Lecture 7: Money, Banks, and Federal Reserve System

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Course: Macroeconomics 201

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The Road Ahead

1. Money Supply and Demand
2. How Do Banks Create Money
3. Federal Reserve System
4. Quantity Theory of Money

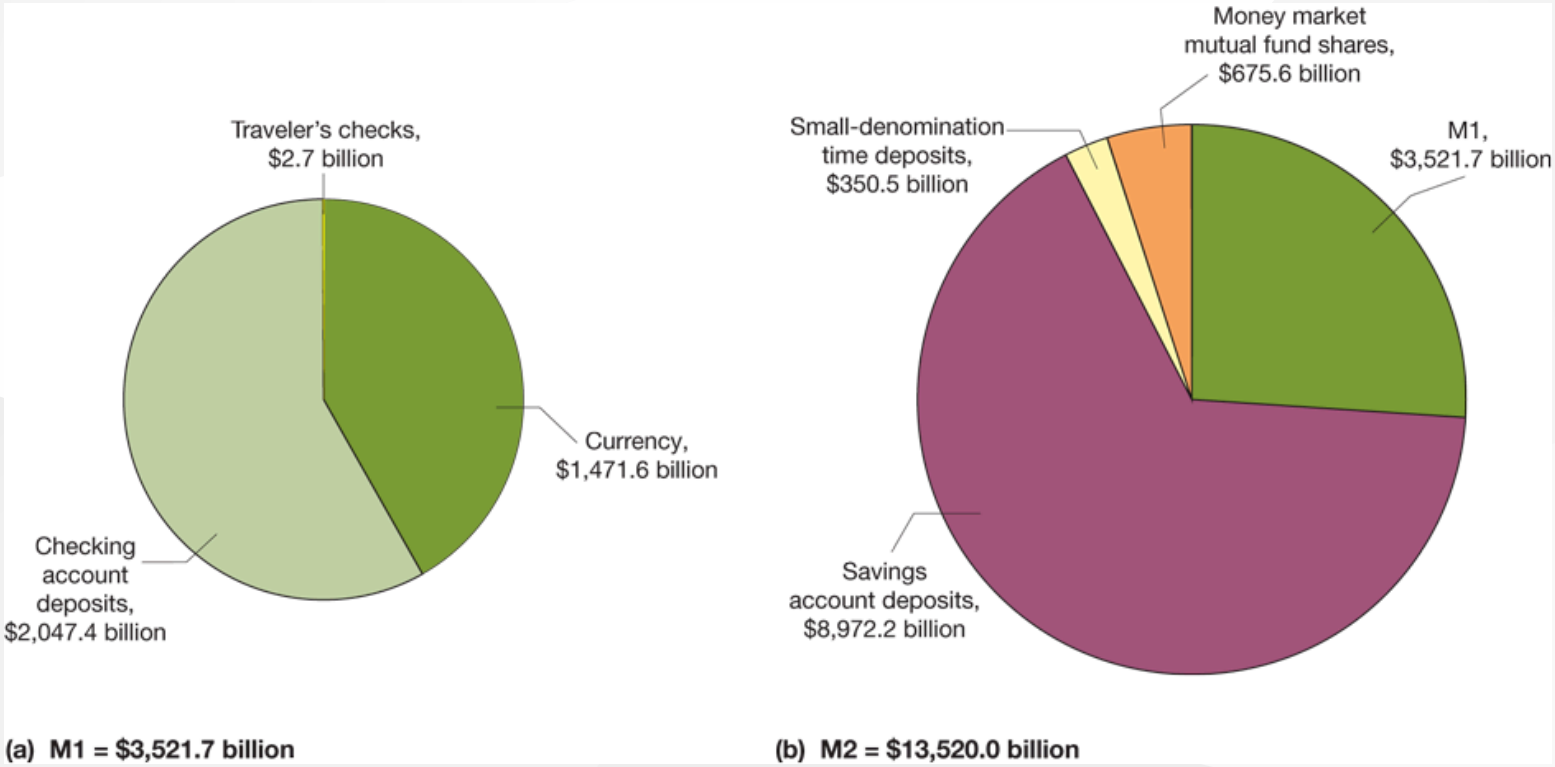
What Is Money?

