

# THE CENTRAL BANK, MONEY SUPPLY, AND MONETARY POLICY TOOLS

WEEK 6

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# 1. THE CENTRAL BANK BALANCE SHEET

## CAN THE CENTRAL BANK SET $i$ ?

- Last week we saw that the central bank can "change" the real interest rate, as a response to changes in inflation ( $\pi$ ), or as a response to some strong exogenous force (changes in  $\bar{r}$ )
- But can the central bank "set" *by law* the level of market short term interest rates? **NO!**
- Does the central bank have some power to "force" the market rates to move to some target range/value? **YES!**
- To understand the logic behind this apparent contradiction we need to understand two issues:
  - The balance sheet of the central bank.
  - The main monetary policy tools available *by law* to the central bank.

# THE CENTRAL BANK BALANCE SHEET

European Central Bank Balance Sheet: 31 December 2000

<b>Assets</b>	<b>%</b>	<b>Liabilities</b>	<b>%</b>
Foreign exchange reserves	46.9	Currency	44.4
Securities	10.1	Reserves of Commercial Banks	15.0
Loans	32.5	Other liabilities	19.6
Other assets	10.5	Equity	21.0
Total assets	100.0	Total liabilities	100.0

Securities: financial assets with a fixed return

Currency: amount of money in circulation outside the banking system

Reserves: amount of money held by commercial banks

Loans: money lent to banks

## 2. CENTRAL BANK BALANCE SHEET CHANGES

# FED BUYS US TREASURY BONDS

The Federal Reserve Bank of New York purchases \$1 billion in U.S. Treasury bonds from a commercial bank. (page 459)

Federal Reserve's Balance Sheet

<b>Assets</b>	<b>\$ Billions</b>	<b>Liabilities</b>	<b>\$ Billions</b>
Securities	+1	Reserves	+1
Total assets	+1	Total liabilities	+1

Banking System's Balance Sheet

<b>Assets</b>	<b>\$ Billions</b>	<b>Liabilities</b>	<b>\$ Billions</b>
Reserves	+1		
Securities	-1		
Total assets	0	Total liabilities	0

Liabilities change +1  
Monetary Base changes +1

# FED BUYS BONDS DENOMINATED IN EUROS

U.S. Treasury instructs the Federal Reserve to buy \$1 billion worth of bonds denominated in euros. (page 459)

Federal Reserve's Balance Sheet

<b>Assets</b>	<b>\$ Billions</b>	<b>Liabilities</b>	<b>\$ Billions</b>
Foreign exchange reserves	+1	Reserves	+1
<b>Total assets</b>	<b>+1</b>	<b>Total liabilities</b>	<b>+1</b>

Banking System's Balance Sheet

<b>Assets</b>	<b>\$ Billions</b>	<b>Liabilities</b>	<b>\$ Billions</b>
Reserves	+1		
Securities	-1		
<b>Total assets</b>	<b>0</b>	<b>Total liabilities</b>	<b>0</b>

Liabilities change +1  
Monetary Base changes +1

# A DISCOUNT LOAN TO COMMERCIAL BANKS

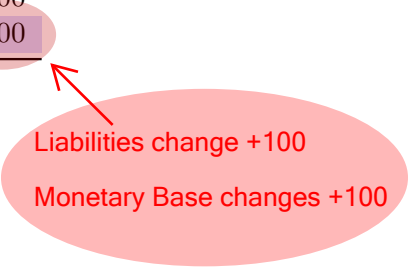
Commercial banks borrow money from the Fed, through the "discount" window, providing collateral.<sup>1</sup> (page 461)

Federal Reserve's Balance Sheet

<b>Assets</b>	<b>\$ Millions</b>	<b>Liabilities</b>	<b>\$ Millions</b>
Discount loans	+100	Reserves	+100
<b>Total assets</b>	<b>+100</b>	<b>Total liabilities</b>	<b>+100</b>

Banking System's Balance Sheet

<b>Assets</b>	<b>\$ Billions</b>	<b>Liabilities</b>	<b>\$ Billions</b>
Reserves	+100	Discount loans	+100
<b>Total assets</b>	<b>+100</b>	<b>Total liabilities</b>	<b>+100</b>



Liabilities change +100  
Monetary Base changes +100

<sup>1</sup>Specific assets pledged by a borrower that a lender can seize in the event of nonpayment.



