Monetary Policy

- **Strategy**
  - The decision making process
    - How the appropriate stance of policy is chosen
      - Determining the value of intermediate targets to achieve objectives
      - Giving directives for implementation

- **Implementation**
  - The operating framework
    - What is (are) the operating target(s)
    - What are the *tools* to achieve the operating target(s)
      - Evolution of the operating framework through the crisis to current

- **Transmission**
  - The *channels* through which monetary policy affects the broader financial conditions, which in turn affect the real economy
    - From the operating targets to the Fed’s objectives

*covered in the previous presentation*
At-a-glance: Implementation and Transmission

Policy tools →

Communication → IOER and ON RRP → Fed Funds Rate (FFR)

Open Market Operations → Fed asset holdings

Fed Funds Rate (FFR) → Short-term rates

Long-term rates

Mortgage, corporate & cons rates

Asset prices → Cash flows, Collateral

Loan supply

Intermediaries’ balance sheet

Risk-taking channel

Asset prices → Aggregate demand

Intermediaries’ balance sheet → Bank lending channel

Cost channel

Long-term rates

Mortgage, corporate & cons rates

Exchange rate

Exchange rate channel

Goals →

Real GDP, Employment, Inflation
First: Some Concepts

- **Reserves**
  - *Reserves* are deposits that banks hold in their accounts at the Federal Reserve (banks’ *assets*, but Fed’s *liabilities*)
    - *Reserve requirement ratio* → percentage of their own deposits that banks must hold at the Fed
    - *Excess reserves* → holding of reserve in excess to required reserves

- **Discount Window (DW)**
  - It’s a credit facility administered by Reserve Banks
    - The Fed lends reserves to commercial banks
  - It reflects the role of the Fed as “lender of last resort”
    - The lending rate is called *discount rate* (typically set above market rates to reflect a penalty for borrowing directly from the Fed)

- **Federal Funds Market**
  - An interbank market (largely overnight) where reserves are exchanged, without collateral requirement
    - Other institutions (GSEs and FHLBs) also participate in the FF market
Some Concepts, cont.

- Open Market Operations (OMO)
  - Purchases or sales of government securities on the secondary market
    - Conducted by the NY Fed Desk
      - A purchase (sale) adds (drain) reserves to the banking system → its purpose is stimulating (restraining) an expansion of credit
  - Repos and Reverse repos are temporary OMO

- Interest on Excess Reserves (IOER)
  - Payment of interest to balances held in their Fed accounts
    - Payable only to depository institutions
  - The Fed was authorized to pay interest on bank reserves starting in Oct. 2008

- Term Deposit Facility (TDF)
  - Tool to manage aggregate quantity of reserves
    - Offered by Reserve Banks – funds in TDF are removed from reserve accounts of depository institutions
Evolution of the Operating Framework

- **Operating framework**: operating target(s) and tools to achieve them
  - **Operating targets**: intermediate objectives set by monetary policy
    - Need to be effective in influencing flow of credit and broad financial conditions
    - Should be controlled reasonably well by the central bank

- **Pre-crisis framework**: FFR is operating target, managed through reserves
- **During the ELB (Effective Lower Bound)**: Fed’s asset holdings are an additional operating target
- **Current framework**: FFR main operating target, managed by IOER & ON RRP
The FFR and the Market for Reserves

- Corridor-like system, unremunerated reserves
  - Demand for reserves (by banks): inversely related to the interest rate
    - Influenced by the reserve requirement
    - DW rate generally prevented FFR from spiking up
  - Supply of reserves (by the Fed): provided to the banking system via OMO
    - OMOs adjust supply of reserves to match the demand at the target rate
    - Crucial: scarcity of reserves