- Any asset accepted in exchange for goods and services or payments of debts, e.g. commodity/fiat money
  - narrow measure includes liquid/monetary assets

$$\text{M1} = \text{currency} + \text{checkable deposits}$$

  - broader measure includes less liquid/non-monetary assets, e.g. time deposits
  - M1 measures money supply (M^s), controlled by Fed
- **Why is it important**
  - by easing trading, money allows specialization that makes people more productive
- Functions of money: medium of exchange, unit of account, store of value, standard of deferred payment

Measuring Money Supply

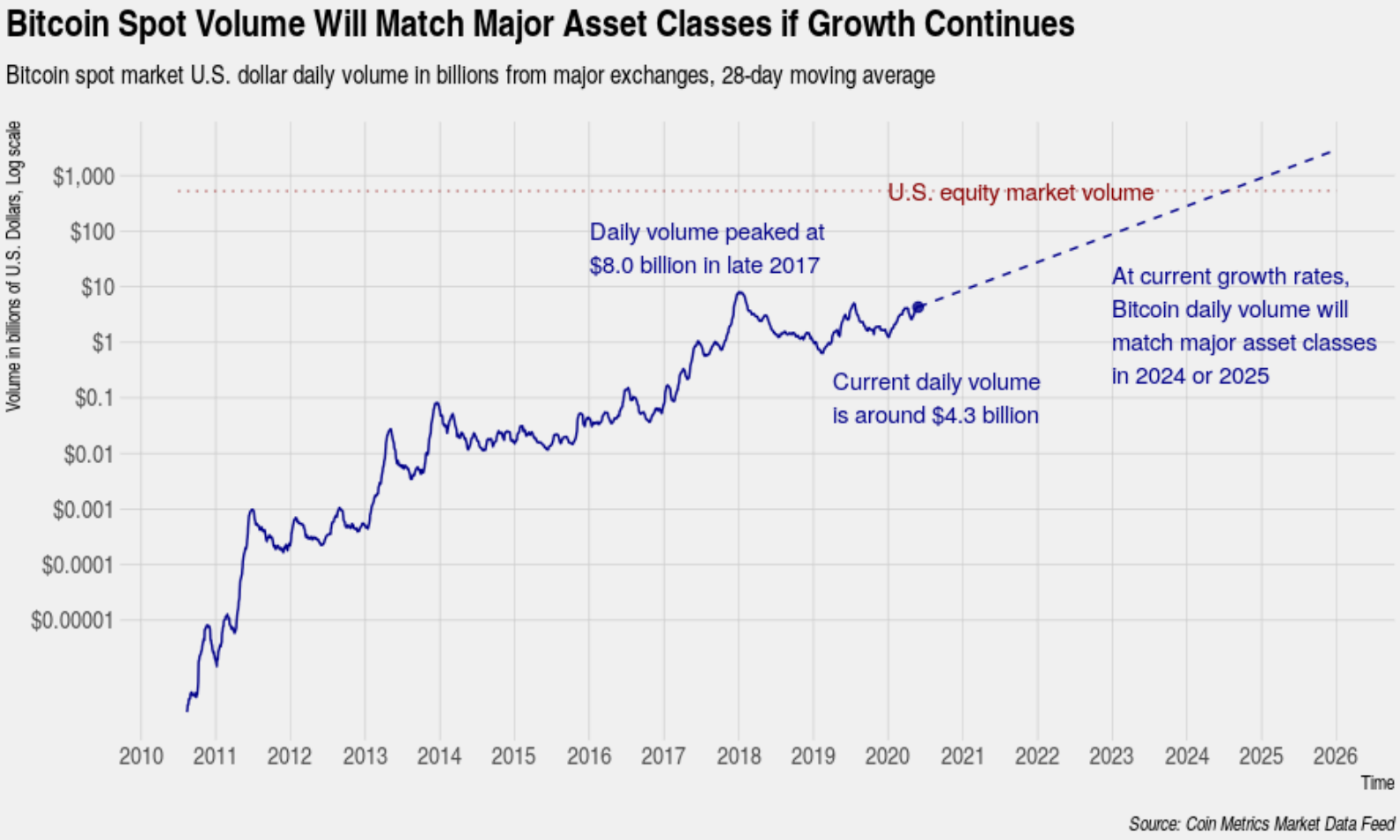


- Fed uses two measures of money supply: M1 & M2 (source: Fed Board of Governors)

What Is Cryptocurrency?