# JANE TAKES CASH OUT OF HER BANK ACCOUNT

Jane withdraws \$100 from your checking account (page 462)

Jane's Balance Sheet

<b>Assets</b>	<b>\$</b>	<b>Liabilities</b>	<b>\$</b>
Currency	+100		
Checkable deposits	-100		
Total assets	0	Total liabilities	0

### Federal Reserve's Balance Sheet

Assets	\$	Liabilities	\$
		Currency	+100
		Reserves	-100
Total assets	0	Total liabilities	0

### Banking System's Balance Sheet

Assets	\$	Liabilities	\$
Reserves	-100	Checkable deposits	-100
Total assets	-100	Total liabilities	-100

Liabilities change +0  
 Monetary Base changes +0

## SUMMARY: FED OPERATIONS AND MONETARY BASE

Transaction	Initiated by	Typical Action	Impact
Open market operation	Central bank	Purchase of Treasury bond	Increases reserves, the size of the Fed's balance sheet, and the monetary base
Foreign exchange intervention	Central bank	Purchase of German government bond	Increases reserves, the size of the Fed's balance sheet, and the monetary base
Discount loan	Commercial bank	Extension of loan to commercial bank	Increases reserves, the size of the Fed's balance sheet, and the monetary base
Cash withdrawal	Nonbank public	Withdrawal of cash from ATM	Decreases reserves and increases currency, leaving the size of the Fed's balance sheet and the monetary base unchanged

### 3. THE MONETARY BASE AND THE MONEY SUPPLY

## MB, M2 & THE MULTIPLIER

- We saw that whenever the central bank buys assets or lends money to banks, the Monetary Base changes.
- The Monetary Base (**MB**) is the total amount of money printed by the central bank that is outside of the central bank (its liabilities).

$$MB = \textit{Currency} + \textit{Reserves} \quad (1)$$

- The total quantity of money supplied to the economy by the banking sector (central bank + commercial banks) is much greater than the MB.
- This aggregate is called the Money Supply: in the US it is called **M2**.
- What links the two aggregates is the **Money Multiplier**.

## THE MONEY MULTIPLIER

- The derivation of the money multiplier is not required in this course.<sup>2</sup>
- The money multiplier gives the following relationship:

$$M2 = \kappa \times MB \quad (2)$$

where  $\kappa$  is called the money multiplier and

$$\kappa = \frac{\beta + 1}{\beta + rr} \quad (3)$$

where:

$\beta = \text{Currency}/\text{TotalDeposits}$

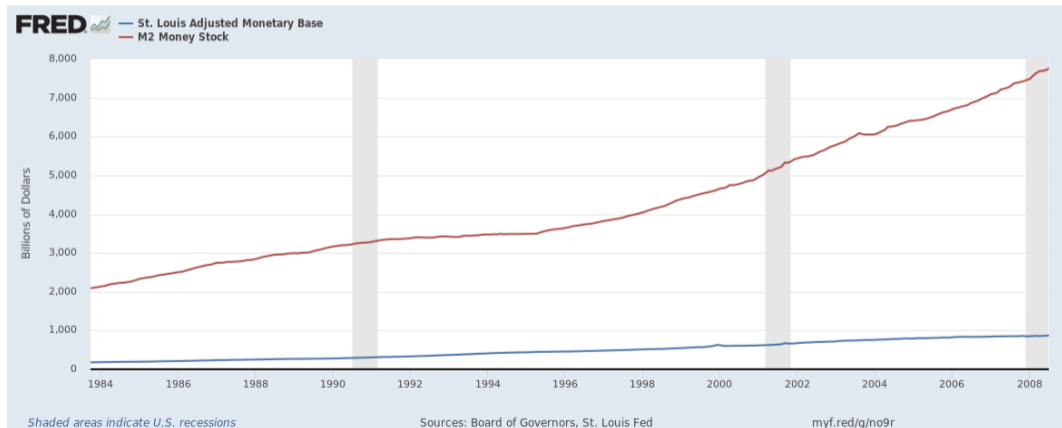
$rr = \text{Reserves}/\text{TotalDeposits}$

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<sup>2</sup>See appendix A, if you are curious how the money multiplier is obtained. But, its derivation is not required for this course.

