

**Economics 442**  
**Macroeconomic Policy**  
**(3/25/2019)**

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UW Madison  
Spring 2019

# Outline

- Taylor Rules
- Monetary policy
- Quantitative/Credit Easing
- Exit Strategy

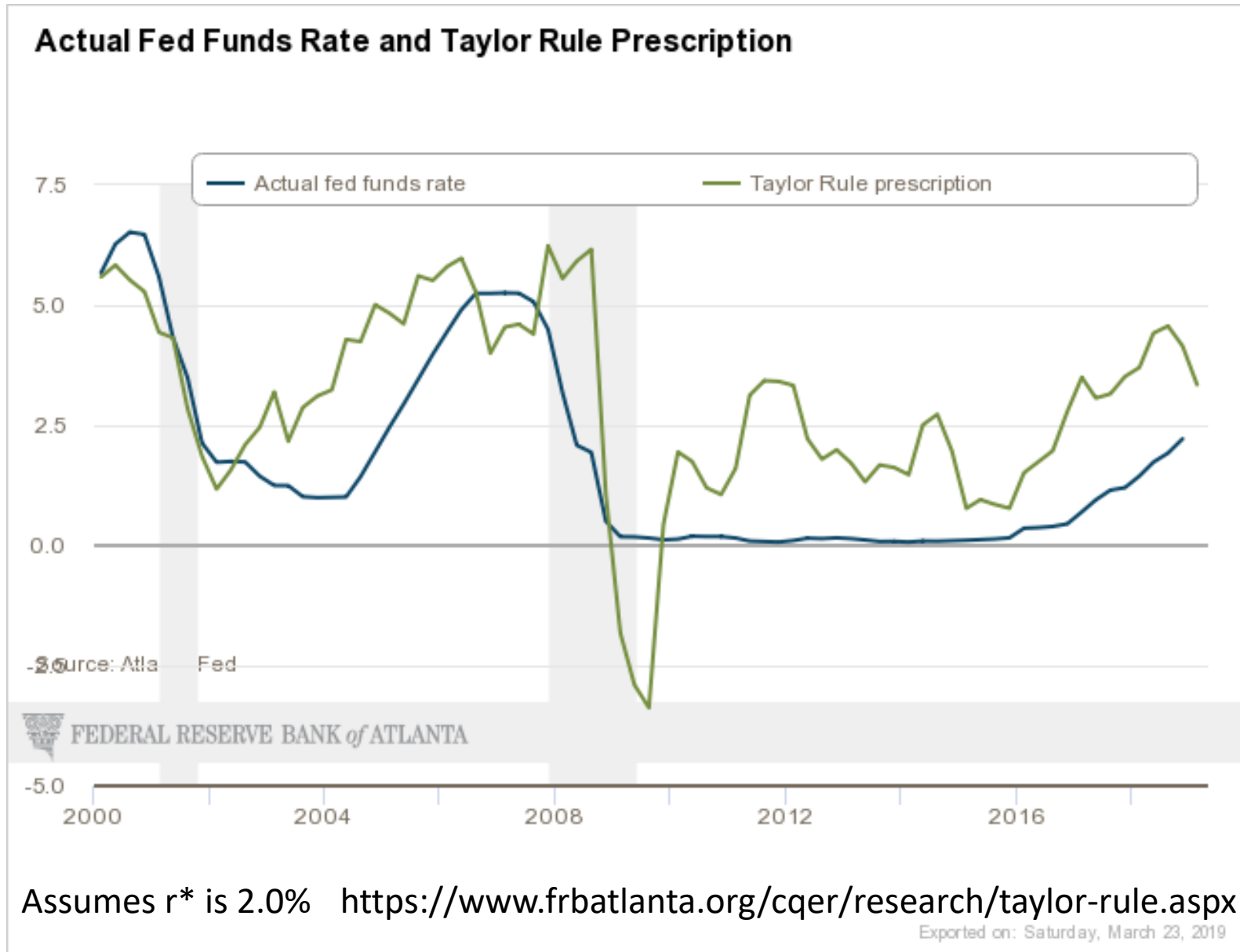
# Taylor Rules

$$i_t^{FedFunds} = \pi_t + \beta(y_t - y_t^*) + \delta(\pi_t - \pi_t^*) + r_t^*$$

