



FEDERAL RESERVE BANK *of* NEW YORK

Policy Implementation with a Large Central Bank Balance Sheet

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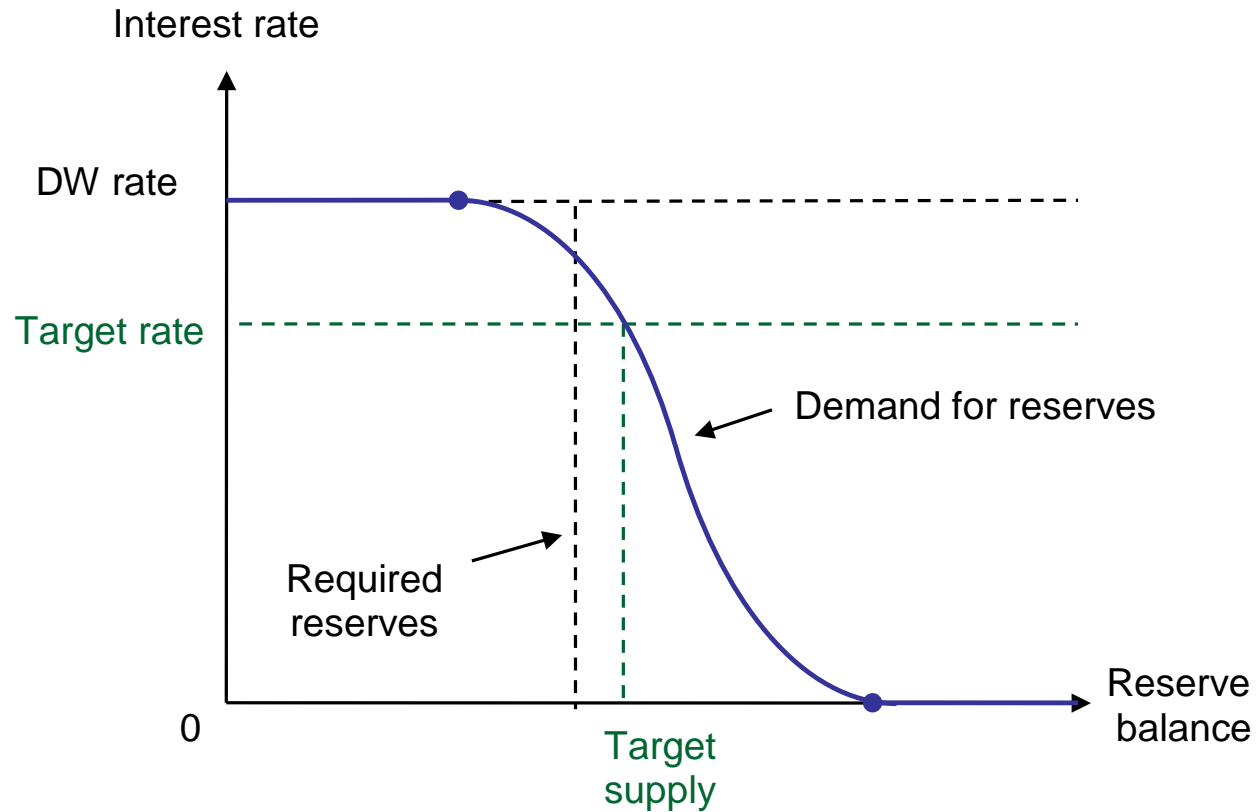
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Outline

- 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
- A framework to think about normalization
- Liftoff