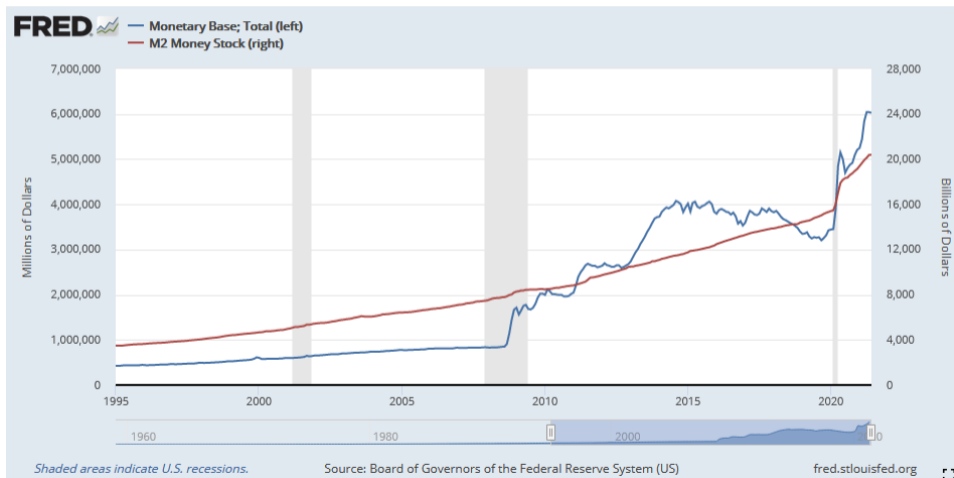
# MB vs M2 IN THE USA: GOOD TIMES

In good times, there was a stable relationship between the MB and M2 and the money multiplier looked good.



# MB vs M2 IN THE USA: BAD TIMES

In turbulent periods, the money multiplier looks awful.





## 4. MONETARY POLICY TOOLS

# MONETARY POLICY TOOLS

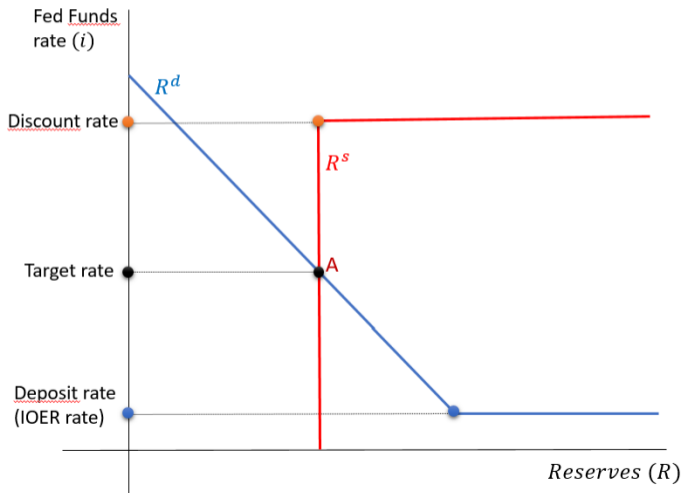
- Controlling M2 is extremely difficult for the Fed, as we saw in the previous figure. The money multiplier behaves like crazy in bad times.
- The other option is trying to control (target), not the quantity of money, but its price: the short term interest rate (Fed Funds Rate).
- The fed has 4 policy tools (instruments) to "control/target" the Fed Funds Rate:
  - Target Federal Funds Rate **Range**
  - Interest Rate on Excess Reserves (IOER Rate)
  - Discount Rate
  - Reserve Requirement