![Graph showing interest rate, reserve balance, and demand for reserves](image)
## Reserve Balances in the Fed’s (stylized) Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Treasury securities</td>
<td>Federal Reserve notes (currency)</td>
</tr>
<tr>
<td>Repurchase agreements (Repos)</td>
<td>Deposits of depository institutions</td>
</tr>
<tr>
<td>Loans to depository institutions</td>
<td>(Reserve balances)</td>
</tr>
<tr>
<td>(Discount Window loans)</td>
<td>Other (including capital)</td>
</tr>
<tr>
<td>Other assets</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total liabilities</td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td><strong>Total liabilities</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>867.7</strong></td>
</tr>
<tr>
<td></td>
<td><strong>867.7</strong></td>
</tr>
</tbody>
</table>

Source: Federal Reserve Board H.4.1., July 26, 2007 Release

Note: Units are Billions of U.S. Dollars
### Impact of OMOs on the Fed’s Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Treasury securities</td>
<td>Federal Reserve notes (currency)</td>
</tr>
<tr>
<td>790.7</td>
<td>776.5</td>
</tr>
<tr>
<td>+10</td>
<td></td>
</tr>
<tr>
<td>Repurchase agreements (Repos)</td>
<td>Deposits of depository institutions (Reserve balances)</td>
</tr>
<tr>
<td>18.8</td>
<td>12.6</td>
</tr>
<tr>
<td>Loans to depository institutions (Discount Window loans)</td>
<td>+10</td>
</tr>
<tr>
<td>0.2</td>
<td>Other (including capital)</td>
</tr>
<tr>
<td>Other assets</td>
<td>78.6</td>
</tr>
<tr>
<td>58.0</td>
<td></td>
</tr>
</tbody>
</table>

**Total assets** 867.7  **Total liabilities** 867.7

Source: Federal Reserve Board H.4.1., July 26, 2007 Release

Note: Units are Billions of U.S. Dollars
## Impact of OMOs on the Fed’s Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Treasury securities 800.7</td>
<td>Federal Reserve notes (currency) 776.5</td>
</tr>
<tr>
<td>Repurchase agreements 18.8 (Repos)</td>
<td>Deposits of depository institutions (Reserve balances) 22.6</td>
</tr>
<tr>
<td>Loans to depository institutions (Discount Window loans) 0.2</td>
<td>Other (including capital) 78.6</td>
</tr>
<tr>
<td>Other assets 58.0</td>
<td></td>
</tr>
<tr>
<td><strong>Total assets 877.7</strong></td>
<td><strong>Total liabilities 877.7</strong></td>
</tr>
</tbody>
</table>

Source: Federal Reserve Board H.4.1., July 26, 2007 Release  
Note: Units are Billions of U.S. Dollars
To alleviate problems in credit markets and stimulate the economy, in turn:

- **Traditional monetary policy**
  - Progressive reduction of the FFR target → from 5¼ percent to effective zero
  - FFR target set at 0 to ¼ percent (ELB) in Dec 2008

- **Liquidity provision**
  - Increases in loans and lengthening of term of loans
    - Provision of liquidity to *commercial banks* and *primary dealers* (TAF, TSLF, PDCF), *then to* other market participants (CPFF, AMLF, TALF)
    - Opening of *currency swap lines* (address dollar borrowing costs overseas)

- **Accelerated plans to pay interest on reserves (IOER)**

- **Asset purchase programs**
  - *Agency debt, Agency MBS, long-term Treasuries*

**Consequences?**
- The size of the balance sheet increases → large amount of reserves are created
- With abundant reserves → traditional operating framework no longer works
What is the Interest On Excess Reserves (IOER)?

- **IOER** is interest on the balances that the banks hold in their account at the Fed
  - Authority to pay IOER to banks granted to the Fed in 2008
- IOER represents a risk-free overnight rate → should put a ‘floor’ on rates
  - It’s opportunity cost of holding reserves vs. alternative assets
  - There should be no incentive to lend below IOER rate
- With scarce reserves, supply and demand would determine equilibrium rate

![Diagram showing the relationship between interest rate, demand for reserves, and required reserves](image-url)
The ELB Changed the Operating Framework

