimal inflation rate to avoid ZLB is about 2 percent