



FEDERAL RESERVE BANK *of* NEW YORK

# The Federal Reserve in the 21<sup>st</sup> Century Implementation and Transmission of Monetary Policy

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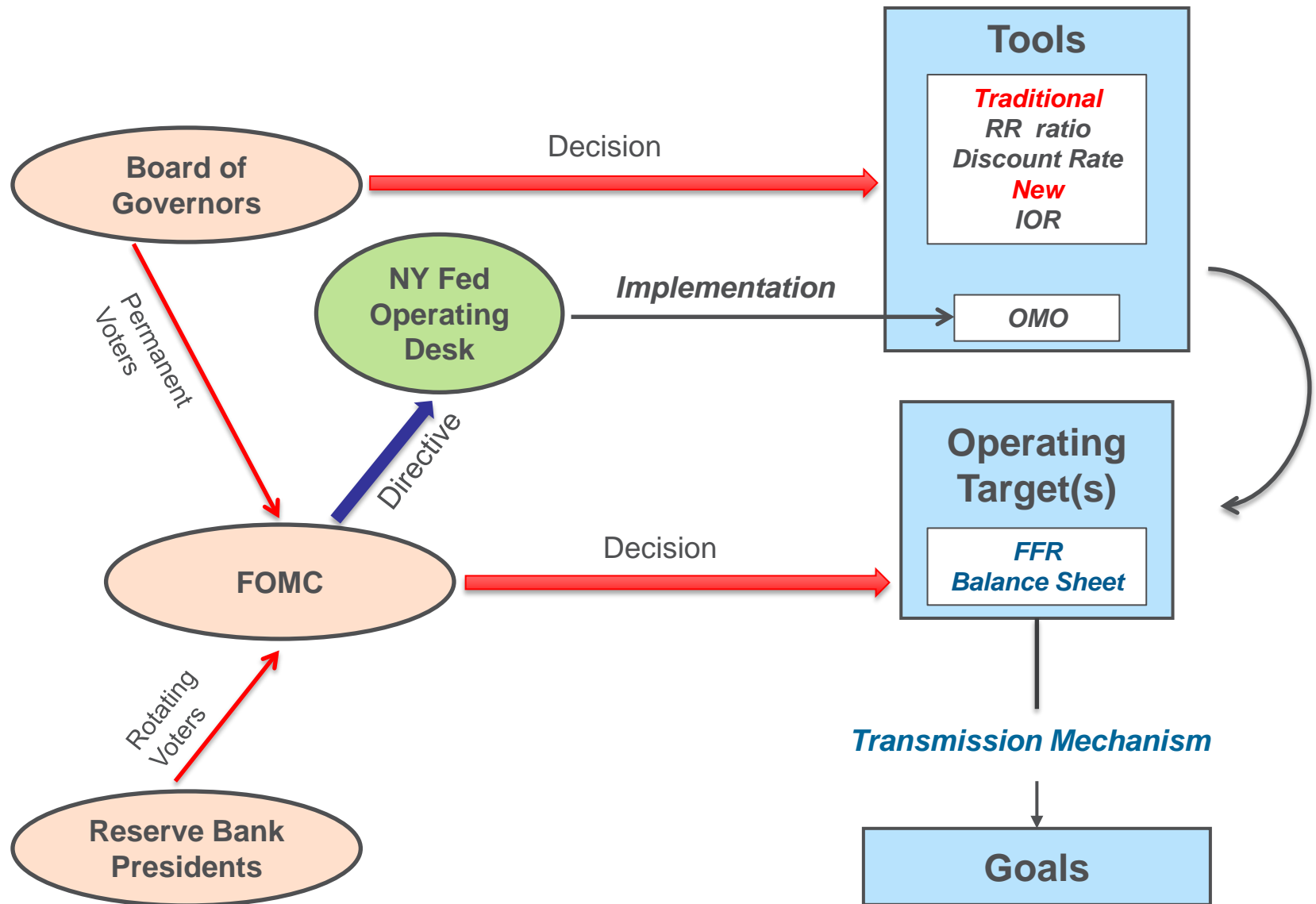
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# Outline of the Presentation

- As we saw, the *decision making process* involves
  - Evaluating the outlook
  - Choosing the stance of monetary policy
    - Setting specific *intermediate target* (value of the FFR, policy regarding the balance sheet) to achieve objectives
- We cover here
  - **Implementation**: the monetary policy operating regime and the *tools* to achieve the operating targets
  - **Transmission**: the *channels* through which the operating targets transmit monetary policy effects to the economy

