



FEDERAL RESERVE BANK *of* NEW YORK

# Monetary Policy Implementation with a Large Central Bank Balance Sheet

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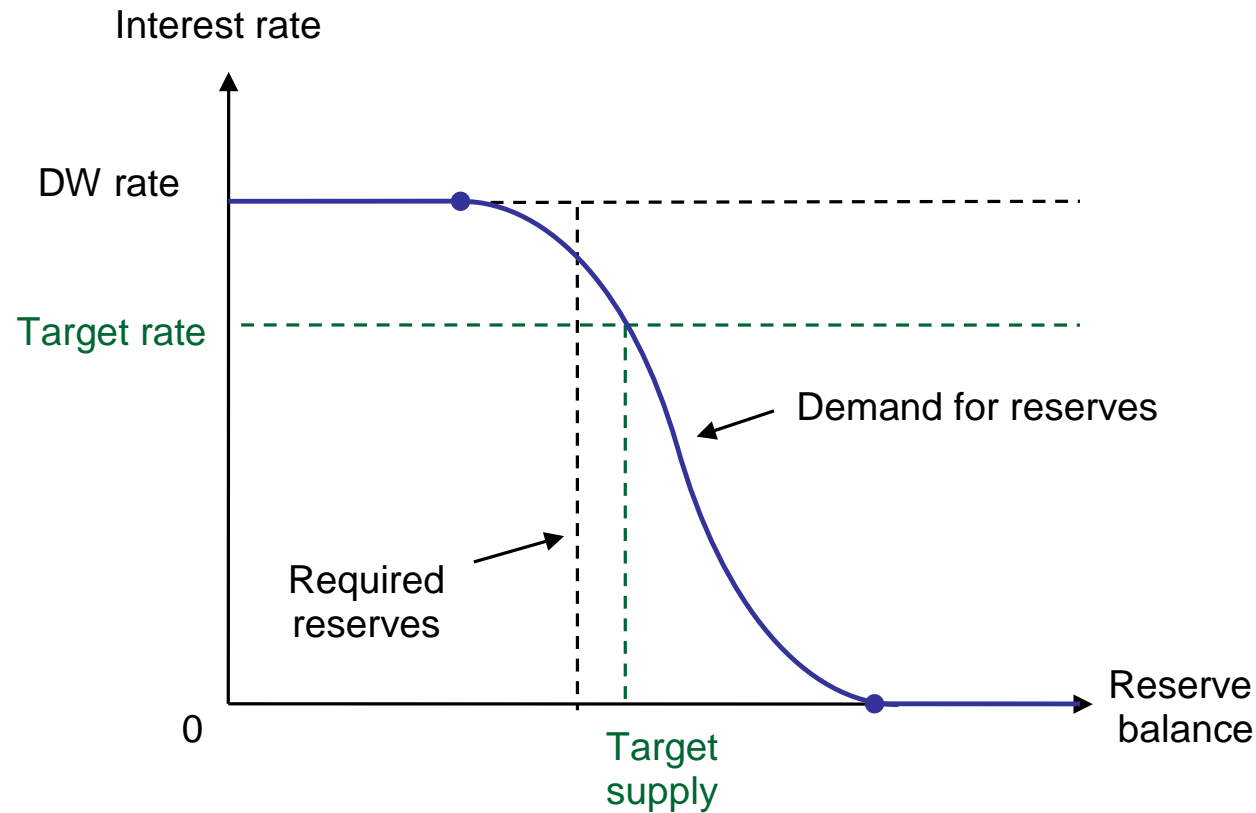
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# Outline

- Setting the stage:
  - Monetary policy implementation before 2008
  - Monetary policy with a lot of reserves
  - Why are banks holding so many excess reserves?
- Monetary policy normalization
  - Raising rates by creating scarcity
  - Raising rates through arbitrage
  - Dealing with the “leaky” floor
- Liftoff
- The long-run framework



# Monetary policy implementation before 2008

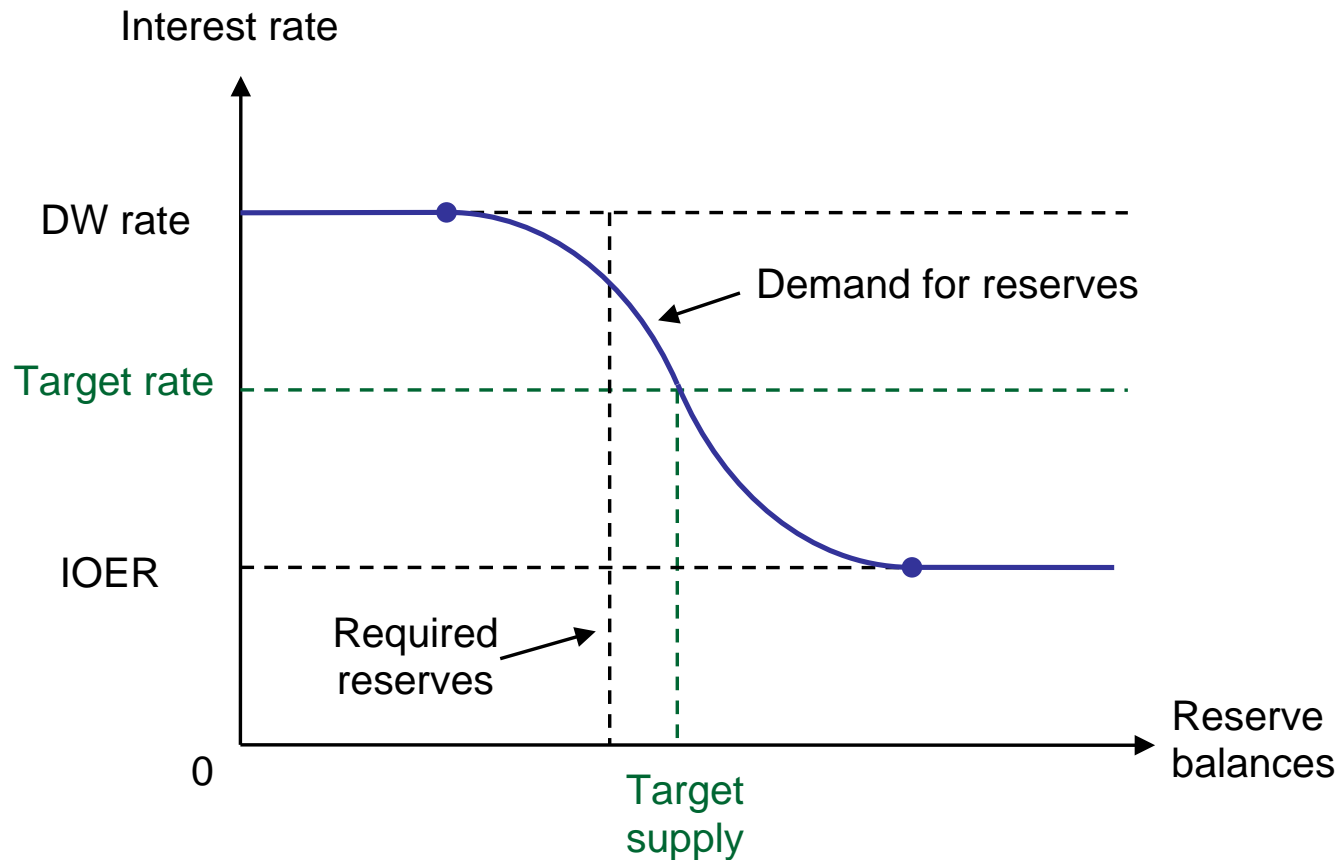


# Pre-Crisis Operational Framework

- The level of reserve balances was quite low
  - Averaged around \$10 billion in 2006
- Desk and Board staff forecast factors driving supply of and demand for reserves
- Almost every day, conduct a repo operation to add enough reserves to hit the fed funds target rate
  - Averaged about \$5-10 billion per operation
- As demand for currency grew, banks' reserves would decrease and the Desk would add reserves through purchases of Treasuries (long-run) and repos (short-run)