# MONETARY POLICY TOOLS

	What Is It?	How Is It Controlled?	What Is Its Impact?
<b>Target Federal Funds Rate Range</b>	Range for the interest rate charged by financial intermediaries on overnight, uncollateralized loans to banks	Announced by the FOMC as the target range for the market federal funds rate	Influences interest rates throughout the economy
<b>Interest Rate on Excess Reserves (IOER Rate)</b>	Interest rate paid by the Federal Reserve on excess reserves held by banks	Announced by the FOMC as a rate to be paid on all excess reserves	Changes interest rates at which banks will lend and borrow
<b>Discount Rate</b>	Interest rate charged by the Federal Reserve on its loans to banks	Set by Reserve Banks, subject to approval by the Federal Reserve Board, at a premium over the interest rate on excess reserves (IOER rate)	Provides liquidity to banks in times of crisis; not used to alter day-to-day monetary policy
<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	Influences the demand for reserves; not used to alter monetary policy

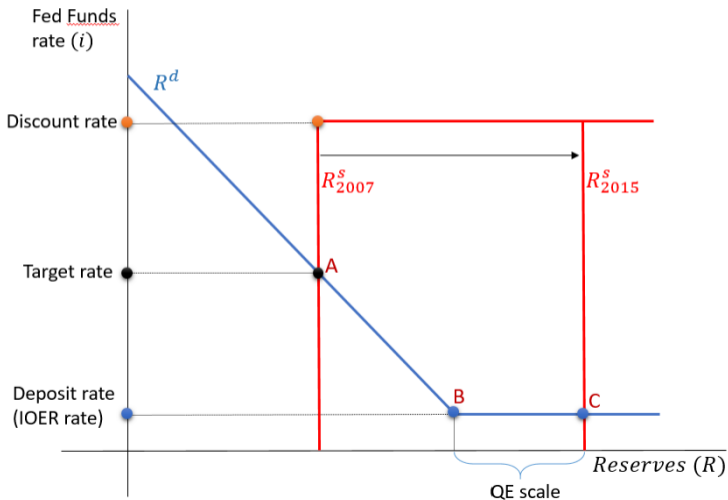
# HOW ARE THE TOOLS COMBINED?

The Fed sets the quantity of reserves supplied ( $R^s$ )



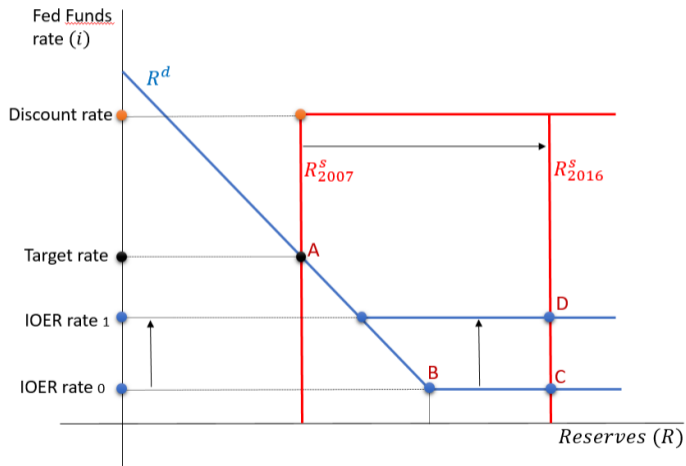
# THE FED WITH QUANTITATIVE EASING (QE)

From 2008 to 2014, the Fed implemented QE.



# AN INCREASE IN IOER

In 2016 the Fed decided to increase the IOER.



# TOOLS AND FED FUNDS RATES IN THE USA

The Fed navigates with the tools close to perfection.