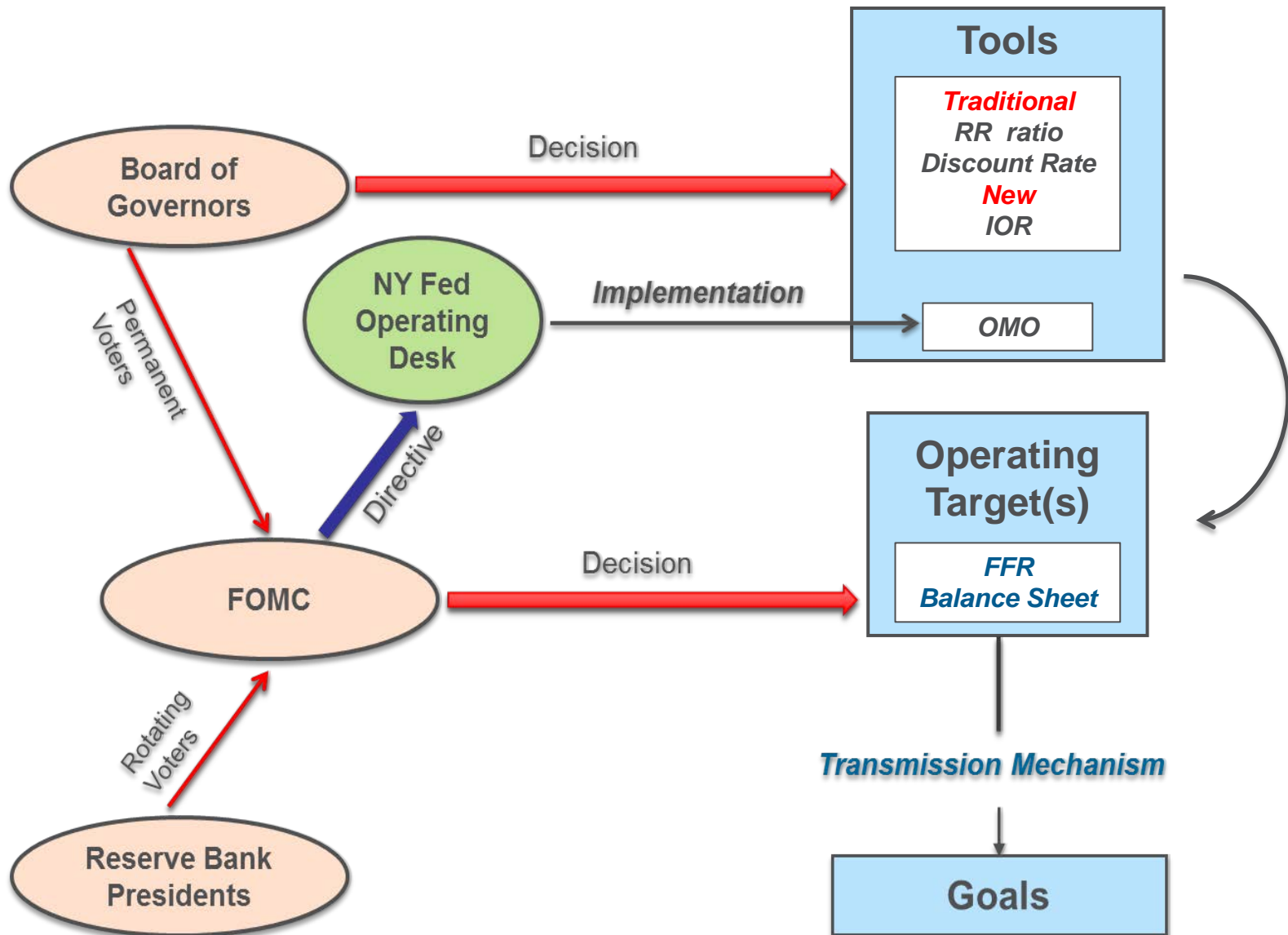


# At-a-glance: Tools, Operating Targets, and Policy Transmission





# Implementation: Tools Used to Reach Operating Targets



# Traditional vs New Operating Regime

Operating regime: setting of an operating target to manage financial conditions

- Before 2008, the FOMC set a target for the FFR
  - The Desk managed the level of reserves to maintain the effective FFR close to the target
- With the FFR near 0 and implementation of balance sheet programs
  - The level of reserves has become very high
    - This required a change in the operating regime and new tools
- In what follows
  - We lay out some important concepts
  - Describe briefly the traditional operating regime
  - Describe the current operating regime



# First: Some Concepts

## ■ What are the **Reserves**?

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

## ■ What is the **Discount Window (DW)**?

- It's a credit facility: 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)

## ■ What is the **Federal Funds Market**?

- An interbank market (largely overnight) where reserves are exchanged, without collateral requirement



# Some concepts, cont.

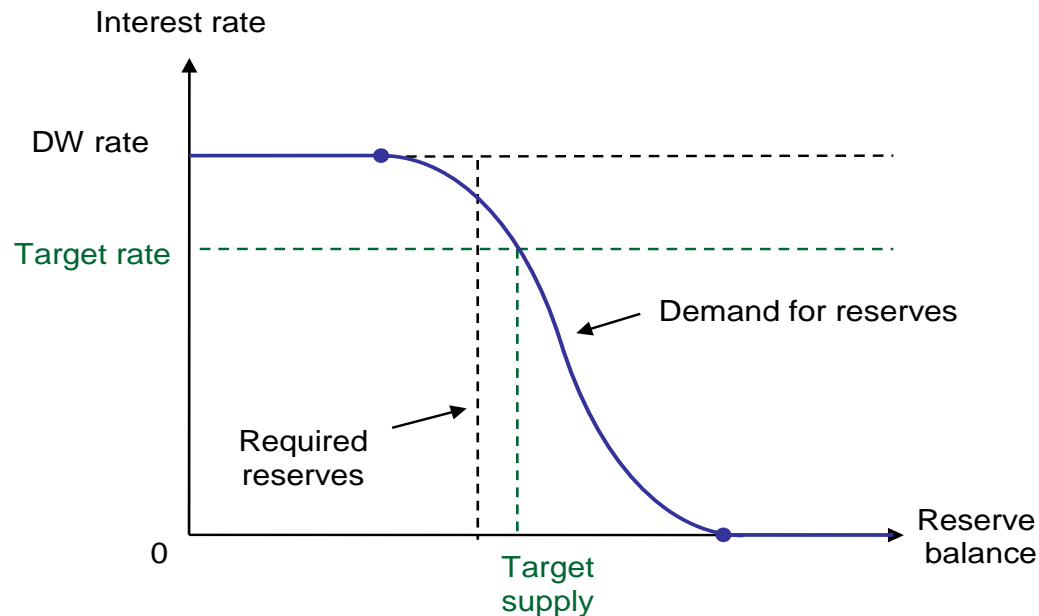
- What are **Open Market Operations (OMO)**?
  - Purchases or sales of government securities on the secondary market
    - A *purchase* adds reserves to the banking system → its purpose is stimulating an expansion of credit
    - A *sale* drains reserves from the banking system → its purpose is restraining the expansion of credit
  - Repos and Reverse repos are temporary OMO
- What is the **Interest on Excess Reserves (IOER)**?
  - Compensation to banks for holding reserves at the Fed
  - The Fed was authorized to pay interest on bank reserves starting in October 2008



# Traditional Operating Regime (pre-2008)

## ■ The FFR and the Market for Reserves

- Demand for reserves (by banks): inversely related to the interest rate
- Supply of reserves (by the Fed): provided to the banking system via OMO
- OM *purchases* (sales) *increase* (decrease) the supply of reserves, lowering (raising) the cost of credit
  - supply is managed so that market equilibrium occurs at the '**target rate**'
- DW rate generally prevented FFR from spiking too high (banks could borrow at the discount window)





# Reserve Balances in the Fed's (stylized) Balance Sheet

Assets		Liabilities	
U.S. Treasury securities	790.7	Federal Reserve notes (currency)	776.5
Repurchase agreements (Repos)	18.8	Deposits of depository institutions ( <b>Reserve balances</b> )	12.6
Loans to depository institutions (Discount Window loans)	0.2	Other (including capital)	78.6
Other assets	58.0		
<i>Total assets</i>	<i>867.7</i>	<i>Total liabilities</i>	<i>867.7</i>

# Impact of OMOs on the Fed's Balance Sheet

Assets		Liabilities	
U.S. Treasury securities	790.7 +10	Federal Reserve notes (currency)	776.5
Repurchase agreements (Repos)	18.8	Deposits of depository institutions (Reserve balances)	12.6 +10
Loans to depository institutions (Discount Window loans)	0.2	Other (including capital)	78.6
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# Impact of OMOs on the Fed's Balance Sheet

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

# Monetary Policy since the Financial Crisis

- **Traditional** monetary policy response to recessions
  - Lower FFR target
    - Fed reduced the FFR target from 5.25% in August 2007 to 0-0.25% (effectively zero) in December 2008
- Under the ZLB Constraint, Fed started “**unconventional**” policies
  - **Forward guidance** on the future path of the FFR (**discussed earlier**)
    - Aims at reducing long-term rates via expectations of low short-rates
  - **Balance-sheet policy**: changes in size/composition of balance sheet
    - Aims at affecting directly *long-term rates*
    - Supports the commitment to an extended period of low policy rate
    - Has implications for the federal funds market

# The Fed's Balance Sheet Policy

A variety of asset purchase programs were implemented since 2008

## ▪ Large-Scale Asset Purchases (LSAPs) I and II

- Purchases of Agency MBS and Agency Debt (Nov '08) - predetermined *total* amount
- Purchases of long-term Treasury securities (Mar '09; Nov '10)  
→ **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 '11-Dec '12)  
→ **changes only the maturity composition of the balance sheet**

