

Economics 442
Macroeconomic Policy
(11/2/2020)

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UW Madison
Fall 2020

Outline

- Monetary Policy Reaction Function
- Central Banks in the Financial System
- Unconventional Monetary Policy (QE/CE/Fwd Guidance)
- Why Didn't Credit Easing lead to inflation?

Monetary Policy Reaction Function

Monetary Policy Reaction Function

- Instead of discretion which leads to time inconsistency, maybe we should use a rule
- Which rule: Money growth, nominal income target, price rule, or Taylor rule?
- For twenty years, it was the Taylor rule:

$$\widehat{FFR}_t = \rho FFR_{t-1} + (1 - \rho)[(r_t^* + \pi_t^*) + 1.5(\pi_t - \pi_t^*) + \beta gap_t]$$

Target
Fed funds

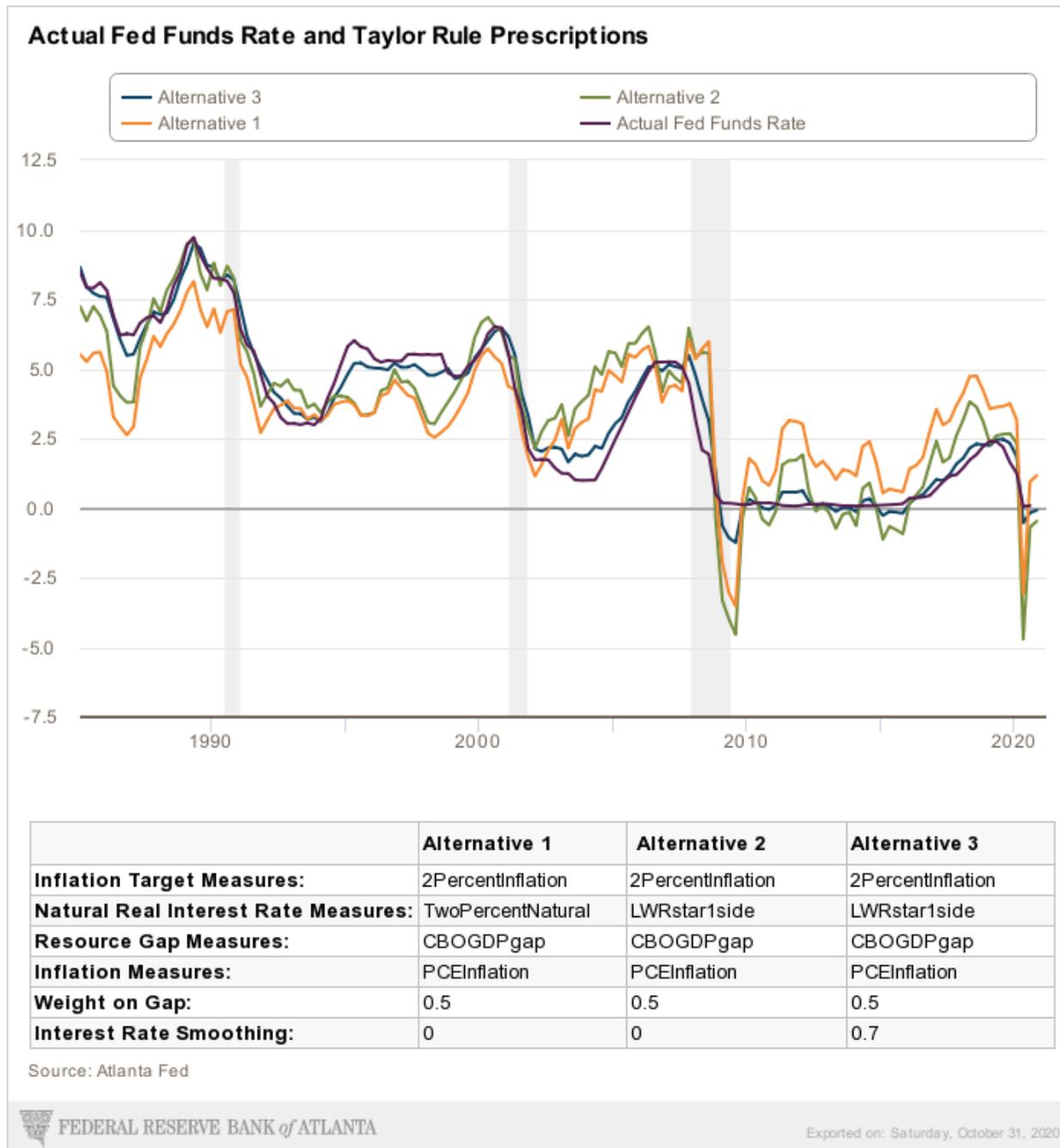
Fed
funds

Inflation
gap

Output
gap

$$[(r_t^* + \pi_t) + 0.5(\pi_t - \pi_t^*) + \beta gap_t]$$

- Alt 1: $\beta = 0.5$, except $r^* = 2\%$
- Alt 2: $\beta = 0.5$, but except r^* estimated
- Alt 3: $\beta = 0.5$, except r^* estimated, smoothing = 0.7

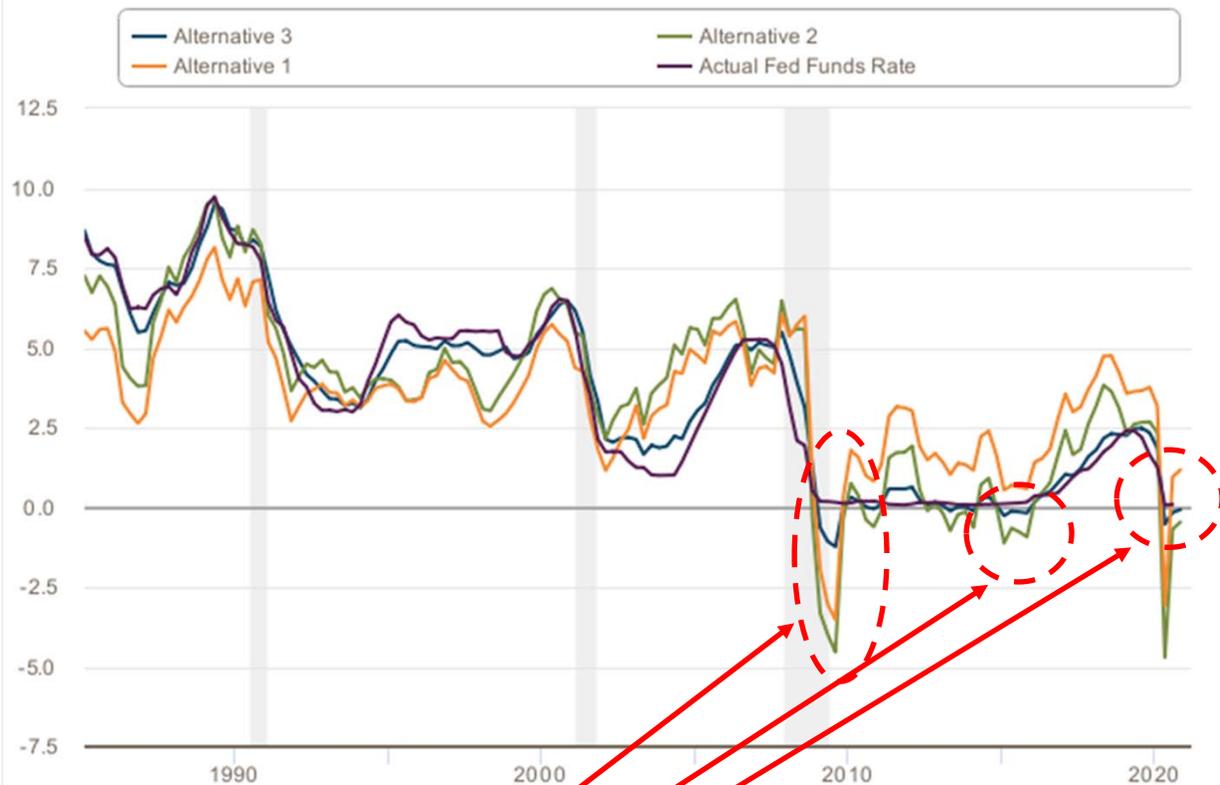


<https://www.frbatlanta.org/cqer/research/taylor-rule.aspx>

- Alt 1: $\beta = 0.5$, except $r^* = 2\%$
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Notice that at certain points, during the Great Recession and 2015, implied rate under Alt 1 and Alt 3 was below 0%, all in 2020