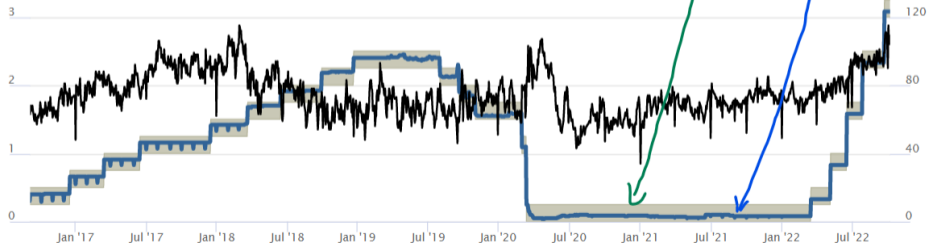
FEDERAL FUNDS CHART

1m 3m 1y All

From 2016-08-31 To Oct 5, 2022

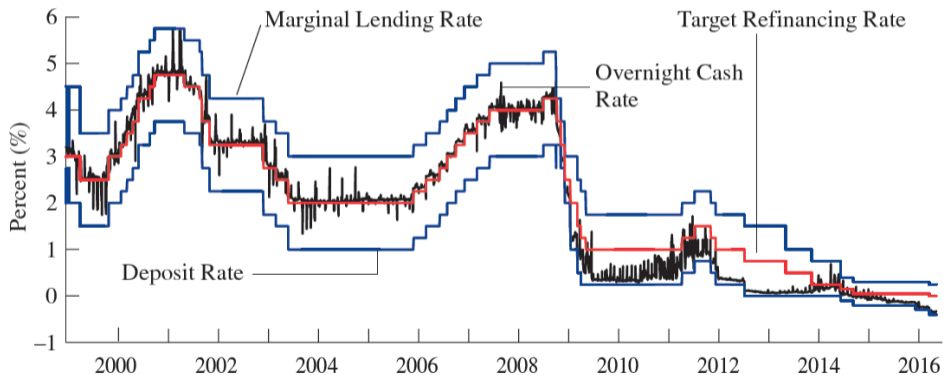
Percent

● Target Rate/Range — EFFR — Volume \$Billions



# THE EUROPEAN CENTRAL BANK

The ECB has a similar monetary policy structure. The names change a little bit, but the essence is the same.





## 5. UNCONVENTIONAL POLICY TOOLS

Material not covered this year

# UNCONVENTIONAL TOOLS OF THE CENTRAL BANK

When the Fed Funds Rate comes down to zero, and the economy still needs some support from monetary policy, the Fed has two options:

- Force short term interest rates (Fed Funds Rate) to go below zero, as many European central banks have done it since 2010.
- Keep rates at zero, and use some "unconventional policy tools".

The unconventional monetary policy tools are basically three:

- **Quantitative easing**
- **Forward guidance**
- **Targeted asset purchases (TAP)**

# QUANTITATIVE EASING

QE consists basically of one decision by the central bank: buying vast quantities of bonds and expanding its balance sheet by a magnitude of 3 or 4 in a few years.

Why is it different from "conventional" monetary policy?

Because the bonds bought under QE are:

- Long term maturity bonds (in opposition to short term maturity)
- They have considerable risk attached to them (in opposition to risk free)
- They belong to classes of bonds that were not eligible to be used by conventional policy.

## FORWARD GUIDANCE

- Forward guidance is usually used by central banks when they communicate with private agents. If the central bank thinks that it is convenient to signal a particular point to the private sector, they will do that.
- But if short term interest rates are at zero (call this as the Zero Lower Bound), this guidance becomes vital.
- At the ZLB there is a danger of deflation, and it is crucial if the private sector gets a clear commitment from the central bank that "**we will do whatever it takes**" to avoid the trap of a long deflationary period.
- The central bank has to clarify that it will not increase interest rates if inflation surpasses the 2% target value by a significant amount: it will allow inflation to "overshoot" the 2% main goal for a significant time.