Monetary policy implementation before 2008

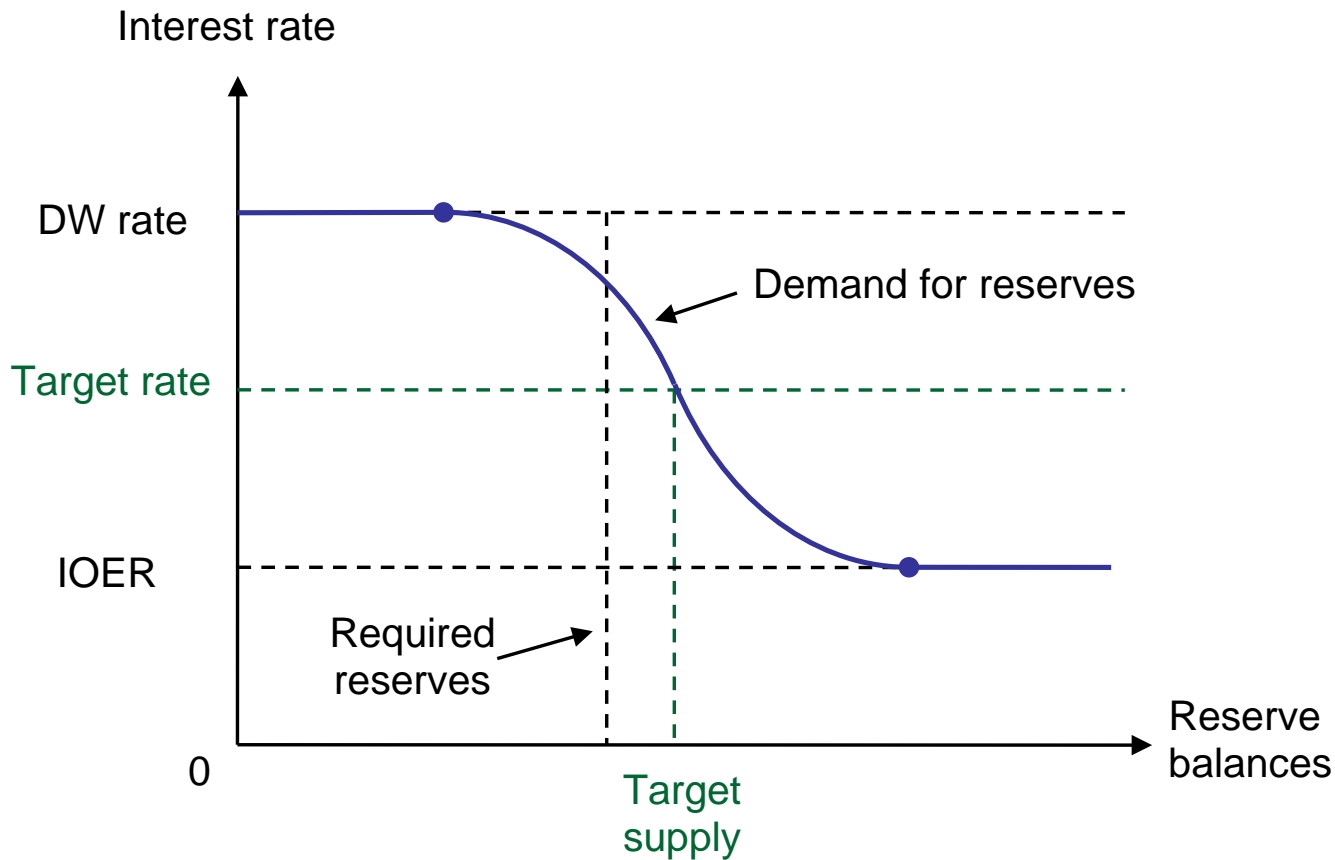


Pre-Crisis Operational Framework

- 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

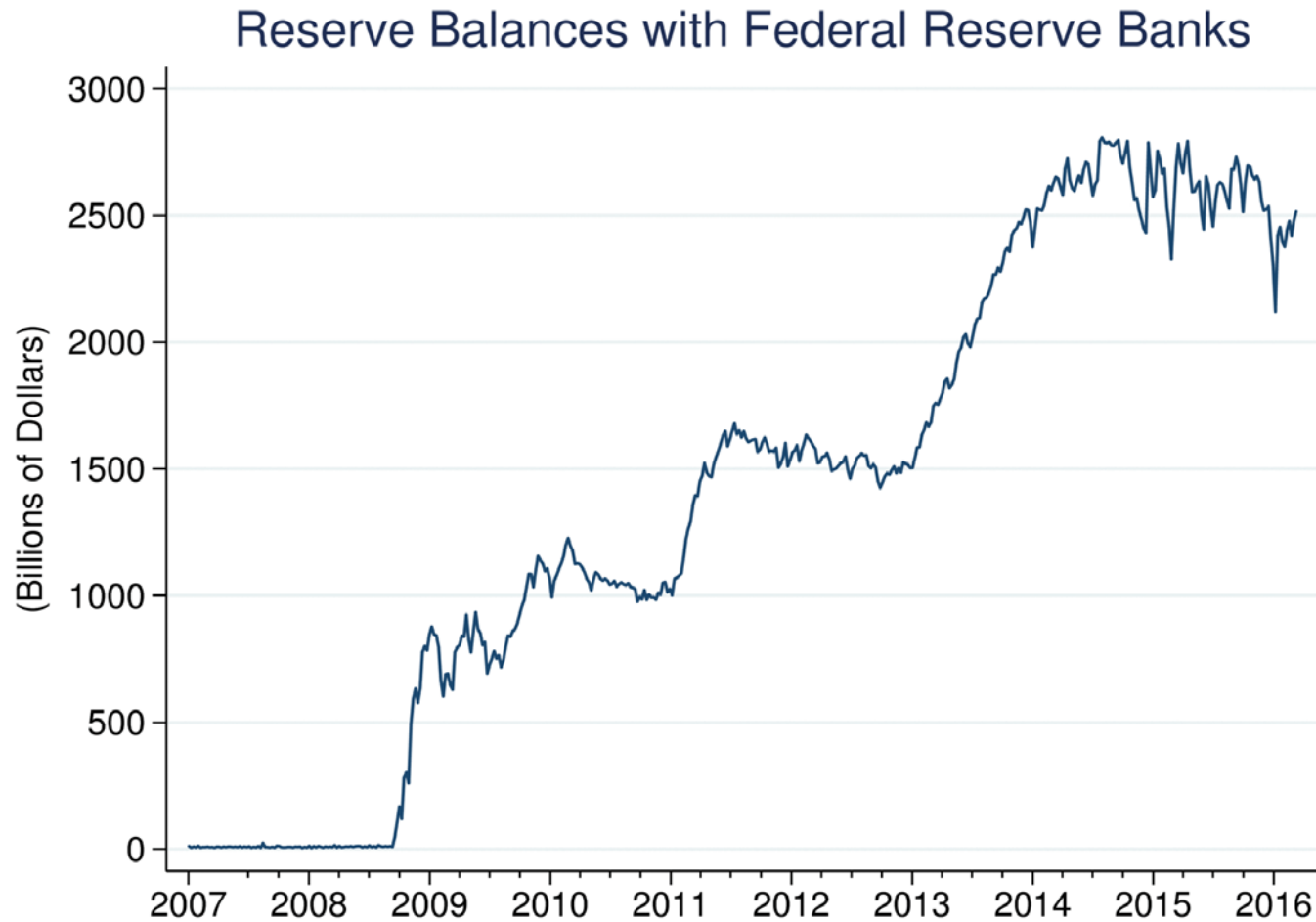


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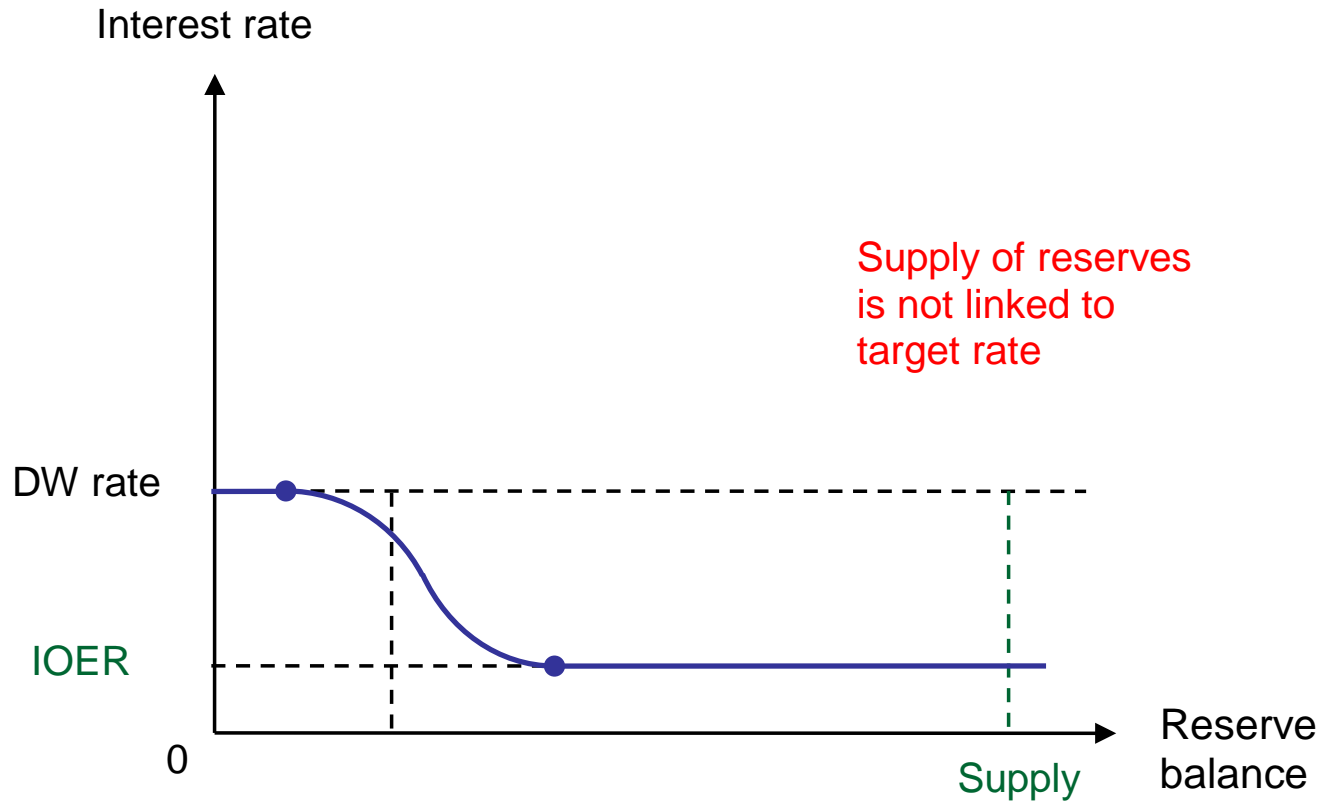
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The crisis lead to a huge increase in reserves