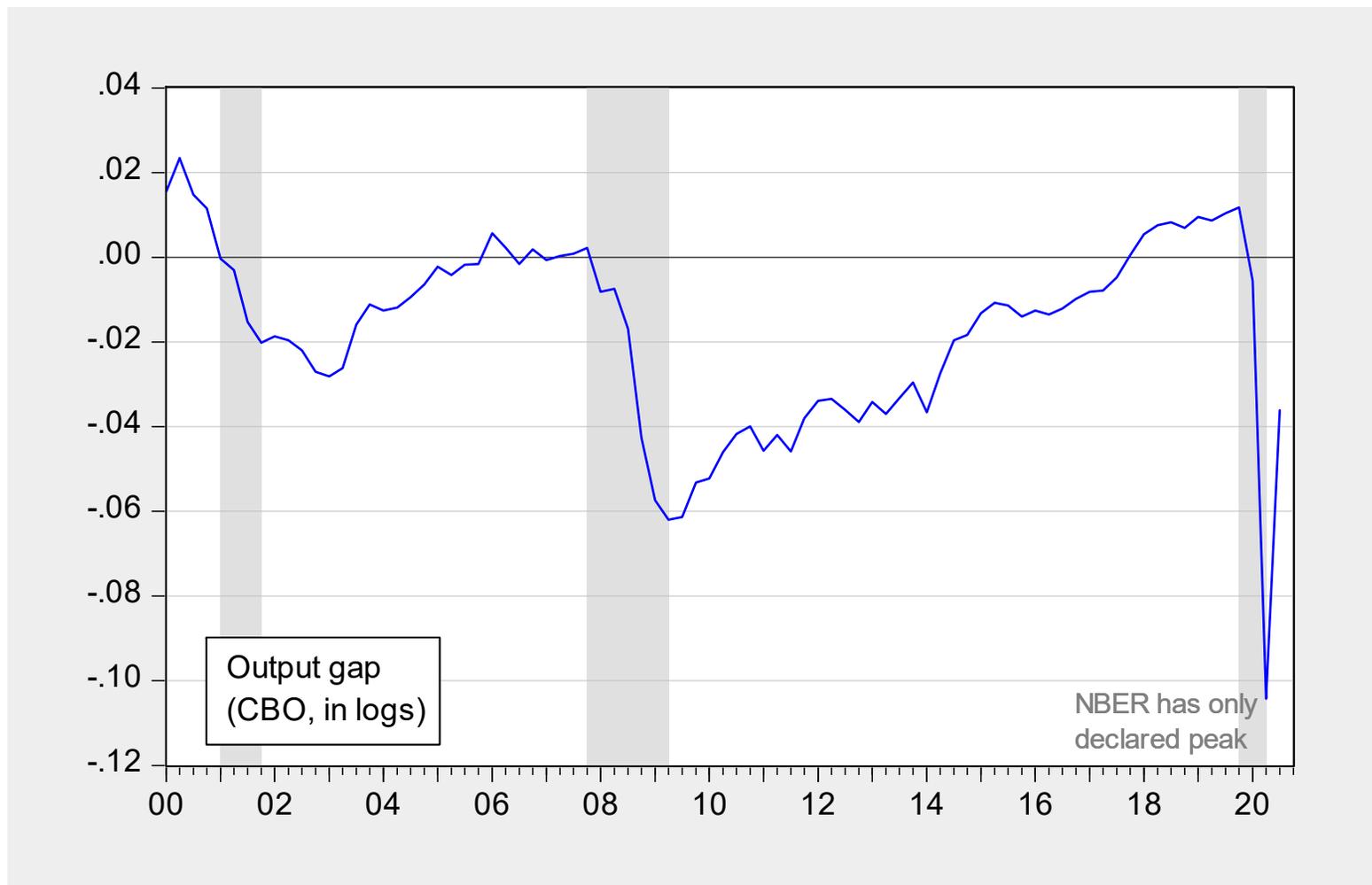
Actual Fed Funds Rate and Taylor Rule Prescriptions



	Alternative 1	Alternative 2	Alternative 3
Inflation Target Measures:	2PercentInflation	2PercentInflation	2PercentInflation
Natural Real Interest Rate Measures:	TwoPercentNatural	LWRstar1side	LWRstar1side
Resource Gap Measures:	CBOGDPgap	CBOGDPgap	CBOGDPgap
Inflation Measures:	PCEInflation	PCEInflation	PCEInflation
Weight on Gap:	0.5	0.5	0.5
Interest Rate Smoothing:	0	0	0.7

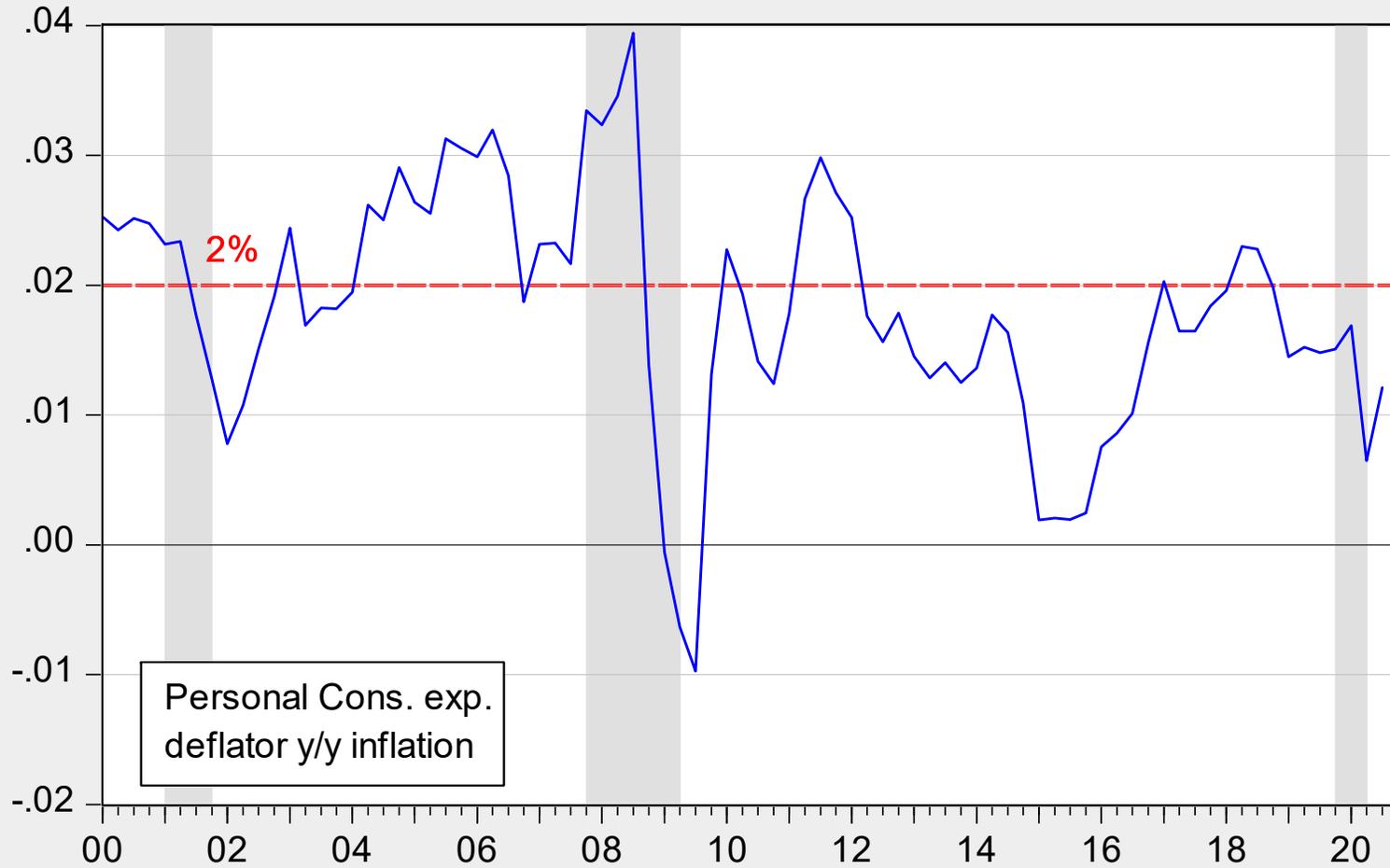
Source: Atlanta Fed

Inputs: Output Gap

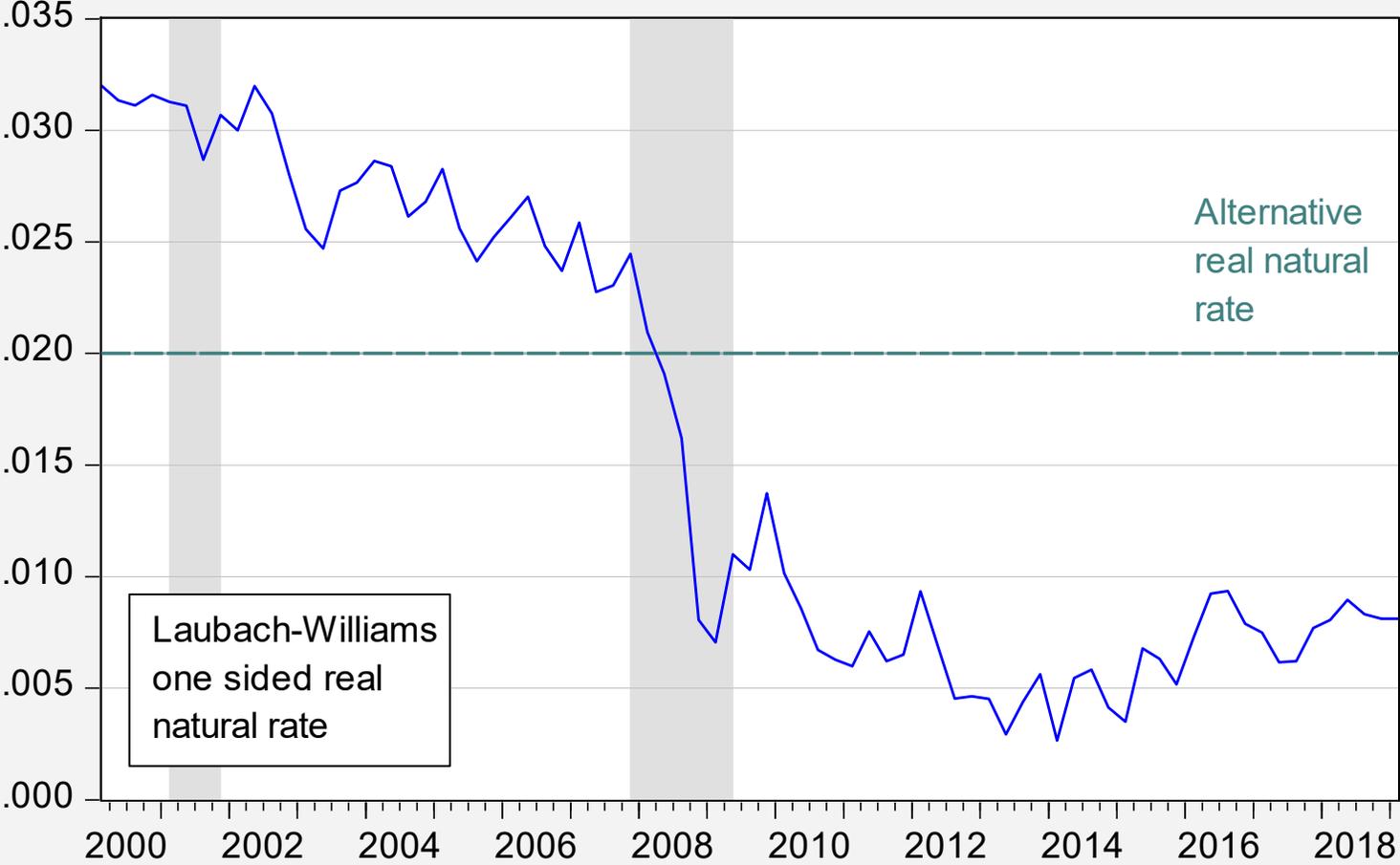


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Inputs: Inflation Gap



Inputs: Natural Rate



Taylor Rule/Taylor Principle

- Positive statement? Is this how central banks behave = Taylor rule
 - Or normative statement? Is this how central banks *should* behave = Taylor principle
- (Set smoothing to zero)

