Econ 135: Week 1

Jeremy

Spring 2025

How many of you have heard the efficient market hypothesis?

Let us see how its creator interpret the meaning of EFFICIENCY
using an example of fund managers beating the market.
`https://www.youtube.com/watch?v=uIYzNxaMaX8&ab_`
`channel=DavidLin`

In his view, the market is already operating efficiently. Are there any benefits for further government's regulation and intervening financial market?

Nigeria Blocks Access To Coinbase, Binance and Kraken As Naira Falls To Record Lows

February 22, 2024 — 01:41 pm EST

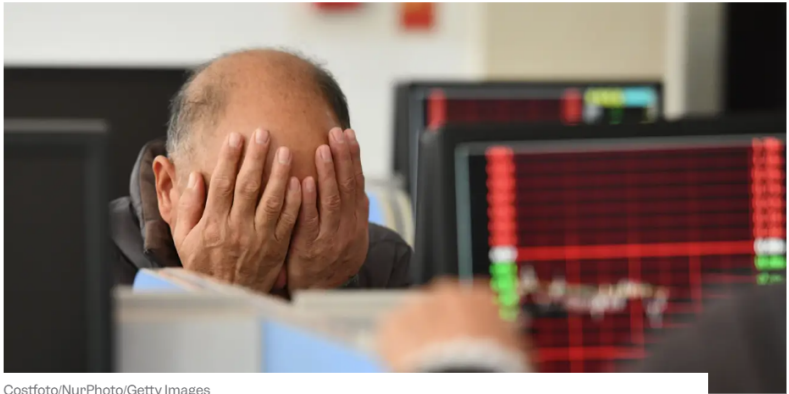Written by **Nik Hoffman** for **Bitcoin Magazine** →

Nigeria has taken drastic measures in to attempt to stabilize its plummeting national

China takes the biggest steps yet to prop up its flailing stock market

By **Yuheng Zhan**

Costfoto/NurPhoto/Getty Images

Feb 21, 2024, 8:27 AM PT

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- China's securities regulators are **prohibiting** major institutional investors from reducing equity holdings at the open and close during trading days

In the end, let us see Fama's unconventional view of monetary policy. But now, let us go over the PSET 1.

I. Financial Markets vs Financial Intermediaries

Explain the difference between financial markets and financial
intermediaries.

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Explain the difference between financial markets and financial intermediaries.

Financial markets allow direct borrowing and lending between savers and borrowers, usually via securities like stocks and bonds. **Financial intermediaries**, such as banks or mutual funds, indirectly connect savers and borrowers by accepting deposits and making loans or investments.

II. Security vs Bond

Discuss the differences between a security and a bond.
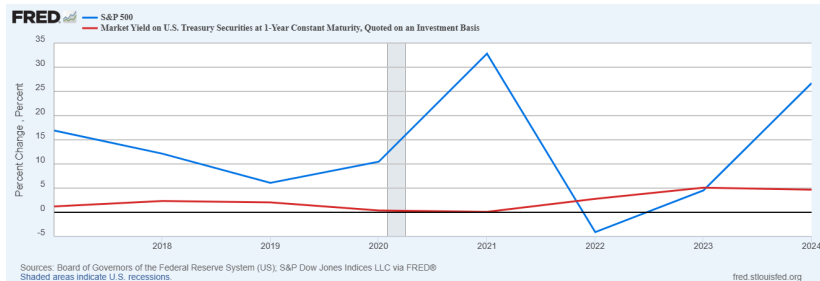
II. Security vs Bond

Discuss the differences between a security and a bond.

A **security** is a broad term for any tradable financial asset, such as stocks, bonds, or derivatives.

A **bond** is a specific type of security that represents a loan made by an investor to a borrower, typically with **fixed interest payments.**

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Discuss the differences between a security and a bond.

Source: FRED, Board of Governors of the Federal Reserve System; S&P
Dow Jones Indices

III. What is Collateral?

Explain what a collateral is and why it is connected to potential financial crises.

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Explain what a collateral is and why it is connected to potential financial crises.

Collateral is an asset pledged by a borrower to secure a loan. If the borrower defaults, the lender can seize the collateral. Collateral helps reduce risk for lenders. If collateral values fall, lending becomes riskier—this dynamic can amplify financial crises.

IV.A. Impact on Financial Intermediaries

Take the market for airplanes, where airlines use the airplanes they purchase as collateral for loans. A. (2 points) Suppose that an accident caused people to trust airplanes less. Discuss the potential changes to the behavior of financial intermediaries.

IV.A. Impact on Financial Intermediaries

Take the market for airplanes, where airlines use the airplanes they purchase as collateral for loans. A. (2 points) Suppose that an accident caused people to trust airplanes less. Discuss the potential changes to the behavior of financial intermediaries.

If people trust airplanes less due to an accident, airplane collateral value may fall.

Financial intermediaries may respond by tightening lending standards or increasing interest rates on airplane-backed loans.

IV.B. Impact on Borrowers

Considering the distrust in airplanes, explain how potential borrowers may change their behavior.

Due to decreased trust in airplanes, borrowers (airlines) may:

- ▶ Reduce borrowing due to higher costs.
- ▶ Seek alternative collateral or financing methods.
- ▶ Delay investment decisions.

V. Debt vs Equity Markets

Explain the differences between debt markets and equity markets.

Debt markets involve borrowing via instruments like bonds—repayment is fixed.

Equity markets involve ownership claims—investors receive dividends and share in profits.

VI. Benefits of Financial Intermediaries

Provide two benefits of financial intermediaries. Explain each one.

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Provide two benefits of financial intermediaries. Explain each one.