# Framework was similar to a “corridor” system



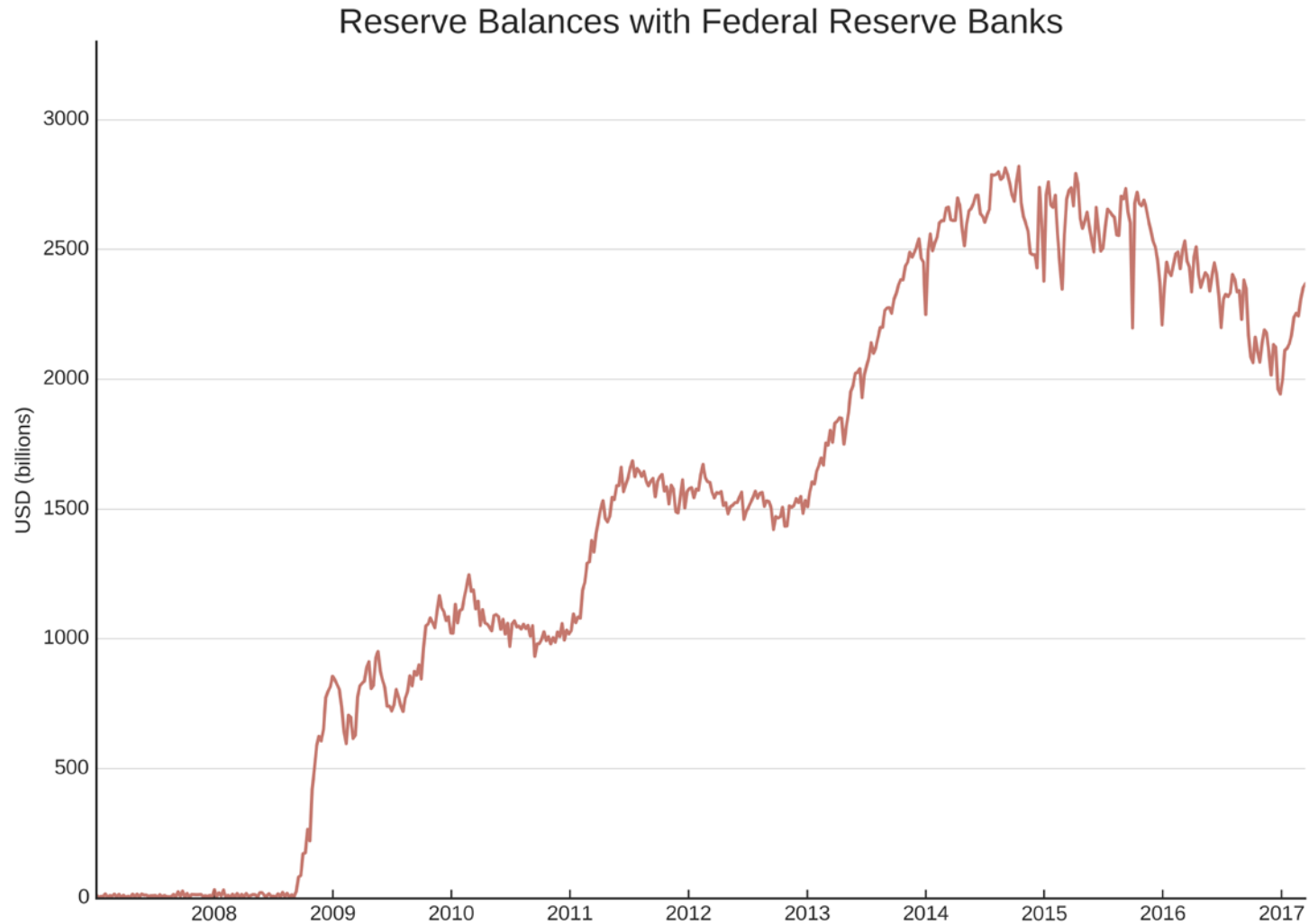


# Outline

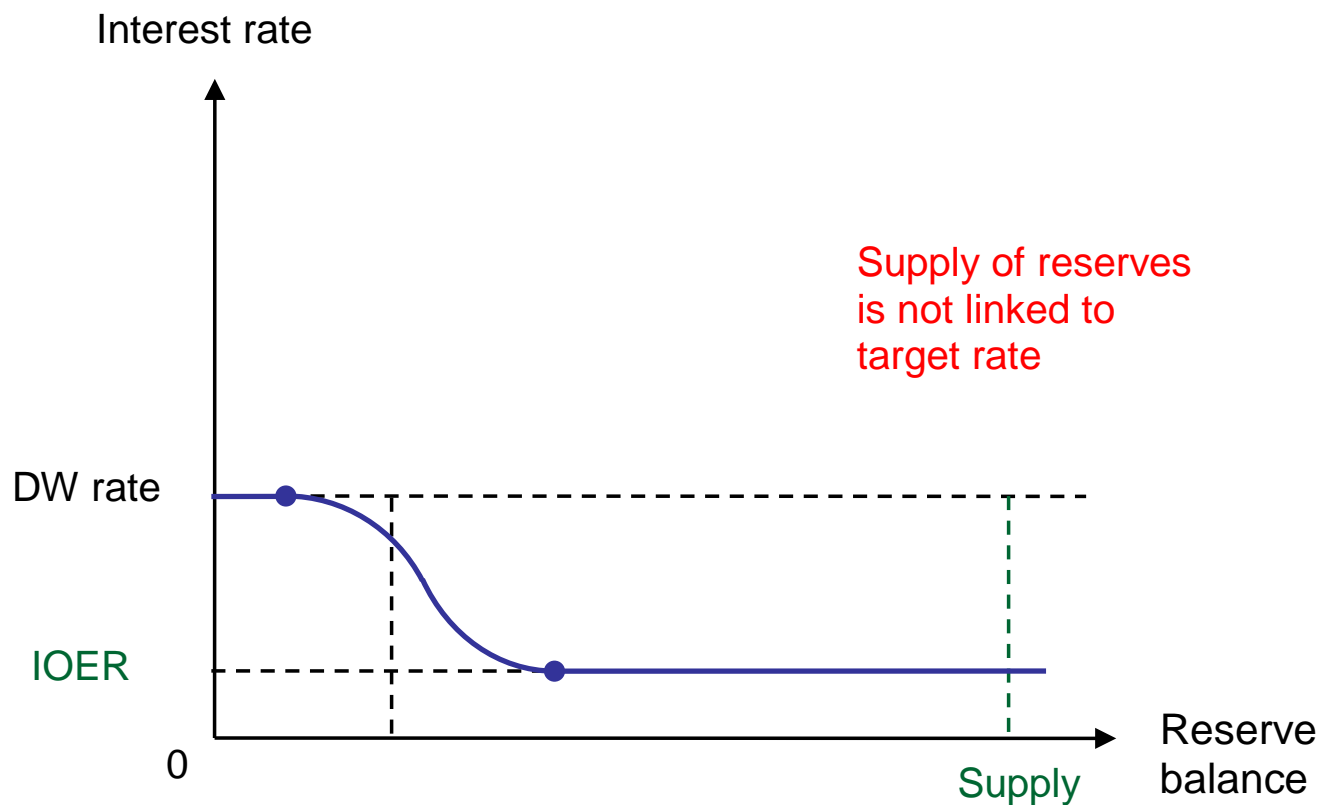
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# The crisis lead to a huge increase in reserves



# Monetary policy with a lot of reserves





# Current Framework

- In recent years, reserves have moved around \$2.5 trillion
  - Peak at \$2.8 trillion, a 28,000% increase!
- Little need to forecast factors driving supply of and demand for reserves each day
- No need to conduct repo operations to set the supply of reserves to the desired level
  - Relatively small-scale adjustments to the supply of reserves might do little to move the fed funds rate
- Since 2008, the Fed can pay interest to banks on the balances that they leave in their account with the Fed
  - Interest on excess reserve (IOER) has been very low: 25 bps from 2009 to December 2015



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# Why are banks holding excess reserves?

