ECON 4325
Monetary Policy
Lecture 11: Zero Lower Bound and Unconventional Monetary Policy

Martin Blomhoff Holm
Outline

1. Recap from lecture 10 (it was a lot of channels!)
2. The Zero Lower Bound and the Liquidity Trap.
3. Forward Guidance.
4. Quantitative Easing/Credit Easing.
Part I: Recap from Lecture 10.
Transmission Channels

- Expansionary open market operation
- Intertemporal substitution and cash-flow effects
- Wealth effect and balance sheet channel
- Asset pricing
- Supply of bank lending
- Bank lending channel
- Exchange rate channel
- Investment and exchange rate channel
- Phillips curve and Euler equation
- Indirect income effect
- Balance sheet channel
- Bank capital channel
- Monetary Policy, Lecture 11

Holm
Part II: The Zero Lower Bound and the Liquidity Trap.
The Liquidity Trap I

Take our standard three equation model with a Taylor rule:

\[ \pi_t = \beta E_t \{ \pi_{t+1} \} + \kappa y_t + u_t \]
\[ y_t = E_t \{ y_{t+1} \} - \frac{1}{\sigma} (i_t - E_t \{ \pi_{t+1} \} - r^n_t) \]
\[ i_t = \max \{ \phi_{\pi} \pi_t + \phi_y y_t + r^n_t, 0 \} \]

Then assume that we get a big negative change in \( r^n_t \). What happens?
The Liquidity Trap II

- If the shock is big enough. We reach the zero lower bound.
- This is the **liquidity trap**: the economy is depressed, inflation is low, and the central bank can do nothing about it.

What should the central bank do in this case? Some options:

1. Forward guidance.
2. Quantitative easing / credit easing.
3. Negative interest rates (i.e. the ZLB does not really exist).
Forward Guidance I

Main idea: promise something in the future. Since agents are forward-looking, it affects the economy today.

Two types:

1. Delphic: describe what the policy function looks like (e.g. if the economy evolves according to our expectations, the interest rate follows this path).

2. Odyssian: contingent promise (e.g. promise to keep the interest rate low until unemployment is lower than x.x %).

Key issues: commitment and credibility (this is management of expectations).
Forward Guidance II

The model:

\[ \pi_t = \beta E_t\{\pi_{t+1}\} + \kappa y_t + u_t \]

\[ y_t = E_t\{y_{t+1}\} - \frac{1}{\sigma}(i_t - E_t\{\pi_{t+1}\} - r_n^t) \]

\[ i_t = \max\{\phi_\pi \pi_t + \phi_y y_t + r_n^t, 0\} \]

The solution (solve forward):

\[ y_t = -\sum_{k=0}^{\infty} E_t\{i_{t+k} - \pi_{t+k+1} - r_{t+k}^n\} \]

\[ \pi_t = \kappa \sum_{k=0}^{\infty} \beta^k E_t\{y_{t+k}\} \]

\[ i_t = \max\{\phi_\pi \pi_t + \phi_y y_t + r_n^t, 0\} \]
Forward guidance is then to promise that \( i_{t+k} \) is lower than predicted from Taylor rule.

What happens?

- Any promised future interest rate change affects all output gaps going from \( t \) to \( t + k \).
- And all these changes in output gaps affect inflation today.
Forward Guidance IV: Normal Times

Let’s assume the central bank promises to keep the interest rate lower than the Taylor rule in period $t + k$

$$y_t = - \sum_{k=0}^{\infty} E_t \{ i_{t+k} - \pi_{t+k+1} - r_{t+k} \}$$

$$\pi_t = \kappa \sum_{k=0}^{\infty} \beta^k E_t \{ y_{t+k} \}$$

$$i_t = \max \{ \phi_\pi \pi_t + \phi_y y_t + r_t, 0 \}$$

What happens?