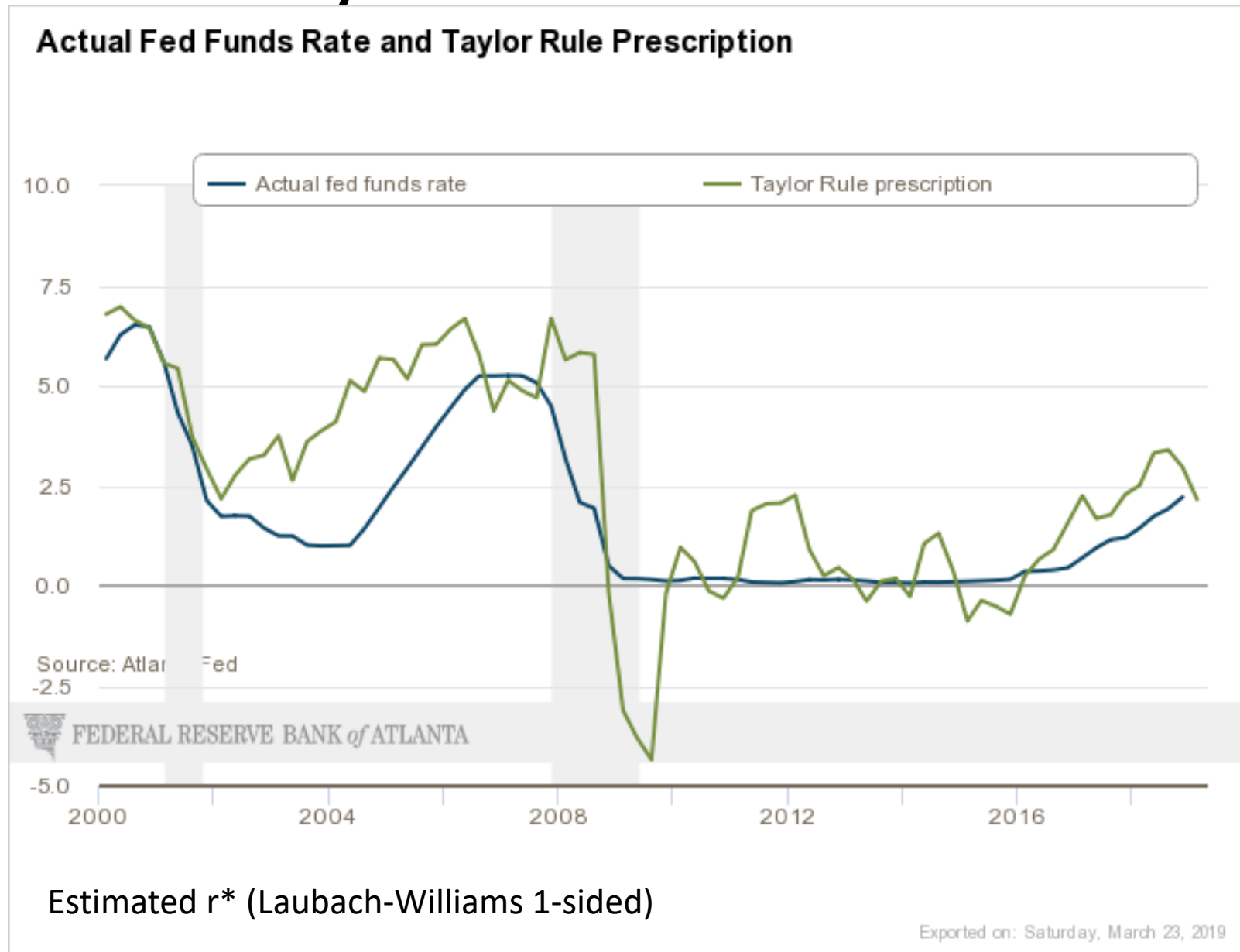
$$i_t^{FedFunds} = (1 + \delta)\pi_t + \beta(y_t - y_t^*) + r_t^* - \delta\pi_t^*$$

- Positive statement? Is this how central banks behave?
- Or normative statement? Is this how central banks *should* behave?