- Decentralized digital money designed to be used over internet, e.g. Bitcoin, Ethereum, Dogecoin
  - transfer value online without a bank/payment processor
  - managed by peer-to-peer networks of computers
  - secured by blockchain—constantly re-verified ledger of all transactions, distributed over network
- **Why is it the future of finance**
  - buy goods/services or invest
  - not manipulated by central authority
  - equal opportunity to anyone with internet access
- Easiest way to acquire cryptocurrency is to purchase via online exchange, e.g. Coinbase

Bitcoin Daily Volume



Demand for Money

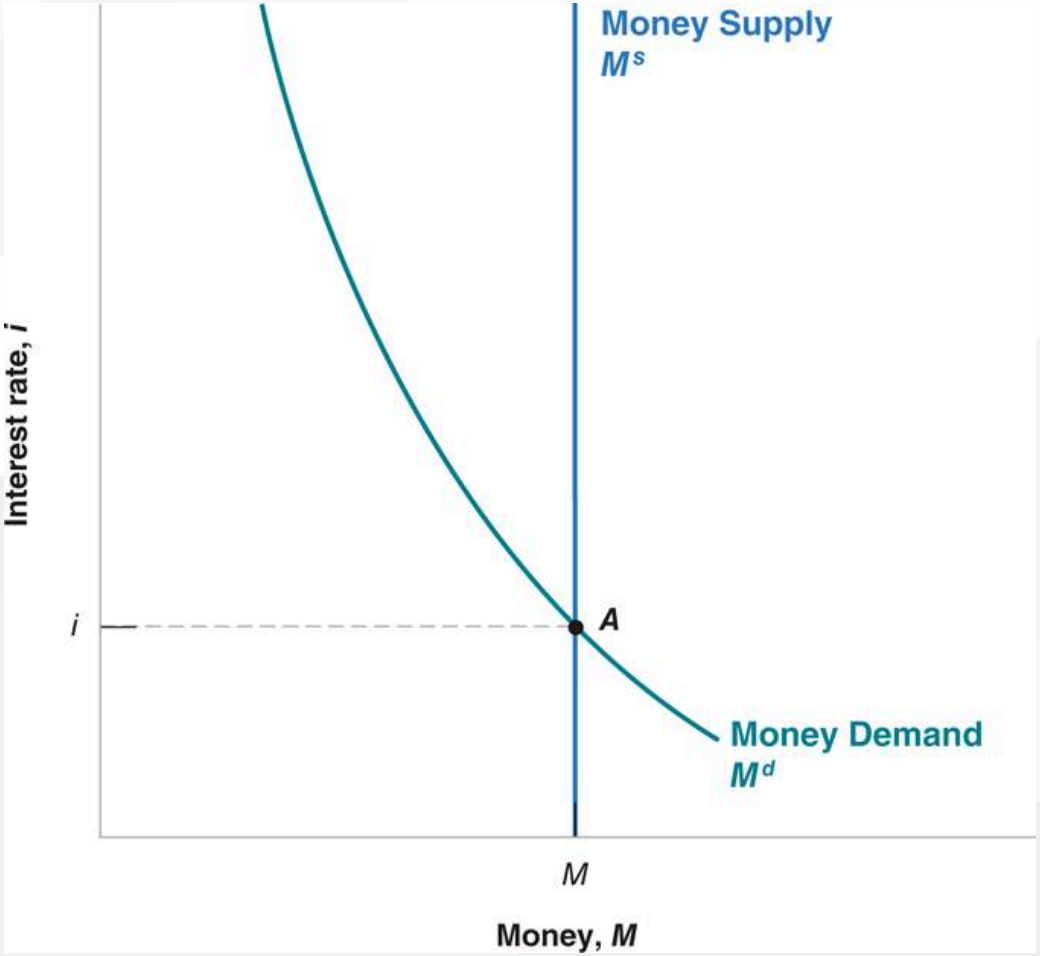
Money demand function

$$M^d = \$Y \times L(i)$$

- Money demand (M^d) depends on two main factors
  - level of transactions, assumed to be proportional to nominal GDP ($\$Y$)
  - nominal interest rate (i) on bonds, hence **opportunity cost/price of holding money**
- Relation b/w bond price ($\$P_B$) and bond yield ($i$): assume one-year bond, face value = $100