$$\widehat{FFR}_t = [(r_t^* + \pi_t) + 0.5(\pi_t - \pi_t^*) + \beta gap_t]$$

Taylor Rules and Inflation Targeting

$$\widehat{FFR}_t = [(r_t^* + \pi_t) + 0.5(\pi_t - \pi_t^*) + \beta gap_t]$$

- Question of interpretation: Why does the output gap enter? Is it determinant of future inflation (via Phillips Curve)? If so, Taylor rule is inflation targeting.
- More explicit: Set $\beta=0$, $\delta=1$.

Central Banks in the Financial System

Central Banks in the Financial System

TABLE 14.1 FINANCIAL RELATIONSHIPS (BALANCE SHEETS) BETWEEN THE BANKS, THE FED, THE GOVERNMENT, AND THE PRIVATE SECTOR

PRIVATE NONFINANCIAL		BANKS		FED		GOVERNMENT	
ASSETS	LIABILITIES	ASSETS	LIABILITIES	ASSETS	LIABILITIES	ASSETS	LIABILITIES
					Currency (CU)		
			Deposits (D)				
		Bonds (B)		Bonds (B)			Bonds (B)
			Reserves (RE)		Reserves (RE)		
	Loans	Loans					

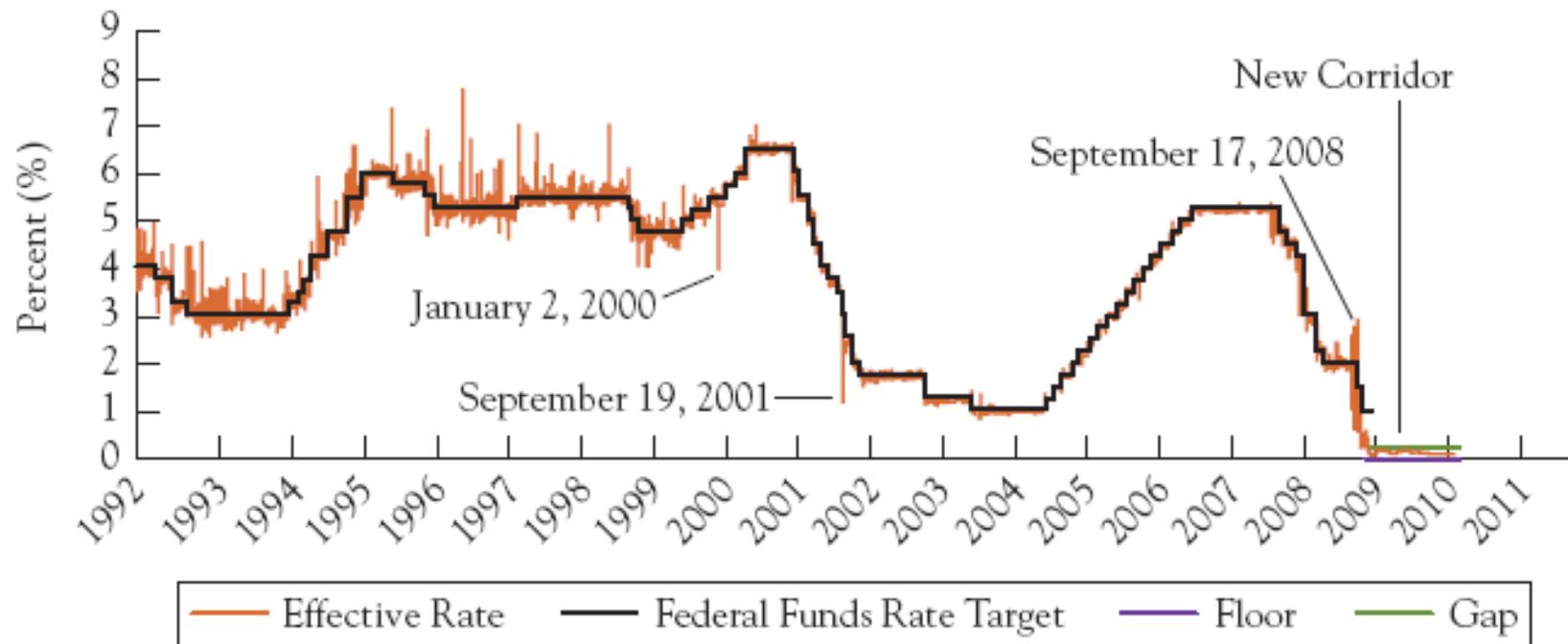
The Fed's Conventional Policy Toolbox

Table 18.1 The Tools of U.S. Monetary Policy

	What Is It?	How Is It Controlled?	What Is Its Impact?
Target Federal Funds Rate	Interest rate charged on overnight loans between banks.	Supply of reserves adjusted through open market operations to meet expected demand at the target rate.	Changes interest rates throughout the economy.
Discount Rate	Interest rate charged by the Federal Reserve on loans to commercial banks.	Set at a premium over the target federal funds rate.	Ceiling on market federal funds rate. Means to provide liquidity to banks in times of crisis.
Deposit Rate	Interest rate paid by the Federal Reserve on excess reserves held by banks.	Set at a spread below the target funds rate.	Sets a floor under the market federal funds rate.
Reserve Requirement	Fraction of deposits that banks must keep either on deposit at the Federal Reserve or as cash in their vaults.	Set by the Federal Reserve Board within a legally imposed range.	Stabilizes the demand for reserves.

The Target Fed Funds Rate

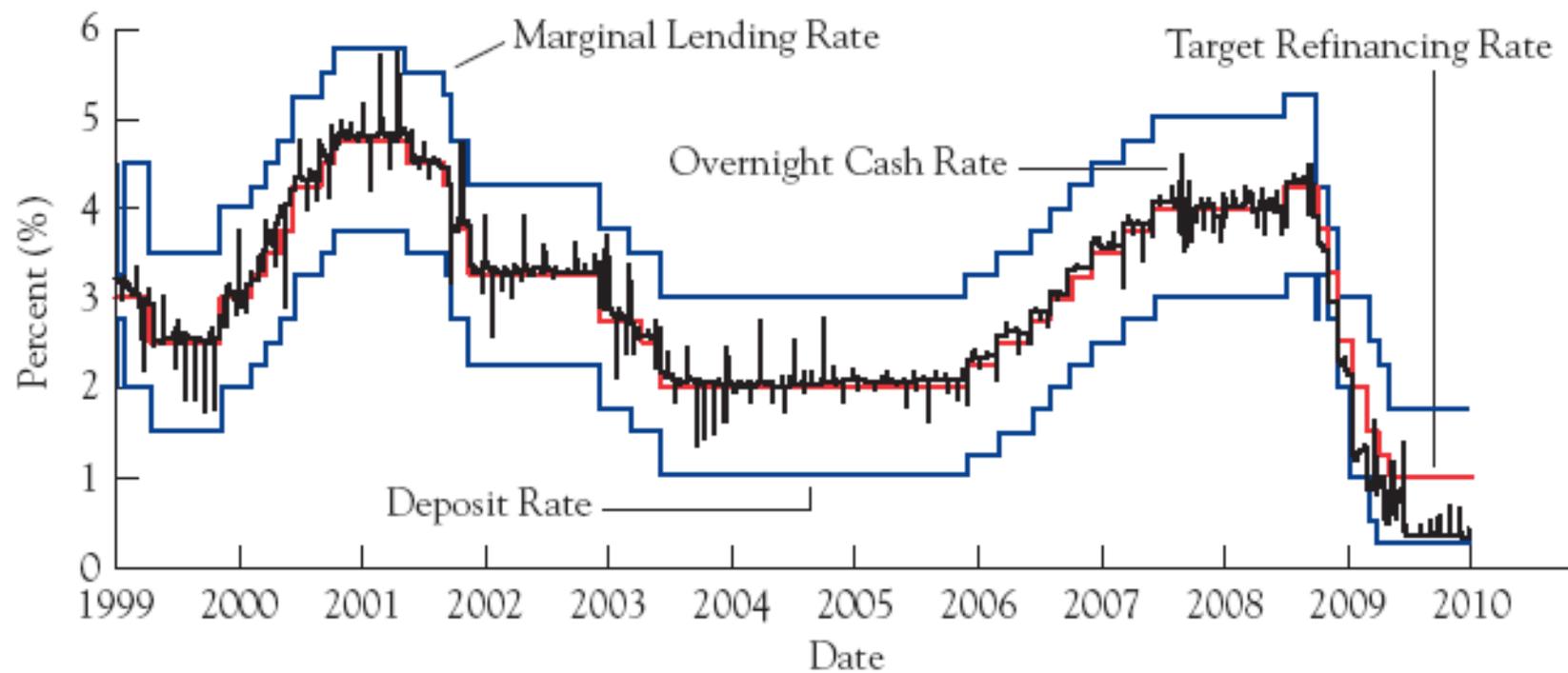
Figure 18.4 Target Federal Funds Rate and Daily Market Rate, 1992-2009



ECB Hitting Target Refi Rate

Figure 18.6

Euro-Area Overnight Cash Rate and ECB Interest Rates, 1999-2009



Unconventional Monetary Policy

Unconventional Monetary Policy

- Most central banks set a target for the overnight interbank lending rate.
- However there are two circumstances when additional policy tools can play a useful stabilization role:
 1. When lowering the target interest-rate to zero is not sufficient to stimulate the economy; and
 2. When an impaired financial system prevents conventional interest-rate policy from supporting the economy.