- Short answer: Because they have no choice
- Reserves are injected in the system when the Federal Reserve purchases assets
- Reserves must be held by institutions that have a Fed account
- Banks can redistribute the reserves among themselves but cannot change the aggregate amount
  - Except for turning reserves into currency
- The analysis that follows is based on Keister and McAndrews (2009)



# Before 2008: Low amount of reserves

- Suppose there are two banks, A and B
- Balance sheets in normal times:

Bank A				Bank B			
Reserves	10	Deposits	100	Reserves	10	Deposits	100
Loans	50			Loans	130	Due to Bank A	40
Due from Bank B	40						
Securities	10	Capital	10	Securities	10	Capital	10

- Note: Interbank lending promotes the efficient allocation of resources



# The “crisis”

- Suppose Bank A is no longer willing to lend to Bank B
  - May have concerns about credit risk or about its own funding needs
  - If Bank B cannot replace this funding, it must reduce lending

Bank A

Reserves	10	Deposits	60
Loans	50		
Due from Bank B	0		
Securities	10	Capital	10

Bank B

Reserves	10	Deposits	100
Loans	90	Due to Bank A	0
Securities	10	Capital	10

# Central bank response to the crisis

- Suppose the central bank lends to Bank B
  - The decrease in lending can be avoided
  - This is the “lender of last resort” function of the central bank

Bank A				Bank B			
Reserves	50	Deposits	100	Reserves	10	Deposits	100
Loans	50			Loans	130	Due to CB	40
Securities	10	Capital	10	Securities	10	Capital	10

- Note: total reserves are now \$60, \$40 of which are excess
- The Central Bank’s policy is highly effective, even though it generates a large amount of excess reserves

# Bank lending and reserves

- But ... isn't there a sense in which the \$50 of reserves in Bank A's account are idle?
  - Don't excess reserves represent "unused capacity" in the banking system?
- Suppose Bank A lends \$20 to Firm X, which is a customer

Bank A				Bank B			
Reserves	50	Deposits	120	Reserves	10	Deposits	100
Loans	70			Loans	130	Due to CB	40
Securities	10	Capital	10	Securities	10	Capital	10

➡ No change in reserve positions!



# Level of reserves is unrelated to bank behavior

- Now suppose Firm X buys \$20 in equipment from Firm Y
  - Firm Y holds its account at Bank B

Bank A				Bank B			
Reserves	30	Deposits	100	Reserves	30	Deposits	120
Loans	70			Loans	130	Due to CB	40
Securities	10	Capital	10	Securities	10	Capital	10

- Reserves (and deposits) are transferred to Bank B
  - Again, **no change** in total reserves
- The total level of reserves is determined *entirely by the actions of the central bank* (almost)
  - Reveal nothing about the lending behavior of banks

# Effect of asset purchases

- Suppose the central bank purchases 100 of assets from nonbanks who are customers of Bank B

Bank A				Bank B			
Reserves	30	Deposits	100	Reserves	130	Deposits	220
Loans	70			Loans	130	Due to CB	40
Securities	10	Capital	10	Securities	10	Capital	10

- Large scale asset purchases (LSAPs) increase the supply of reserves
  - Purchases from nonbanks increase the size of the banking system's balance sheet



# Banks must hold reserves

- Banks can reduce the amount of reserves they hold, and the size of their balance sheets, by repaying central bank loans

Bank A				Bank B			
Reserves	30	Deposits	100	Reserves	90	Deposits	220
Loans	70			Loans	130	Due to CB	0
Securities	10	Capital	10	Securities	10	Capital	10

- Once the loans have been repaid, the only remaining option is to turn reserves into currency
  - Not an attractive option
- Bottom line: The banking system as a whole must hold the reserves supplied



# Outline

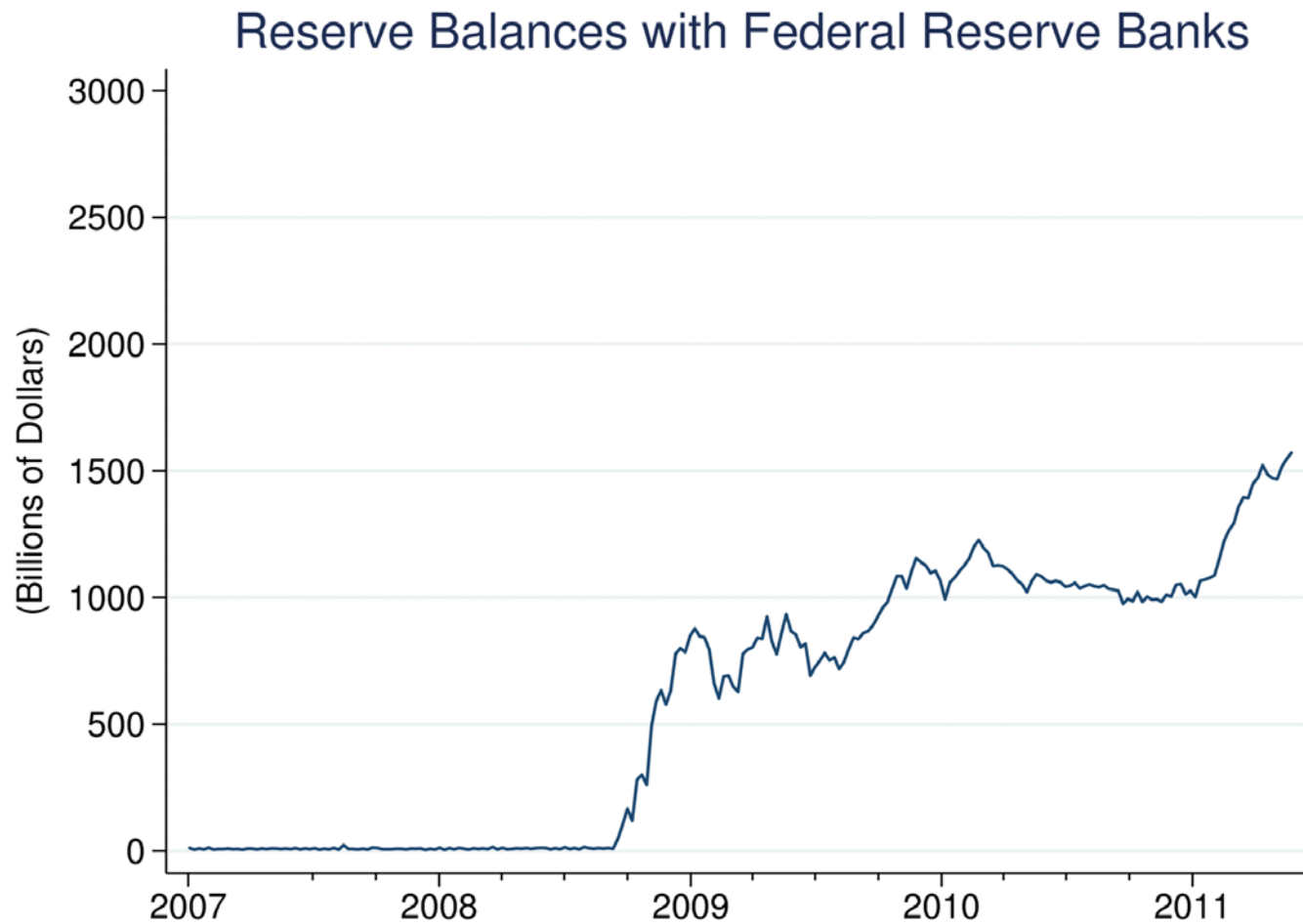
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# Monetary policy normalization

- Key question: Can we raise interest rates with a large balance sheet?
- To do so, we need to make reserves sufficiently valuable
  - Banks must be willing to pay a high enough rate to borrow reserves
- Two mechanisms:
  - Make reserves sufficiently scarce—Plan around 2011
  - Give reserves a rate of return and rely on arbitrage—Current framework

# Reserves in June 2011



# Raising rates by making them sufficiently scarce

- The FOMC's Exit Strategy Principles from 2011 focused on draining and returning to reserve scarcity
  - To begin the process [...] the Committee will likely first cease reinvesting some or all payments of principal on the securities holdings in the SOMA.
  - At the same time or sometime thereafter, the Committee [...] will initiate temporary reserve-draining operations aimed at supporting [...] increases in the federal funds rate...
  - [...] the Committee's next step in the process [...] will be to begin raising its target for the federal funds rate...