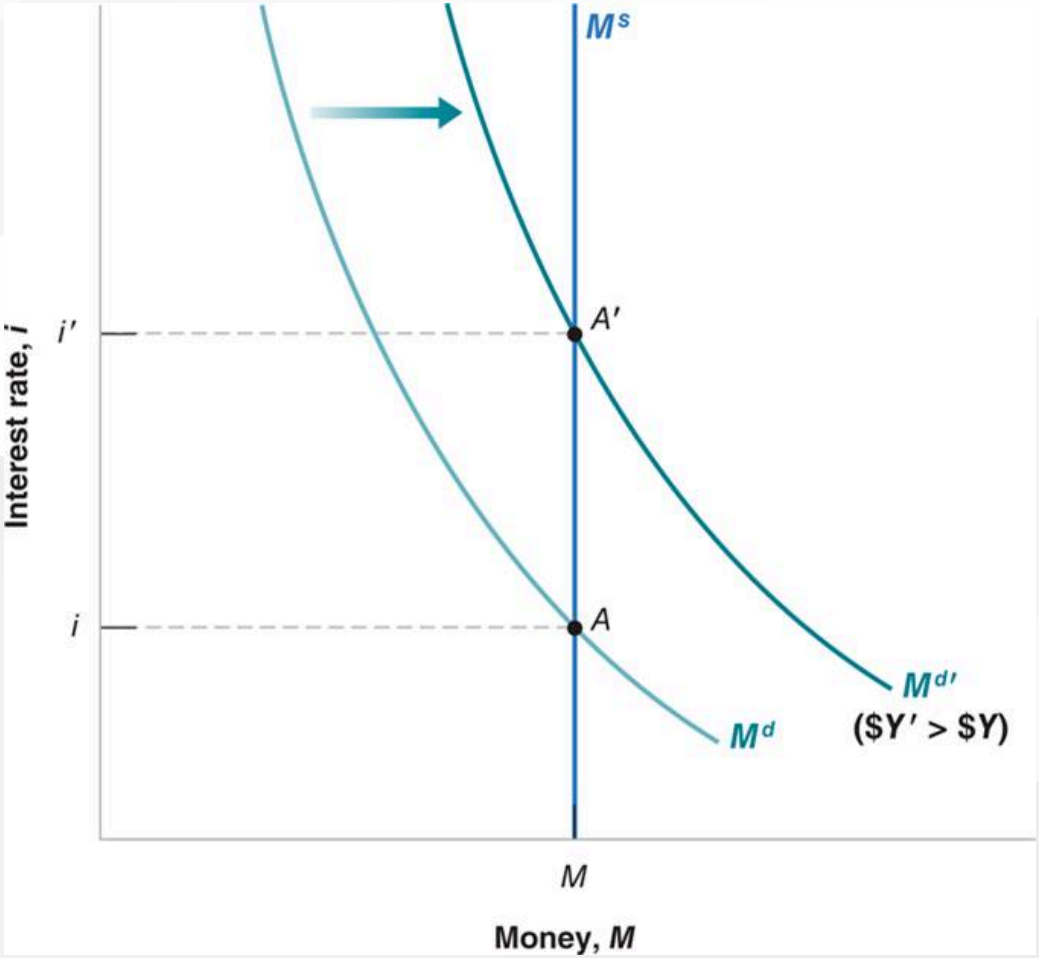
$$i = \frac{\$100 - \$P_B}{\$P_B} \times 100\% \quad \Rightarrow \quad \$P_B = \frac{\$100}{1+i}$$

