

# Economics 100B: Macroeconomics

## Money, Banking, and the Macroeconomy – Part I

October 19 & 21, 2020

### Reading:

- McLeay, M., Radia, A., & Thomas, R. (2014). “Money in the modern economy: an introduction.” *Bank of England Quarterly Bulletin*, **54**(1), 4–13.
- Mishkin - Chapter 5

## *Agenda:*

- ① What is Money?
- ② The Federal Reserve.
- ③ The Quantity Theory of Money.
- ④ Inflation and Interest Rates.
- ⑤ The Cost of Inflation.

# What is Money?

## *What is money?*

*Money* is a *financial asset* that serves three functions

- 1 The unit of account.
- 2 A store of value.
- 3 The medium of exchange.

# What is Money?

## *The three functions of money*

### *1: The Unit of Account*

As the *unit of account* (e.g. \$, £, ¥, €, ...) money:

- is how value in the economy is measured.
- indicates the price of all goods and services in the economy.

# What is Money?

## *The three functions of money*

### *2: A Store of Value*

- Money is a means of preserving purchasing power.
- Other assets can also serve as a store of value, but not as a medium of exchange.
- Money is the most *liquid* of all assets.

# What is Money?

## *The three functions of money*

### *3: The Medium of Exchange*

- Money is the financial asset that can be used to finalize transactions.
- Money is generally accepted in:
  - payment for goods and services.
  - the repayment of debts.

# What is Money?

## *What is isn't and where it comes from.*

- Money is not wealth.
- Money is not income.
- The two major sources of money are:
  - *currency and coins* issued by the government.
  - *other money* issued by the financial system.

# What is Money?

## *Measures of Money*

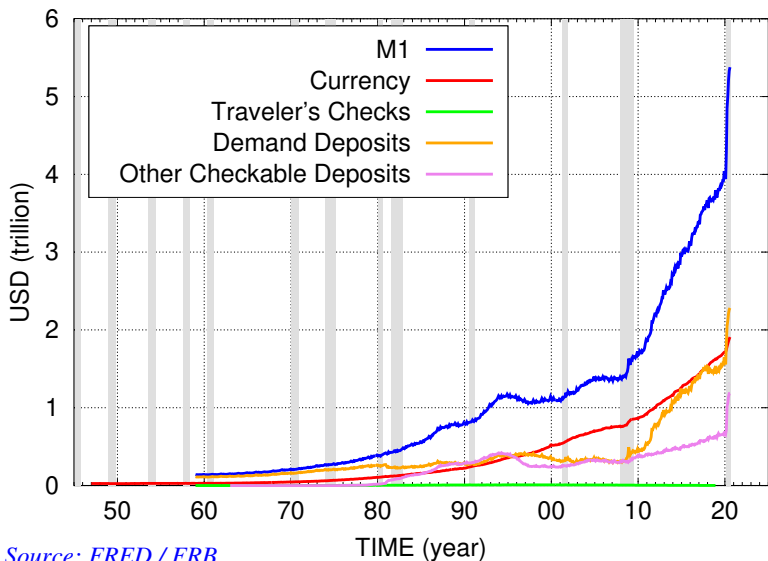
### *Monetary Aggregates*

*Monetary aggregates* are measures of those assets that serve as money. In the US the two *monetary aggregates* are:

- 1 The *M1* money supply.
- 2 The *M2* money supply.