1. $i_{t+k} \downarrow$
2. $\{ y_{t+s} \}_{s=0}^{k} \uparrow$ & $\{ \pi_{t+s} \}_{s=0}^{k} \uparrow$
3. $\{ i_{t+s} \}_{s=0}^{k} \uparrow$
4. pretty big effect on $y$ and $\pi$. 
Forward Guidance V: Zero Lower Bound

Let’s assume the central bank promises to keep the interest rate lower than the Taylor rule in period $t + k$

$$y_t = - \sum_{k=0}^{\infty} E_t \{ i_{t+k} - \pi_{t+k+1} - r^n_{t+k} \}$$

$$\pi_t = \kappa \sum_{k=0}^{\infty} \beta^k E_t \{ y_{t+k} \}$$

$$i_t = \max \{ \phi_\pi \pi_t + \phi_y y_t + r^n_t, 0 \}$$

What happens?

1. $i_{t+k} \downarrow$
2. $\left\{ y_{t+s} \right\}_{s=0}^{k} \uparrow \& \left\{ \pi_{t+s} \right\}_{s=0}^{k} \uparrow$
3. $\left\{ i_{t+s} \right\}_{s=0}^{k} \uparrow$
4. pretty BIG effect on $y$ and $\pi$. 
Forward Guidance VI: BIG effects!

Figure 6: Impulse response functions to contemporaneous and anticipated policy shocks

0  

Quarters Ahead: 4 8

Interest Rate

10-Year Rate

Output Level

Core PCE Inflation

Notes: The figure shows the percent change over a 1/2 quarter horizon of the short term interest rate, the 10-year nominal rate, the level of output, and Core PCE inflation in response to a contemporaneous, 4 quarter and 8 quarter ahead negative 10 basis points policy shock.

Del Negro-Giannoni-Patterson (2015)
Too big effects of forward guidance on current inflation at the zero lower bound.

And the effect is bigger the farther in the future the change in interest rate is.

This is the forward guidance puzzle.
(macro: puzzle is a euphemism for the model is wrong)
Forward Guidance - Solutions to the FG "puzzle"

**Theoretical solution:** add discounting in the dynamic IS-curve

\[ y_t = \beta E_t\{y_{t+1}\} - \frac{1}{\sigma}(i_t - E_t\{\pi_{t+1}\} - r^n_t) \]

How?
- Life-cycle (Del-Negro-Giannoni-Patterson, 2015)
- Incomplete markets (McKay-Nakamura-Steinsson, 2016)

Or **dampen the general equilibrium income effects**
(e.g. wage stickiness or information frictions)
Forward Guidance - Empirical Evidence I

Very hard to test. This is like identifying monetary policy to the power of two. Some issues:

- **Multidimensional.** Effect of everything that is communicated in an interest rate meeting. Changes across the whole interest rate path matter.

- **Hard to distinguish.** Between news about central bank’s assessment of the economy and forward guidance.

- **Theory suggests.** Subtle differences in communications should have big effect (explicit vs. implicit; odyssean vs. delphic).

- **Hard to read.** From information about the interest rate meeting what was the news that the market participants reacted to.
Forward Guidance - Empirical Evidence II

But a couple of attempts have been made:

1. Event studies (Woodford, 2012).

The Bank of Canada today announced that it is lowering its target for the overnight rate by one-quarter of a percentage point to 1/4 per cent, which the Bank judges to be the effective lower bound for that rate. [...] With monetary policy now operating at the effective lower bound for the overnight policy rate, it is appropriate to provide more explicit guidance than is usual regarding its future path so as to influence rates at longer maturities. Conditional on the outlook for inflation, the target overnight rate can be expected to remain at its current level until the end of the second quarter of 2010 in order to achieve the inflation target.

Bank of Canada, April 21, 2009
Forward Guidance - Event Studies II

Figure 1: Intraday OIS rates in Canada on April 21, 2009. The dotted vertical line indicates the time of release of the Bank of Canada’s announcement of its “conditional commitment” to maintain its policy rate target at 25 basis points through the end of the second quarter of 2010. Source: Bloomberg.