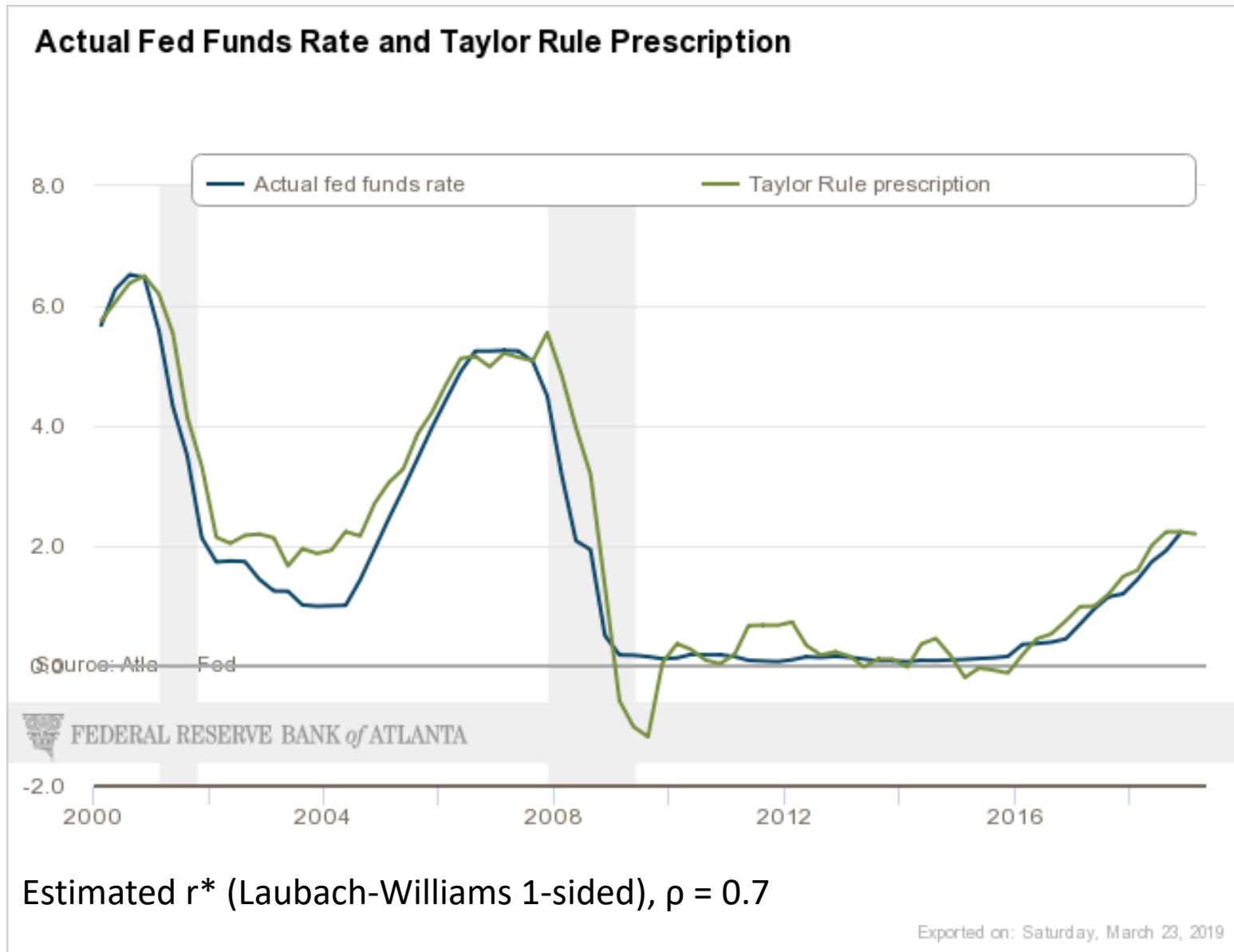
# The Taylor Rule: Baseline



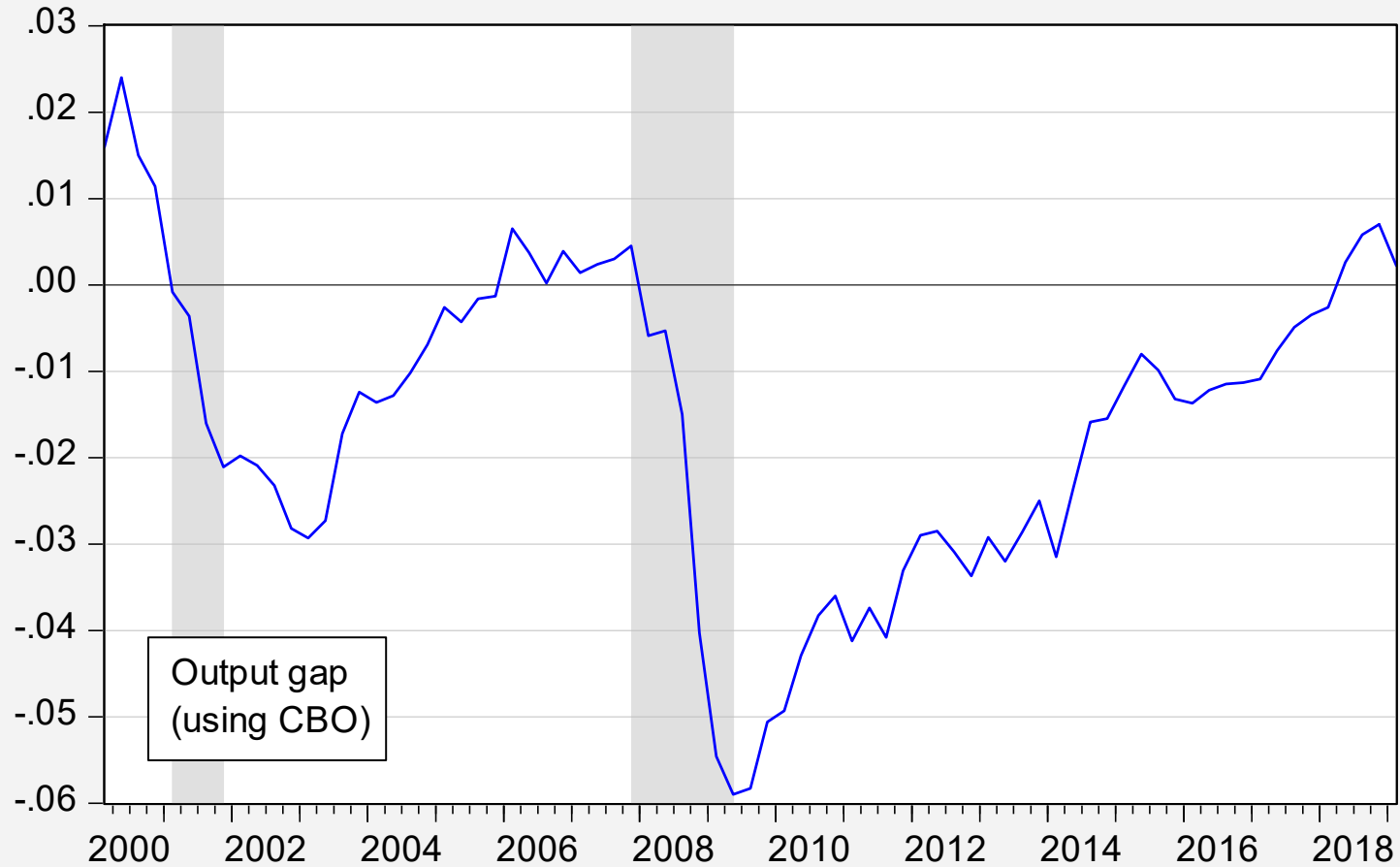
# The Taylor Rule: Estimated $r^*$



# The Taylor Rule: Estimated $r^*$ , $\rho=0.7$

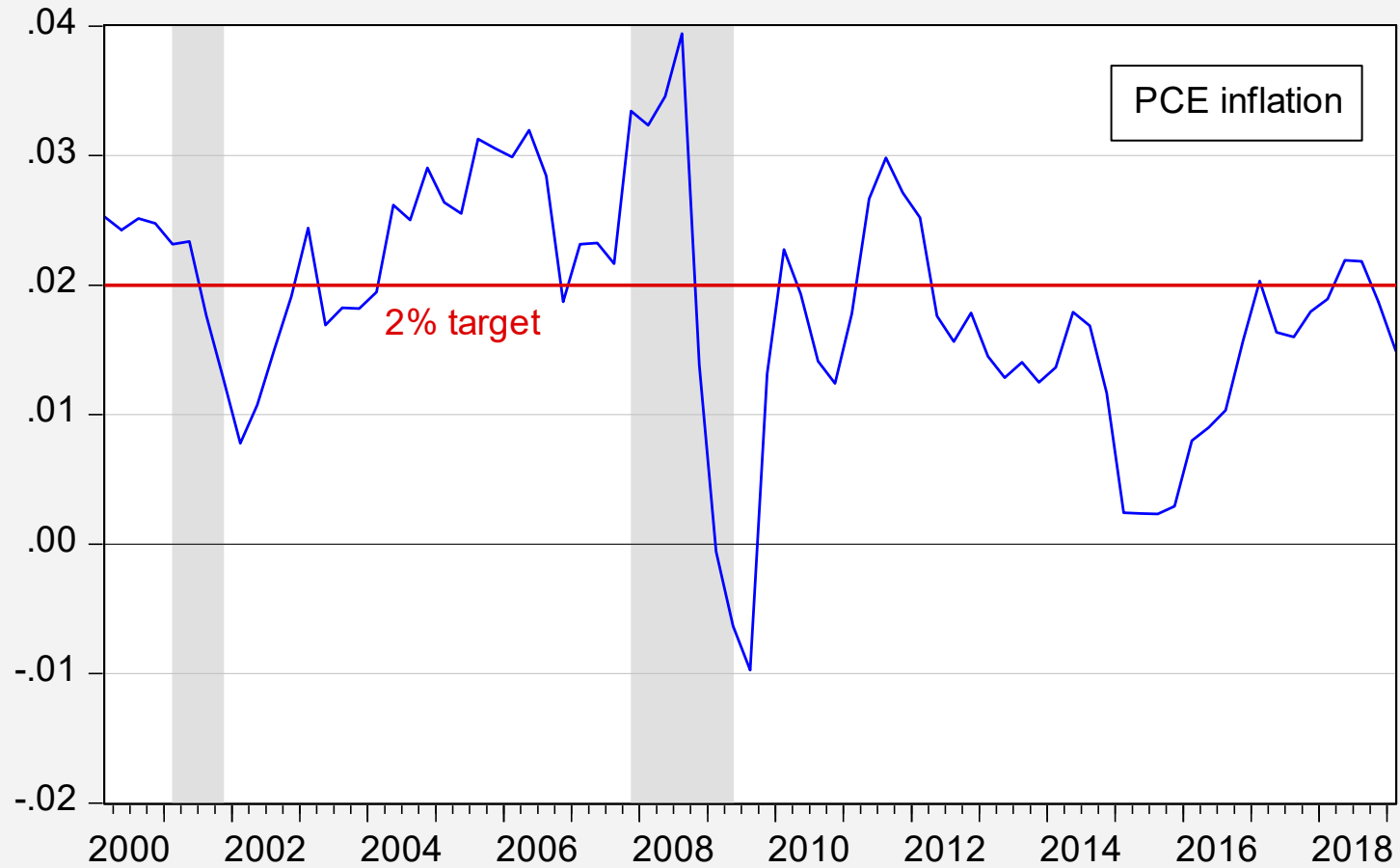


# Inputs: Output Gap



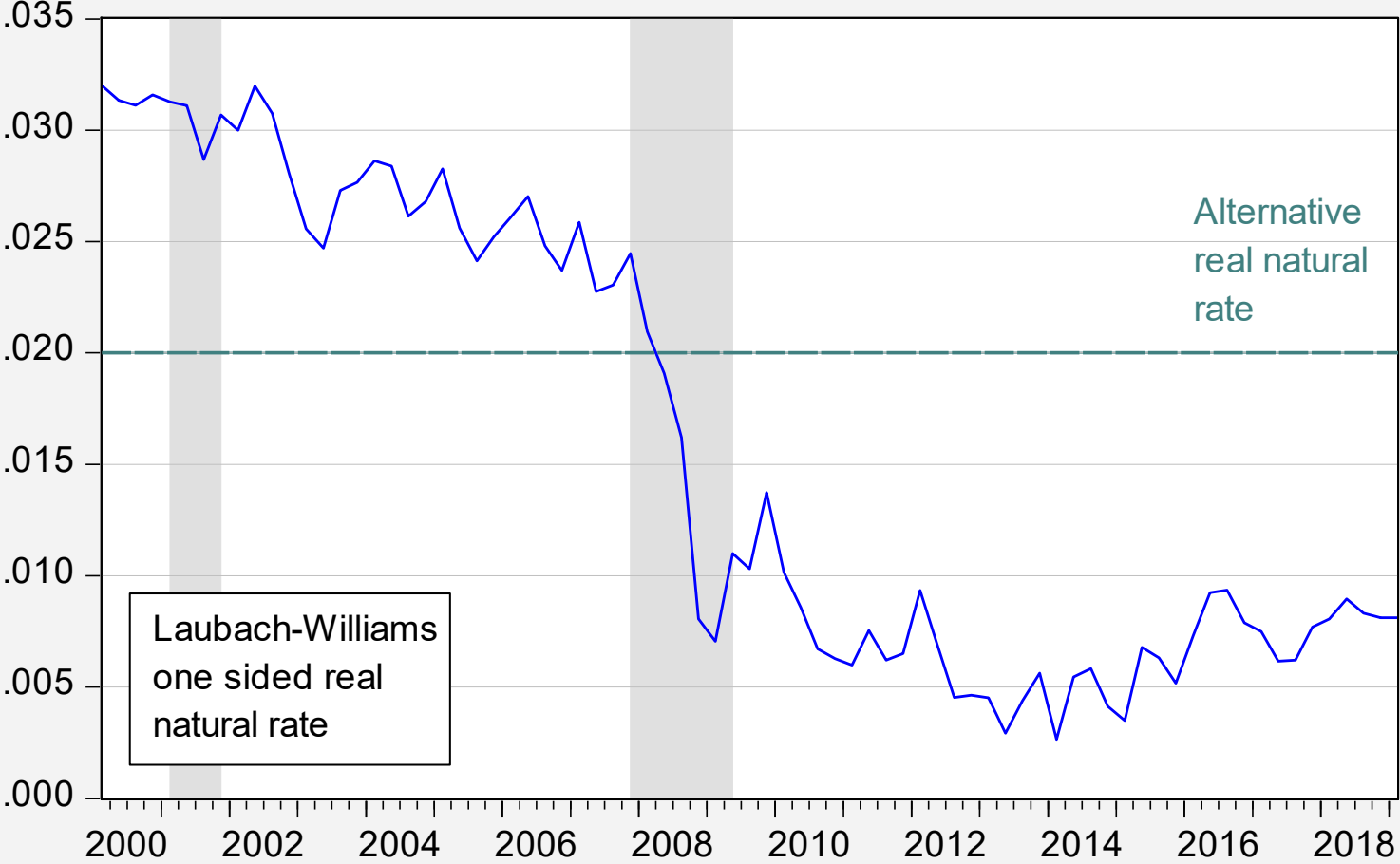
<https://www.frbatlanta.org/cqer/research/taylor-rule.aspx>