# What is Money?

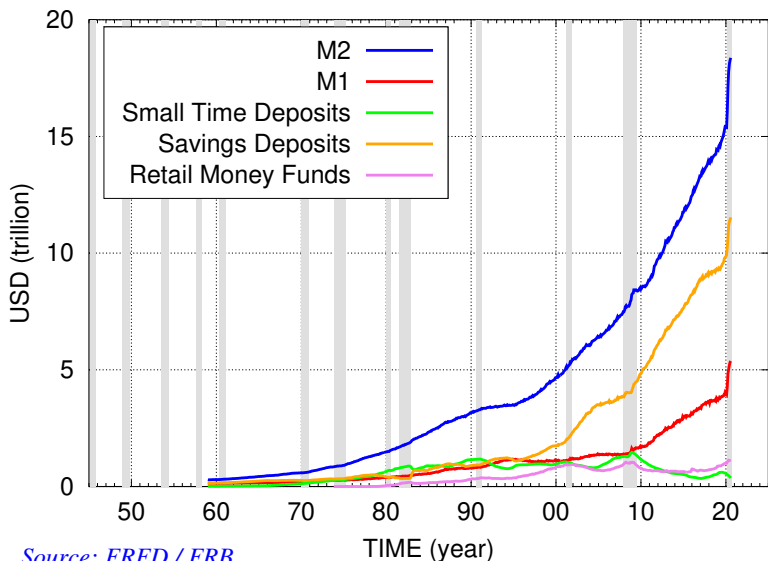
*Monetary aggregates: the M1 money supply*



*Source: FRED / FRB*

# What is Money?

*Monetary aggregates: the M2 money supply*



*Source: FRED / FRB*

# What is Money?

## *The money supply.*

### *Three groups affect the money supply:*

- ① *The Central Bank* conducts monetary policy.
  - *The Central Bank* of the US is the Federal Reserve System.
- ② *Depository institutions* (e.g. banks) accept deposits and make loans.
- ③ *The non-bank public* (i.e. people and firms) holds money as currency, coin and bank deposits.

# What is Money?

## *The Central Bank and the creation of money:*

A Central Bank *creates money* when it buys real assets from the public.

- This is one way to get money into circulation.
- People accept money if they believe other people will accept it in exchange.
- The government usually decrees that paper money and coins are *legal tender*.

## *History and mandate:*

- Was created by an Act of Congress on December 23, 1913.
- Is the central bank of the United States.
- Has the following responsibilities:
  - ① Functions as the government's bank.
  - ② Regulates and supervises banks.
  - ③ Acts as lender of last resort.
  - ④ Implements *monetary policy*.

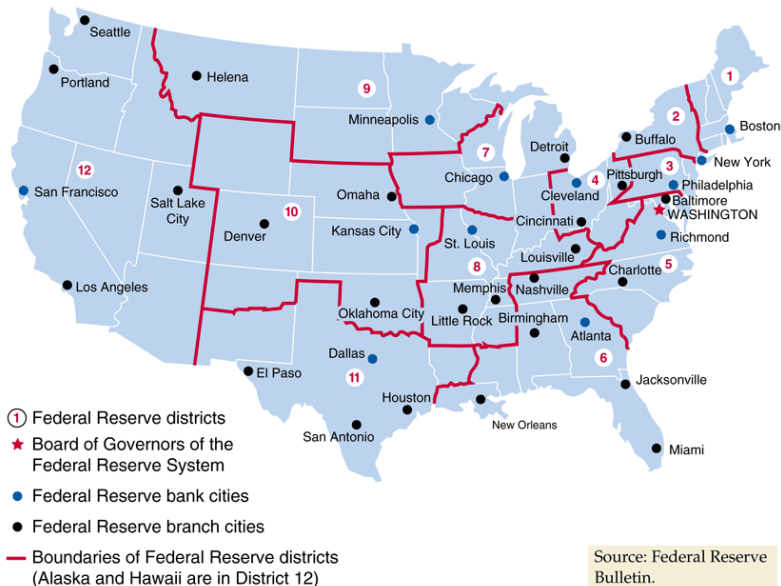
# The Federal Reserve System

## *Structure:*

- 1 The Board of Governors in Washington DC.
- 2 12 regional Federal Reserve Banks located throughout the country.
- 3 The Federal Open Market Committee (FOMC).

# The Federal Reserve System

Source: Mishkin, Figure 5.1



## *History and Structure:*

- The Chairman of the FOMC is traditionally the Chairman of the Board of Governors.
- The Vice Chairman of the FOMC is traditionally the President of the New York Federal Reserve Bank.