## ▪ LSAP III: outcome-based program

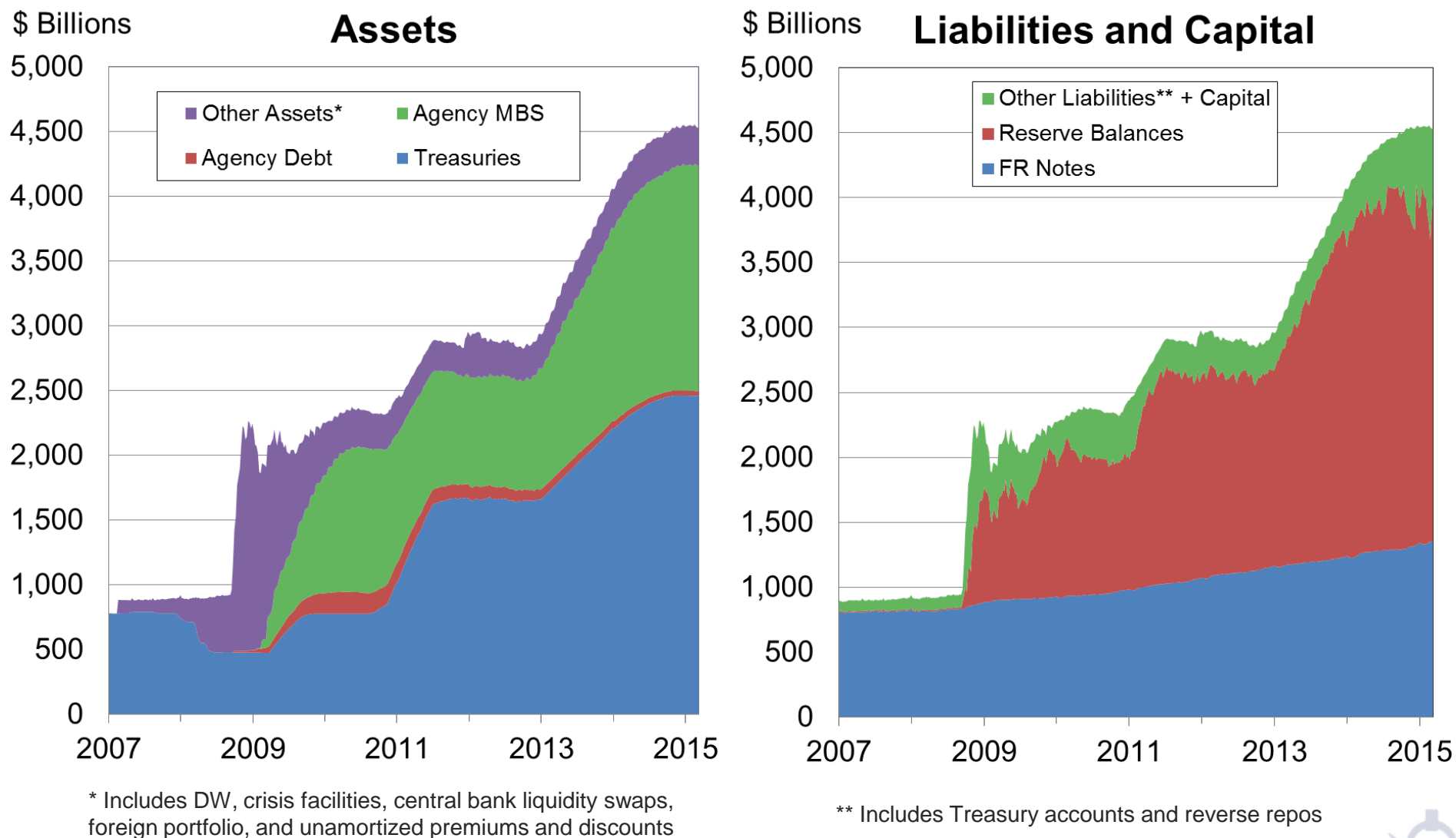
- Purchase of agency MBS (Sep '12) and long-term Treasuries (Jan '13) - fixed amount *per month*, until set objectives are reached
    - Incremental reduction in the pace of purchases (“tapering”) from Jan '14
    - Purchases ended in Oct '14
- **increases size and composition of the balance sheet**



# Impact of LSAPs on the Fed's Balance Sheet

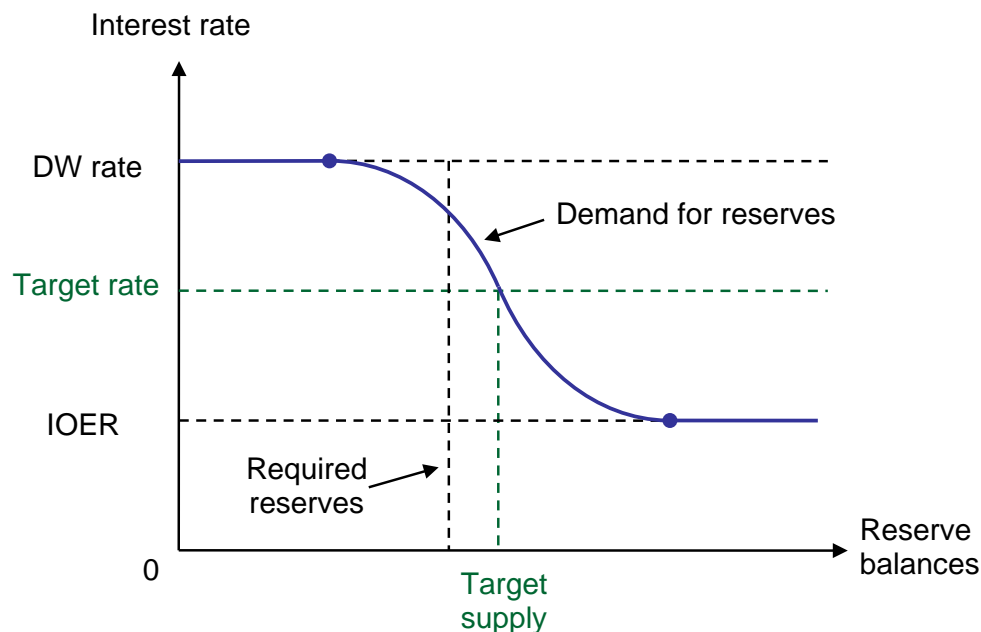
Assets		Liabilities	
Securities		Federal Reserve notes (currency)	1,312
U.S. Treasury Securities	2,460		
Agency Debt & MBS	1,777	Deposits of depository institutions (Reserve Balances)	2,720
Repurchase agreements (Repos)	0		
Loans to depository institutions	0	Reverse Repos	265
		Treasury GA	27
Other assets	252	Other (including capital)	165
<i>Total assets</i>	<i>4,489</i>	<i>Total liabilities</i>	<i>4,489</i>

# Evolution of the Fed's Balance Sheet



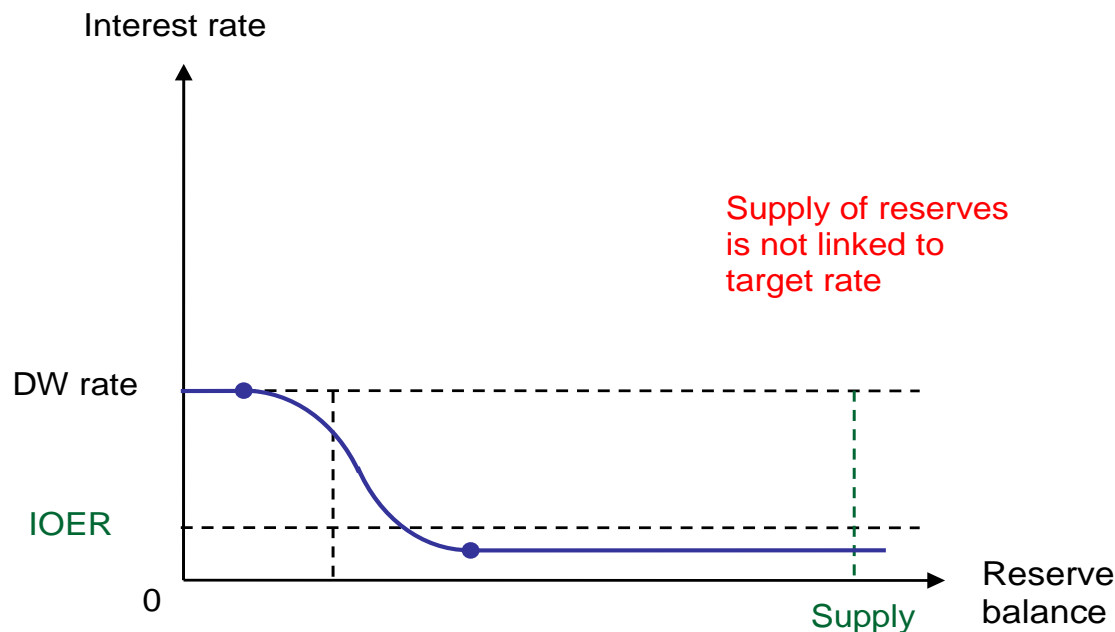
# Introduction of Interest On Excess Reserves (IOER)