# Inputs: Inflation Gap





# Inputs: Natural Rate



# Taylor Rules and Inflation Targeting

$$i_t^{FedFunds} = \pi_t + \beta(y_t - y_t^*) + \delta(\pi_t - \pi_t^*) + r_t^*$$

$$i_t^{FedFunds} = (1 + \delta)\pi_t + \beta(y_t - y_t^*) + r_t^* - \delta\pi_t^*$$

- 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

**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					

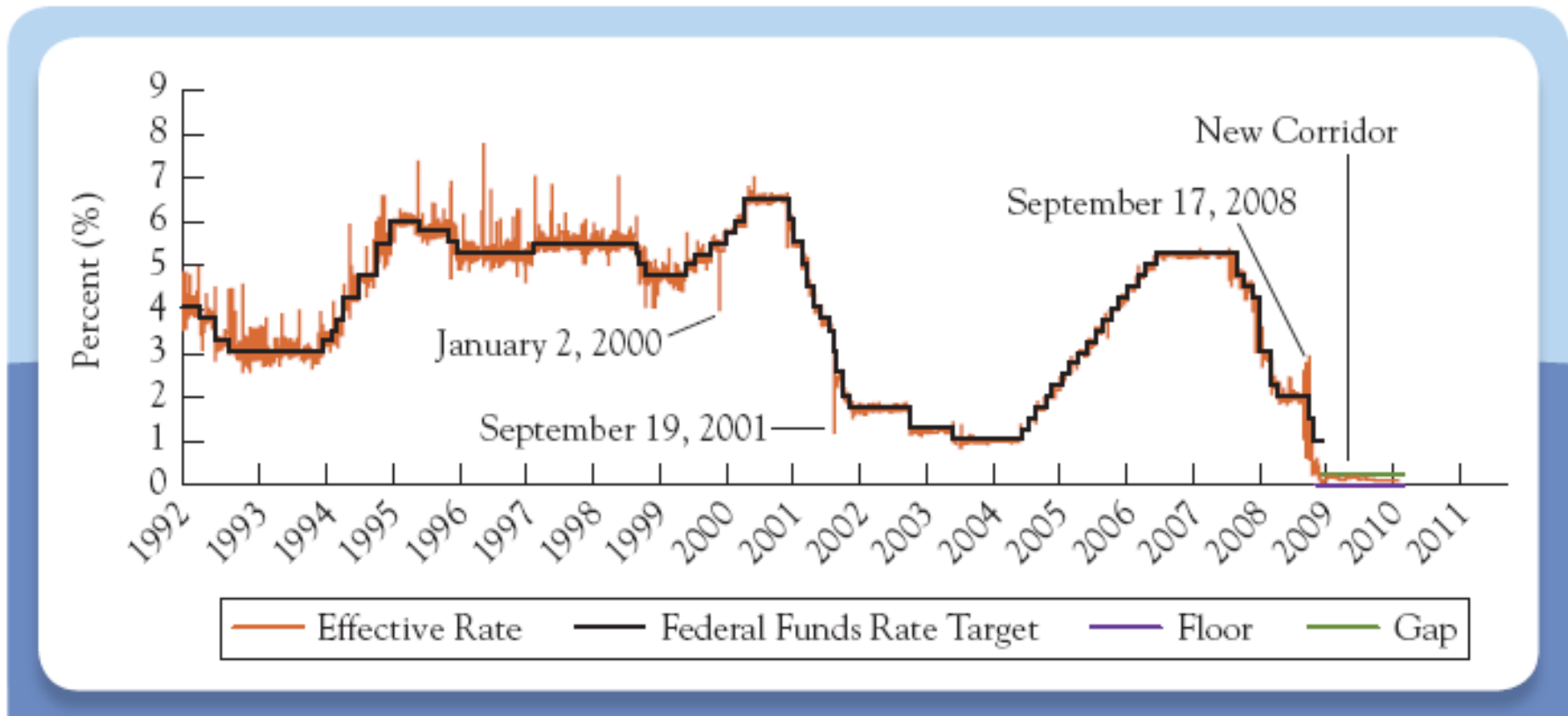
# The Fed's Conventional Policy Toolbox

**Table 18.1** The Tools of U.S. Monetary Policy

	What Is It?	How Is It Controlled?	What Is Its Impact?
<b>Target Federal Funds Rate</b>	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.
<b>Discount Rate</b>	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.
<b>Deposit Rate</b>	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.
<b>Reserve Requirement</b>	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