Monetary policy with a lot of reserves



Current Framework

- Current level of reserves is around \$2.7 trillion
 - A 27,000% 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	
Due from						Bank A	40
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
		Capital	10				
Securities	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



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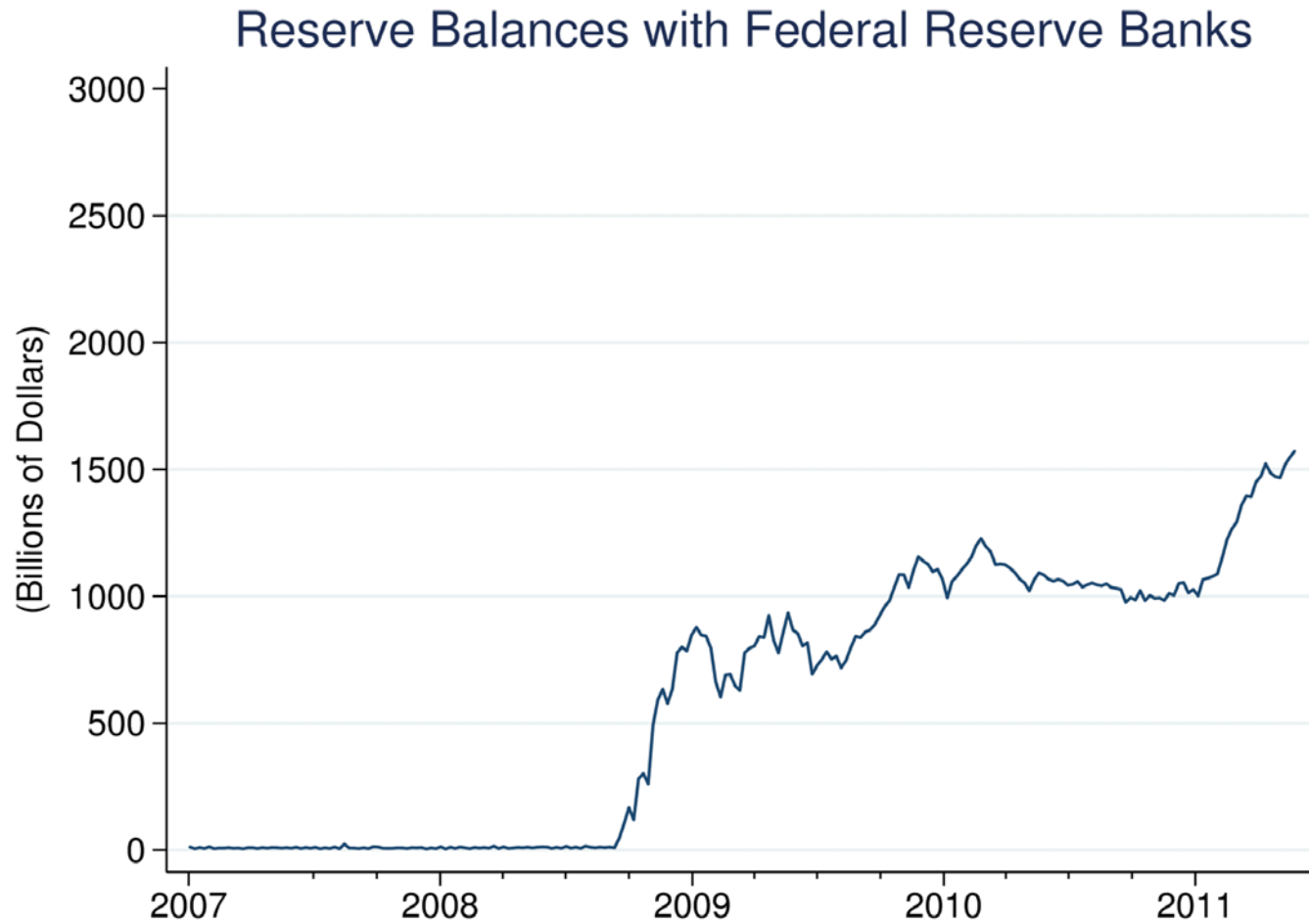