- In 2008 the Fed is granted authority to pay **IOER** to banks (interest on the balances that they hold in their account with the Fed)
- IOER should put a floor on rates: If a bank can earn, say, 0.25% leaving money in their Fed account, they won't have an incentive to lend it out to a riskier counterparty below that rate
- Supply and demand of reserves would determine the equilibrium rate



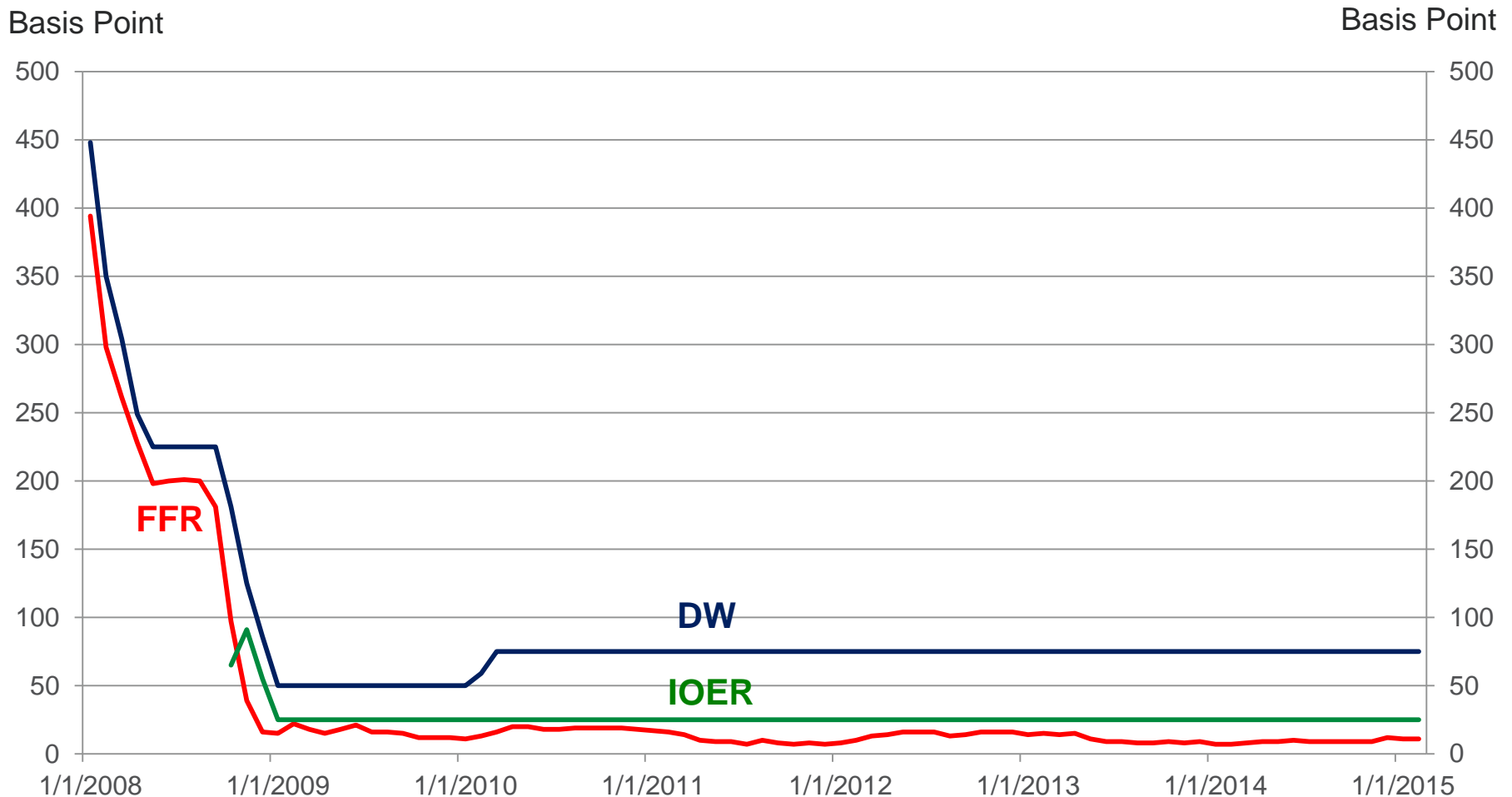
# Impact of Large Amount of Reserves on FF Market

- However, with a large amount of supply of reserves (now ~ \$2.5 trillion) these are no more linked to the target rate
  - Even large changes in reserves supply don't change the FFR very much
- Also, the IOER proved to be a “leaky” floor



# A 'Leaky' Floor

- Market interest rates, including the fed funds rate, have been below IOER





# Consequences for Monetary Policy Implementation

## ■ Why is the FF rate below the IOER?

- There are institutions (GSEs and FHLBs) who can trade in the FF market but cannot earn interest on reserves
  - They have an incentive to lend reserves even if the rate they receive is lower than the IOER
- Other features limit full arbitrage

## ■ Why is this a problem?

- Because it may impair the Fed's ability to raise the FFR when policy accommodation needs to be reduced

## ■ How to fix the problem?

- Introduce a new (use of an old) tool: ON RRP (Over Night Reverse Repo)
  - A form of collateralized loan to the Fed
  - Investors give the Fed cash overnight and the Fed gives them Treasury securities as collateral
  - Supports a floor under rates<sup>[1]</sup>
  - The tool works because it goes beyond banks

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[1] If an investor can earn, say, 0.05% investing at the Fed, he would not invest with a private counterparty at a lower rate