## *Meetings:*

A policy statement follows each meeting announcing:

- Any policy action taken.
- Summary of economic and inflationary conditions.
- The policy bias.
- The vote.

## *Independence within the Government*

### ① Independent:

- Appointment of Governors.
- Appointment of Bank Presidents.
- Financed from their own resources: surplus turned over to the Treasury.

### ② Within the Government:

- Ultimately responsible to Congress.

## *Components and definitions*

- The money supply process is linked to changes in the central bank's balance sheet.
- This (indeed, any) balance sheet consists of:
  - Assets.
  - Liabilities.

## *Central bank assets include*

- Government securities.
  - Acquired through *open market operations*.
- Discount loans to depository institutions:
  - Banks' borrowings from the central bank or *borrowed reserves*.
  - Borrowing rate is called *the discount rate*.

## *Central bank liabilities include*

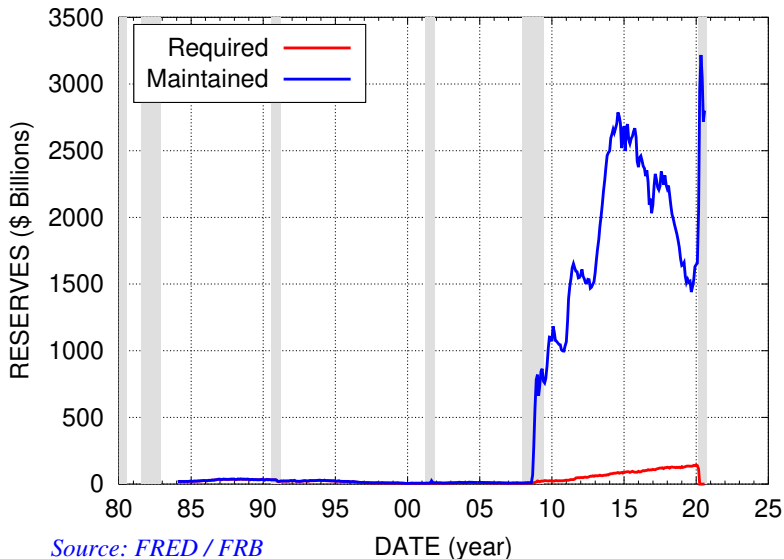
- Currency in circulation.
  - Held by the non-bank public.
- *Reserves*
  - Bank reserves held at the central bank.
  - Vault cash.

## *Types of Reserves: Required and Excess*

- *Required reserves.*
  - The legal minimum that banks must hold against their deposits.
  - The *required reserve ratio*,  $rr$ .
  - *Note: Some central banks do not have a reserve requirement.*
- *Excess Reserves*
  - Additional reserves that banks choose to hold above their required reserves.

# The Fed's Balance Sheet

## *Required and Excess Reserves*



## *Money creation by the central bank*

- A central bank *creates money* when:
  - It acquires real assets from the public.
  - The liabilities it issues are used to create money.
  - These liabilities are called:
    - *The monetary base.*
    - *High-powered money.*
- A commercial bank *creates money* when it makes a loan.

# The Quantity Theory of Money

## Overview:

- *The quantity theory of money* is the relationship between money and nominal income (or output) in the economy.
- This theory was derived under the assumption that wages and prices are completely flexible.
- Therefore, it is also a theory about the *long-run*.

# The Quantity Theory of Money: Basic mechanics:

We begin with the equation of exchange

$$M \times V \equiv P \times Y$$

where

$M$  = the money supply,

$V$  = the velocity of money,

$P$  = the general price level, and

$Y$  = real GDP.