Monetary policy normalization

- 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 plan



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

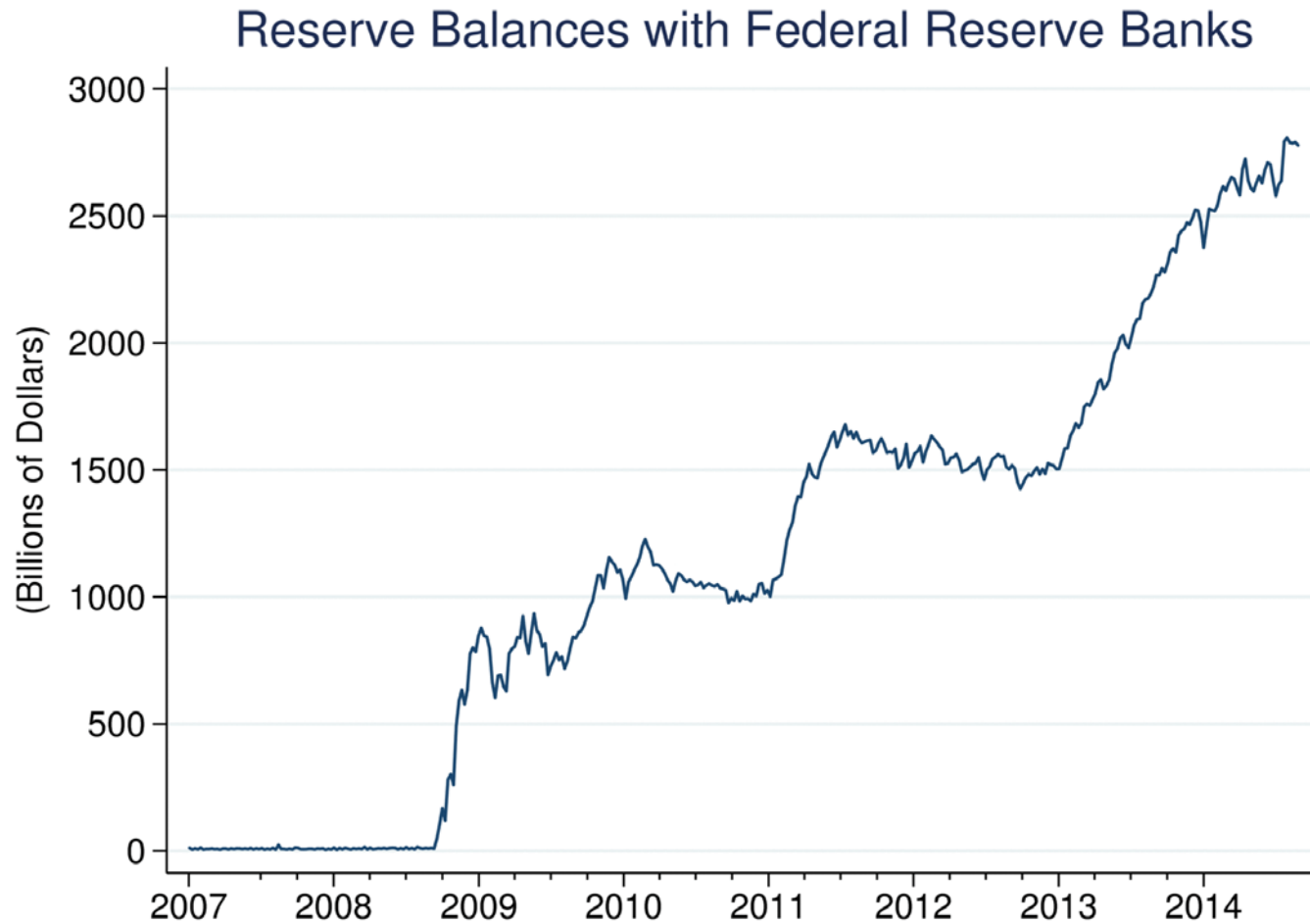
- Fixed-quantity reverse repurchase agreements (RRPs)
 - A traditional tool
 - How does it work? → In tri-party repo system, investors give cash to the Fed and we give them Treasury securities as collateral (essentially, a collateralized loan to the Fed)
- Fixed-quantity term-deposit facility (TDF)
 - 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 0.50% (or 50 bps) 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?

