Evaluating Central Banks’ Tool Kit: Past, Present, and Future

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Monetary Policy

Before Great Recession

- Central banks focus on short term, interbank rates

ZLB

- Central banks resort to unconventional policies
  - Quantitative easing (QE)
  - Forward guidance (FG)
  - Negative interest rate policy (NIRP)

Our paper: compare all these policies and study their interactions in a unified framework
Contributions

Literature: mainly in piecemeal fashion

**One main contribution:** study all unconventional tools together

- Two channels for NIRP: forward guidance and banking
- New timing assumption for FG: no “puzzle”
- Novel endogenous rule for QE

Results

- In principal, all of QE, FG, NIRP can mimic a conventional rate cut
- The requisite FG and NIRP interventions are implausibly large
- QE seems the most promising tool
Main Takeaways

Simulation: Great Recession

- Output decreases by over 10%
- Lower policy rate to -2%
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Main Takeaways

Simulation: Great Recession

- QE mitigates the effects of the binding ZLB
- QE1-QE3 is equivalent to 2% decline in the policy rate
Empirically, unconventional monetary policy has lowered the “shadow” fed funds rate by 3%.

Our model implies 2/3 of the drop can be attributed to QE.
But, large balance sheet has consequences

- Balance sheet normalization (QT): has impact for the efficacy of QE
- NIRP is less effective the larger the balance sheet
- First attempt at endogenizing an effective lower bound
Outline

1. Model and (Un)conventional monetary policy tools

2. Comparing Alternative Policies

3. Endogenous QE and the Great Recession

4. Future Issues
Medium-scale DSGE model

(a) Households

(b) Financial Intermediaries

(c) Production

(d) Fiscal authority

(e) Central Bank: interest-bearing reserves
Four types of debt instruments in our model

- **Short term:** deposits ($R^d$) and reserves ($R^{re}$)
- **Long term:** private ($R^F$) and government ($R^B$) perpetual bonds (Woodford, 2001)
<table>
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<th>Model</th>
<th>Exogenous Policies</th>
<th>Endogenous QE</th>
<th>Future</th>
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**Monetary Policy**

\[
\text{Long rate} = \text{expectation} + \text{risk premium}
\]
Conventional Policy

Long rate = expectation + risk premium

Conventional

Conventional: works on the short rate today

$$\ln R_t^{TR} = \rho_r \ln R_{t-1}^{TR} + Taylor \ rule + \varepsilon_{r,t}$$
Forward Guidance

\[ \text{Long rate} = \underbrace{\text{expectation}}_{\text{FG}} + \text{risk premium} \]

FG: works on the expected future short rate

\[ \ln R_T^{TR} = \rho_r \ln R_{t-1}^{TR} + \text{Taylor rule} + \gamma \xi_{r,t} \]

- **ZLB**

\[ \ln R_t^d = \ln R_t^{re} = \max \left\{ 0, \ln R_t^{TR} \right\} \]

- **Timing assumption:**
  - facilitates comparison with NIRP
  - mitigates “forward guidance puzzle”

- \( \gamma \in [0, 1] \): credibility
“The problem with QE is it works in practice but it doesn’t work in theory” – Bernanke

$\text{Long rate} = \text{expectation} + \underbrace{\text{risk premium}}_{\text{QE}}$
Constraints

- Leverage constraint (Gertler and Karadi 2011, 2013): $R^F, R^B > R^d$
- Loan in advance constraint (Carlstrom, Fuerst and Paustian 2017): real effect
QE

- Ease leverage constraint and lowers excess return
- Ease loan in advance constraint on firm: stimulate investment
Long rate = expectation + risk premium

\[
Long \ rate = expectation + risk \ premium
\]

FG
Banking
NI RP

\[ R_t^{re} = R_t^{TR} \]
\[ \ln R_t^d = \max \left\{ 0, \ln R_t^{TR} \right\} \]

FG channel

- The same as FG: change future deposit rate
  \[ \ln R_t^{TR} = \rho_r \ln R_{t-1}^{TR} + Taylor\ rule + \varepsilon_{r,t} \]
- Differently than FG: NIRP involves an observable action \( R_t^{re} \)
Banking channel is like QE in reverse: it tightens FI’s leverage constraint

\[ N_t = (R^{re}_{t-1} - R^d_{t-1}) RE_{t-1} + \ldots \]
Conventional Monetary Policy

- 100 basis point conventional shock
Unconventional Monetary Policy

- Unconventional policies at the ZLB
- Choose shocks to match output responses
Shock Sizes

- FG and NIRP: require shock about twice the size of conventional policy shock
- QE: 4 percent increase in balance sheet
Yield Curve

Depositrnte

Real long yield

Nominal long yield

Spread

- MP: increase spread; QE: decrease spread
- Real long yield similar across policies
Summary

- All of QE, FG, NIRP can mimic a conventional rate cut
- The requisite FG and NIRP interventions are large
- FG depends on a central bank's credibility
- Implementing large NIRP implausible in practice

QE seems the most promising tool in our model as well as in real world
Propose Taylor type rule for QE

- endogenous response at the ZLB
- exogenous otherwise
Liquidity Shock

- MP: lower output and inflation, lower policy rate
Liquidity Shock

- **Output**
- **Inflation**
- **Policy rate**
- **CB Balance sheet**

- **ZLB**: exacerbates these effects
Liquidity Shock

- **Model**: Exogenous Policies
- **Future**: Endogenous QE

Endogenous QE: similar to MP
Productivity Shock

- Exogenous Policies
- Endogenous QE

- Output
- Inflation
- Policy rate
- CB Balance sheet

▶ Endogenous QE: similar to MP
Endogenous QE: similar to MP
Endogenous QE mitigates the effects of the binding ZLB

QT is contractionary

Policy rate: -2%, 2/3 of Wu and Xia’s (2016) shadow rate.

Balance sheet: 25% of GDP, about post-QE3
Simulation

1000 draws

- endogenous QE is highly effective
Quantitative Tightening

Benchmark

Output

Inflation

CBBalance sheet

Eric Sims and Cynthia Wu (Notre Dame & NBER)
Immediate selloff after the ZLB
Quantitative Tightening

Carry large balance sheet forward

QT has an important impact for the economy during the ZLB.
NIIRP and the Balance Sheet

- Banking channel: NIIRP less effective the larger the balance sheet
- Timing of unconventional policy interventions matters
ELB on Policy Rate

What is the lowest policy rate that the constraint FIs don’t want to voluntarily shut down?

We provide a useful first benchmark to endogenize ELB
Conclusion

We develop quantitative DSGE model to study all three types of unconventional policies and interactions

▶ Two channels for NIRP: forward guidance and banking channel
▶ New timing assumption on FG: no puzzle
▶ Endogenous rule for QE neutralizes effects of ZLB

Issues going forward

▶ QT has an important impact for the economy during the ZLB
▶ NIRP: size of balance sheet matters
▶ The order of different policies matter
▶ Larger balance sheet implies a tighter ELB