# Changes in the Operating Regime

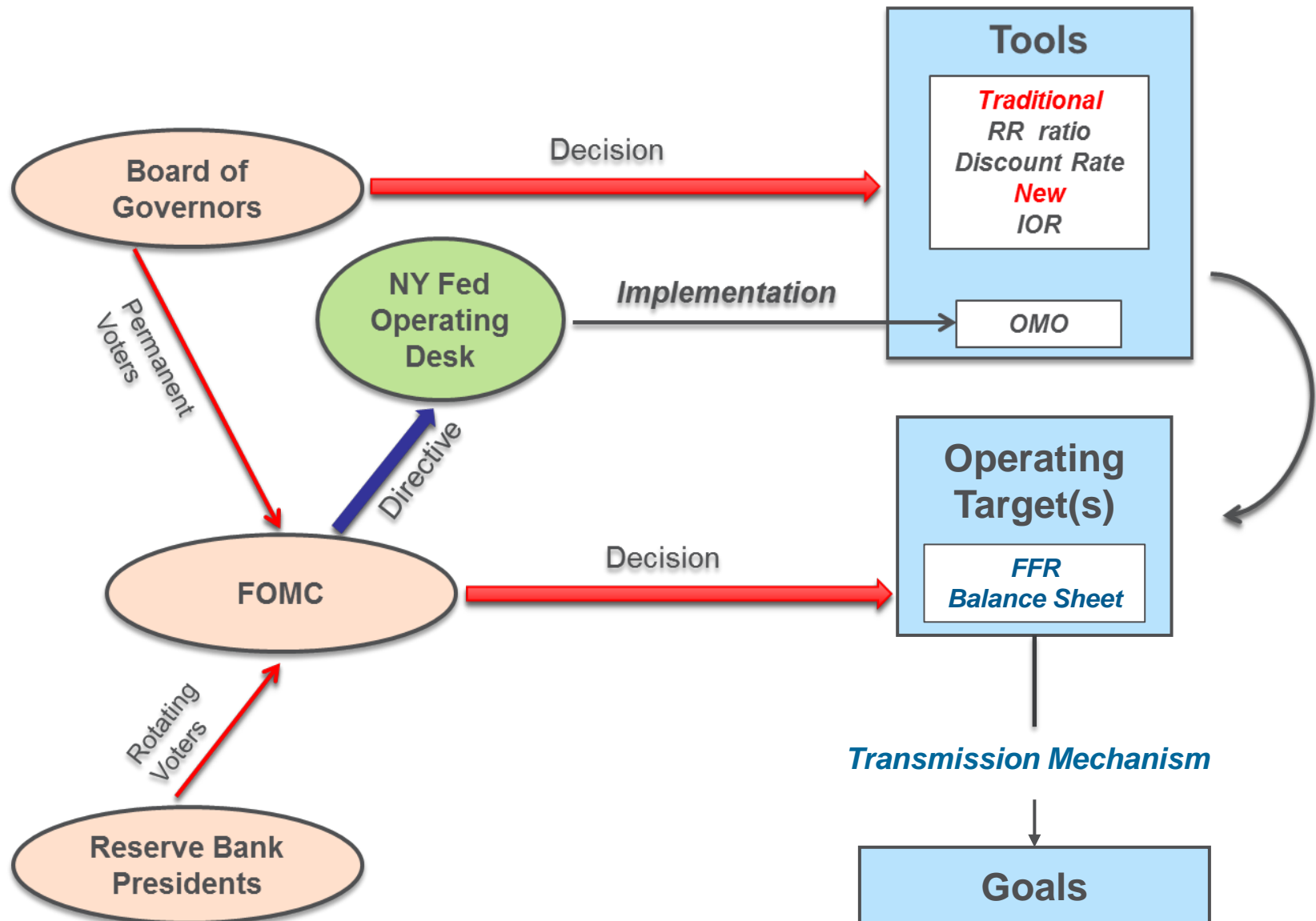
## *Policy Normalization Principles and Plans (September 11, 2014)*

- 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.”

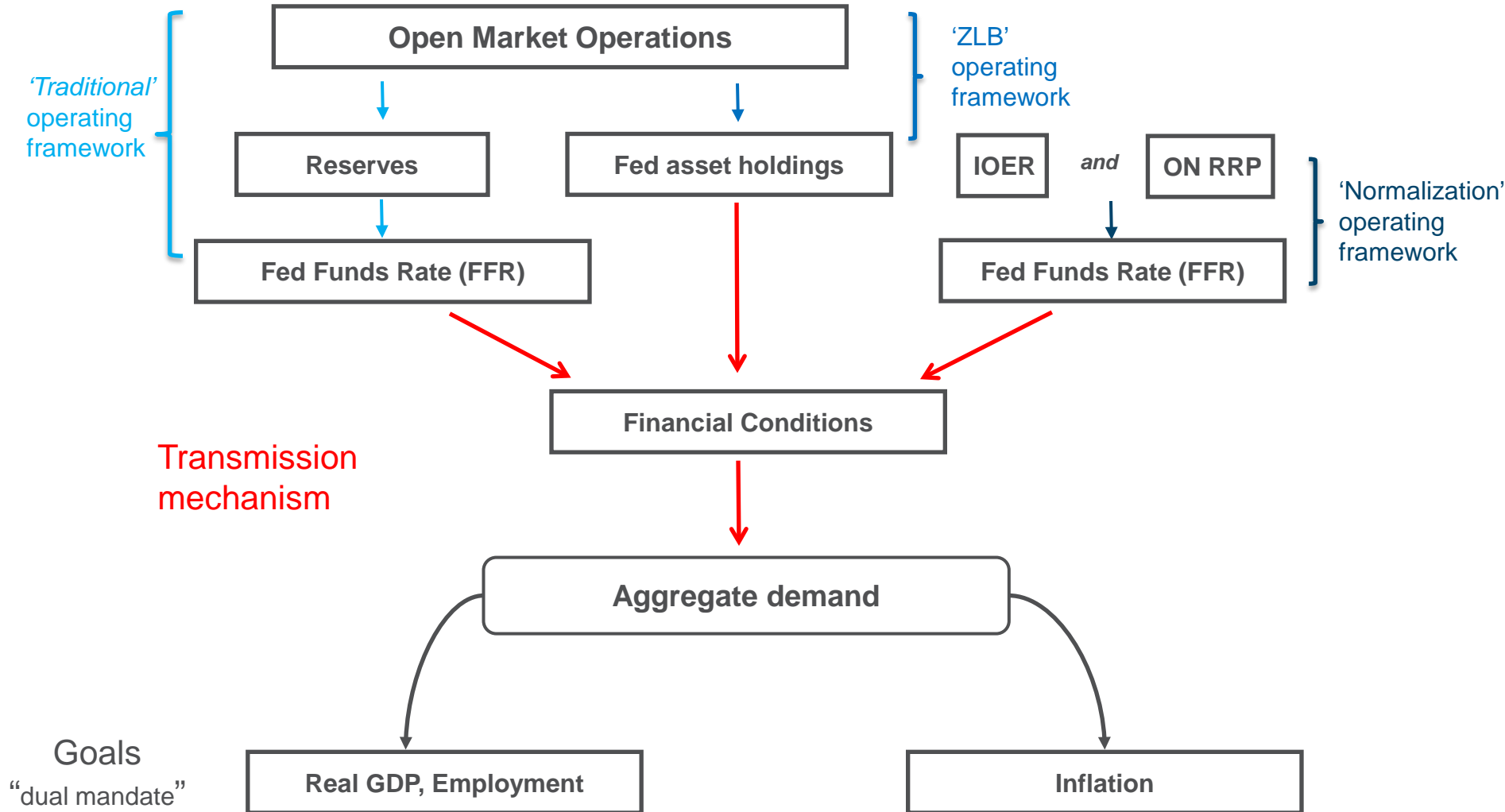
# Key Takeaways on Policy Implementation

- Policy implementation **‘pre-crisis’**
  - FFR as operating target
  - OMO manage the supply of reserve to maintain FFR near target
- Policy implementation **during the crisis (at ZLB)**
  - Two operating targets
    - **FFR**: while at ZLB, expectations managed via forward guidance
    - **Balance sheet policy**: active management of the asset side
- Policy implementation **during normalization**
  - FFR main operating target
    - To be achieved by setting IOER; potentially supported by the ON RRP
  - Balance sheet expected to wind down naturally once reinvestment is ceased