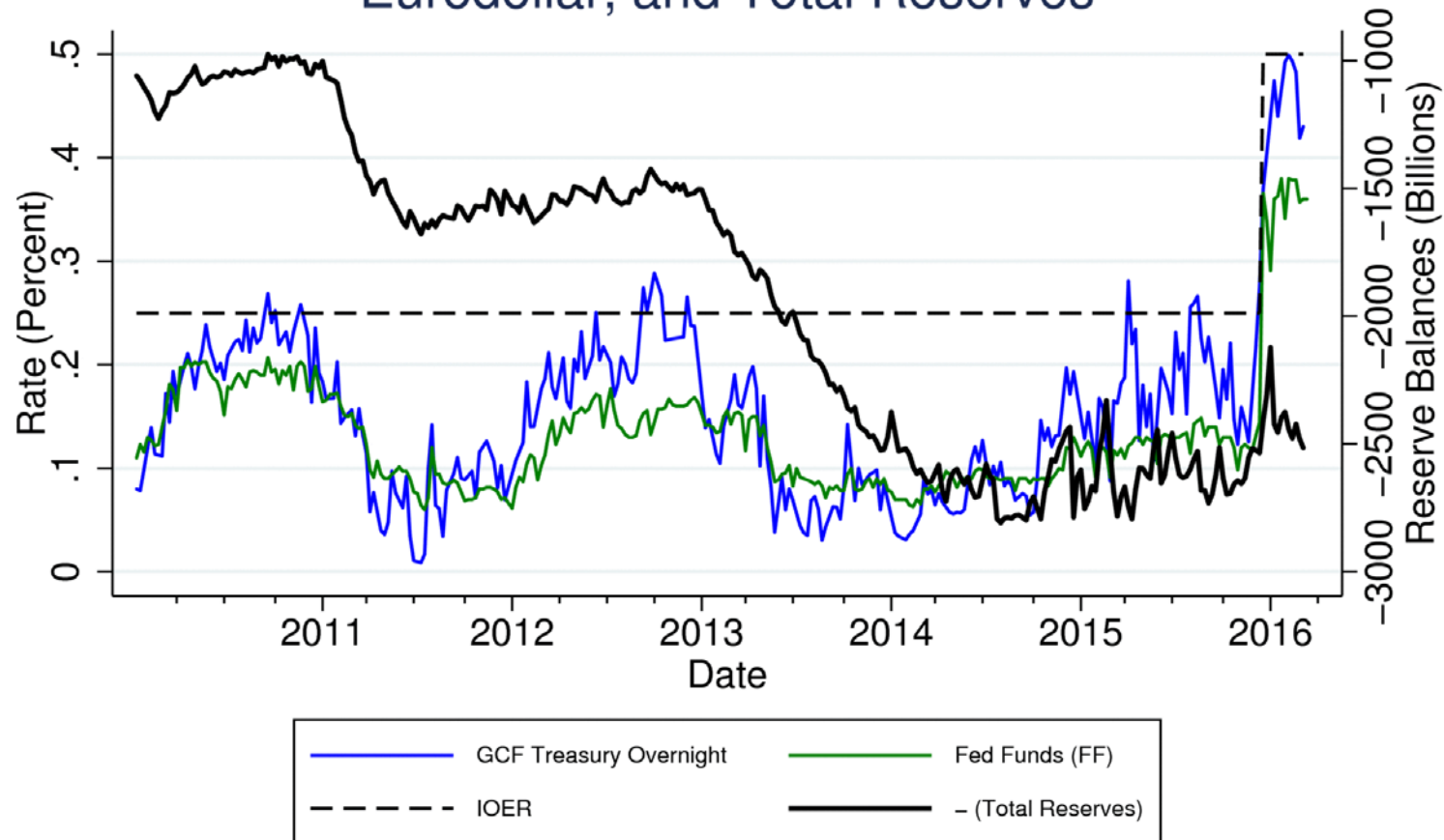


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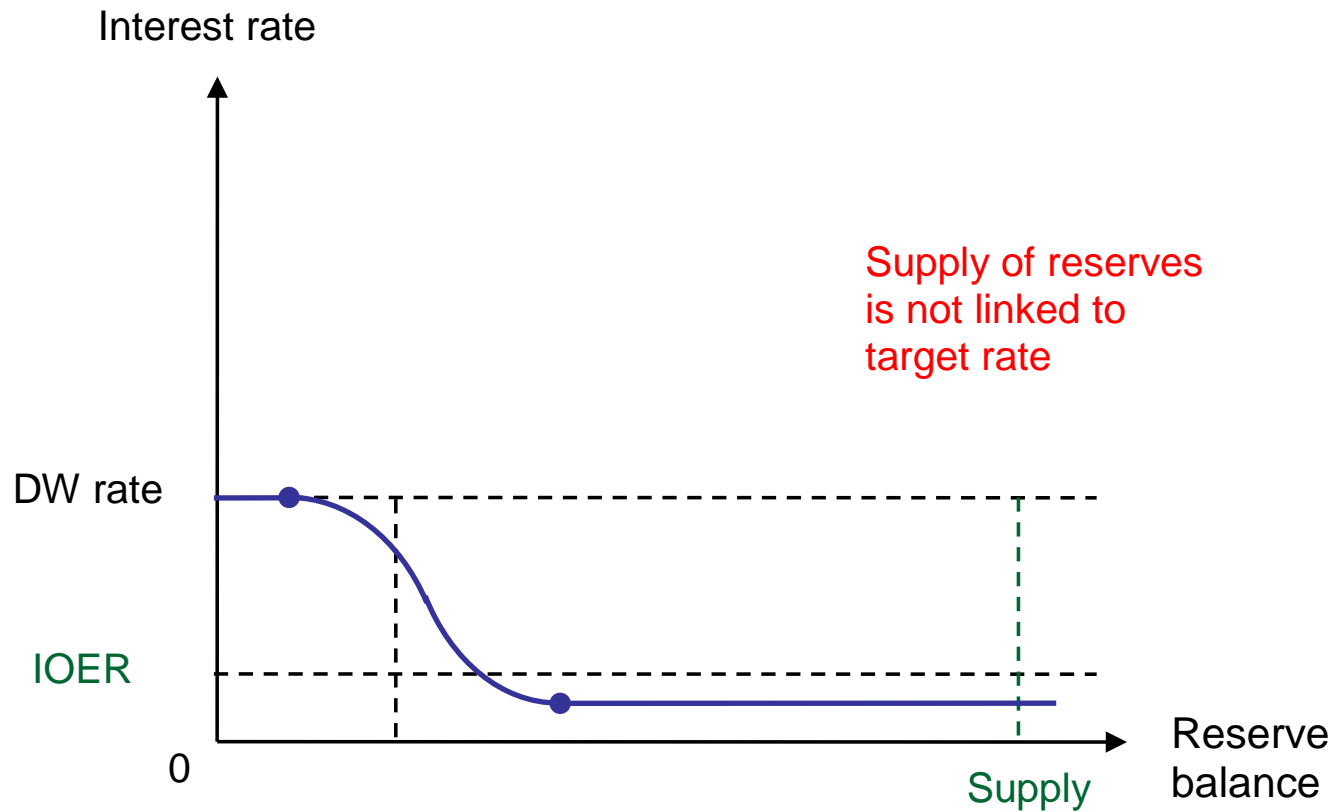
Reserves and Money Market Rates

GCF Treasury Overnight, Effective Fed Funds, IOER, Eurodollar, and Total Reserves



Sources: FRED, Federal Reserve Economic Data, from the Federal Reserve Bank of St. Louis, Bloomberg, and Federal Reserve Data Releases, H15

The “leaky floor”



Why are market rates below the 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

- IOER
- 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 can support rate even if there is no take-up



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A framework to think about normalization

- Analysis based on Martin, McAndrews, Palida, and Skeie
- We build a simple model with households, firms, banks, and nonbanks
- In our model:
 - Households use the financial system to save for consumption at a later date
 - Firms produce consumption goods
 - Banks lend to firm, offer deposits, and have access to IOER
 - Nonbanks hold government debt on behalf of households and cannot earn IOER



Key Frictions

- Absent frictions, all money market rates would be equal to the IOER
- There are three main frictions:
 - Banks face convex balance sheet costs
 - Market for reserves may not be perfectly competitive
 - Explains why money market rates are below IOER
 - Banks face convex interbank monitoring costs (reserve scarcity)
 - Explains why interbank rates are above IOER
- Nonbanks do not face balance sheet costs because they are more transparent