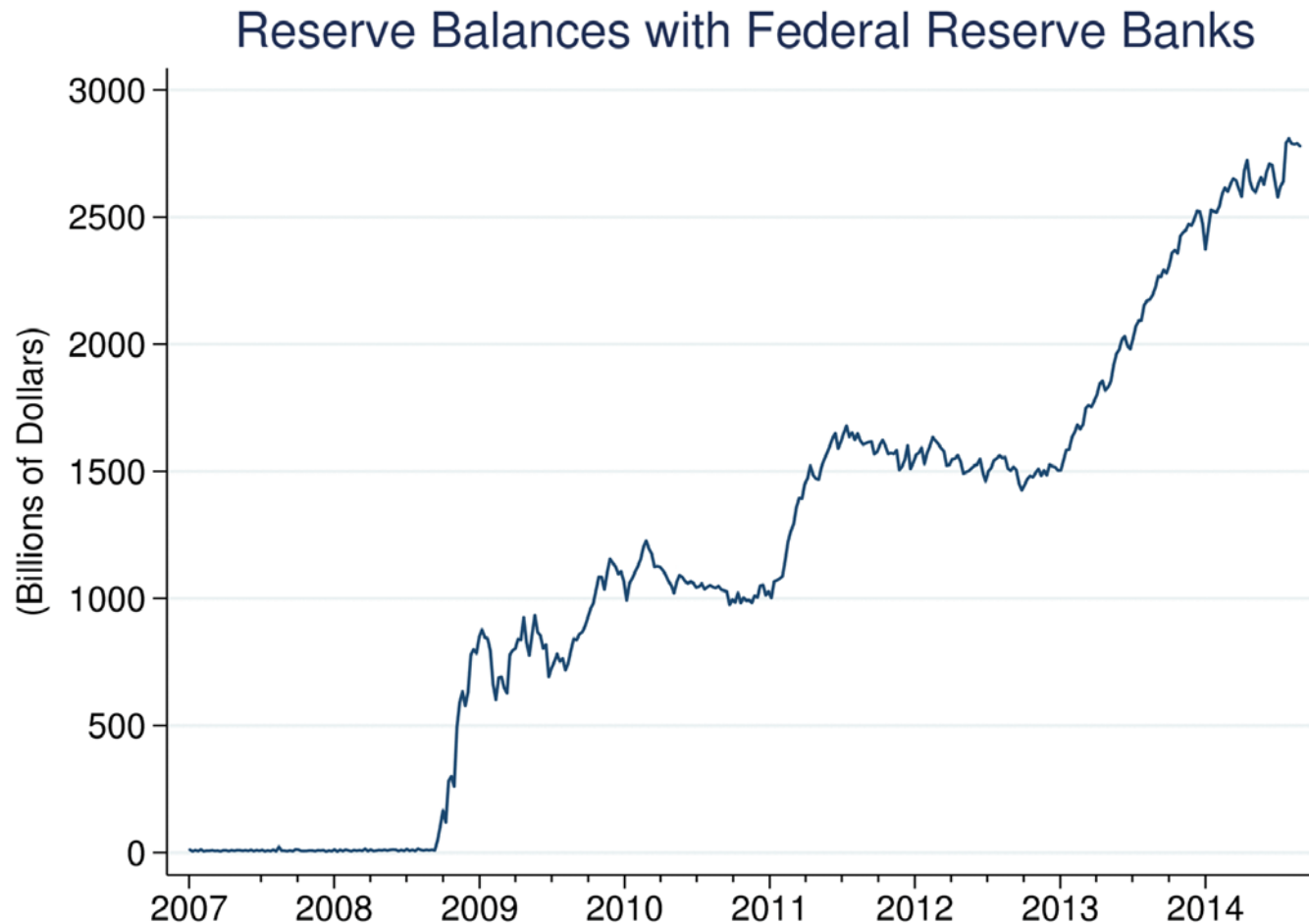
# Potential draining tools

- Fixed-quantity reverse repurchase agreements (RRPs)
  - A traditional tool
  - How does it work? → In tri-party repo system, investors give cash to the Fed and we give them Treasury securities as collateral (essentially, a collateralized loan to the Fed)
- Fixed-quantity term-deposit facility (TDF)
  - A relatively new tool
  - How does it work? → Banks can place a fixed amount of their reserves in the TDF, reducing their available reserves
- These tools change the composition of the Fed's balance sheet but not its size
  - Every \$1 in RRP or TDF reduces reserves by \$1

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# Draining is less practical as reserves increase



# Raising rates through arbitrage

- Policy Normalization Principles and Plans (Sept 2014)
  - In light of the changes in the SOMA portfolio since 2011 [...] some aspects of the eventual normalization process will likely differ from those specified earlier
  - During normalization, the Federal Reserve intends to
    - move the federal funds rate into the target range set by the FOMC primarily by adjusting the [IOER].
    - use an overnight reverse repurchase agreement (ON RRP) facility and other supplementary tools as needed to help control the federal funds rate.
- Why use the ON RRP? Isn't IOER enough?

# How is IOER supposed to work?

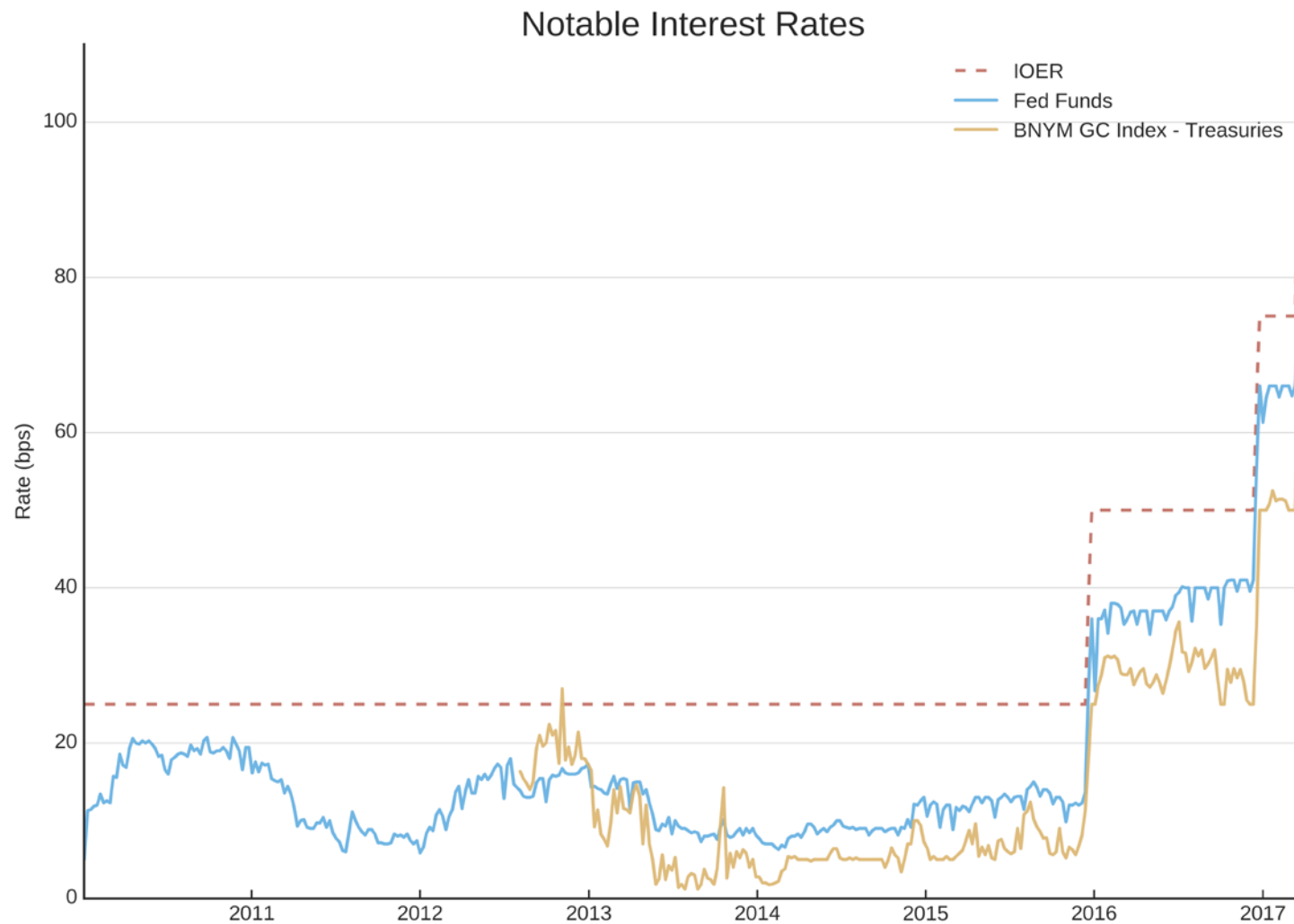
- If banks can earn 1% leaving money in their Fed account, they won't have an incentive to lend it out below that rate
  - Should provide a floor on interbank rates
- Absent frictions, we would expect competition to pull other market interest rates close to IOER
  - Banks earn arbitrage profits when they borrow reserves at a rate below IOER and earn IOER on these reserves
  - Competitions should drive arbitrage profits to zero
- In practice, money market rates did trade well below IOER
  - What is going on?