Unconventional Monetary Policy (UMP)

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 2. When an impaired financial system prevents conventional interest-rate policy from supporting the economy.

Interpreting UMP

$$i_{nt} = \frac{\widetilde{(i_{1t} + i_{1t+1}^e + \dots + i_{1t+n-1}^e)}}{n} + t\rho_{nt}$$

Quantitative
easing

Credit
easing

Duration Commitment,
aka "forward guidance"

Unconventional Policy Tools

1. 1. Quantitative easing (QE).

When the central bank supplies aggregate reserves beyond the quantity needed to lower the policy rate to zero.

2. Credit easing (CE).

When the central bank alters the mix of assets it holds on its balance sheet in order to change their relative prices in a way that stimulates economic activity.

3. A policy duration commitment.

This is when the central bank promises to keep interest rates low in the future, aka “forward guidance”

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Interpreting QE

$$i_{nt} = \frac{\tilde{i}_{1t} + i_{1t+1}^e + \dots + i_{1t+n-1}^e}{n} + t\rho_{nt}$$



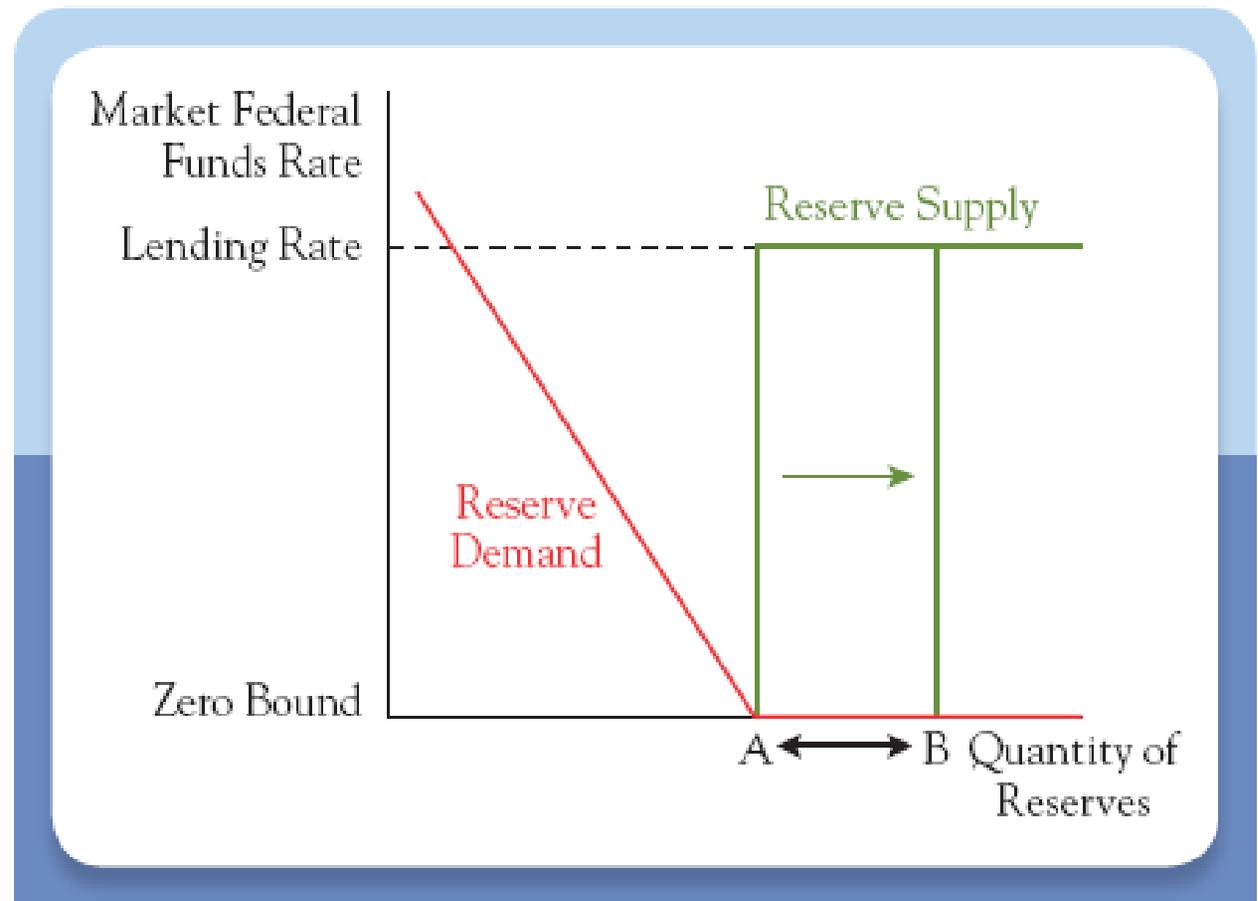
Quantitative
easing

Quantitative Easing

- At a rate of zero, banks hold cash rather than lend.
- The Fed can add limitlessly to reserves without affecting the market federal funds rate.
- QE is the difference between A and B.

Figure 18.10

Quantitative Easing



Quantitative Easing

- It is difficult to predict the effects of QE.
- Our limited experience means that we have little data on which to base such a forecast.
- Moreover, the mechanism by which QE affects economic prospects is not clear.
- An increase in the supply of reserves (QE) may simply lead banks to hold more of them rather than provide additional loans.

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Interpreting Credit Easing

$$i_{nt} = \frac{\widetilde{(i_{1t} + i_{1t+1}^e + \dots + i_{1t+n-1}^e)}}{n} + \underbrace{tp_{nt}}_{\substack{\text{Credit} \\ \text{easing}}}$$


Credit Easing

- *Credit easing* (CE) shifts the *composition* of the balance sheet away from risk-free assets and toward risky assets.
- The central bank's actions can influence both the cost and availability of credit, changing spreads
- In the absence of private demand for the risky asset, the central bank's purchase makes credit available where none existed.
- Impact:
 - To be greater in thin, illiquid markets.
 - To be larger the bigger the difference between the yield on the asset that the central bank buys and the yield on the asset that the central bank sells.

Quantitative Easing and the Money Supply, 2007-2018

- When the global financial crisis began in the fall of 2007, the Fed initiated lending programs and large-scale asset-purchase (“LSAPs”) programs in an attempt to bolster the economy.
- By June 2014, these purchases of securities had led to a quintupling of the Fed’s balance sheet and a 377% increase in the monetary base.

Credit Easing

Table 1

Characteristics of the Four Asset Purchase Programs

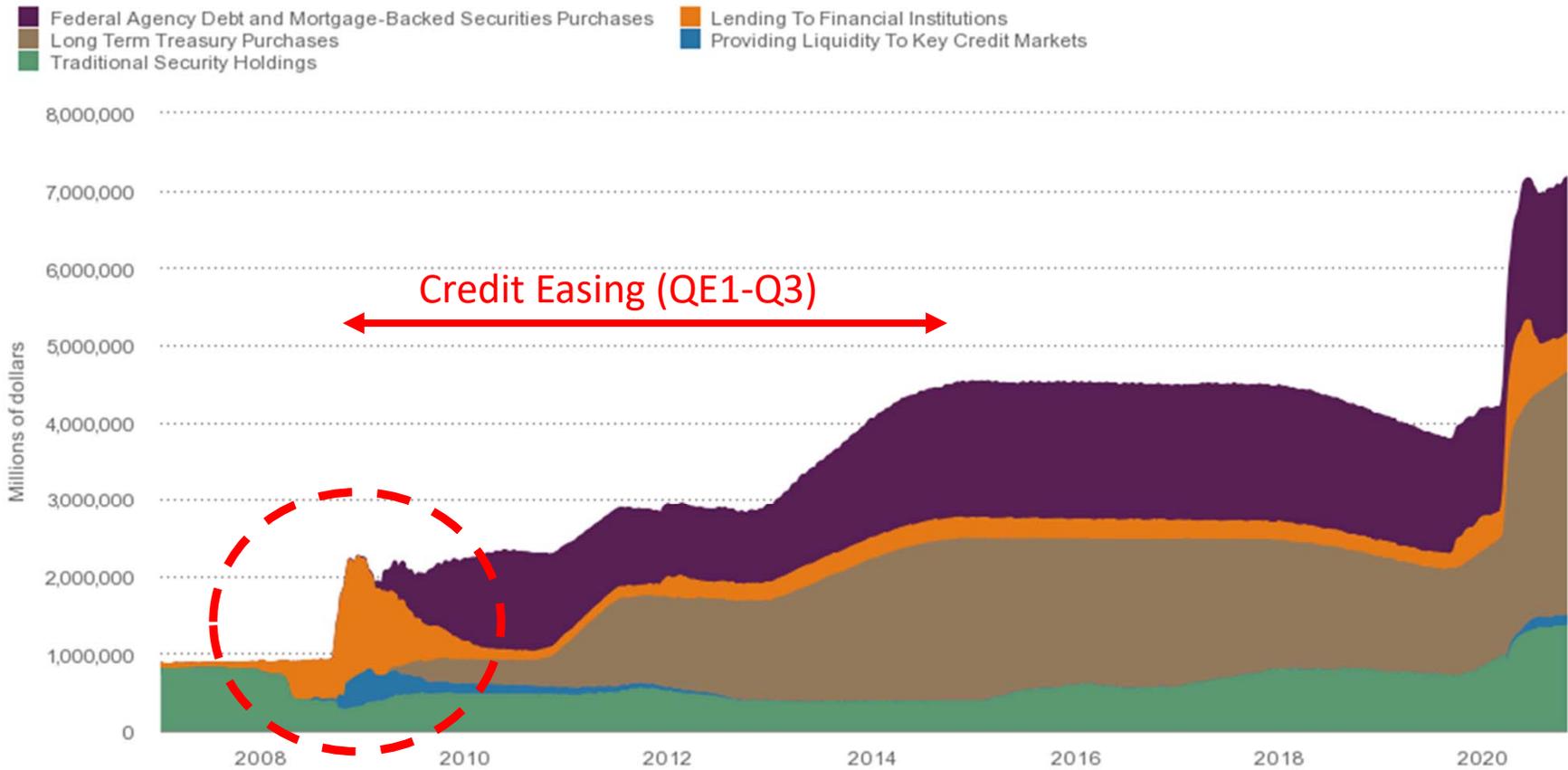
<i>Program</i>	<i>Dates</i>	<i>Assets purchased</i>	<i>Size (billions)</i>	<i>Sterilized?</i>
First LSAP (QE1)	11/2008 to 3/2009	Agency debt	\$200	No
		Agency MBSs	\$1,250	
		Treasuries	\$300	
Second LSAP (QE2)	11/2010 to 6/2011	Longer-dated Treasuries	\$600	No
MEP (“Twist”)	9/2011 to 12/2012	6- to 30-year Treasuries	\$667	Yes
Third LSAP (QE3)	9/2012 to 10/2014	MBSs	\$40/month	No
	12/2012 to 10/2014	Longer-dated Treasuries	\$45/month	