Woodford, 2012
Figure 2: The forward rate (for the period between 6 and 12 months in the future) implied by the term structure of OIS rates (see text for explanation), for both the Canadian dollar and the US dollar, over the course of 2009. The dotted vertical line marks the date of the announcement of the Bank of Canada’s “conditional commitment.” Daily data. Source: Bloomberg.
Forward Guidance - Factor Models

**Idea:** Any effects on market prices during a sufficiently narrow window must indicate an effect of speech.

**Implementation:** Use principal components analysis to extract the two most important factors explaining movements in the forward funds rate:

1. the ”target” factor: immediate changes in the fed funds target.
2. the ”path” factor: changes in the fund rate farther in the future.

**Findings:** the ”path” factor explains substantial share of variation in the forward funds rate (and treasury yields), suggesting that ”guidance” had effects on prices today.

**However:**

- No way of assessing what mattered in communication.
- Does affect forecasts by experts in the wrong way. (suggesting that the news is really about the economy and not forward guidance).
Forward Guidance - Summary

Good forward guidance should be

▶ ... explicit
▶ ... credible

Simpler ways to implement it are price level (Eggertsson-Woodford, 2003) or nominal GDP target paths.

But:

▶ forward guidance always suffer from time-inconsistency. 
  *(it is all about expectations)*

▶ the theoretical/empirical effects of credibly changing interest rates in the future is disputed. 
  *(Do we have discounting in the Euler-equations? Do we have effects on wages? Does it affect anything?)*
Part IV: Quantitative Easing/Credit Easing.
Quantitative Easing vs. Credit Easing

- Quantitative Easing = expansion of central bank balance sheet.
- Credit Easing = quantitative easing + targeted asset purchases (ex. “operation twist”)

(examples on blackboard)
Quantitative Easing - Theory I

Now, the Bank of Japan’s argument is, “Oh well, we’ve got the interest rate down to zero; what more can we do?” It’s very simple. They can buy long-term government securities, and they can keep buying them and providing high-powered money until the high-powered money starts getting the economy in an expansion.

Milton Friedman at a conference in 2000

Main idea: the quantity theory of money.

\[ MV = PT \]

1. Central bank increases M0
2. M1/M2 also increases through the money multiplier
3. Under the assumption that V is constant, PT (nominal GDP) increases.
Quantitative Easing - Theory II

Or in terms of bank balance sheets:

1. Central bank increases R and buys treasuries.
2. The bank responds by lending more to firms
3. GDP goes up since some previously constrained firms can borrow.

Problems:

► The money multiplier is not constant. Why?
  ▶ Reserves and treasuries are pretty good substitutes
  ▶ The QE is not expected to be permanent, making banks and firms reluctant to adjust.
  ▶ Money multiplier also demand-driven.
  ▶ Banks hit implicit or explicit constraints.

► (The velocity of money is not necessarily constant.)
Example 1: Japan 2001-2006

Figure 14: The evolution of the monetary base in Japan; the region between the curve labeled ‘monetary base’ and the one labeled ‘currency’ indicates the quantity of current account balances. The first grey region indicates the period of the Bank of Japan’s policy of “quantitative easing”; the second grey region indicates the period of its policy of “comprehensive monetary easing.” Units (left scale): trillions of yen. Source: Bank of Japan and Federal Reserve Bank of St. Louis.
QE2 (Fall 2010 - Summer 2011) had no effect on bank lending or employment while QE1 and QE3 (credit easing) had effects. (Darmouni-Rodnyanski, 2017; Luck-Zimmermann, 2018)

**Summary:** quantitative easing, being an expansion of the central bank’s balance sheet by buying treasuries, had little or no effect on bank lending and employment.
Credit Easing - Theory I