# Outline

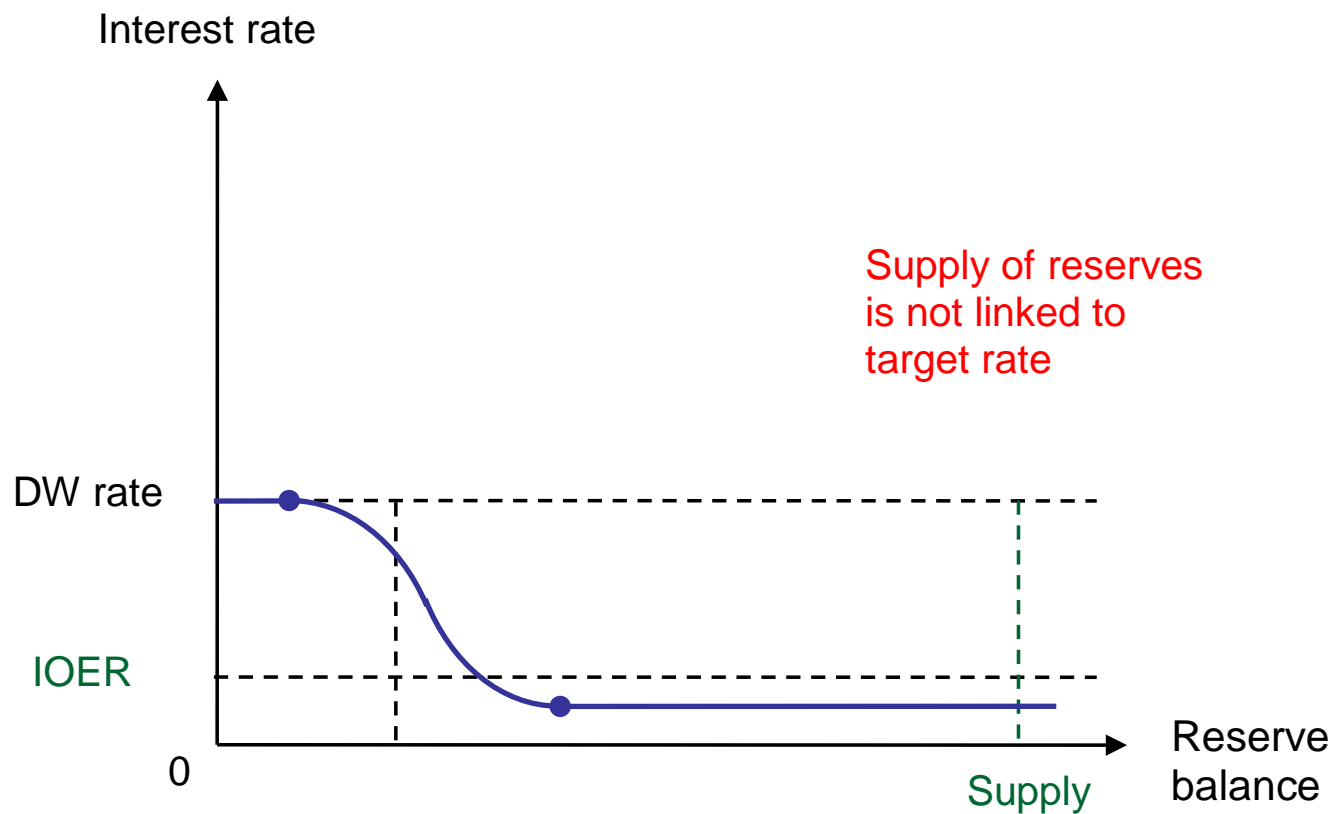
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# Reserves and Money Market Rates

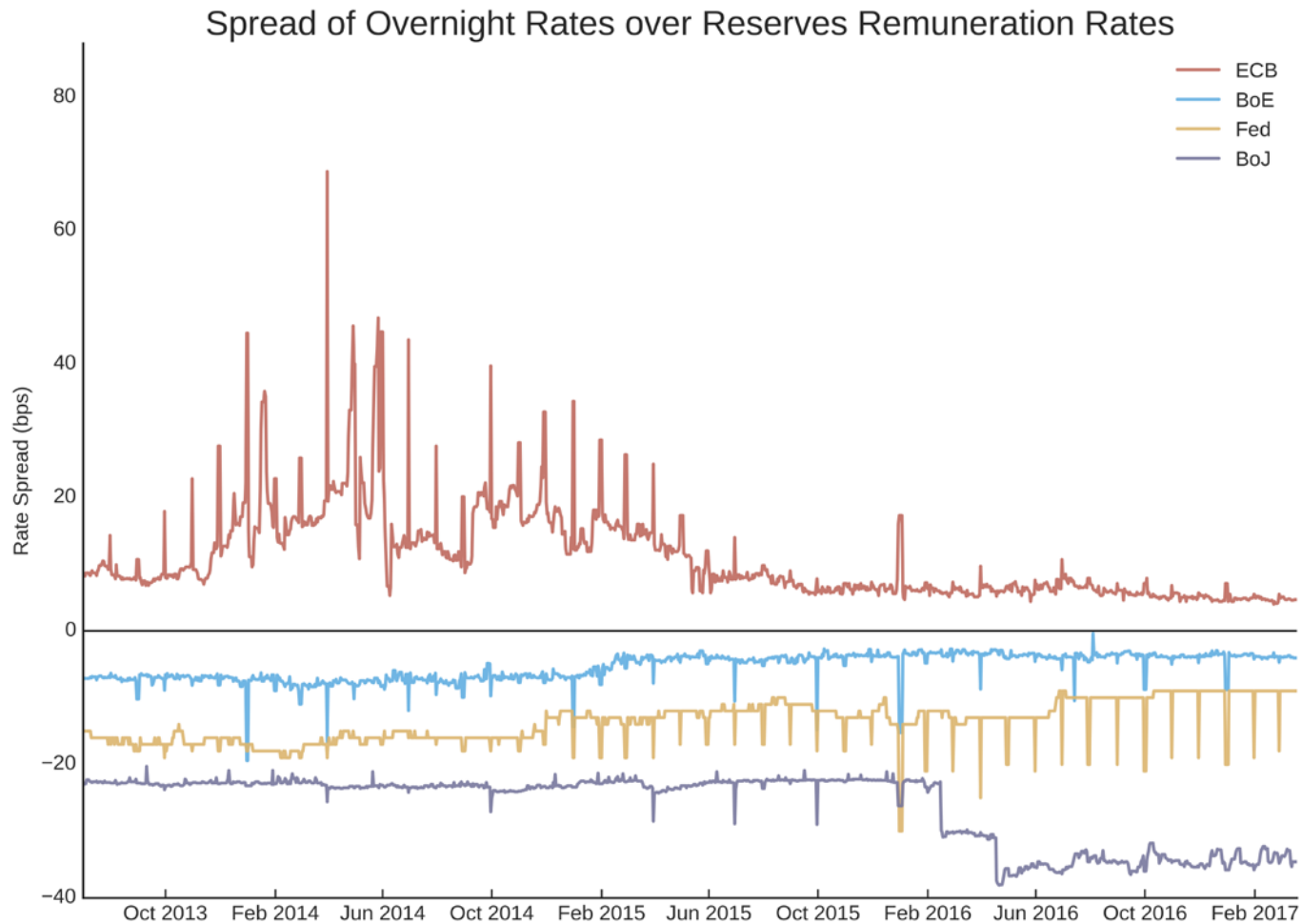




# The “leaky floor”



# A leaky floor is nothing strange



# What explains the spread to IOER?

- In the Fed funds market:
  - GSEs, including FHLBs, have Fed accounts but cannot earn interest on reserves
  - Interbank trades occur at rates above IOER but non-bank to bank trades occur at rates below IOER
  - Market is dominated by non-banks lending to banks
- In other money markets (eurodollar, repo)
  - Most cash lenders in U.S. money markets are non-banks, including MMFs, and do not have a Fed account
  - They cannot earn IOER

# Why doesn't competition lift market rates?

- Two frictions could be limiting the pull of IOER:
  - Banks face balance sheet costs related to FDIC assessment fee and new Basel III regulation
    - No arbitrage profits: Spread between IOER and money market rates reflects regulatory cost
  - U.S. money market appear to be imperfectly competitive
    - Some arbitrage profit: Spread reflects market power of banks
- There is evidence in support of both frictions
  - Banks publicly stating they want to reduce deposits
  - Tightening IOER – ON RRP rates spread with no change in ON RRP demand