Note: Quantitative easing refers to a set of four asset purchase programs: the three Large-Scale Asset Purchases (LSAPs), commonly known as QE1, QE2, and QE3; and the Maturity Extension Program (MEP), also known as the second “Operation Twist.” The table summarizes the key features of these programs. MBSs are mortgage-backed securities.

Kuttner (2018).

Summary View

Click/drag to zoom



Source: Federal Reserve Bank of Cleveland calculations based on data from Federal Reserve Board and Haver Analytics.

Source: Cleveland Fed <https://www.clevelandfed.org/our-research/indicators-and-data/credit-easing.aspx>

Credit Easing

- CE purposely deviates from such *asset neutrality* in order to influence relative prices.
- Exiting from CE probably is also more difficult than unwinding QE.
- Risky assets are generally harder to sell than Treasuries.
 - The central bank may not be able to get rid of them exactly when it wants.
 - Political influences can become important if the Fed is hindered from selling specific assets for fear of raising the costs of a particular class of borrowers.

Estimated Impact (I)

Table 2
Estimated Event-Study Interest Rate Effects

<i>Study</i>	<i>Window (days)</i>	<i>Yield on:</i>	<i>QE1 (basis points)</i>	<i>QE2 (basis points)</i>	<i>MEP (basis points)</i>	<i>QE3 (basis points)</i>
Gagnon, Raskin, Remache, and Sack (2011)	1	T10	-91***			
		Agency	-156***			
		MBS	-113***			
Krishnamurthy and Vissing-Jorgenson (2011)	2	T10	-107*	-30***		
		Agency	-200***	-29***		
		MBS	-88	-13**		
Ehlers (2012)	1	T10		-14	-27***	
	2	T10		-40***	-46***	
Bauer and Neely (2014)	1	T10	-123**	-23		-14

Notes: “T10” refers to the 10-year Treasury, MBS to the 15-year Agency mortgage-backed securities, and “Agency” to the debt issued by Ginnie Mae, Fannie Mae, and/or Freddie Mac. QE1, QE2, and QE3 are three quantitative easing programs. MEP is the Maturity Extension Program. Asterisks indicate the magnitude of the ratio of the observed event-day relative to the standard deviation of the yield changes at the indicated horizon, as reported by the authors:

***denotes ratios greater than 2.58 in absolute value (1 percent tail),

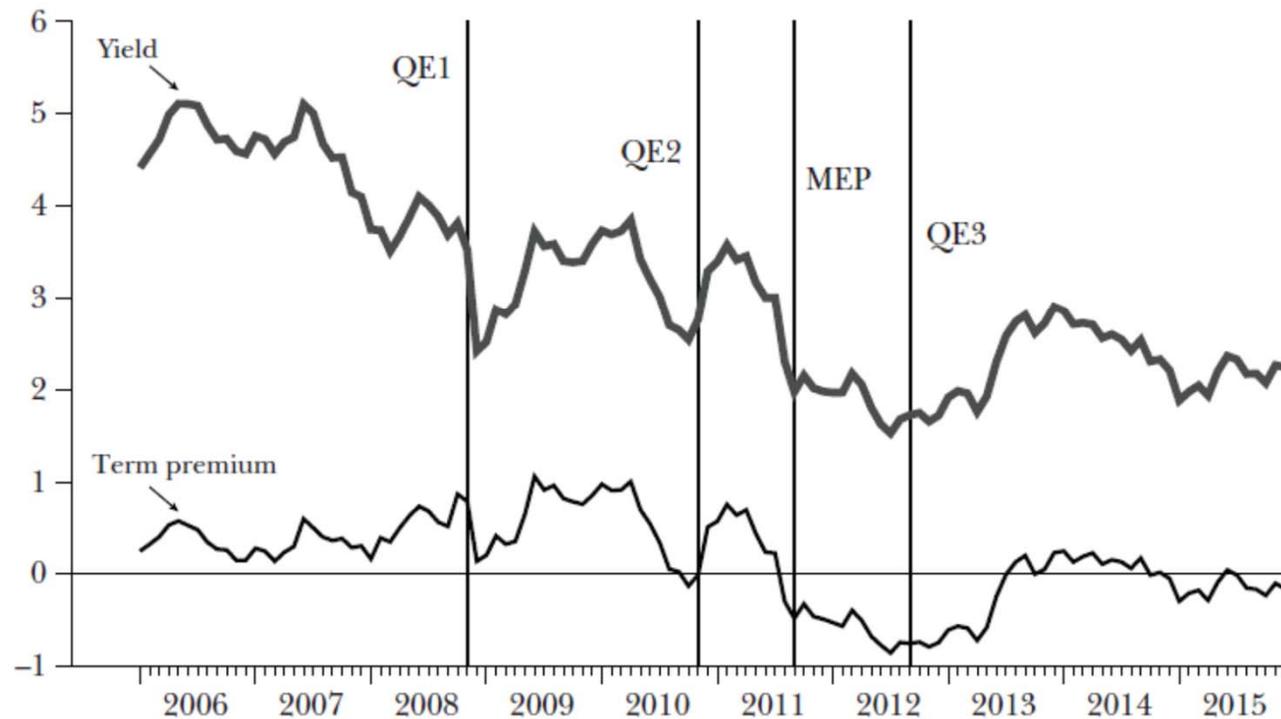
**ratios greater than 1.96 (5 percent tail), and

*greater than 1.69 (10 percent tail).

Estimated Impact (II)

Figure 2

Kim-Wright Estimated 10-year Term Premium and 10-year Treasury Yield
(percent)



Note: QE1, QE2, and QE3 are three quantitative easing programs. MEP is the Maturity Extension Program.

Estimated Impact (II)

Table 3

Estimated Effects of Quantitative Easing on 10-year Term Premiums (basis points)

<i>Study</i>	<i>QE1</i>	<i>QE2</i>	<i>MEP</i>	<i>QE3</i>
Gagnon, Raskin, Remache & Sack (2011)	-38 ^a			
D'Amico, English, López-Salido & Nelson (2012)	-35	-45		
Ihrig, Klee, Li, Schulte & Wei (2012)	-40	-40	-17	-50 ^b
Hamilton & Wu (2012)			-27 ^c	

Notes: QE1, QE2, and QE3 are three quantitative easing programs. MEP is the Maturity Extension Program.

^a The smallest of the range of estimates reported.

^b Estimated by Engen, Laubach, and Reifschneider (2015) using the Ihrig, Klee, Li, Schulte, and Wei (2012) model.

^c The reported impact of a \$400 billion maturity swap, scaled up to the \$667 billion size of the Maturity Extension Program.