A Simple Economy

- Households get utility from consumption when old
 - Sell endowment to firm when they are young
 - Save through banks and non-banks
 - Purchase good to consume when they are old
- Banks maximize profits
 - They may experience a liquidity shock
 - They use reserves to absorb the shock or borrow in the interbank market
- Firms maximize profits
 - Buy household endowment and use it as input for production
 - Sell the goods they produce to the households



Two polar cases

- When the supply of reserves is small
 - Interbank market is active
 - Interbank market frictions are high
 - Balance sheet costs are low
 - Because of scarcity, banks compete for reserves

- When the supply of reserves is high
 - Interbank market is inactive
 - Interbank market frictions are low
 - Balance sheet costs are high
 - Banks don't need to compete for reserves



How do the tools affect the frictions?

- The tools work by affecting the two frictions that determine interest rates:
 - Balance sheet costs: Reducing balance sheet size raises market rates by decreasing the spread to IOER
 - Competition: Scarcity makes banks compete for reserves; banks must compete with the ON RRP
 - Interbank market frictions: Increasing the interbank market activity raises interbank market rates
- Assessment:
 - TDF: Creates reserve scarcity but does not affect balance sheet size
 - RRP: Create reserves scarcity and reduce balance sheet size (if RRP rate < IOER)



Do we have the tools to raise rates?

- Yes, TDF and RRP's can help raise rates
- Large reserves → RRP's are more effective
 - RRP's (but not TDF) reduce balance sheet size
 - Creating scarcity through TDF only would require massive drain of reserves



How should we use our tools?

- Welfare in our economy can be measured as the (negative of the) sum of the three frictions
- TDF: Increases rates in part by increasing interbank market costs → Lower welfare
- RRPs: Increase rates by lowering balance sheet costs and increasing interbank costs
 - Trade-off: Effect on welfare can be ambiguous but likely positive when reserves are large
 - ON RRPs also stabilize rate by absorbing liquidity shocks



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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 has gone very well so far
 - Money market rates have moved in the range
 - ON RRP demand has remained very low