# Transmission: From Operating Targets to Goals



# At-a-glance: Operating Frameworks & Transmission

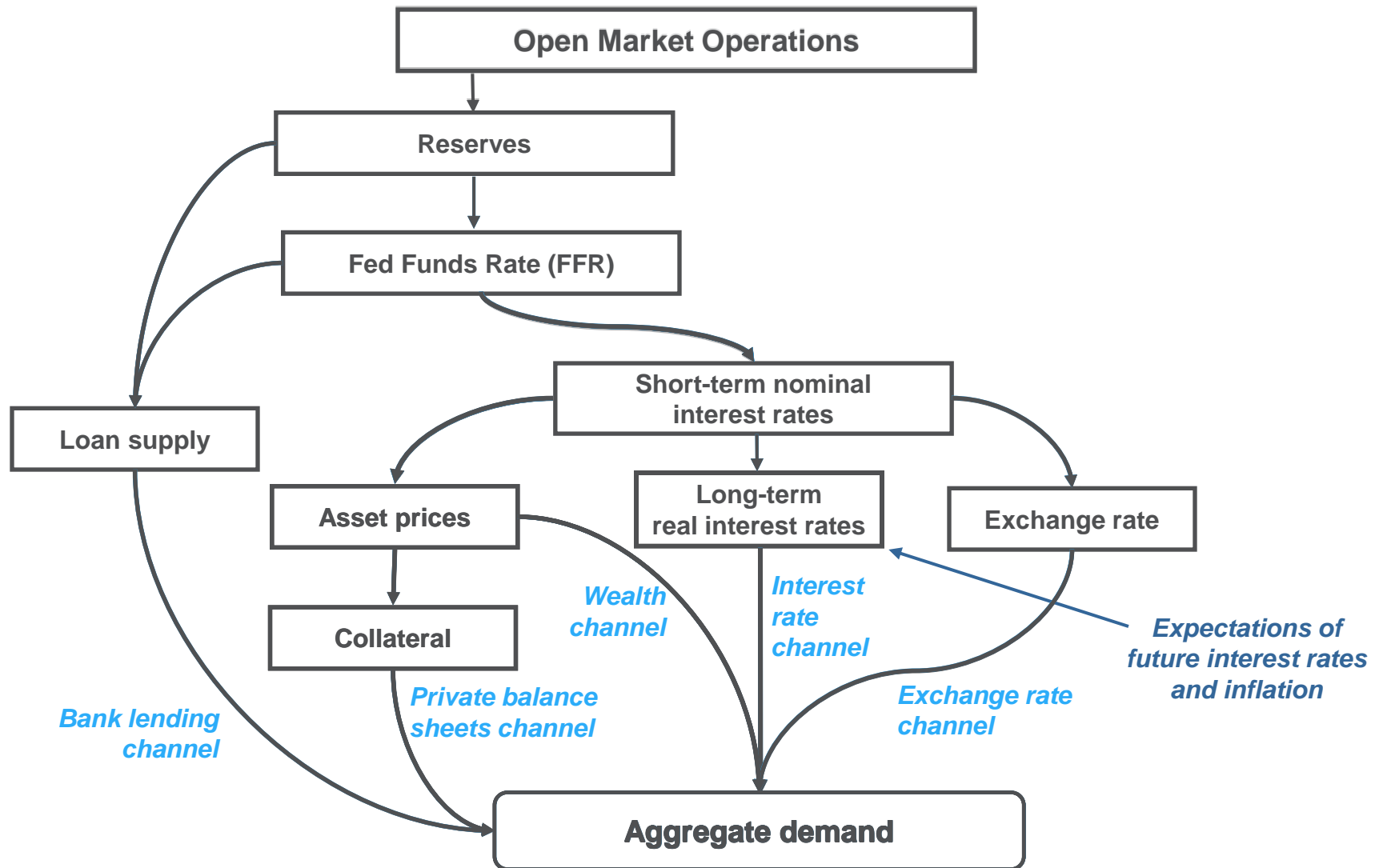




# Understanding the Transmission Mechanism

- Operating targets have little *direct* effect on aggregate spending
  - They work *through the financial system*
    - Affect the *structure* of nominal interest rates and other financial prices
    - These in turn affect the economy through a variety of channels
      - *Interest rate* channel
      - *Exchange rate* channel
      - *Asset prices* channels
      - *Bank lending* channel
- With the federal funds rate near the zero bound (ZLB)
  - Monetary transmission *no more* initiated by changes in the *current* FFR, but still operates via traditional channels
    - Critical role played by:
      - *Expectations* of the future path of the FFR
      - *Size and composition of asset holdings*
- During ‘normalization’ transmission again initiated primarily by FFR
  - Works again through traditional channels

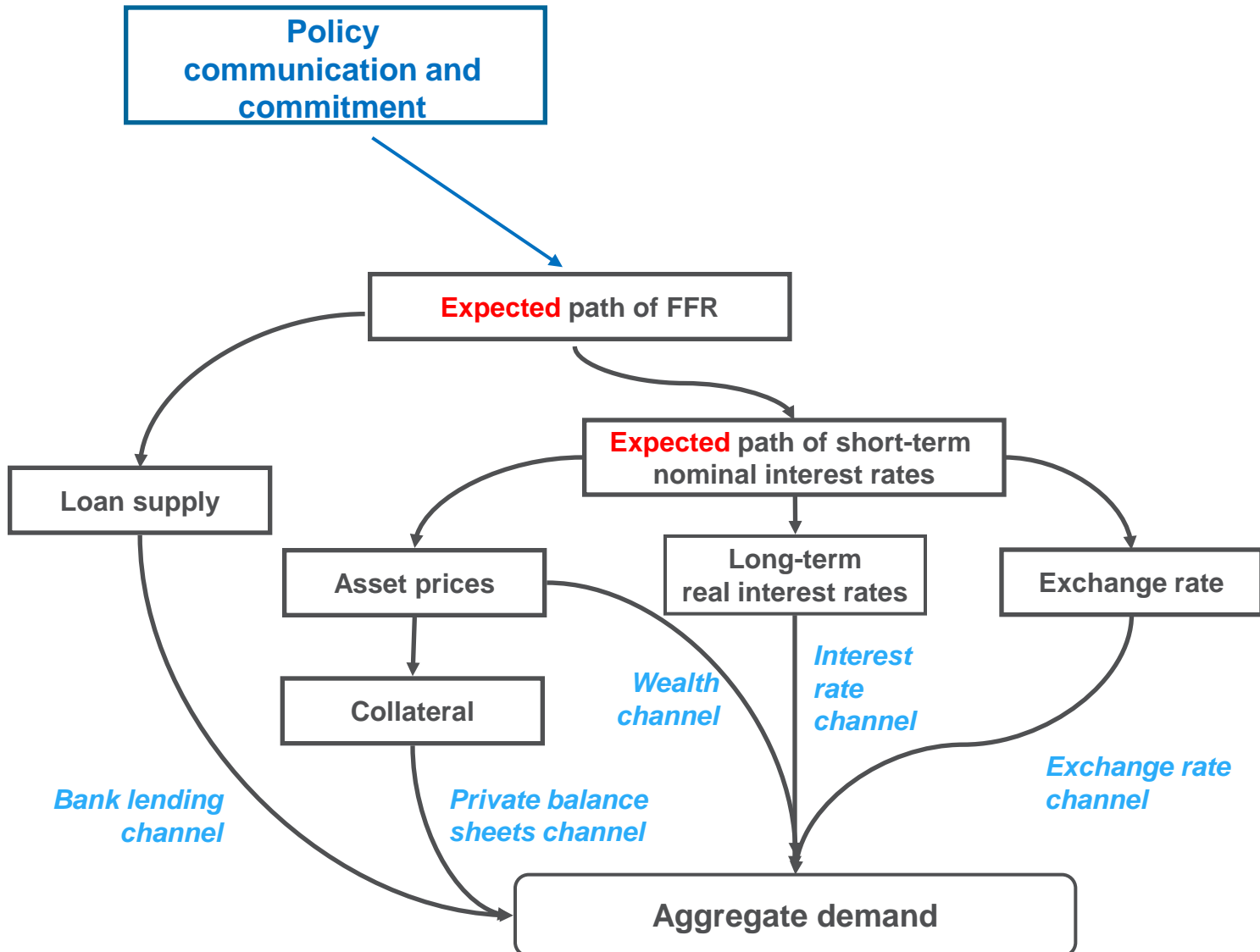
# Overview of 'Standard' Transmission Channels