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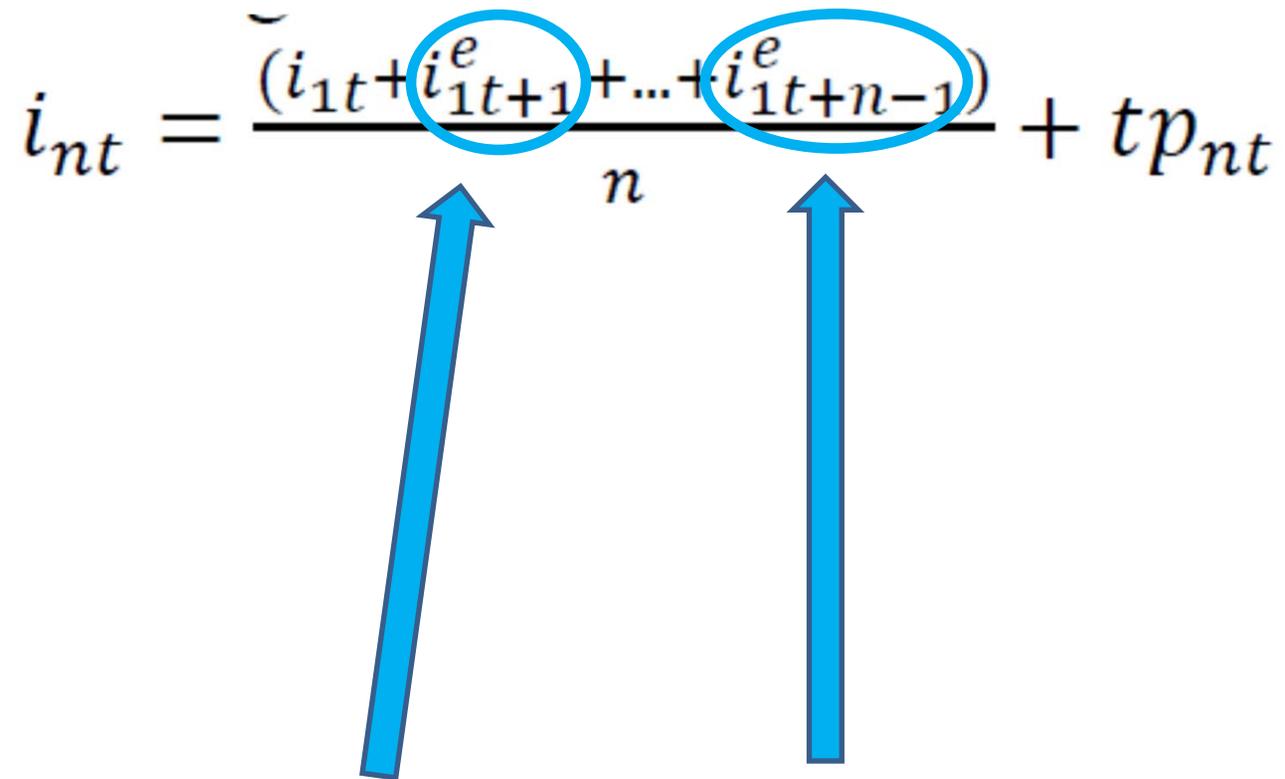
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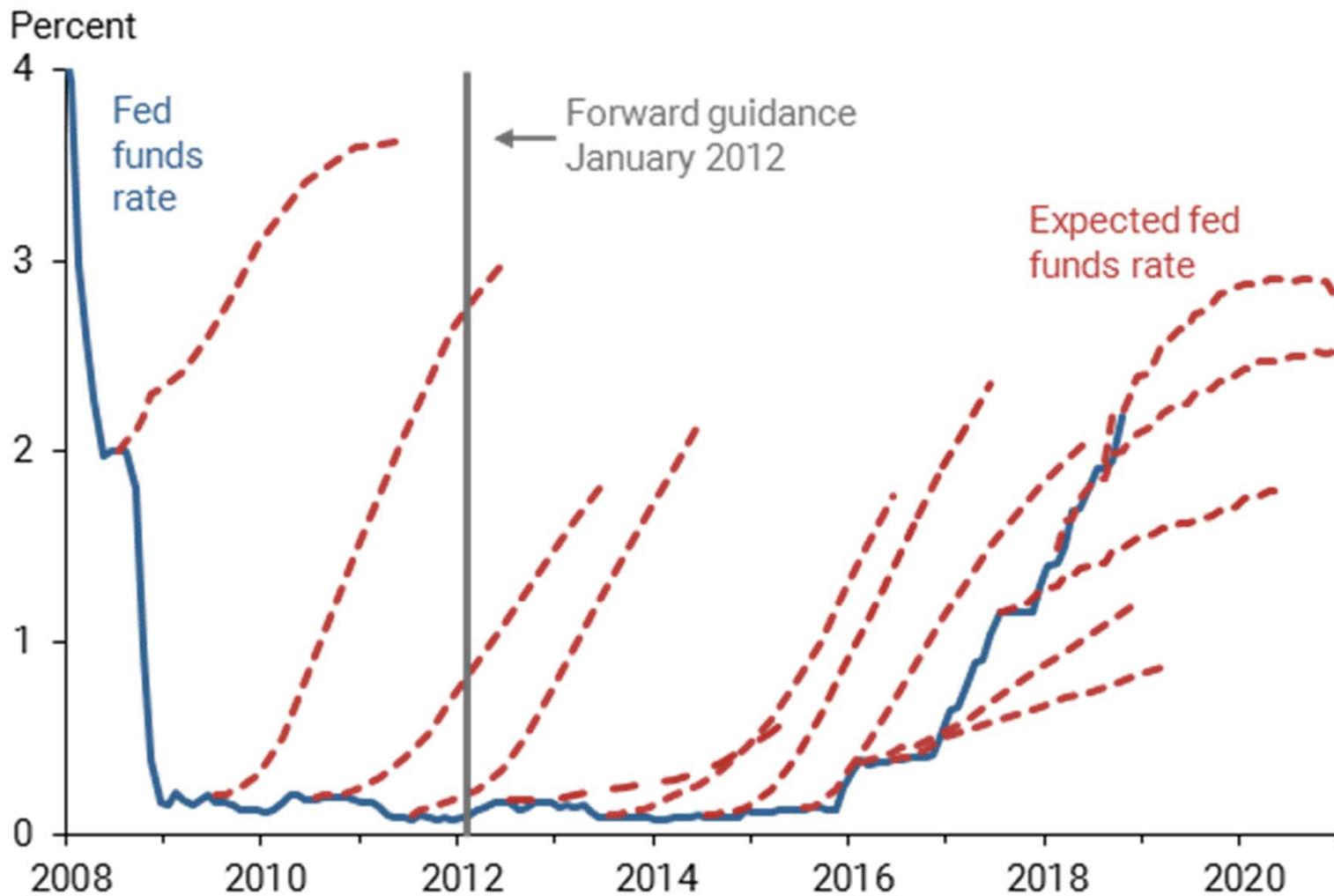
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Interpreting Policy Duration Commitment

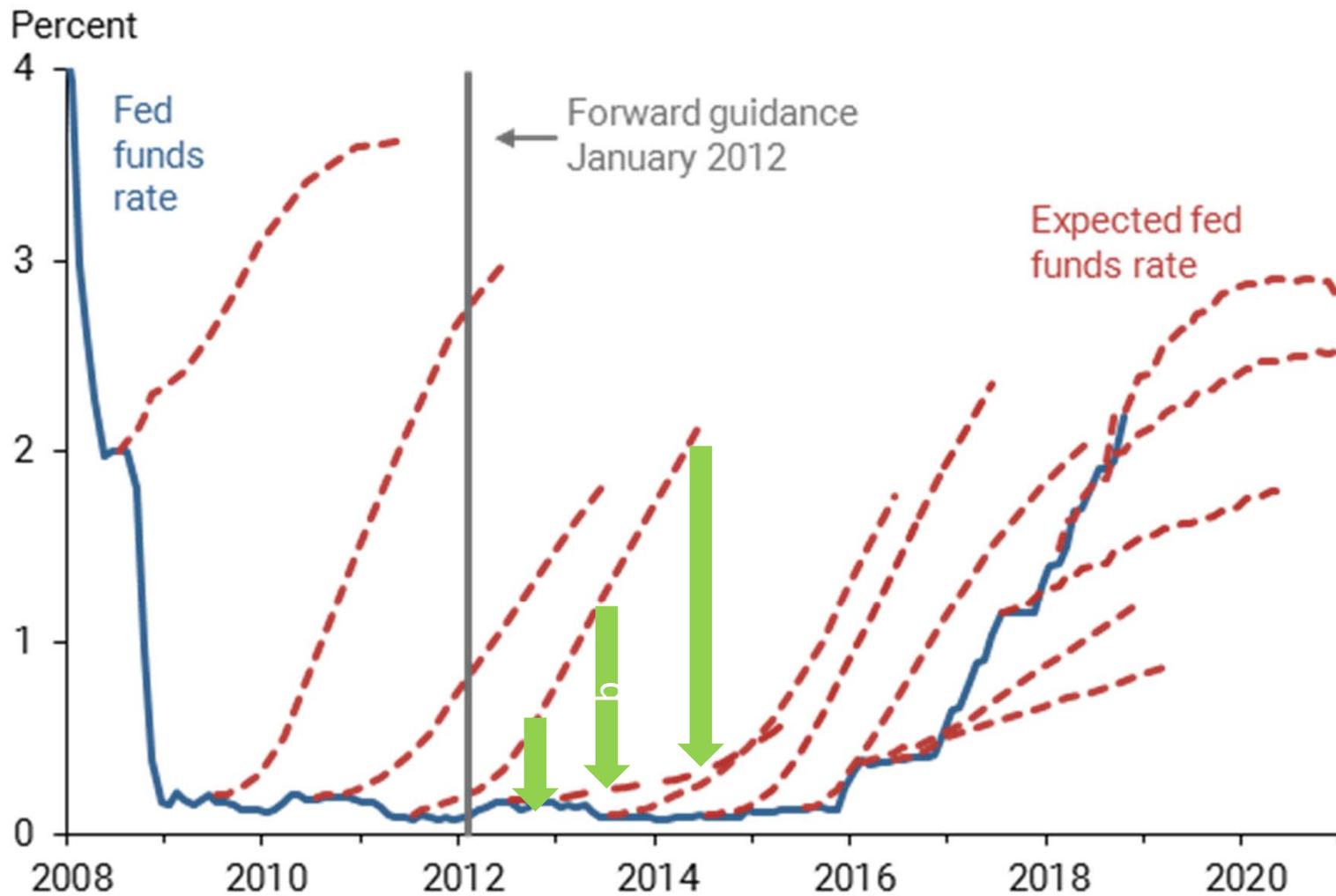
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Policy Duration Commitment
Aka “Forward guidance”

Policy Duration Commitment



Policy Duration Commitment



Why Didn't Credit Easing Lead to
Inflation?