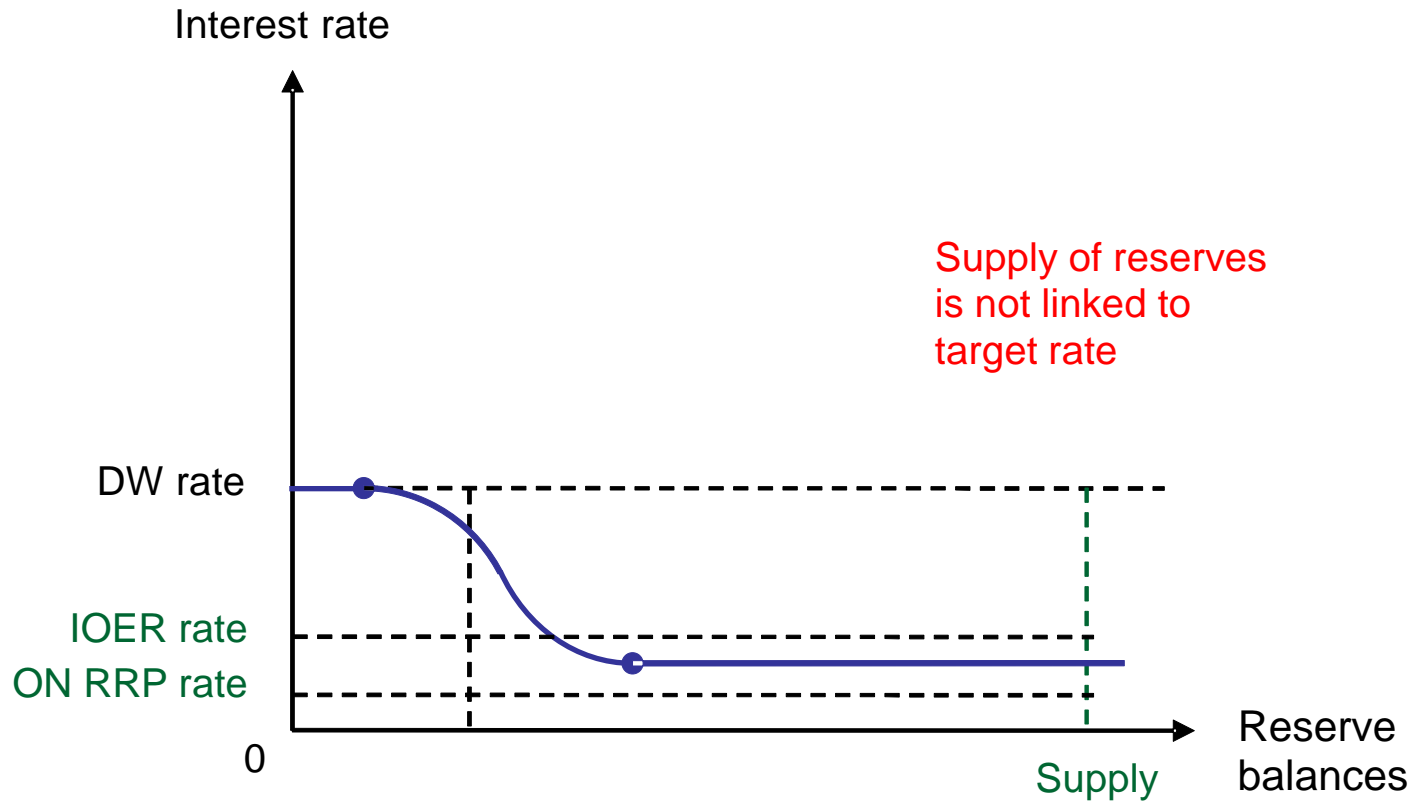


# Additional arbitrage tools

- Fixed-rate term-deposit facility (TDF)
  - Works like IOER but with term rates
  - Typically needs to be offered above IOER; otherwise, why lock up your money for longer than you need to?
- Fixed-rate reverse repurchase agreements (RRPs)
  - Traditional tool with a new twist
  - Provides non-bank counterparties with an investment options at a fixed rate
- RRP could support rate even if there is no take-up



# The ON RRP supports IOER



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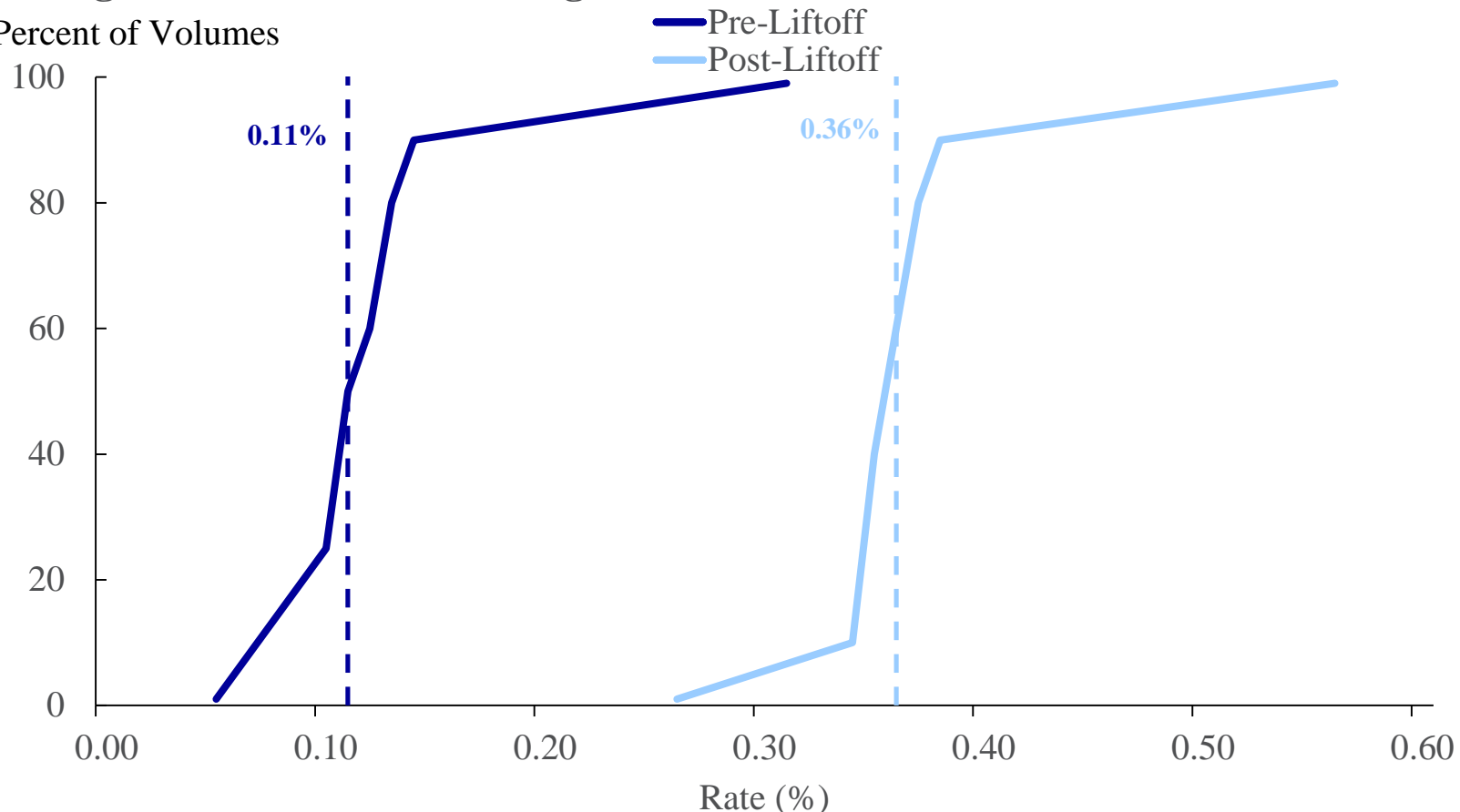
- On December 16, 2015, the FOMC decided to tighten policy
  - IOER was raised from 25 to 50 bps
  - ON RRP rate was raised from 5 to 25 bps
  - Target range for the fed funds rate was raised from 0-25 bps to 25-50 bps
  - ON RRP cap was raised from \$300 billion to an amount limited only by the value of Treasury securities held outright in SOMA and available for such operations (about \$2 trillion)
- Liftoff and subsequent policy firming have gone very well
  - Money market rates have moved in the range
  - ON RRP demand has remained very low

# Rates in Fed Funds market have increased

**Figure 1**

## Average Distribution of Overnight Federal Funds Rates

Percent of Volumes



Distributions include 1st, 10th, 20th, 25th, 30th, 40th, 50th, 60th, 70th, 75th, 80th, 90th, and 99th percentiles. Dashed lines represent volume-weighted median rates.