*The equation of exchange is an identity.*

# The Quantity Theory of Money: Velocity

- *Velocity* is the “turnover rate” of the money supply.
- *Velocity* is determined by the institutions that affect the way consumers and businesses conduct transactions.
- Institutions and payments technologies were assumed to change very gradually.
- Consequently, *velocity was assumed to be a constant  $\bar{V}$* . thus:

$$M \times \bar{V} = P \times Y$$

*The level of nominal income (or output),  $P \times Y$ , is determined solely by the quantity of money,  $M$ .*

# The Quantity Theory of Money

## *The Classical Dichotomy and The Neutrality of Money:*

- In the long-run, real economic output,  $Y$ , is determined by:
  - The quantity of the factors of production, and
  - The level of total factor productivity.
- These *real variables* are unaffected by the quantity of money or the price level, which are *nominal variables*.
- Because nominal variables have no effect on real variables in the long-run, the real and nominal sectors of the economy are independent of one another.
  - *This is known as “The Classical Dichotomy”.*
- Therefore, changes in the money supply, a nominal variable, will not affect any real variables.
  - *This is known as “the (long-run) neutrality of money”.*

# The Quantity Theory of Money

## *Relationship to inflation:*

If

$$M \times \bar{V} = P \times Y$$

then taking the natural log of both sides

$$\ln(M) + \ln(\bar{V}) = \ln(P) + \ln(Y)$$

followed by the time derivative, we obtain

$$\frac{1}{M} \frac{dM}{dt} + \frac{1}{\bar{V}} \frac{d\bar{V}}{dt} = \frac{1}{P} \frac{dP}{dt} + \frac{1}{Y} \frac{dY}{dt}$$

or

$$g_M + g_{\bar{V}} = \pi + g_Y$$

*where  $\pi$  is the rate of inflation.*

# The Quantity Theory of Money

## *Relationship to inflation:*

We just showed that  $g_M + g_{\overline{V}} = \pi + g_Y$ , but we also know that