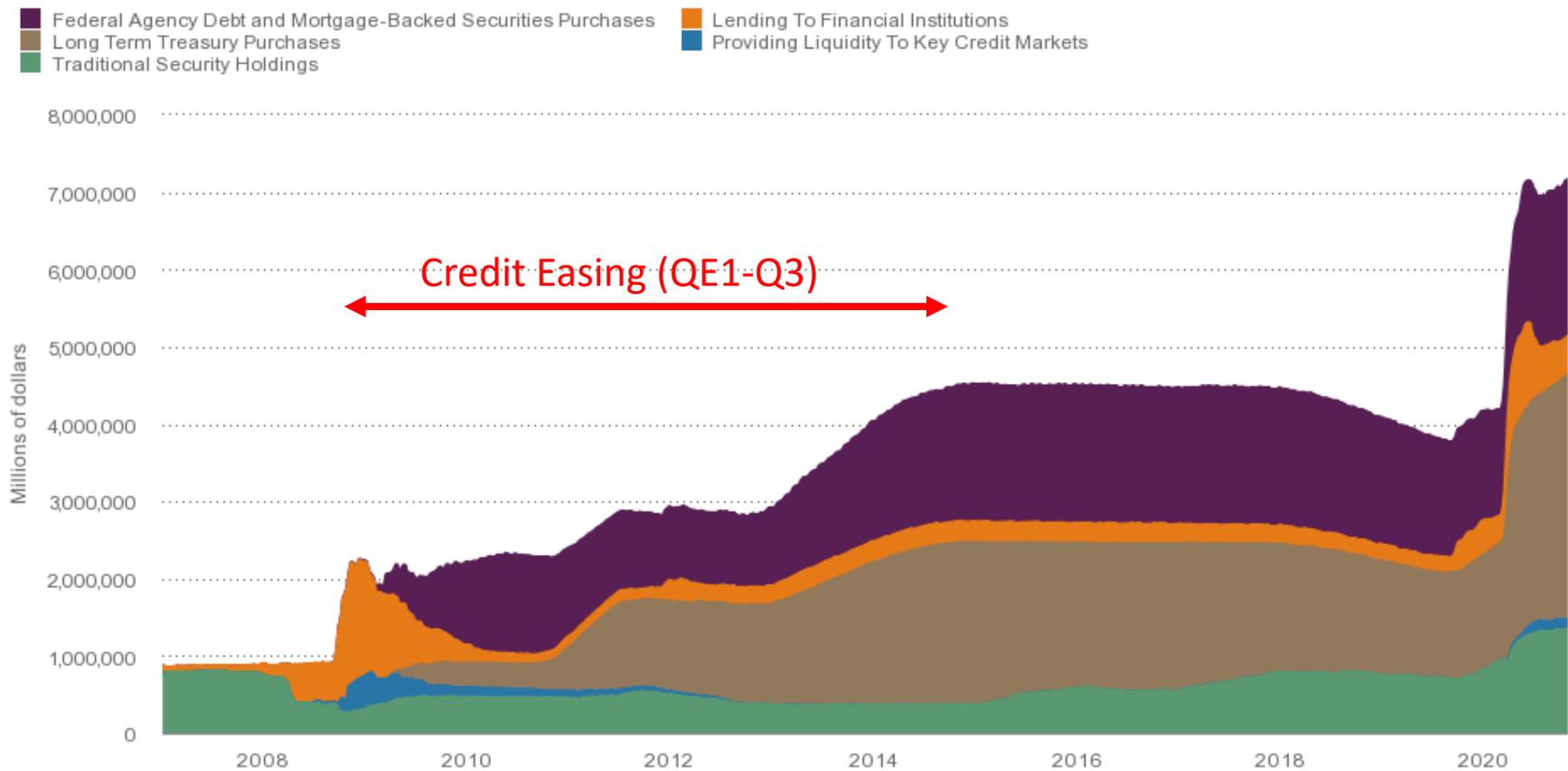
LSAP's and the Money Supply, 2007-2018

- These lending and asset-purchase programs resulted in a huge expansion of the monetary base and have been given the name “quantitative easing.”
- This increase in the monetary base did not lead to an equivalent change in the money supply because excess reserves rose dramatically.

Asset Side: Credit Easing

Summary View

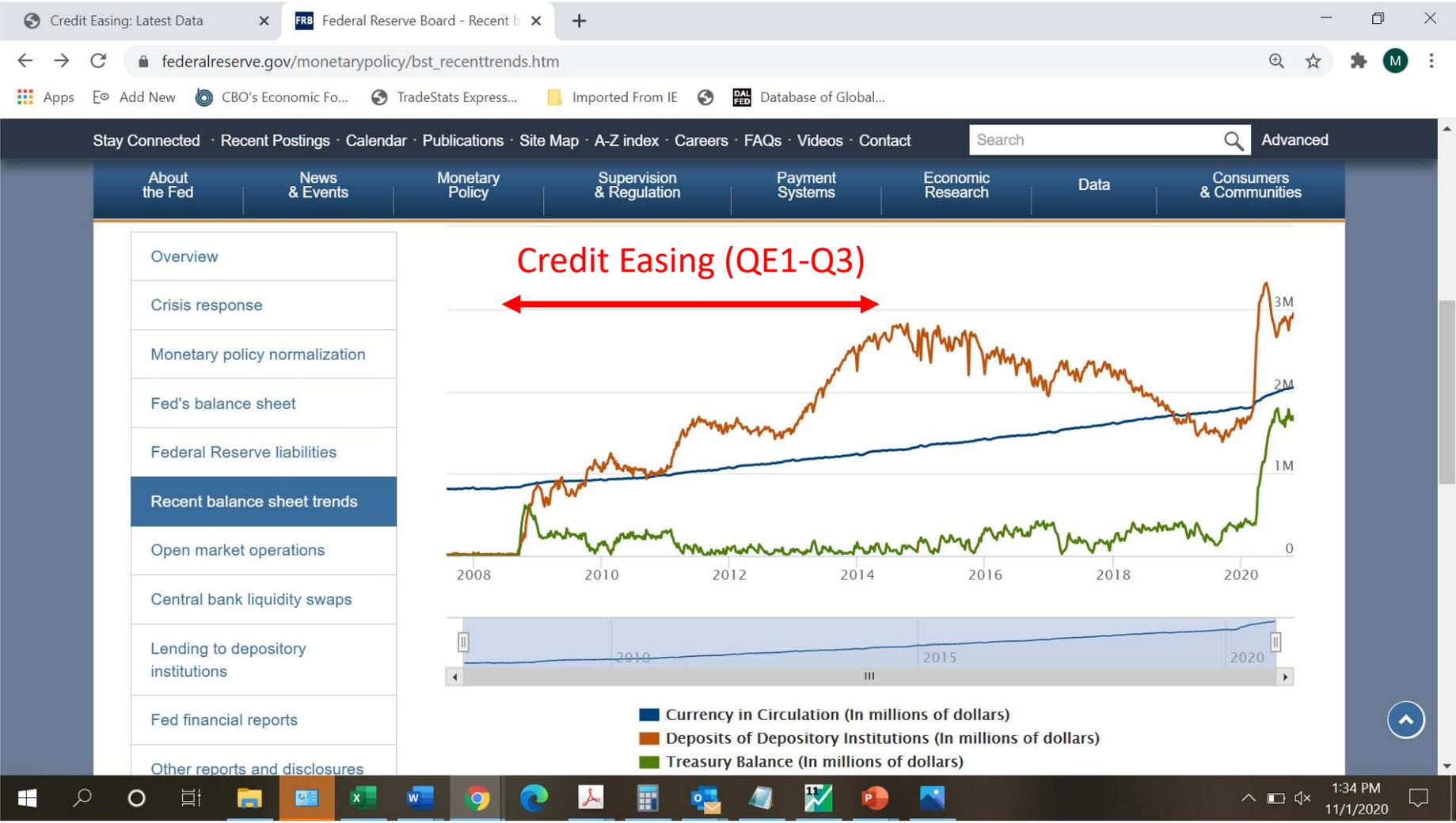
Click/drag to zoom



Source: Federal Reserve Bank of Cleveland calculations based on data from Federal Reserve Board and Haver Analytics.

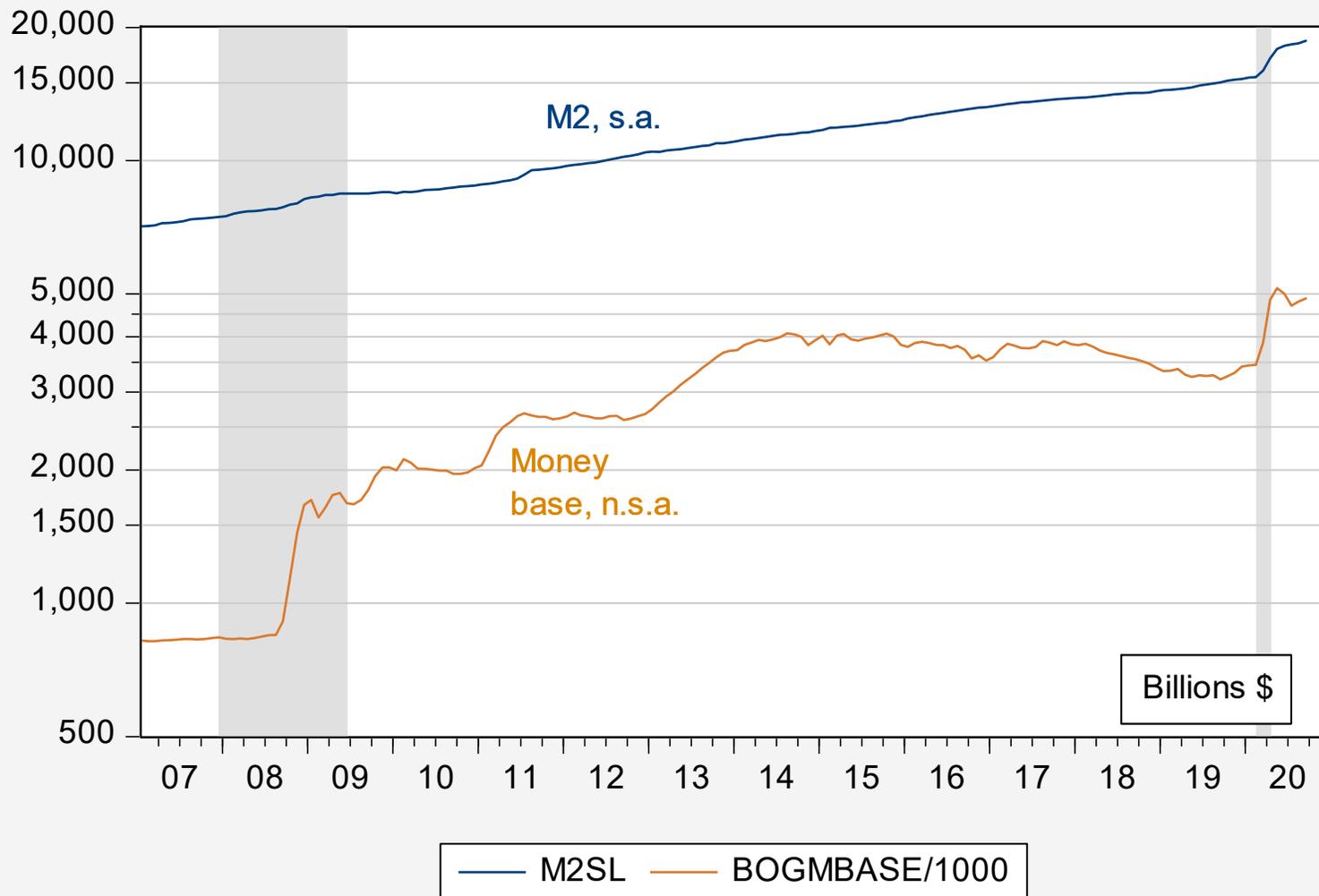
<https://www.clevelandfed.org/our-research/indicators-and-data/credit-easing.aspx>