Pre-Liftoff includes data from November 2 through December 16, 2015.

Post-Liftoff includes data from December 17 through February 17, excluding December 31.

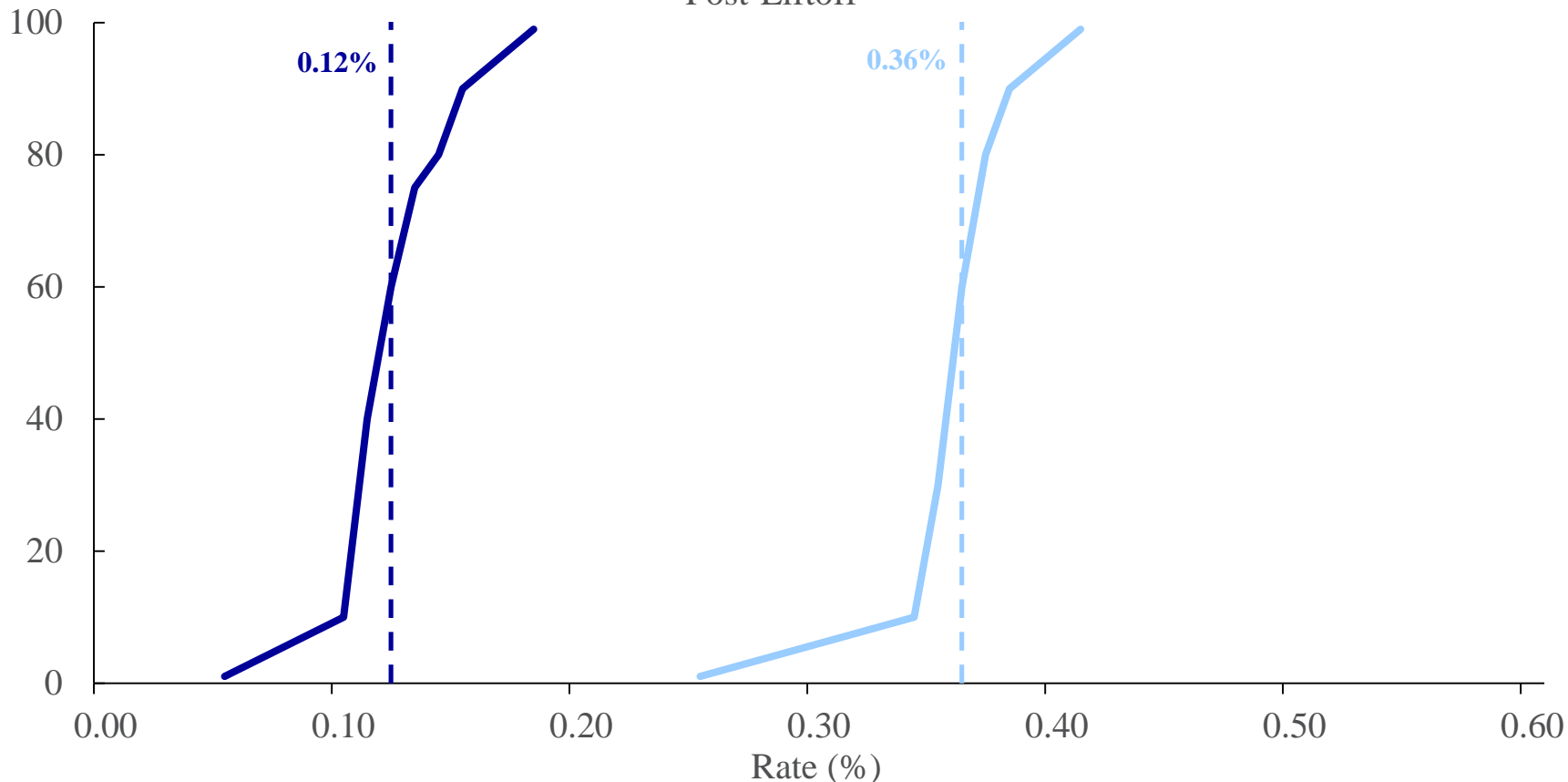
# Rates in Eurodollar market have increased

**Figure 4**

## Average Distribution of Overnight Eurodollar Rates

Percent of Volumes

— Pre-Liftoff  
— Post-Liftoff



Distributions include 1st, 10th, 20th, 25th, 30th, 40th, 50th, 60th, 70th, 75th, 80th, 90th, and 99th percentiles. Dashed lines represent volume-weighted median rates.

Pre-Liftoff includes data from November 2 through December 16, 2015.

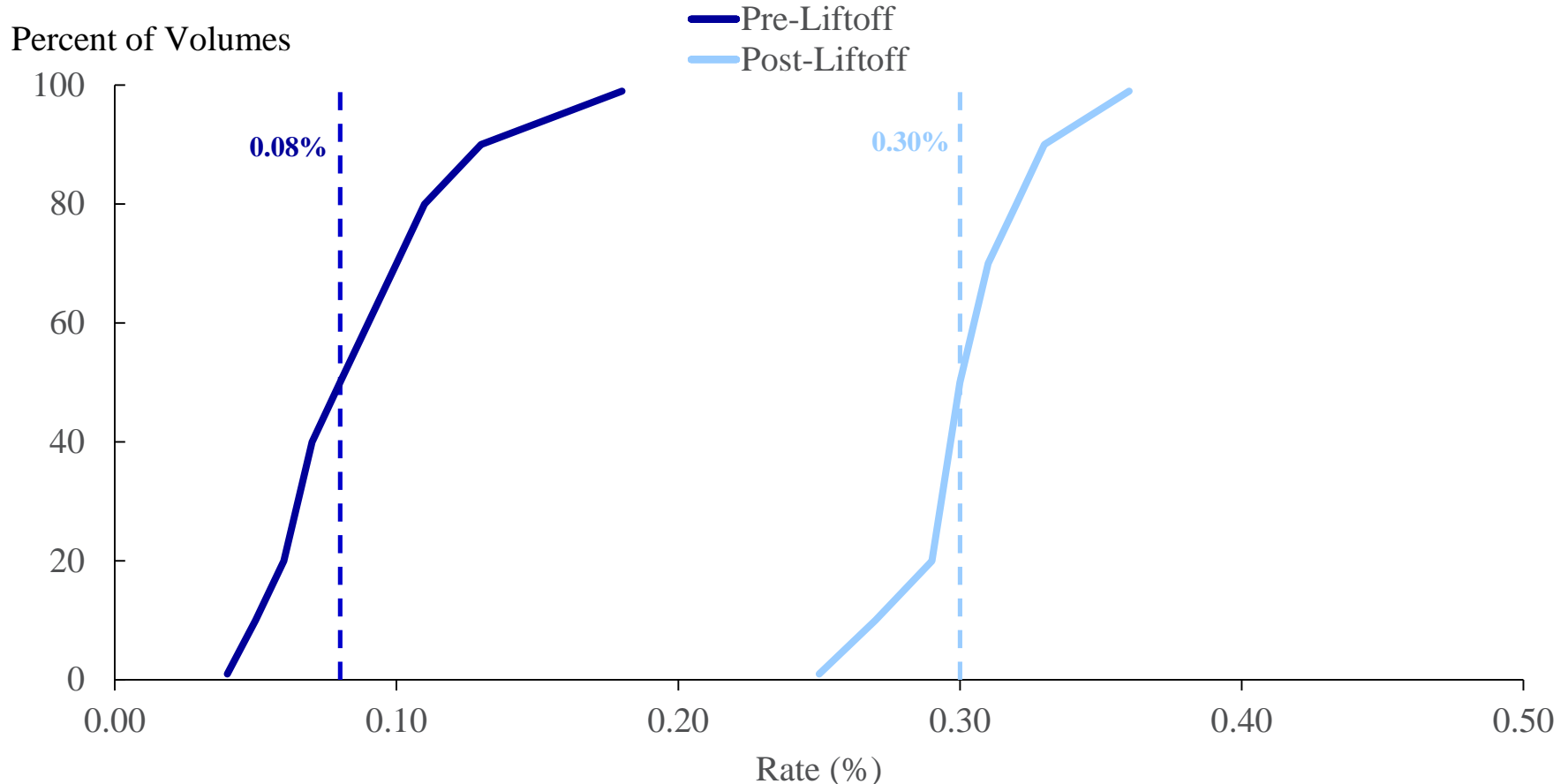
Post-Liftoff includes data from December 17 through February 17, excluding December 31.