- At the **ELB**, two type of policies to affect financial conditions
  - **Balance sheet policy** (LSAPs, aka QE)
    - Changes in size and composition of the Fed’s asset holdings
      - *How it works*
        - Reduces *long-term rates* by reducing term premia
        - Supports commitment to extended period of low rates
    - As a byproduct, reserves increase --> reduced control of the FFR
  - **Forward guidance** on the future path of the FFR
    - FOMC set expected time/conditions for liftoff and path afterwards
      - *How it works*
        - Expected low path of short term rates puts downward pressure on longer-term interest rates and makes financial conditions more accommodative.
Variety of asset purchase programs implemented since 2008

- **Large-Scale Asset Purchases (LSAPs) I and II**
  - Purchases of Agency MBS and Agency Debt (Nov 2008)
  - Purchases of long-term Treasury securities (Mar 2009; Nov 2010)
    - Predetermined *total amounts*, purchased over a period of months
    - \( \rightarrow \text{increase size and composition of the balance sheet} \)

- **Maturity Extension Program (MEP)**
  - Purchase of long-term Treasury securities and sale of an *equal amount* of short-term Treasury securities (Sept 2011-Dec 2012)
    - \( \rightarrow \text{changes only the maturity composition of the balance sheet} \)

- **LSAP III: outcome-based program**
  - Purchase of agency MBS (Sep 2012) and long-term Treasuries (Jan 2013)
    - Fixed amount *per month*, until set objectives are reached
    - Incremental reduction in the pace of purchases (“tapering”) from Jan 2014
    - Purchases ended in Oct 2014
    - \( \rightarrow \text{increases size and composition of the balance sheet} \)
### Impact of LSAPs on the Fed’s Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Securities held outright</td>
<td>Federal Reserve notes (currency)</td>
</tr>
<tr>
<td>U.S. Treasury Securities</td>
<td>1,484</td>
</tr>
<tr>
<td>Agency Debt &amp; MBS</td>
<td>Deposits of depository institutions (Reserve Balances)</td>
</tr>
<tr>
<td>Repurchase agreements (Repos)</td>
<td>2,460</td>
</tr>
<tr>
<td>Loans to depository institutions</td>
<td>Reverse Repos</td>
</tr>
<tr>
<td>Other assets</td>
<td>222</td>
</tr>
<tr>
<td>Total assets</td>
<td>Total liabilities</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total assets</strong></td>
<td><strong>Total liabilities</strong></td>
</tr>
<tr>
<td>4,470</td>
<td>4,470</td>
</tr>
</tbody>
</table>

Source: Federal Reserve Board H.4.1, March 16, 2017 Release

Note: Units are Billions of U.S. Dollars
Evolution of the Federal Reserve’s Balance Sheet

**Assets**

USD, billions

- Treasuries
- Agency Debt
- Agency MBS
- Other Assets*

**Liabilities and Capital**

USD, billions

- Federal Reserve Notes
- Reserve Balances
- Term Deposits
- Treasury Accounts*
- RRPs**
- Other Liabilities
- Capital

* Includes DW, crisis facilities, central bank liquidity swaps, foreign portfolio, and unamortized premiums and discounts.

Source: Federal Reserve Board H.4.1, March 16, 2017 Release

**Includes** Treasury General Account and Supplementary Financing Account.

**Includes** Foreign Repo Pool and RRP open market operations.
Impact of Large Amount of Reserves on FF Market

- With large amount of reserves
  - No more need to forecast reserve demand and adjust accordingly the supply
  - Small adjustments of reserves via OMO, as in pre-crisis framework, would not impact the federal funds rate
- With abundant reserves, the IOER could be used to control the target rate

![Graph showing the relationship between interest rate, DW rate, IOER, and reserve supply balance. Supply of reserves is not linked to target rate.](image-url)
A “leaky” floor

- IOER should set a floor beneath interbank rates
  - If banks can earn 1% leaving money in their Fed account, they won’t have an incentive to lend it out below that rate
- However, some institutions (GSEs and FHLBs) can trade in the FF market but cannot earn interest on reserves
  - Hence they have an incentive to lend reserves at a lower rate than the IOER
  - Interbank trades occur at rates above IOER but non-bank to bank trades occur at rates below IOER
Addressing the ‘leaky’ floor problem