Financial Market Equilibrium



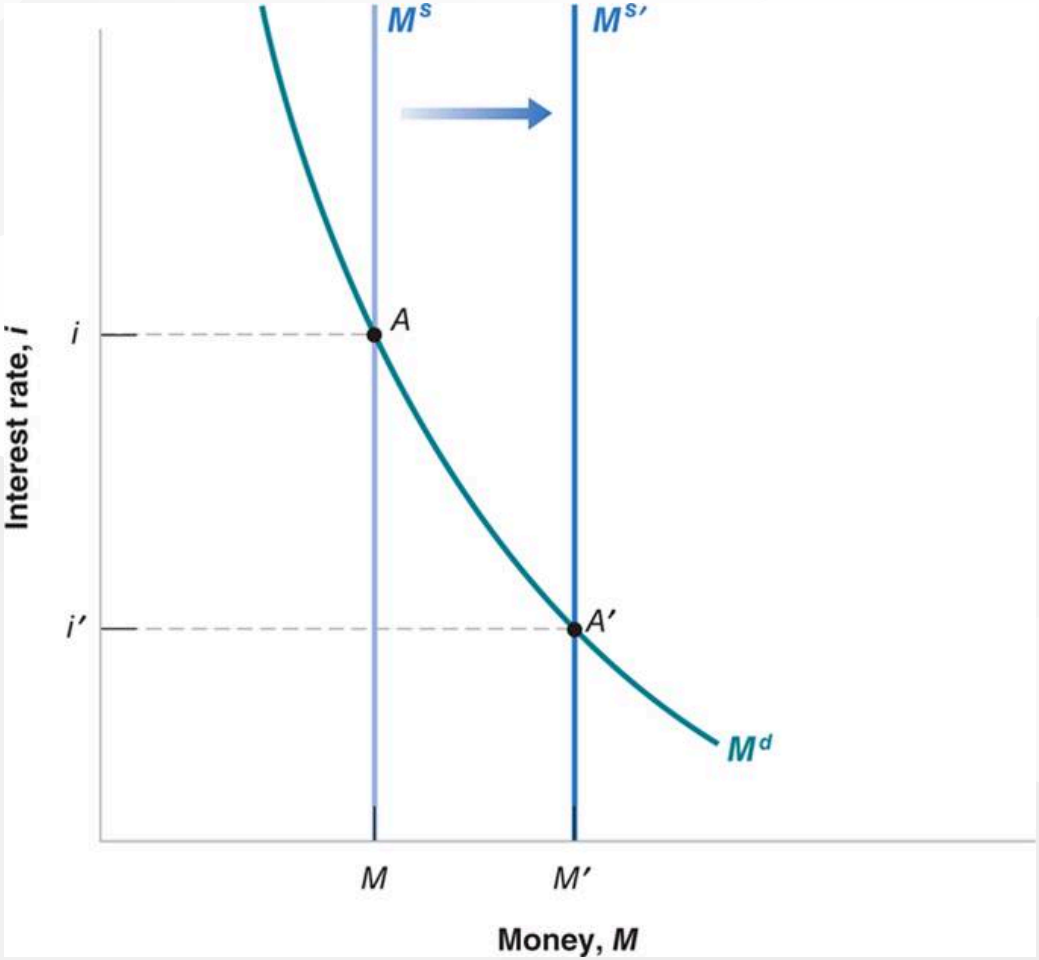
- Equilibrium requires money supply equal demand
- LM relation: $M^s = M^d$

Effects of Higher Income



- $\$Y \uparrow \Rightarrow M^d > M^s \Rightarrow i \uparrow$ to restore equilibrium

Effects of Higher Money Supply



- $M^s \uparrow \Rightarrow M^d < M^s \Rightarrow i \downarrow$ to restore equilibrium

Bank Balance Sheet

Assets = liabilities + net worth (capital/stockholder's equity)

Assets		Liabilities and Net Worth	
Reserves	$130	Deposits	$1000
Loans	$900	Long-term debt	$700
Securities	$700	Net worth	$30

- Examples of assets
  - reserves: bank deposits in vault and with Fed (required reserve ratio (RR), excess reserves)
  - loans to consumers and firms
- Examples of liabilities
  - deposits, e.g. checking/saving accounts
  - long-term debt, e.g. bonds

Example: Money Creation

Bank of America T-account

Assets		Liabilities	
Reserves	+$100	Deposits	+$1000
Loans	+$900		

- Tom deposits $1000 in currency at BoA
- with RR = 10%, BoA loans out $900 to Jerry

Chase T-account

Assets		Liabilities	
Reserves	+$90	Deposits	+$900
Loans	+$810		

- Jerry deposits $900 in currency at Chase
- with RR = 10%, Chase loans out $810 to Tom

Simple Deposit Multiplier

Bank	Change in deposits (D)
Bank of America	+$1,000
Chase	+$900 (=.9×$1,000)
Third Bank	+$810 (=.9×$900)
⋮	⋮