Liability Side: Quantitative Easing



Source: https://www.federalreserve.gov/monetarypolicy/bst_recenttrends.htm

Money Base & Money Supply (M2)



Exit from Credit Easing

Exiting from Credit Easing

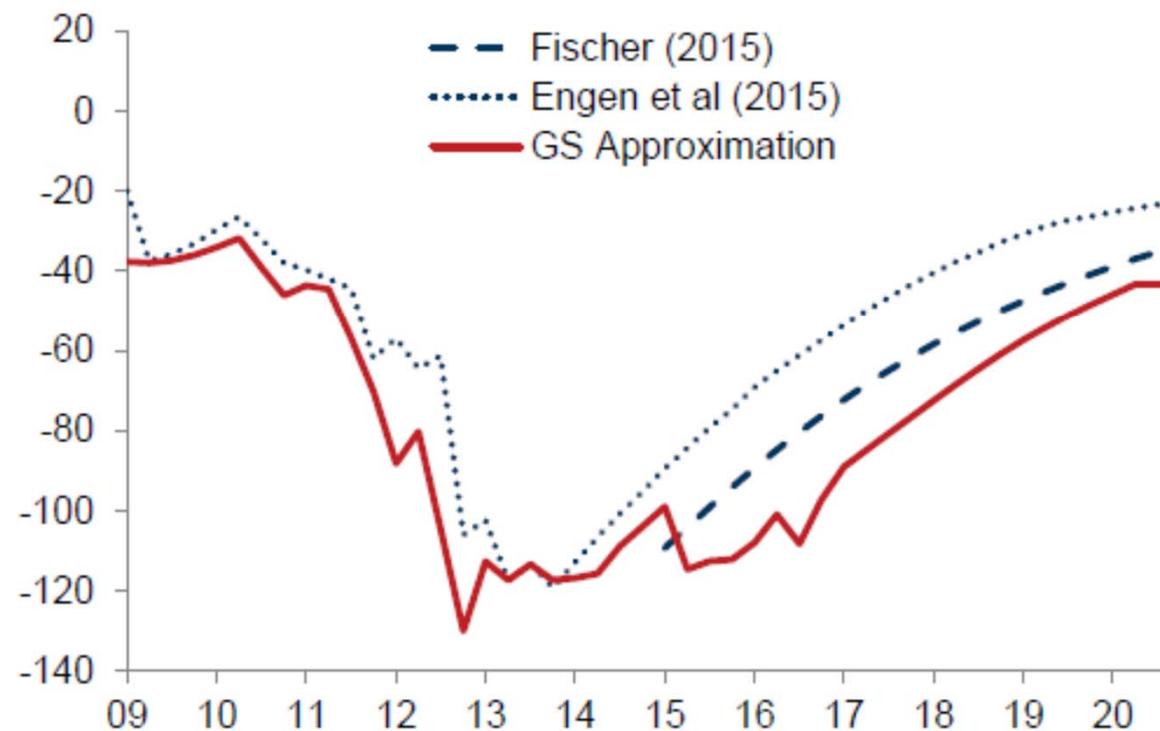
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 - Political influences can become important if the Fed is hindered from selling specific assets for fear of raising the costs of a particular class of borrowers.

Impact on Rates

$$i_{nt} = \frac{(i_{1t} + i_{1t=1}^e + \dots + i_{1t+n-1}^e)}{n} + rp_{nt}$$

Portfolio rebalancing in reverse

Model-implied portfolio balance effects of QE on 10y UST yield, bp



Source: Goldman Sachs Global Investment Research.

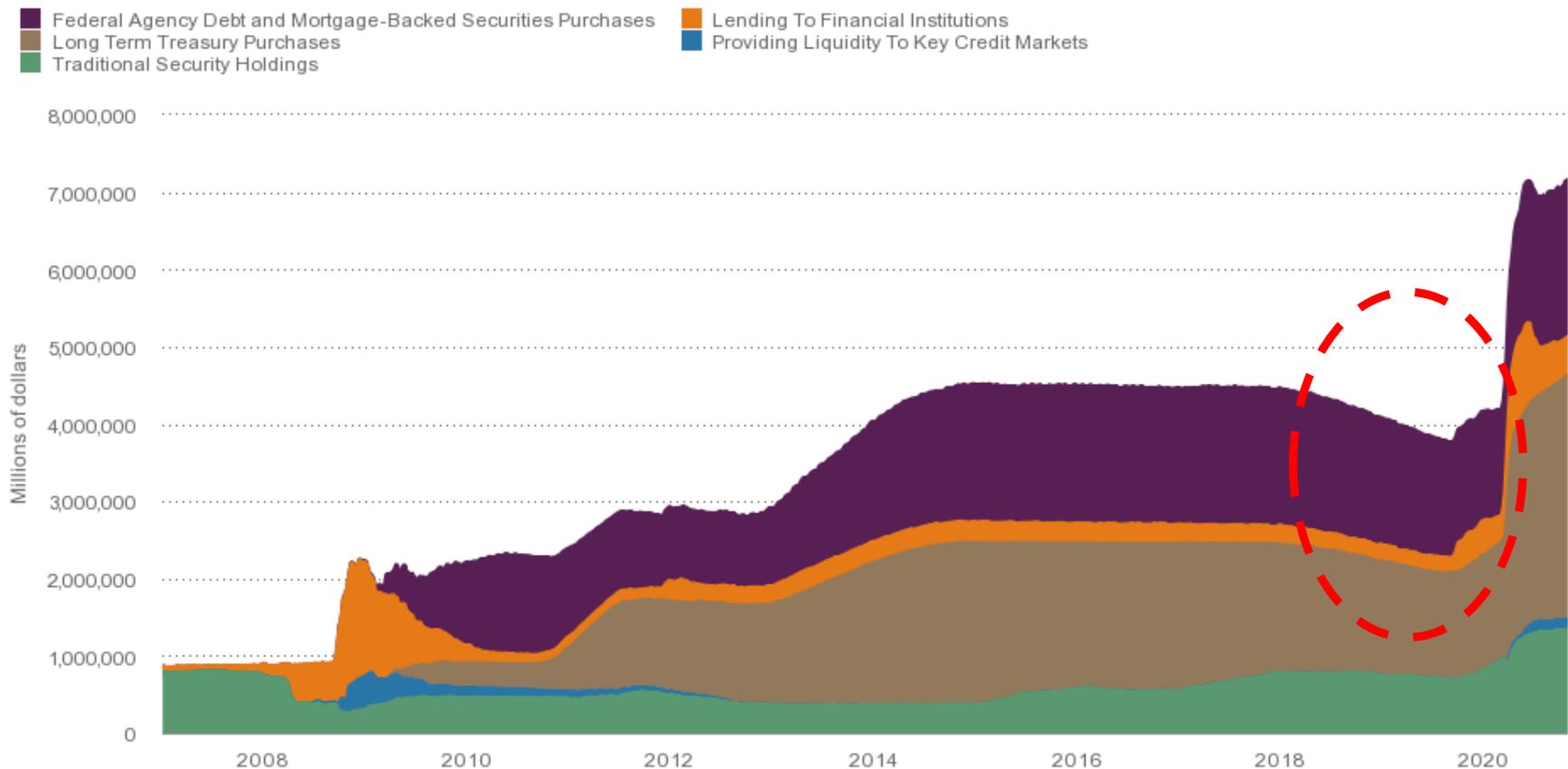
Making an Effective Exit

- Paying interest on reserves allows a central bank to use two powerful policy tools independently of one another:
 1. It can adjust the target rate for interbank loans without changing the size or composition of its balance sheet, and
 2. It can adjust the size and composition of its balance sheet without changing the target interest rate for interbank loans.
- This means the central bank can change its balance sheet in a fashion consistent with financial stability and keep inflation under control.
- It can avoid a fire sale by simply raising the deposit rate that they pay on reserves.

Asset Side: Exit Strategy

Summary View

Click/drag to zoom



Source: Federal Reserve Bank of Cleveland calculations based on data from Federal Reserve Board and Haver Analytics.

<https://www.clevelandfed.org/our-research/indicators-and-data/credit-easing.aspx>