# When the FFR is at the ZLB

- At the ZLB, policy accommodation is conducted via:
  - **Forward guidance** on the future path of the policy rate
    - 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.
  - **Balance sheet policy (aka LSAP or QE)**
    - Changes in size and composition of the Fed's asset holdings
    - How it works*
      - Support commitment to extended period of low rates
      - Affect long-term rates by reducing term premia
- **Tools are new, but transmission *not* that *unconventional!***

# Forward Guidance



# Channels of Transmission of Asset Purchases

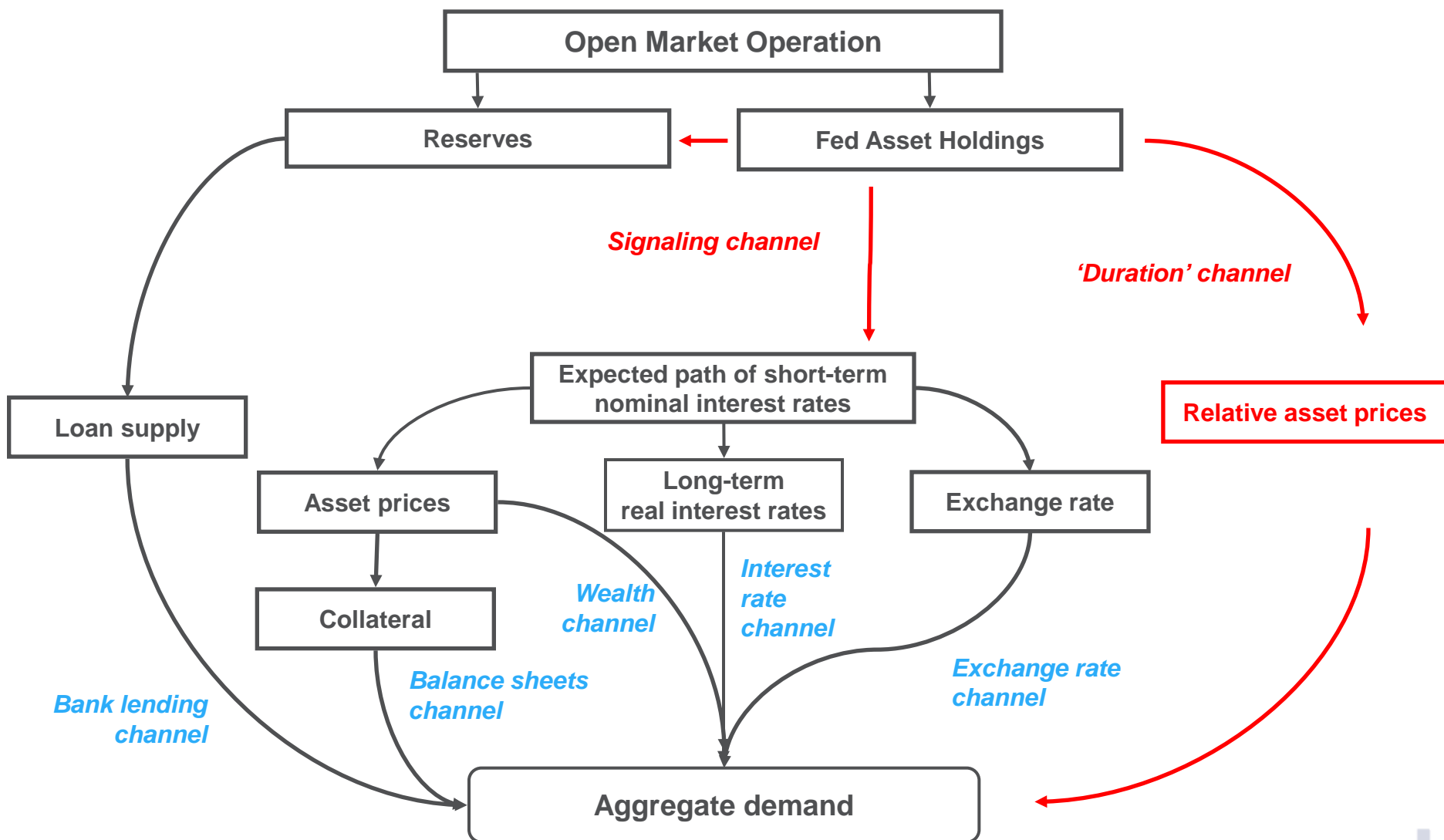
- Duration channel (or term premium effect)
  - In President Dudley's words\*
    - “Our view is that asset purchases work primarily through asset side of the balance sheet by transferring duration risk from the private sector to the central bank's balance sheet.”
    - “This pushes down risk premia, and prompts private sector investors to move into riskier assets. As a result, 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

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[1] Remarks at the Japan Society, May 21, 2013