$$g_{\overline{V}} = 0 .$$

So it follows that

$$g_M = \pi + g_Y$$

or

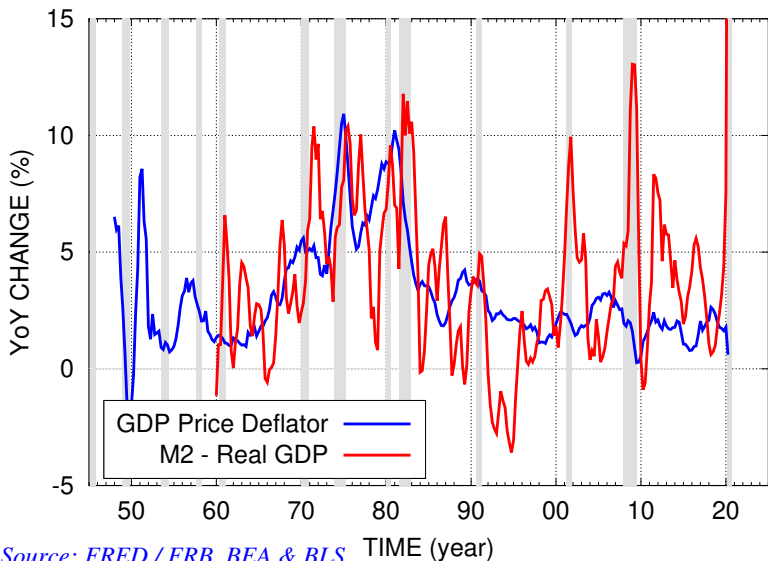
$$\pi = g_M - g_Y$$

*“Inflation is always and everywhere a monetary phenomenon.”*

– Milton Friedman

# The Quantity Theory of Money: $\pi = g_M - g_Y$

*Difference estimates of  $\pi$ ,  $g_M$ , and  $g_Y$ .*

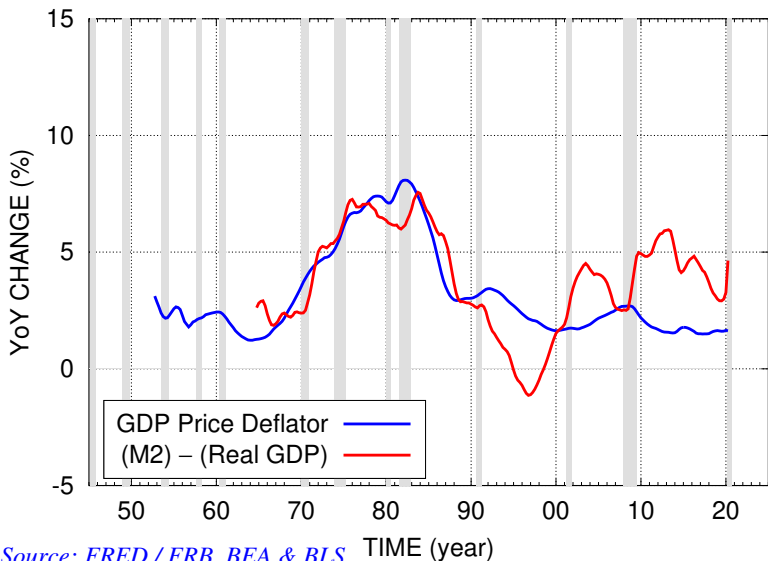


*Source: FRED / FRB, BEA & BLS*

TIME (year)

# The Quantity Theory of Money: $\pi = g_M - g_Y$

*Difference estimates of  $\pi$ ,  $g_M$ , and  $g_Y$ . 5-year moving averages.*



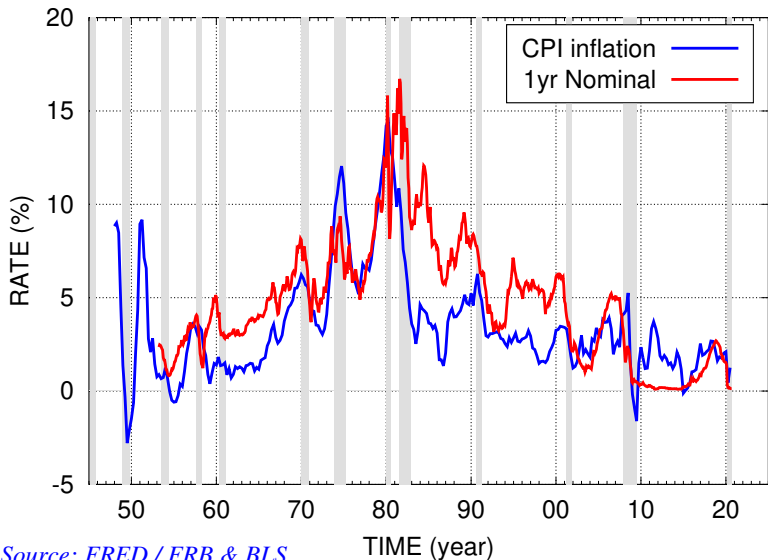
## The Fisher Equation and Fisher Effect

- The *Fisher equation* is  $i = r + \pi^e$  where

$i \equiv$  the *nominal* interest rate,  
 $r \equiv$  the *real* interest rate, and  
 $\pi^e \equiv$  *expected* inflation.

- The *classical dichotomy* says that  $r$  is:
  - Unaffected by inflation or expected inflation.
  - Determined by saving and investment decisions.
- This implies the *Fisher effect*:  $\Delta i = \Delta \pi^e$

# Inflation and Interest Rates: $\Delta i = \Delta \pi^e$



## *Anticipated and unanticipated inflation costs:*

The costs of *anticipated inflation* include:

- Shoe-leather costs,
- Menu costs,
- Tax distortions,
- Increased variability of relative prices, and
- Loss of the dollar yardstick.

## *Anticipated and unanticipated inflation costs:*

The costs of *unanticipated inflation* include:

- Increased uncertainty,
- Increased variability of relative prices, and
- Inflation uncertainty is higher when the level of inflation is already high.