- Example: RR=10%, initially Tom deposits $1000
- Calculate deposit multiplier

$$\Delta D = \$1000 \times (1 + .9 + .9^2 + .9^3 + \cdots)$$

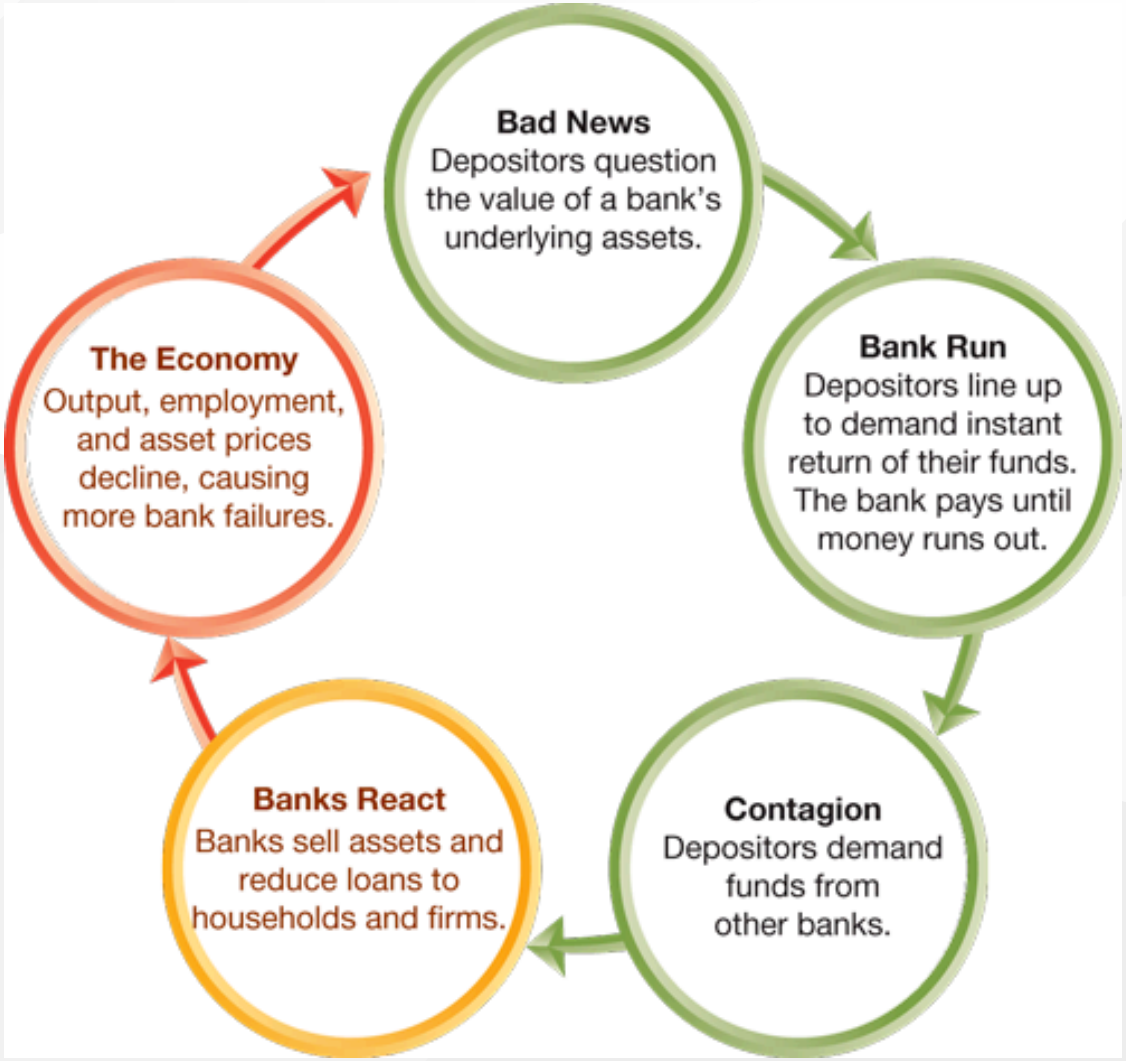
$$\Rightarrow \quad \text{multiplier} = \frac{1}{1 - .9} = \frac{1}{\text{RR}} = 10 \quad (\text{why?})$$