The Federal Reserve’s approach to supporting credit markets is conceptually distinct from quantitative easing (QE), the policy approach used by the Bank of Japan from 2001 to 2006. Our approach—which could be described as "credit easing"—resembles quantitative easing in one respect: It involves an expansion of the central bank’s balance sheet. However, in a pure QE regime, the focus of policy is the quantity of bank reserves, which are liabilities of the central bank; the composition of loans and securities on the asset side of the central bank’s balance sheet is incidental. Indeed, although the Bank of Japan’s policy approach during the QE period was quite multifaceted, the overall stance of its policy was gauged primarily in terms of its target for bank reserves. In contrast, the Federal Reserve’s credit easing approach focuses on the mix of loans and securities that it holds and on how this composition of assets affects credit conditions for households and businesses.

Bernanke, Jan 13, 2009
Credit Easing - Theory II

**Main Goal:** Reducing credit market spreads.

**Assumption:** No Modigliani-Miller.

*(in the absence of taxes, bankruptcy costs, agency costs, and asymmetric information, and in an efficient market, the value of a bank is unaffected by how that bank is financed)*

**Then:** Substituting high-risk assets (mortgage backed securities (MBS)) with reserves makes banks healthier and allows them to initiate lending. *(remove liquidity risk from banks)*
Credit Easing - Empirical Evidence I

Again: very hard to test. And even harder than forward guidance.

- Multidimensional. Effect of everything that is communicated.
  (time + other instruments)

- Disagreement about whether credit easing should have instant effect
  (as estimated by effects in a short window) or slow effects (as
  estimated as cumulative effect of the CE-period).
  - Instant effect: good identification. But it does not really answer the
    most interesting questions.
  - Slow effects (cumulative effect): not that good identification, but can
    answer the most interesting questions.
Credit Easing - Empirical Evidence II

Method 1: Calculate the effect on various interest rates within a small window of the QE announcement.

![Figure 7. Cumulative Interest Rate Changes around Announcement Events, Alternative Event-Study Parameters](image)

Source: Bloomberg, Barclays Capital.

Gagnon et al (2011)
Credit Easing - Empirical Evidence III
(Darmouni-Rodnyanski)

Main Idea: compare banks with more prior exposure to the targeted asset with those with less exposure. If the banks are similar in other dimensions, the differences in outcomes is due to CE.

Implementation: compare banks with more MBS and less MBS under QE1 and QE3; compare banks with more and less treasuries under QE2.

Result: Banks with more exposure to MBS under QE1 & QE3 increased lending more. Exposure to treasuries under QE2 had no effect.

Take-away: Credit easing potentially has some effects, quantitative easing has no effect.
Credit Easing - Empirical Evidence III
(Luck-Zimmermann)

Main Idea: compare employment in counties where banks have more prior exposure to the targeted asset with those with less exposure. If the banks and counties are similar in other dimensions, the differences in outcomes is due to CE.

Implementation: compare banks with more MBS and less MBS under QE1 and QE3; compare banks with more and less treasuries under QE2.

Result: Banks with more exposure to MBS under QE1 & QE3 increased lending more. Exposure to treasuries under QE2 had no effect.

Take-away: Credit easing potentially has some effects, quantitative easing has no effect.
Quantitative Easing/Credit Easing - Summary

- Seems to be very little effect of quantitative easing.
- Could be some effect of credit easing on bank lending and employment.
- But: there are costs to quantitative easing.
  - Central bank buys assets at a premium.
  - Balance sheet risk.
  - Transfer to banks.
  - At some point, the QE must be reversed (probably slowly).
- We have no assessment of whether the benefits outweighs the costs.
Summary

You should know

- Theory and empirical results on
  1. Forward guidance.
  2. Quantitative easing.
  3. Credit easing.

- The difference between quantitative easing and credit easing.

**Basically:** you should be able to write a note on the policies available to a central bank that is constrained by the zero lower bound.
Next week

- Negative interest rates.