OverNight Reverse Repos (ON RRP)
- Temporary exchange of cash for Treasury securities held by the Fed
- Engages a wide range of counterparties (MMFs, GSEs, PDs, banks)
  - Supports a floor under rates

Supply of reserves is not linked to target rate

Interest rate

Reserve balances

ON RRP rate

IOER rate

DW rate
Towards a New Operating Framework

Policy Normalization Principles and Plans (September 16, 2014)

- During normalization: **FFR primary operating target**
  - **IOER**: “the Federal Reserve intends to move the federal funds rate into the target range set by the FOMC *primarily* by adjusting the interest rate it pays on excess reserve balances.”
  - **ON RRP**: “the Federal Reserve intends to use an overnight reverse repurchase agreement facility and other *supplementary* tools as needed to help control the federal funds rate. The Committee will use an overnight reverse repurchase agreement facility only to the extent necessary and will phase it out when it is no longer needed to help control the federal funds rate.”

- During normalization: **Balance sheet policy**
  - **No active balance sheet policy**: “The Committee expects to cease or commence phasing out reinvestments after it begins increasing the target range for the federal funds rate.”
  - **No sizeable sales of MBS expected**: “The Committee currently does not anticipate selling agency mortgage-backed securities as part of the normalization process.”
FOMC raised target range for the first time (lift-off) on December 16, 2015 to a range of ¼ to ½ percent

Range raised again on December 2016 and March 2017

FOMC post-meeting communication

Statement
- Announces the FOMC decision about the target range for the FFR (target range currently at 3/4 to 1 percent)

Implementation Note
- Announces Board of Governors’ decision about the level of the IOER (currently 1.00 percent)
- Gives the FOMC directives to the Desk to conduct OMO, including ON RRPs, as necessary to maintain the federal funds rate in the set target range
- Announces Board’s decision about requests submitted by regional Feds about the discount rate (currently 1.50 percent)
Effective Fed Funds Rate Is Up

Federal Funds Rate

- Effective Fed Funds Rate
- Fed Funds Target Range

Rate (bps)

Money Market Rates Are Up

Notable Interest Rates

- IOER
- Fed Funds
- BNYM GC Index - Treasuries
Key Takeaways on Policy Implementation

- Policy implementation **‘pre-crisis’**
  - FFR as operating target
  - OMOs manage the supply of reserve to maintain FFR near target

- Policy implementation **during the crisis (at ELB)**
  - Two operating targets
    - **FFR**: while at ELB, expectations managed via forward guidance
    - **Balance sheet policy**: active management of the asset side

- Policy implementation **during normalization**
  - FFR main operating target
    - Achieved by setting IOER; supported by ON RRP
    - Balance sheet expected to wind down gradually through redemptions and paydowns, once reinvestment is ceased

- **Long-run Framework**
  - Is still under discussion
    - Issues: floor versus corridor, abundant vs scarce reserves
Understanding the Transmission Mechanism
What is the Transmission Mechanism?

- Intermediate targets have little *direct* impact on aggregate spending.
- They work by affecting the broad financial conditions.

Diagram:

1. **Fed Funds Rate (FFR)**
2. **Short-term rates**
3. **Broader financial conditions**
4. **Aggregate demand**
5. **Real GDP, Employment, Inflation**
Channels of Monetary Policy Transmission

- **Fed Funds Rate (FFR)**
- **Short-term rates**
- **Long-term rates**
  - Mortgage, corporate & cons rates

- **Intermediaries’ balance sheet**
- **Loan supply**
- **Asset prices**
- **Cash flows, Collateral**
- **Aggregate demand**
  - Real GDP, Employment, Inflation

- **Exchange rate**

- **Financial Intermediation**
- **Risk-taking channel**
- **Bank lending channel**
- **Wealth channel**
- **Interest rate channel**
- **Exchange rate channel**
Interest rate channel