- Higher RR leads to lower multiplier

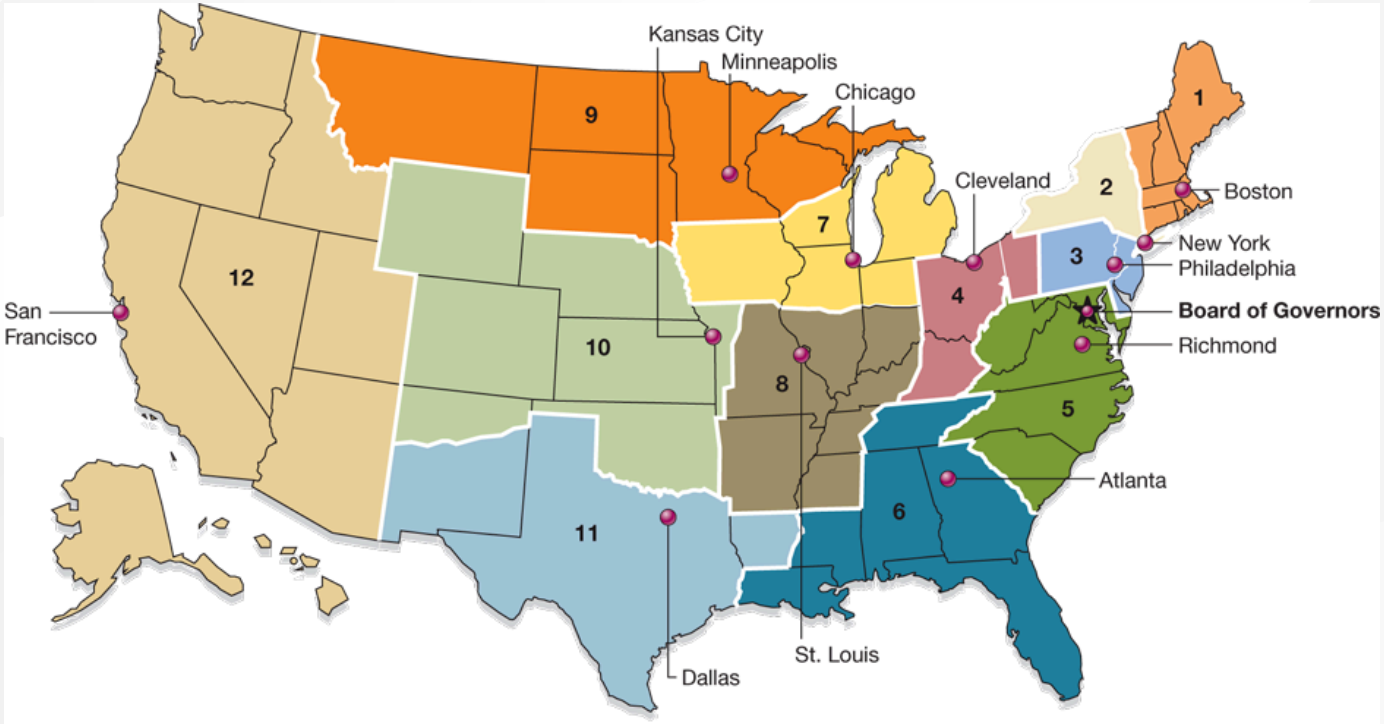
Federal Reserve System

- Fractional banking system: banks keep less than 100% of deposits as reserves, hence subject to
  - bank run: depositors simultaneously withdraw money
  - bank panic: banks simultaneously experience runs
- Example: Federal reserve system
  - began operation in 1914 as lender of last resort to prevent panics
  - central bank in U.S., bankers' bank
  - make discount loans to banks, charge discount rate
- Federal Deposit Insurance Corporation (FDIC) established in 1934 to insure deposits up to $250,000
- Fed's monetary policy tools, e.g. open market operations, discount policy, reserve requirements

Feedback Loop During Panic



Federal Reserve System (Cont'd)



Board of Governors
Responsible for overseeing the Federal Reserve System. Seven members are appointed by the president and serve 14-year, nonrenewable terms. One member is appointed chair and serves a 4-year, renewable term.

Federal Open Market Committee (FOMC)
Responsible for open market operations. Twelve members, consisting of the 7 members of the Board of Governors, the president of the Federal Reserve Bank of New York, and 4 presidents of the other 11 district banks, who serve rotating 1-year terms. The chair of the Board of Governors also serves as chair of the FOMC.