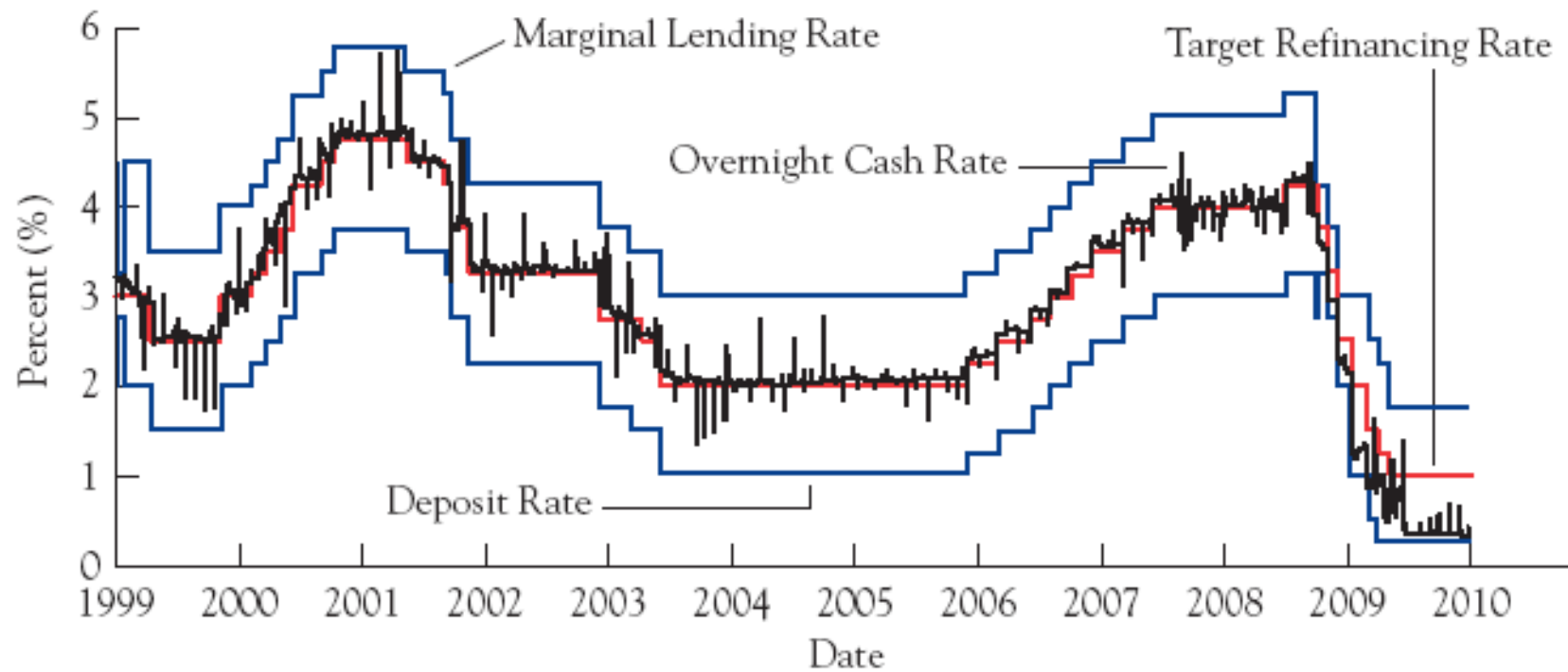
**Figure 18.4** Target Federal Funds Rate and Daily Market Rate, 1992-2009



# ECB Hitting Target Refi Rate

Figure 18.6

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



# Unconventional Policy Tools

- 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 Policy Tools

1. A policy duration commitment.
  - This is when the central bank promises to keep interest rates low in the future.
2. Quantitative easing (QE).
  - When the central bank supplies aggregate reserves beyond the quantity needed to lower the policy rate to zero.
3. 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.