Given inflation expectations, the nominal rate determines the real short-term interest rate; current and expected future real rates affect longer-term real rates, which influence interest-sensitive expenditures.
Channels of Monetary Policy Transmission

Fed Funds Rate (FFR) → Short-term rates → Exchange rate → Aggregate demand

**Exchange rate channel**
Given expectations of future exchange rate levels, a higher interest rate implies a stronger currency (Uncovered Interest Rate Parity, UIP). A stronger currency reduces net export demand.
Channels of Monetary Policy Transmission

Fed Funds Rate (FFR)

- Short-term rates

- Asset prices

Wealth channel:
A higher interest rate reduces the price of equities, reducing financial wealth

- Effect on households: negative on consumption expenditures
- Effect on firms: decline in market valuation of the firm relative to the cost of capital (Tobin’s q) leads to a decline in investment spending

Aggregate demand
Channels of Monetary Policy Transmission

Fed Funds Rate (FFR) → Short-term rates → Asset prices → Cash flows, Collateral → Aggregate demand

Balance sheet channel
A reduction in asset prices also reduces the collateral value of borrowers, reducing loans and aggregate demand.
Channels of Monetary Policy Transmission

Fed Funds Rate (FFR)

Short-term rates

Loan supply

Bank lending channel

A reduction in reserves and/or a higher cost of reserves lead to an inward shift in the supply of bank loans, a decline in loans and a decline in spending by bank-dependent firms and consumers

Aggregate demand
Channels of Monetary Policy Transmission

Fed Funds Rate (FFR)

Short-term rates

Risk-taking channel

Intermediaries’ balance sheet

Loan supply

Risk-taking channel

The policy rate directly influences bank profitability and risk appetite:
lower rate \(\rightarrow\) higher risk-taking capacity \(\rightarrow\) higher credit supply
\(\rightarrow\) reduced risk premia

Aggregate demand
The Crisis: House Prices and Spreads

Case-Shiller Index (SA)

1 Month USD Libor to OIS

30-Year FRM to 10-Year Treasury

BAA Bond Yield to 10-Year Treasury

Source: S&P, Fiserv, and MacroMarkets LLC

Source: Bloomberg

Source: HSH Associates and Datastream

Source: Federal Reserve Board
Fed Interventions to Restore Transmission

Credit availability → Asset prices → Collateral → Aggregate demand → Short-term nominal interest rates → Fed Funds Rate (FFR) → TAF, FX SWAPS → CPFF, TALF AMLF → LSAP I → Exchange rate

Fed Interventions:
- TSLF, PDCF
- CPFF, TALF AMLF
- LSAP I

Key Concepts:
- Short-term nominal interest rates
- Long-term real interest rates
- Aggregate demand
- Fed Funds Rate (FFR)
- Credit availability
- Asset prices
- Collateral
- Exchange rate
How does Forward guidance work?

- At the ELB stimulus cannot be provided by lowering the current FFR
- FOMC set expected time/conditions for liftoff and path afterwards

Monetary transmission works via *expectations* of the future path of the FFR

- Expected low path of short term rates puts downward pressure on longer-term interest rates and makes financial conditions more accommodative
Forward Guidance

Policy communication and commitment

Expected path of FFR

Expected path of short-term nominal interest rates

Credit availability

Asset prices

Collateral

Long-term real interest rates

Aggregate demand

Exchange rate

Bank lending channel

Balance sheets channel

Wealth channel

Interest rate channel

Exchange rate channel
How do asset purchases work?

**Duration channel** (or term premium effect)
- Asset purchases work primarily by reducing risk premia
  - Purchases transfer duration risk from the private sector to the central bank’s balance sheet.
  - The reduction in risk premia prompts private sector investors to move into riskier assets
  - Financial market conditions ease, supporting wealth and aggregate demand.”