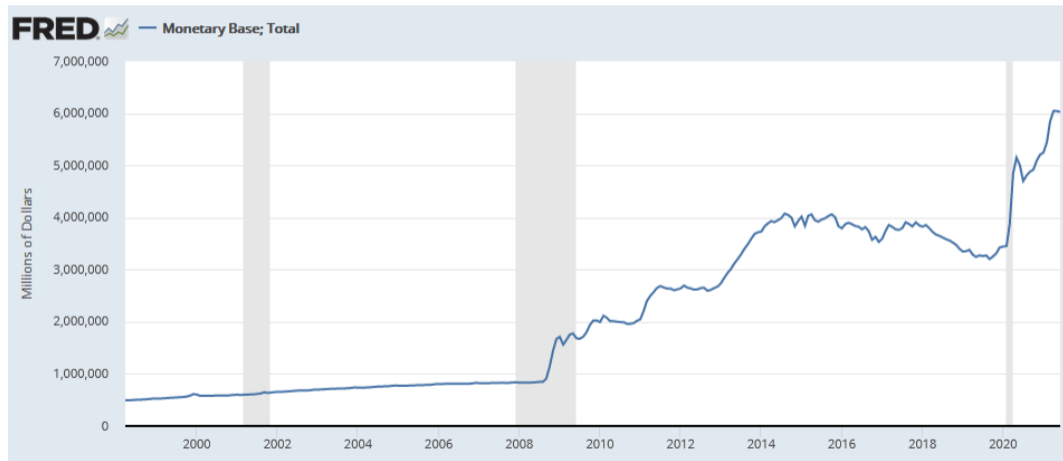
## TARGETED ASSET PURCHASES

In contrast to QE, which increases the **size** of the central banks balance sheet by all sorts of bonds, targeted asset purchases (TAP) shift the **composition** of the balance sheet toward selected assets in order to boost their relative price, reducing their yields, and stimulate economic activity.

A recent example of this type of tool has become known as the "**Operation Twist**". The Fed bought longer-term Treasuries and Mortgage-Backed Securities. It simultaneously sold some of the short-term assets it already held to ease the economy by bringing down long-term interest rates.

# HOW FAR UNCONVENTIONAL CAN I GO?

In 2008: MB=0.8 trillion dollars; in 2021: MB = 6 trillion US dollars



APPENDIX A: DERIVATION OF THE MONEY  
MULTIPLIER (**not required reading**)

## DERIVATION OF THE MONEY MULTIPLIER (I)

- Main monetary aggregates are defined as:

$$M2 = C + TD$$

$$MB = C + R$$

$C$  is "Currency",  $TD$  is "Total Deposits",  $R$  is "Reserves"

- The relationship between  $MB$  and  $M2$ :

$$\frac{M2}{MB} = \frac{C + TD}{C + R}$$

- Dividing the right hand side of the previous equation by  $TD$ :

$$\frac{M2}{MB} = \frac{C/TD + TD/TD}{C/TD + R/TD}$$



## DERIVATION OF THE MONEY MULTIPLIER (II)

- $C/TD = \omega$  is a ratio that is supposed to be stable in the short-run
- The reserves requirement rate set by the central bank is given by:

$$R/TD = rr$$

- Therefore:

$$\frac{M2}{MB} = \frac{\beta + 1}{\beta + rr}$$

- Then:

$$M2 = \underbrace{\frac{\beta + 1}{\beta + rr}}_{= \kappa} \times MB$$

–  $\kappa$  is the money multiplier.

## 5. READINGS

## READINGS

Stephen G. Cecchetti and Kermit L. Schoenholtz (2017). *Money, Banking, and Financial Markets*, Fifth Edition, McGraw-Hill.

### Chapter 17.

"The Central Banks Balance Sheet" (pages 453–457). The subsection "The Importance of Disclosure" not required reading.

"Changing the Size and Composition of the Balance Sheet" (pages 457–463).

"The Monetary Base and the Money Supply" (468–473). It deals with the money multiplier in some detail. *This part should be skipped.* You have just to know what the money multiplier is supposed to do; nothing else.

### Chapter 18

"The Federal Reserves Conventional Policy Toolbox" (485–494). All pages are very important. Concentrate on Table 18.1 and on figures 18.2 a 18.4, as we do in the slides above.

"Unconventional Policy Tools" (pages 506–513). The subsection "Making an Effective Exit" is not required reading.