Example: Open Market Purchase

Banking system T-account

Assets		Liabilities	
Reserves	+$10 million		
Treasury bills	-$10 million		

- Federal Open Market Committee (FOMC) directs purchase of $10 million Treasury bills from banks
- reserves ↑ $\Rightarrow M^s \uparrow$ through deposit multiplier

Federal Reserve T-account

Assets		Liabilities	
Treasury bills	+$10 million	Reserves	+$10 million

- Fed deposits funds in reserve accounts for banks
- To decrease M^s, Fed conducts open market **sale**

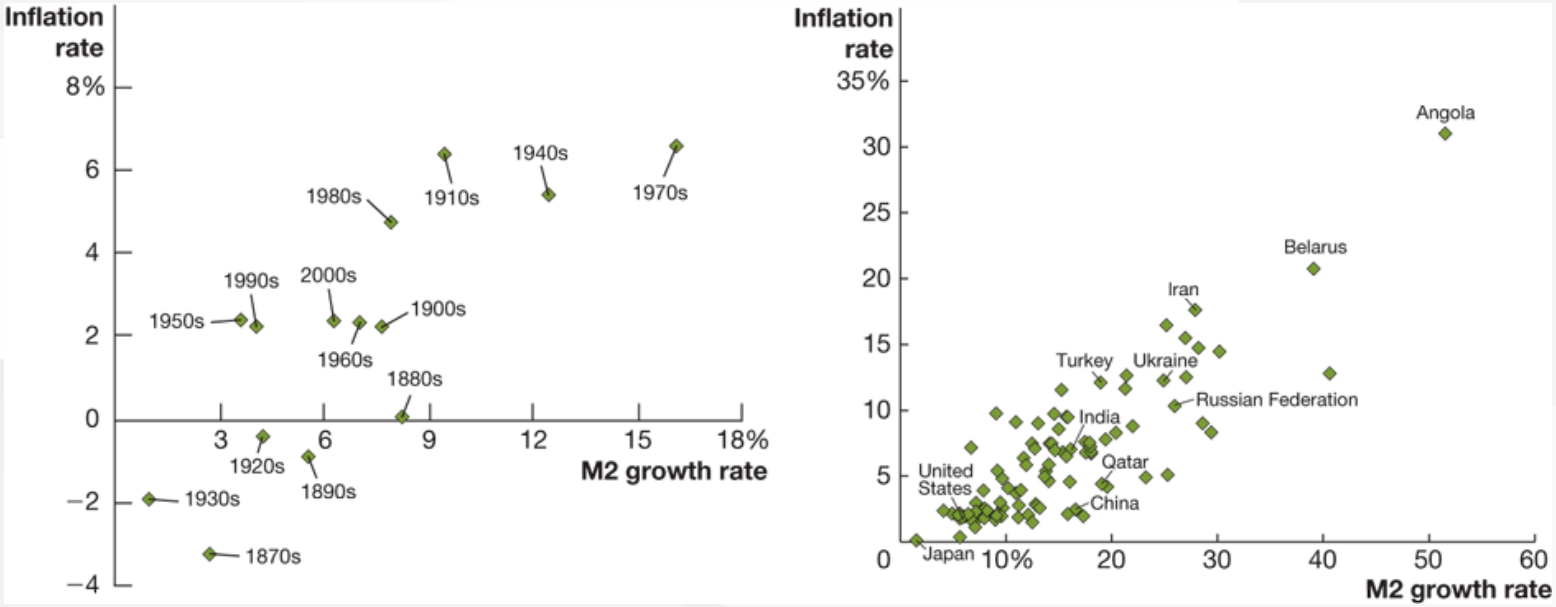
Connecting Money and Prices

Quantity equation

$$M \times V = P \times Y \quad \Rightarrow \quad g_M + g_V = g_P + g_Y$$

- Notations
  - g_X = growth rate of variable X
  - M = money supply, e.g. M1
  - V = velocity of money
  - P = price level, e.g. GDP deflator
  - Y = real output, e.g. real GDP
- Quantity theory of money
  - assume constant V, giving $\pi = g_M - g_Y$
  - inflation occurs whenever $g_M > g_Y$

Money Growth and Inflation



- (a) source: Friedman and Schwartz (1982), Fed Board, & BEA; Decades of higher money growth were often associated with higher inflation
- (b) source: IMF; Countries with higher money growth tend to have higher inflation

Readings & Exercises

- Readings
  - HO: chapter 14
  - BJ: lecture 3 (sec. 1, 2) (supplementary)
  - Bitcoin: A Peer-to-Peer Electronic Cash System
  - Ethereum Whitepaper
  - Tascha's A Crash Course on Crypto Economics in 1 Hour
- Exercises
  - HO: problem 3.10, 3.12, D14.1, D14.2