# 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 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.

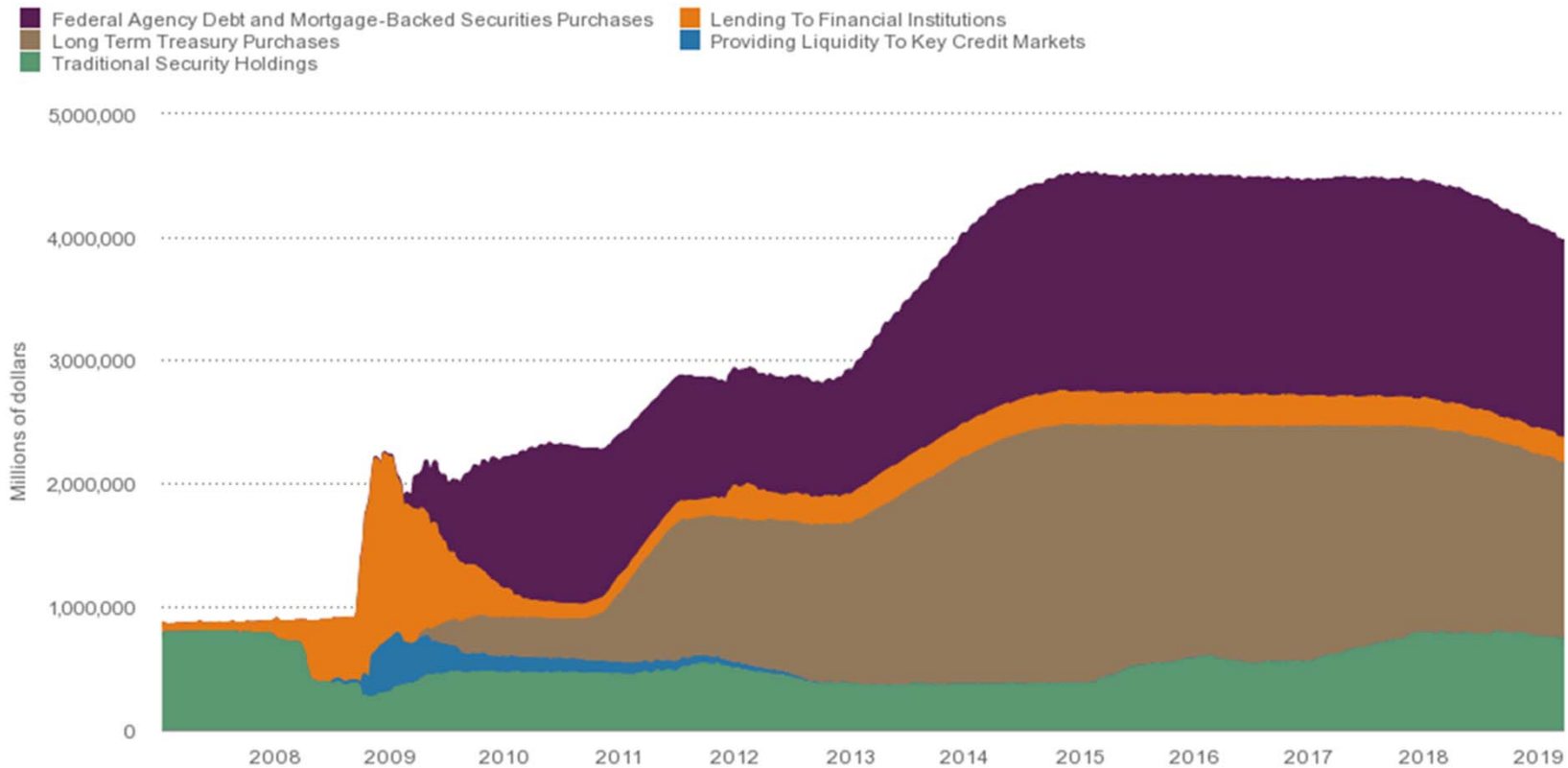
# Quantitative Easing and the Money Supply, 2007-2018