**Signaling channel**
- Works through FFR path expectations
  - Purchasing long-term assets serves as a credible commitment to keep interest rates low (as the CB incurs a loss when raising rates)

**Other channels** (not in the figure)
- Liquidity channel: by increasing reserves (most liquid asset)
- Inflation expectations channel: by reducing real rates
Asset Purchases

Fed Interventions

Fed Asset Holdings

Reserves

Expected path of short-term nominal interest rates

Expected path of short-term nominal interest rates

Long-term real interest rates

Exchange rate

Exchange rate channel

Bank lending channel

Balance sheets channel

Wealth channel

Interest rate channel

Credit availability

Asset prices

Collateral

Aggregate demand

LSAP II, LSAP III; MEP

Signaling channel

‘Duration’ channel
Efficacy of asset purchases is difficult to quantify

- Financial market responses seem consistent with expected effects
  - General downward trend in 10-yr Treasury yield since 2008
  - MBS yields, mortgage rates lower
  - Equity prices up
  - Corporate bond spreads narrower

Effects vary across programs and asset classes

- Treasury purchases appear to affect significantly long-term Treasury rates and highly-rated corporate bonds rates; but affect less low-rated corporate bonds and mortgages
- MBS purchases appear to have significant effects on mortgage rates

Empirical assessments based primarily on ‘announcement effects’

- Event studies focus on narrow windows around the time of announcements to measure changes in a variety of long-term rates
  - Hard to establish ‘causation’ since there may be other concurrent events
  - Market reaction depends on the dynamics of expectations, hard to measure
- Average estimate: $100 billion purchases → -5bp in 10-yr Treasury yield
Fed’s Securities Holdings, 10y & 30y Treasury Yields

MBS + Agency + Treasuries (Left Axis)

30yr Treasury yield (Right Axis)

Source: Federal Reserve Bank of St. Louis, Federal Reserve Board, H.4.1 release of March 16, 2017
Corporate Credit Spreads

Source: Federal Reserve Economic Data (FRED)
### Selected Estimates of LSAPs’ Impact on Yields

#### Estimated Impact of LSAPs on the 10-Year Treasury Yield

<table>
<thead>
<tr>
<th>Research Paper</th>
<th>Estimated Decline in 10Yr Treasury Yield (bp)</th>
<th>Impact per $100Bn (bp)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LSAP1: 12/5/2008 - 3/31/2010</strong>&lt;br&gt;($1.25 Trillion MBS purchases, $300 Billion Treasury security purchases, $172 Billion agency debt security purchases)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D’Amico and King (2013) [Treasury only]</td>
<td>20 to 30</td>
<td>7-10</td>
</tr>
<tr>
<td>D’amico et al. (2012) [Treasury only]</td>
<td>35</td>
<td>12</td>
</tr>
<tr>
<td>Krishnamurthy and Vissing-Jorgensen (2011)</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>Gagnon et al. (2011) [Events] &amp; [Regression]</td>
<td>91 &amp; 36 to 82</td>
<td>5 &amp; 2-5</td>
</tr>
<tr>
<td><strong>LSAP2: 11/2/2010 - 6/30/2011</strong>&lt;br&gt;($600 Billion Treasury security purchases)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D’amico et al. (2012)</td>
<td>55</td>
<td>9</td>
</tr>
<tr>
<td>Krishnamurthy and Vissing-Jorgensen (2011)</td>
<td>25</td>
<td>4</td>
</tr>
<tr>
<td>Meaning and Zhu (2011)</td>
<td>21</td>
<td>4</td>
</tr>
<tr>
<td>Swanson (2011)</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>Hamilton and Wu (2012)</td>
<td>22</td>
<td>2</td>
</tr>
<tr>
<td>Meaning and Zhu (2012)</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td><strong>LSAP3: 9/14/2012 - 10/31/2014</strong>&lt;br&gt;($823 Billion MBS purchases, $790 Billion Treasury security purchases)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engen, Laubach, and Reifschneider (2015)</td>
<td>60</td>
<td>4</td>
</tr>
</tbody>
</table>
Did Asset Purchases Improve Economic Conditions?