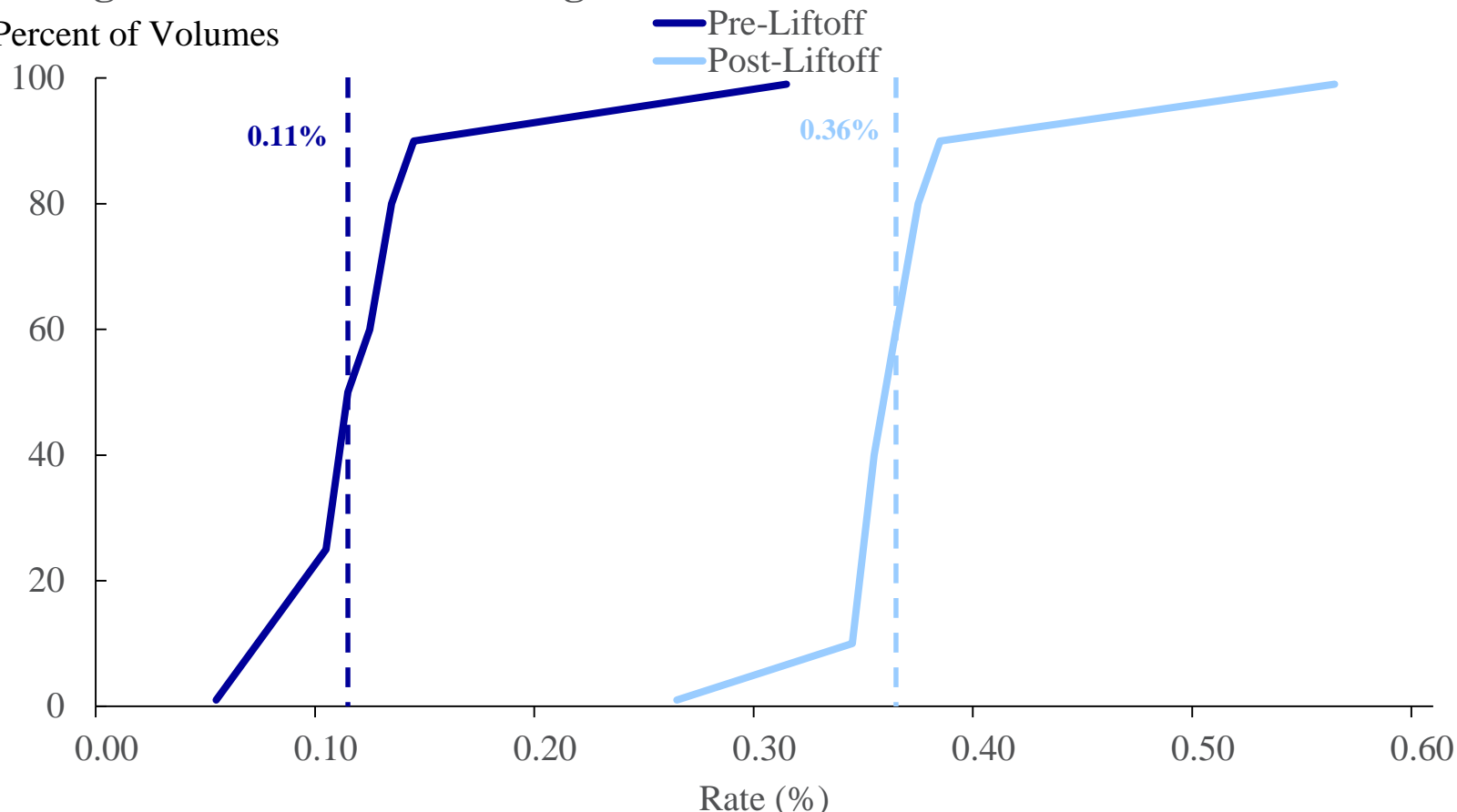


Rates in Fed Funds market have increased

Figure 1

Average Distribution of Overnight Federal Funds Rates

Percent of Volumes



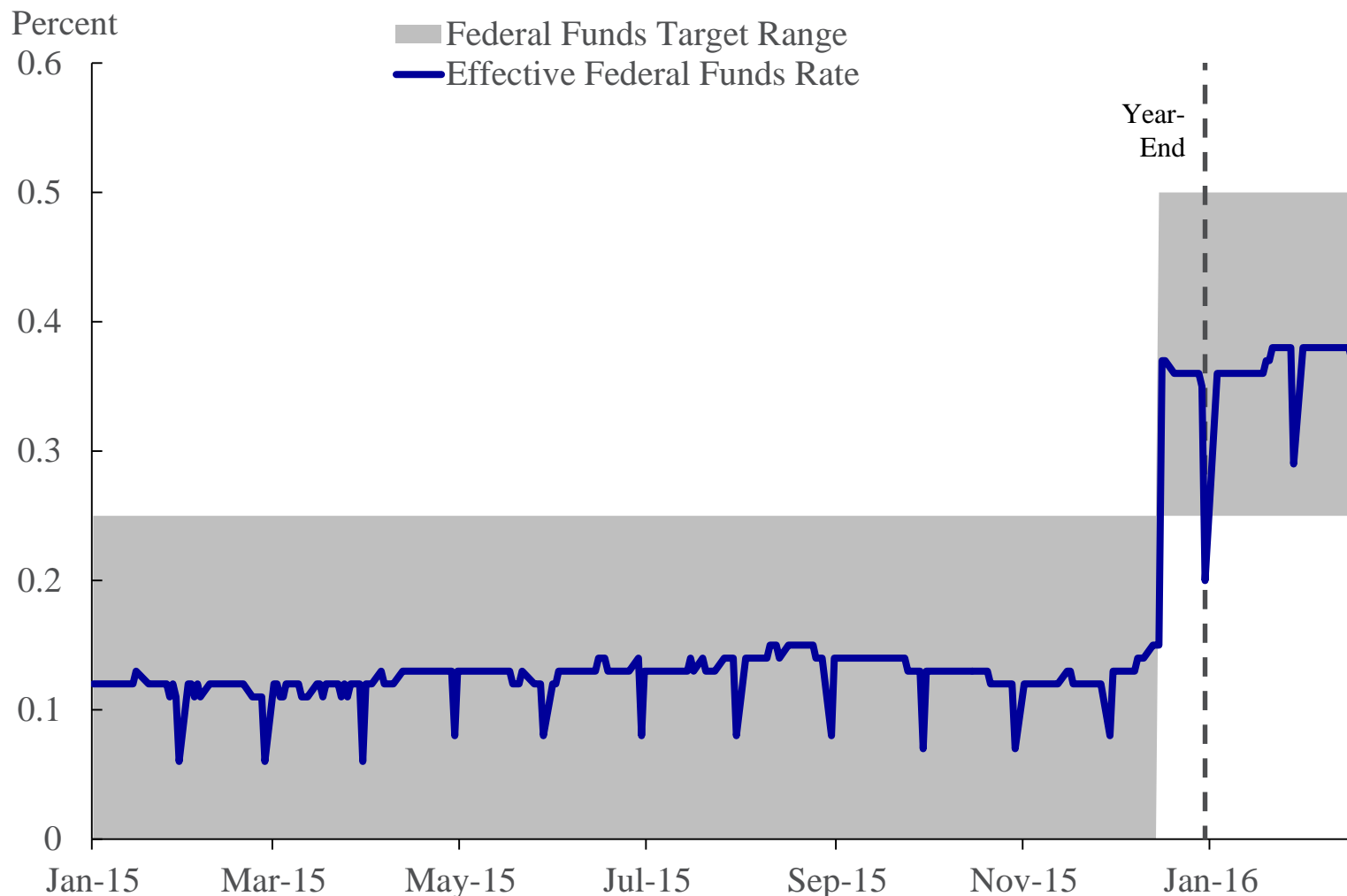
Distributions include 1st, 10th, 20th, 25th, 30th, 40th, 50th, 60th, 70th, 75th, 80th, 90th, and 99th percentiles. Dashed lines represent volume-weighted median rates.

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

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

Effective Fed Funds rate is up

Figure 2
Effective Federal Funds Rate



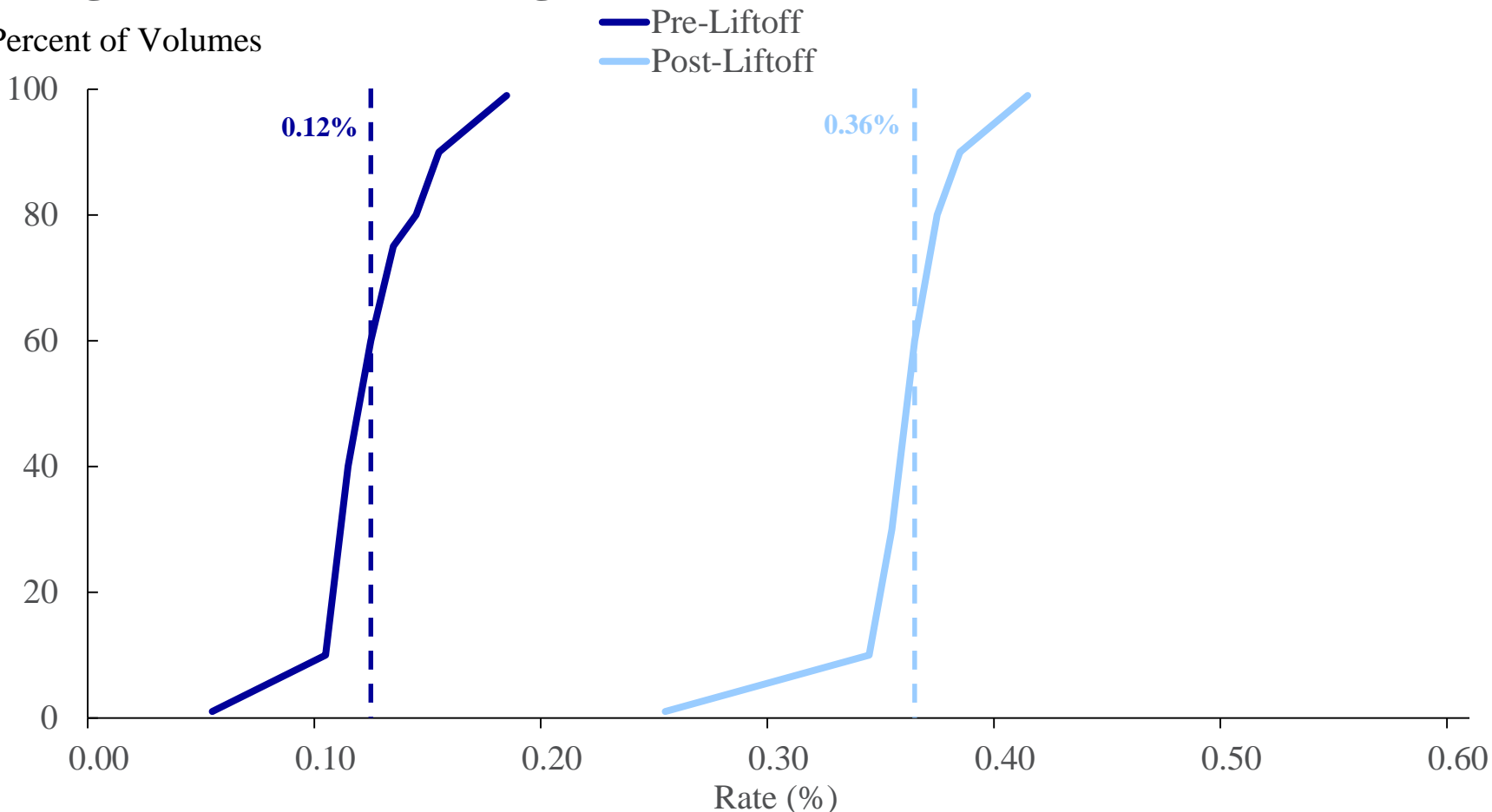
The effective federal funds rate is a volume-weighted average of rates on trades arranged by major brokers.