Source: Federal Reserve (FR 2420)

# Treasury repo rates are higher

**Figure 6**

## Average Distribution of Overnight Treasury Tri-party Repo Rates



Distributions include 1st, 10th, 20th, 25th, 30th, 40th, 50th, 60th, 70th, 75th, 80th, 90th, and 99th percentiles.

Dashed lines represent volume-weighted median rates.

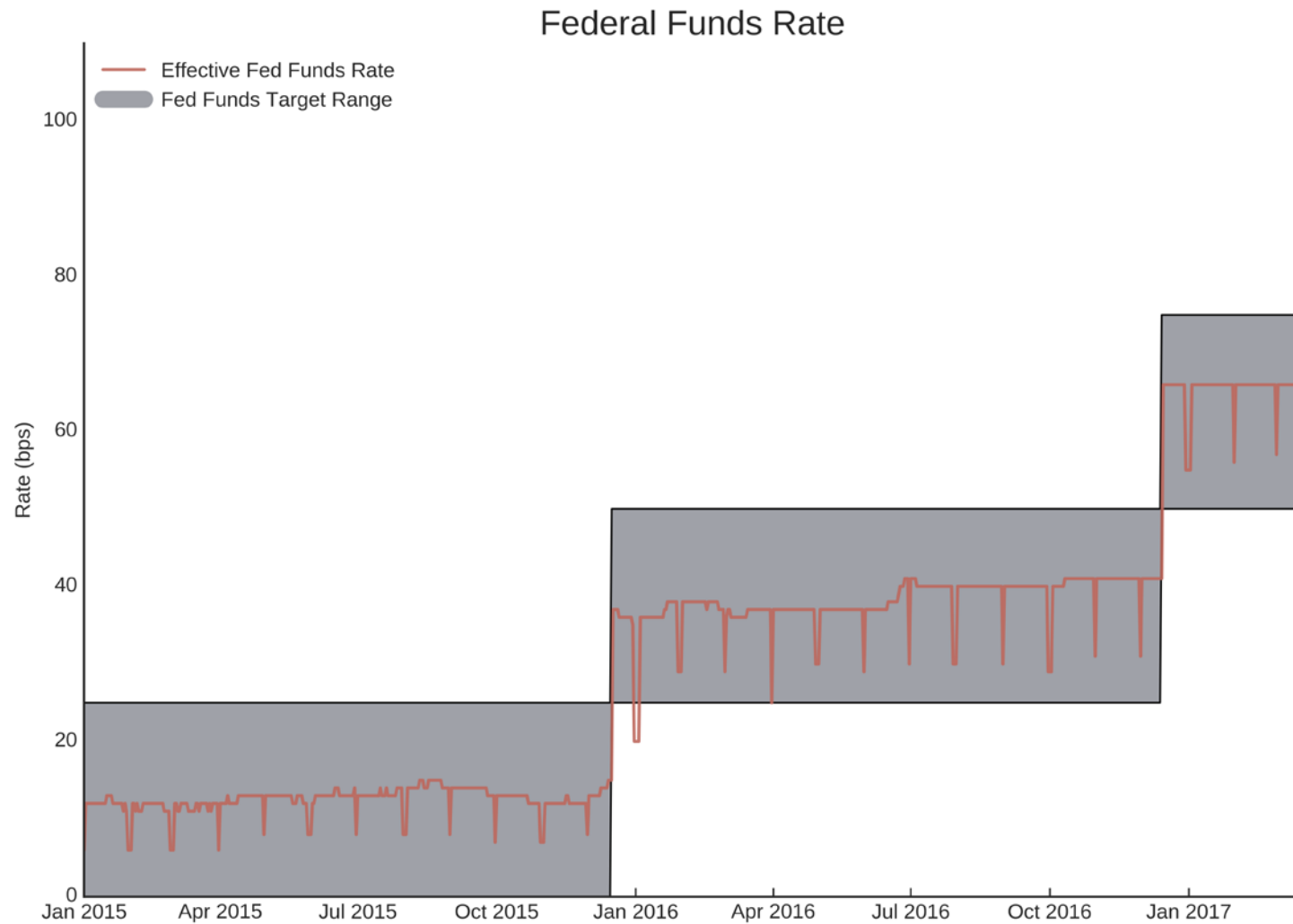
Treasury GCF repo transactions are not included in these data.

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# Effective Fed Funds rate is up



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# The long-run framework (LRF)

- At the July 2015 FOMC meeting Chair Yellen announced “an extended effort to evaluate potential *long-run monetary policy implementation frameworks*” (see Minutes)
- System-wide project involving all 12 Reserve Banks and the Board of Governors
- Several conferences with academic, market participants and central bankers were held on the topic
- A number of blog posts and research articles related to that work are already public and more are on the way

# Overview of the work

- Two phases
  - Foundational work was done on foreign central banks' experience, lessons from the crisis in the U.S., and changes in money markets
  - With that base of knowledge, potential policy interest rates, operating regimes and balance sheet options were considered
- Final material was presented during the July and November 2016 FOMC meetings (see Minutes)
- No decisions have been made yet
- There is an opportunity to learn more about the current framework as rates increase



# Some lessons from the foundational work

- Foreign central banks have used a wide variety of frameworks to control short-term interest rates and their approaches have evolved over time
  - Importance of institutional setting
- The Fed's pre-crisis framework led to a tension between providing liquidity to markets and interest rate control
- Changes in money markets, including new liquidity regulation, suggest that demand for reserves could be larger than pre-crisis

# Framework options: Policy rate

- Focus on overnight rate
- Policy rate could be
  - Administered or market-based
  - Explicit or implicit
  - Secured or unsecured
- Transmission is key:
  - Arbitrage links short-term rates together, and links those rates to longer term rates, broader financial conditions and the real economy
- In practice, central banks have been able to successfully conduct monetary policy with different types of policy rates

# Framework options: Floor vs. corridor

- Floor systems have a number of benefits
  - They are simple because active management of reserves is not necessary
  - They remove the tension between stabilizing markets in times of crisis and interest rate control
  - Facilitate transition to QE if necessary
- A floor system would be compatible with a smaller balance sheet than at present, though likely larger than pre-crisis
- A corridor system could accommodate the smallest Fed balance sheet

# Framework options: Balance sheet

- The balance sheet is an unconventional tool that has been used to achieve policy objectives since the crisis
- Many important question about the long-run:
  - How large should the balance sheet be?
  - What assets should it contain: Treasuries only or also MBS?
  - What should be the maturity of the assets the Fed holds?
- Some considerations:
  - Is there a benefit to society from providing “money-like” assets?
  - Should “balance-sheet” policies be used only when interest rates are zero or negative?

# Conclusion

- Monetary policy implementation with a large balance sheet requires relying on arbitrage, rather than scarcity
- Fixed-rate tools, like IOER or fixed-rate RRP's are necessary
- The quantity of reserves becomes less important—No need for fine tuning
- Liftoff has worked very well so far but we still have a lot to learn from future rate increases
- The LRF could look different than pre-crisis

# Questions?

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## Further reading

- Exit Strategy Principles: FOMC minutes June 2011
- Policy Normalization Principles and Plans
- Minutes of the July 2015 FOMC meeting
- Minutes of the July 2016 FOMC meeting
- Minutes of the November 2016 FOMC meeting
- Keister and McAndrews (2009). “Why Are Banks Holding So Many Excess Reserves?”

# Some papers on monetary policy implementation

- Armenter and Lester (2015). “Excess Reserves and Monetary Policy Normalization.”
- Clouse, Ihrig, Klee and Chen (2014). “The Federal Reserve’s Tools for Policy Normalization in a Preferred Habitat Model of Financial Markets.”
- Martin, McAndrews, Palida and Skeie (2013). “Federal Reserve Tools for Managing Rates and Reserves.”