- Effects of purchases on aggregate demand are harder to assess
  - Simulations from structural models suggest *positive*, but relatively small, macroeconomic effects
  - Economic recovery remained fragile despite large purchases
    - Inflation moving only slowly towards objective
    - Unemployment rate fell faster than expected, particularly after the outcome-based program, but other labor market indicators slower to recover (low job-finding rate, low employment/population ratio, sluggish wages)
  - but counterfactual not observed!

- Some ‘headwinds’ inhibited transmission of LSAPs
  - Contractionary fiscal policy
  - Tighter lending standards/private deleveraging
  - European sovereign debt crisis
  - Low global growth

- Benefits/costs assessment of nontraditional tools still subject to *considerable uncertainty*
- Debate continues over their role when away from the ELB
## Some Estimates of LSAPs’ Macroeconomic Impact

### Estimated Impact of LSAPs on Various Macroeconomic Variables

<table>
<thead>
<tr>
<th>Investigator</th>
<th>Variable of Interest</th>
<th>Assumptions (approx)</th>
<th>Total Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macro Advisers [MA Model]</td>
<td>Real GDP (effect</td>
<td>$600 Bil LSAP → -20 bp in 10Y Treasury</td>
<td>+ 0.4%</td>
</tr>
<tr>
<td></td>
<td>after 8 qtrs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boston Fed [BF Model]</td>
<td>Real GDP (effect</td>
<td>N/A</td>
<td>+ 0.8%</td>
</tr>
<tr>
<td></td>
<td>after 8 qtrs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unemployment (effect</td>
<td>N/A</td>
<td>- 0.5%</td>
</tr>
<tr>
<td></td>
<td>after 8 qtrs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF Fed [FRBUS]</td>
<td>Real GDP (effect</td>
<td>$600 Bil LSAP → -20 bp in 10Y Treasury</td>
<td>+ 0.6%</td>
</tr>
<tr>
<td></td>
<td>after 8 qtrs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chan, Curdia and Ferrero [DSGE Model]</td>
<td>Real GDP (effect</td>
<td>$600 Bil LSAP → -10 to -20 bp</td>
<td>+ 0.1% to</td>
</tr>
<tr>
<td></td>
<td>after 8 qtrs)</td>
<td>in 10Y Treasury</td>
<td>+ 0.3%</td>
</tr>
<tr>
<td></td>
<td>Inflation (effect</td>
<td>&quot; &quot;</td>
<td>+ 0.02% to</td>
</tr>
<tr>
<td></td>
<td>after 8 qtrs)</td>
<td></td>
<td>+ 0.05%</td>
</tr>
<tr>
<td>Baumeister and Benati [SVAR]</td>
<td>Real GDP growth</td>
<td>Shock of 60 bp to Treasury spread</td>
<td>≈ + 3.5%</td>
</tr>
<tr>
<td></td>
<td>(effect after 1 qtr)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inflation (effect</td>
<td>&quot; &quot;</td>
<td>≈ + 1.0%</td>
</tr>
<tr>
<td></td>
<td>after 1 qtr)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Board staff’s study: Chung et al (2012) [FRB/US model]</td>
<td>Unemployment</td>
<td>$600 Bil LSAP</td>
<td>- 0.25 %</td>
</tr>
</tbody>
</table>
Key Takeaways on Policy Transmission

- Monetary policy affects the economy by influencing broad financial conditions
  - Operating targets affect the *structure* of nominal interest rates and other financial prices
  - These in turn affect the economy through a variety of channels, involving movements in long-term interest rates, the exchange rate, asset prices and changes in the broad supply of credit

- When the federal funds rate is near the zero bound, expectations of the future path of the FFR and size and composition of asset holdings play an important role in the transmission of monetary policy

- During normalization, monetary policy primary operating target is the FFR
  - Target range for the FFR is achieved by setting the IOER rate and terms of ON RRP transactions
Some useful references