Rates in Eurodollar market have increased

Figure 4

Average Distribution of Overnight Eurodollar 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.

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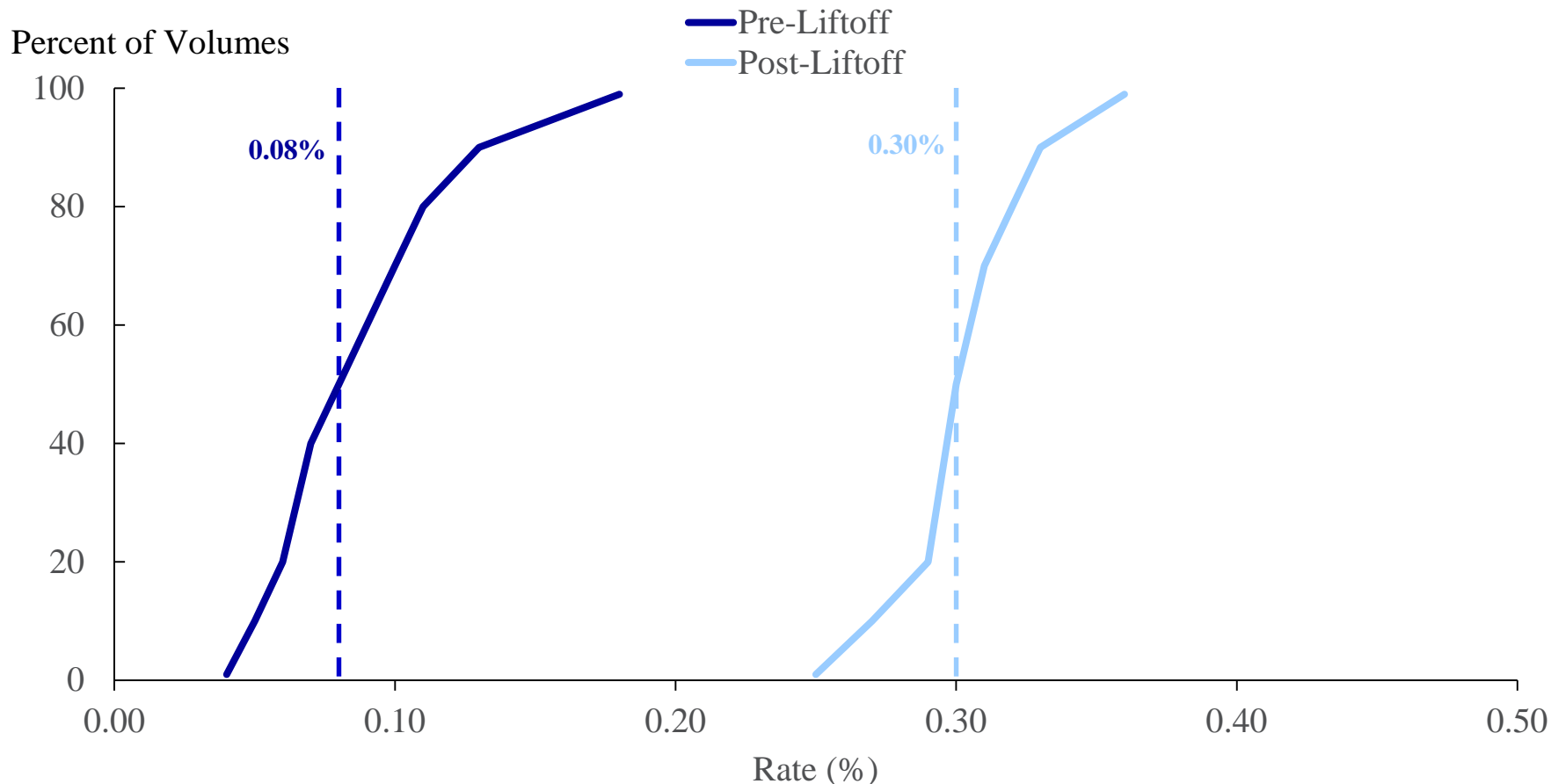
Post-Liftoff includes data from December 17 through February 17, excluding December 31.

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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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



Questions?



Further reading

- Exit Strategy Principles: FOMC minutes June 2011
- Policy Normalization Principles and Plans
- 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.”
- Keister and McAndrews (2009). “Why Are Banks Holding So Many Excess Reserves?”
- Martin, McAndrews, Palida and Skeie (2013). “Federal Reserve Tools for Managing Rates and Reserves.”