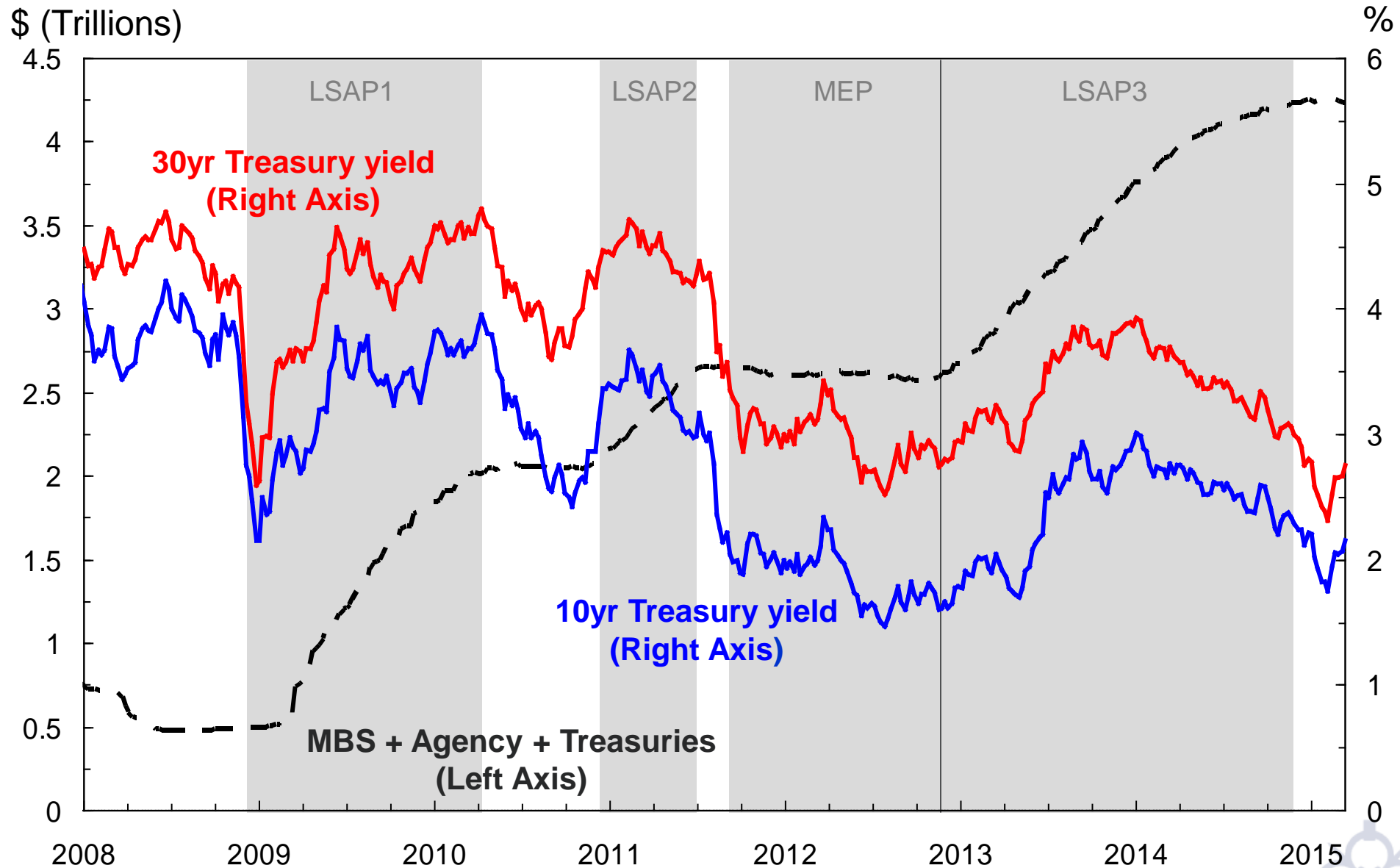
# Asset Purchases



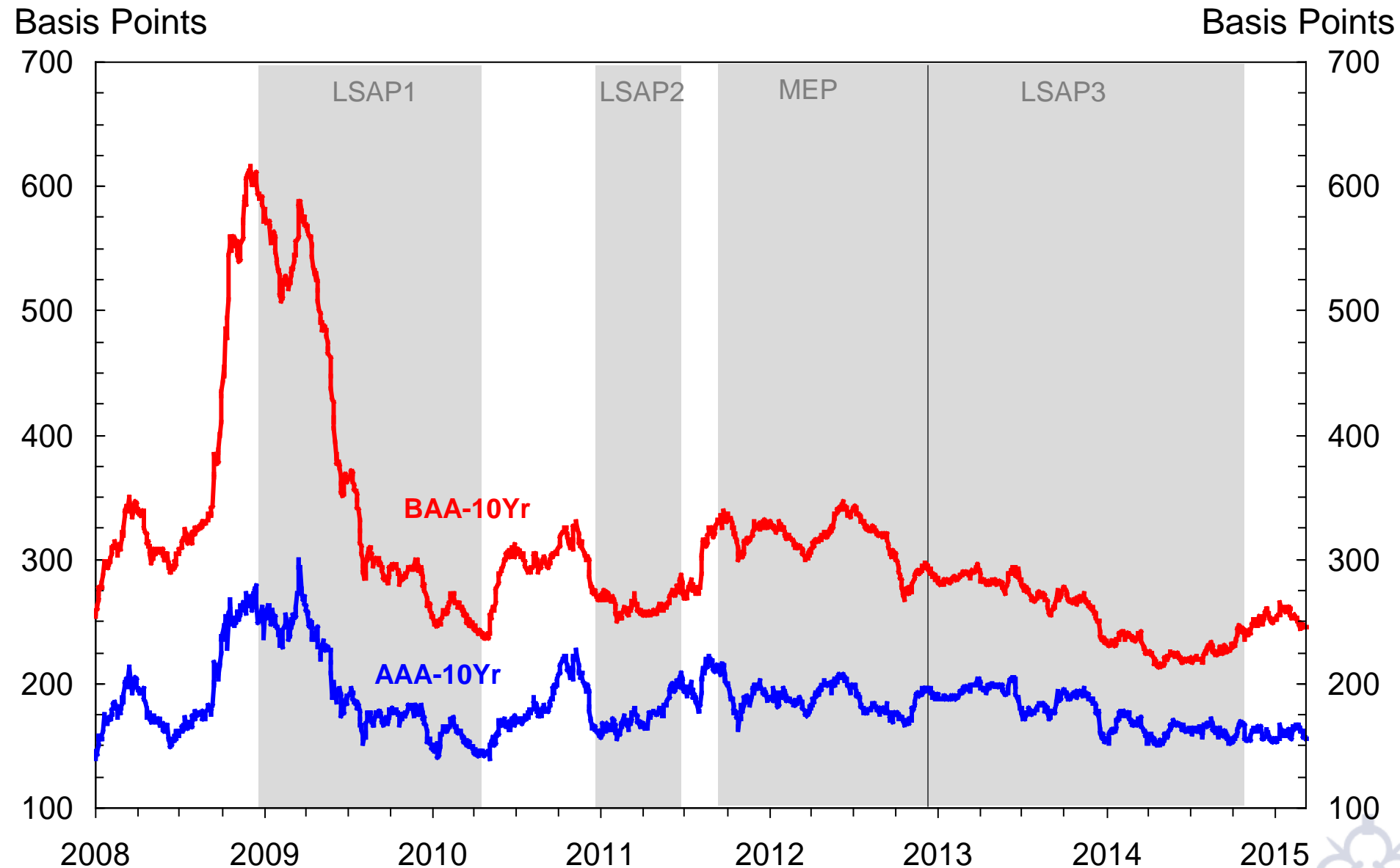
# Did Asset Purchases Ease Financial Conditions?

- 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 Tr yield

# Fed's Securities Holdings, 10y & 30y Treasury Yields



# Corporate Credit Spreads



Source: Federal Reserve Economic Data (FRED)

# Some Estimates of LSAPs' Impact on Yields

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

Research Paper	Estimated Decline in 10Yr Treasury Yield (bp)	Impact per \$100Bn (bp)
<b>LSAP1: 12/5/2008 - 3/31/2010</b>		
(\$1.25 Trillion MBS purchases, \$300 Billion Treasury security purchases, \$172 Billion agency debt security purchases)		
D'Amico and King (2013) [Treasury only]	20 to 30	7-10
D'amico et al. (2012) [Treasury only]	35	12
Krishnamurthy and Vissing-Jorgensen (2011)	100	6
Gagnon et al. (2011) [Events] & [Regression]	91 & 36 to 82	5 & 2-5
<b>LSAP2: 11/2/2010 - 6/30/2011</b>		
(\$600 Billion Treasury security purchases)		
D'amico et al. (2012)	55	9
Krishnamurthy and Vissing-Jorgensen (2011)	25	4
Meaning and Zhu (2011)	21	4
Swanson (2011)	15	3
<b>Maturity Extension Program: 10/3/2011 - 12/30/2012</b>		
(\$667 Billion Treasury security purchases, \$667 Billion Treasury security sales/maturities)		
Hamilton and Wu (2012)	22	2
Meaning and Zhu (2012)	17	1
<b>LSAP3: 9/14/2012 - 10/31/2014</b>		
(\$823 Billion MBS purchases, \$790 Billion Treasury security purchases)		
Engen, Laubach, and Reifschneider (2015)	60	4

# 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 remains below objective
    - Unemployment rate has fallen faster than expected, particularly after the outcome-based program, but other labor market indicators have not recovered to pre-recession levels (low job-finding rate, low employment/population ratio, sluggish wages)
  - but counterfactual not observed!
- Some 'headwinds' have inhibited transmission
  - 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*

# Some Estimates of LSAPs' Macroeconomic Impact

## Macroeconomic Impact

### *Estimated Impact of LSAPs on Various Macroeconomic Variables*

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

# Key Takeaways on Policy Transmission

- Monetary policy affects the economy by influencing 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