- 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

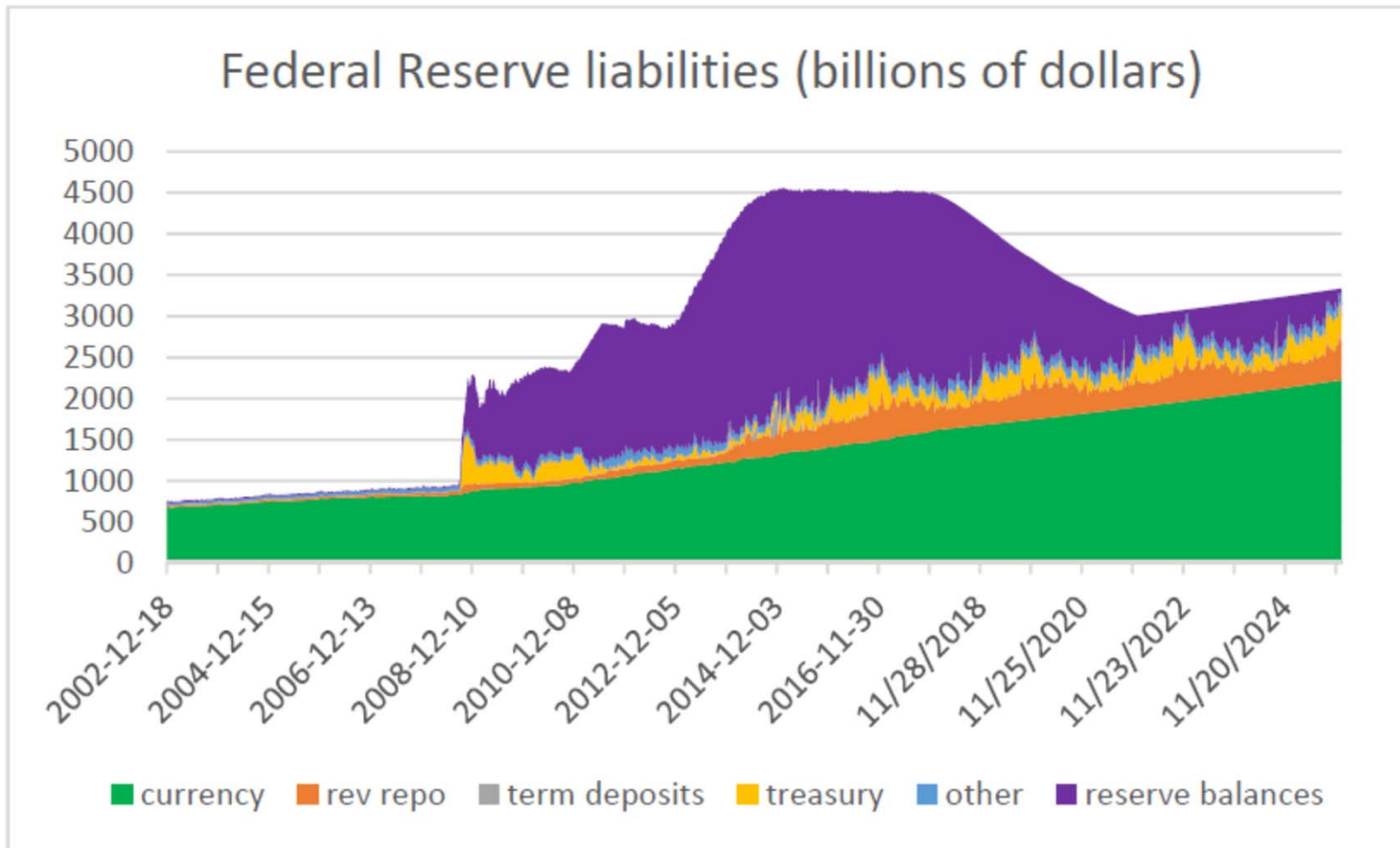


Source: Federal Reserve Board, Haver Analytics.

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

# Liability Side: Quantitative Easing

**Exhibit 6.4.** Historical and projected Fed liabilities, Dec 18, 2002 to Dec 31, 2025



Source: Greenlaw, Hamilton, Harris, West (2018)

# 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.

# 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.

# 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.

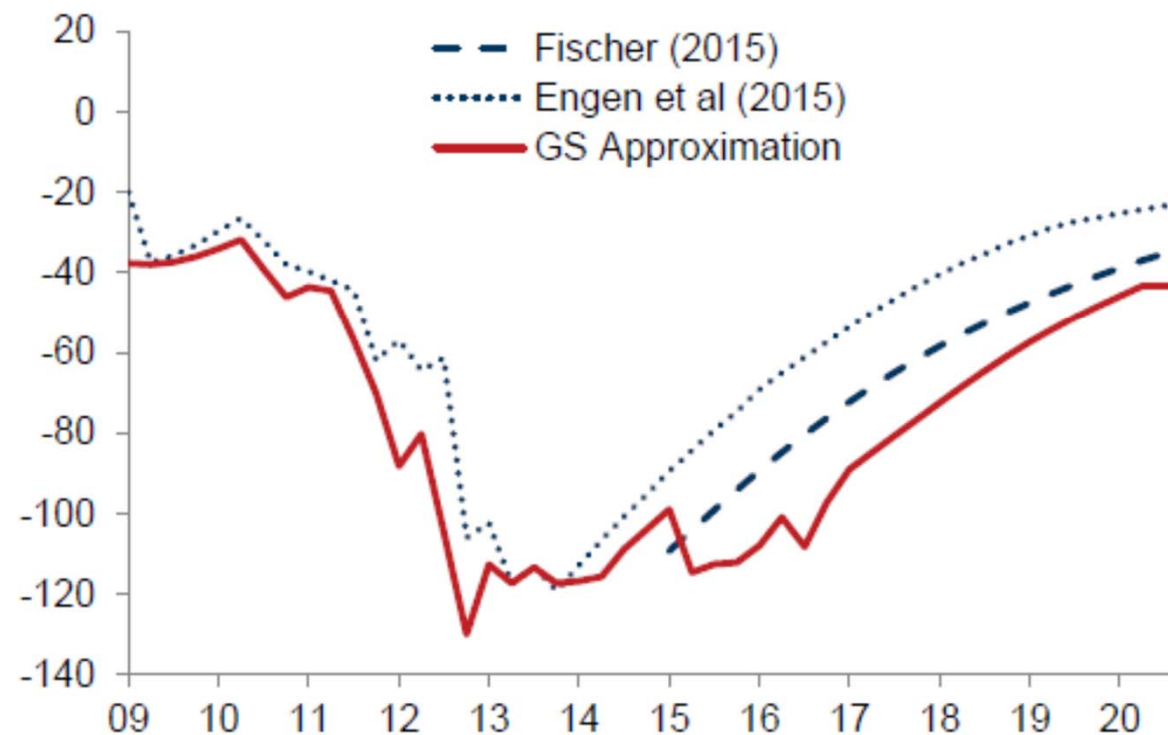
# Impact on Rates

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

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## Portfolio rebalancing in reverse

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



Source: Goldman Sachs Global Investment Research.



# Impact of QE(CE)1-3

**Chart 9. Impact of QE1 and QE2 on economy**

	MA	Boston Fed		Chung et al. (2012) (FRB/US)	Chen et al. (2011)	DB
		VAR	BF Model			
10-Year Treasury (bps)	-78	-98	-98	-60	-39 to -78	-155
Real GDP (percent)	1.57	2.58	2.45	3.00	0.39 to 1.18	1.95
UE Rate (% points)	-0.78	-1.29	-1.22	-1.50	-0.20 to -0.59	-0.97
Employment (mm)	1.4	2.0	1.9	3.0	0.3 to 0.9	1.5
Residential Investment (percent)	N/A	N/A	14.07	N/A	N/A	N/A

Sources: MA (February 7, 2011), Fuhrer and Olivei (2011), Chung, Laforte, Reifschneider, and Williams (2012), Chen, Curdia, and Ferraro (2011), and DB Global Markets Research

**Chart 11. Estimated impact of QE3, cumulative over eight quarters**

10-Year Treasury (bps)	-51
Real GDP (percent)	0.64
UE Rate (percentage points)	-0.32
House Prices (percent)	1.82
S&P 500 (percent)	3.06
Inflation Expectations (percent)	0.25

Sources: DB Global Markets Research

Source: Deutsche Bank, "QE3 to Boost Asset Values and Growth," *Global Economic Perspectives* (Sep. 27, 2012).

# 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.