- ▶ **Risk Sharing**: Pool and diversify risk among savers.
- ▶ **Lower Transaction Costs**: Economies of scale reduce costs in matching savers and borrowers.

VII. Concerns about Financial Intermediaries

Two concerns:

- ▶ Potential for risk-taking and instability (e.g., bank runs).
- ▶ Lack of transparency in investment decisions.

VIII. Moral Hazard vs Adverse Selection

Explain the difference between moral hazard and adverse selection.

Moral hazard: Risk that borrowers engage in undesirable activities after receiving funds.

Adverse selection: Risk that borrowers most likely to default are the ones most eager to seek loans.

Econ 135: Week 02

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Spring 2025

Discounting

A given amount of money in the future is worth less than the same amount today. Why is this the case?

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Suppose you invest $100 in a bank account that pays interest of r = 7% a year.
In the first year you will earn interest of $.07 \times \$100 = \$7$ and the value of your investment will grow to $107 ($100 \times (1 + r) = 100 \times 1.07 = \$107$) **By investing, you give up the opportunity to spend $100 today, but you gain the chance to spend $107 next year.**

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In the end, illustrating discounting through a class activity: money machines and millionaires.

Example: What is the present value of $100 received one year from now if the interest rate is 5%?

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In the end, illustrating discounting through a class activity: money machines and millionaires.

Example: What is the present value of $100 received one year from now if the interest rate is 5%?

Answer:

$$PV = \frac{100}{1 + 0.05} = 95.24$$

Basic Bond Concepts

- **Coupon Rate:** Annual interest rate paid on a bond's face value
- **Coupon Payment Frequency:** How often the bond pays interest (e.g., annually, semiannually)
- **Principal (Face Value):** The amount repaid at maturity (e.g., $1,000)
- **Maturity Date:** The date when the bond's principal is repaid
- **Issue Date:** The date the bond was originally sold
- **Maturity:** Length of time until the maturity date

Perpetuity Example

A perpetuity is a bond that pays a fixed payment forever.

Example: What is the price of a perpetuity that pays \$100 each year if the interest rate is 5%?

Answer:

$$P = \frac{C}{i} = \frac{100}{0.05} = 2000$$

Deriving the Formula for a Perpetuity (not required!)

A perpetuity pays a constant payment C forever. Its present value is the sum of an infinite geometric series.

$$PV = \frac{C}{1+i} + \frac{C}{(1+i)^2} + \frac{C}{(1+i)^3} + \cdots$$

This is a geometric series with first term $a = \frac{C}{1+i}$ and ratio $r = \frac{1}{1+i}$.

$$PV = a \cdot \frac{1}{1-r} = \frac{C}{1+i} \cdot \frac{1}{1 - \frac{1}{1+i}} = \frac{C}{i}$$

Perpetuity Formula:

$$P = \frac{C}{i}$$

Yield to Maturity and Rate of Return

Yield to Maturity (YTM): Interest rate that equates present value of cash flows with bond price.

Rate of Return (RET): Total return including coupon payments and capital gain/loss.

Motivating Questions:

▶ Once U.S. government issues bonds, you and I can buy these bonds and sell them again before they mature in the secondary market. If you purchase such a bond for price P and hold this bond to maturity, how do you know your return?

▶ If you sell a bond before maturity, what is your return?

YTM Formula: (for a bond with face value F, coupon C, price P, and maturity n)

$$P = \left(\sum_{t=1}^{n} \frac{C}{(1+i)^t} \right) + \frac{F}{(1+i)^n}$$

Rate of Return Formula:

$$RET = \frac{C + (P_{t+1} - P_t)}{P_t}$$

Capital Gains and Current Yield

Current Yield: Measures the income portion of a bond's return.

$$\text{Current Yield} = \frac{\text{Coupon Payment}}{\text{Purchase Price}} = \frac{C}{P}$$

Capital Gain (or Loss): Reflects the change in the bond's price over time.

$$\text{Capital Gain} = P_{t+1} - P_t$$

Rate of Return (combines both):

$$\text{Return} = \frac{C + (P_{t+1} - P_t)}{P_t}$$

Example: Bought a bond for \$950, received \$40 coupon, sold at \$970.

$$\text{Return} = \frac{40 + (970 - 950)}{950} = \frac{60}{950} \approx 6.32\%$$

Discount Bond Example

Discount Bond: A bond sold below face value with no coupon payments.

Example: A one-year discount bond is bought for $950 and repays $1,000 in one year.

YTM Formula:

$$i = \frac{F - P}{P} = \frac{1000 - 950}{950} = 0.0526 = 5.26\%$$

Deriving the Formula for a One-Year Discount Bond

A one-year discount bond makes no coupon payments and repays face value F at maturity. If the current price is P, then:

$$P = \frac{F}{1 + i}$$

Solving for the yield to maturity i:

$$1 + i = \frac{F}{P} \quad \Rightarrow \quad i = \frac{F - P}{P}$$

YTM Example from a Three-Year Bond

Given: You bought a bond for $965, 3 years to maturity, annual coupons at 4.2%, face value $1,000.
Coupon Payment:

YTM Example from a Three-Year Bond

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Coupon Payment: $1,000 \times 4.2\% = \$42$

YTM Formula:

YTM Example from a Three-Year Bond

Given: You bought a bond for $965, 3 years to maturity, annual coupons at 4.2%, face value $1,000.

Coupon Payment: $1,000 \times 4.2\% = \$42$

YTM Formula:

$$965 = \frac{42}{(1+i)} + \frac{42}{(1+i)^2} + \frac{1042}{(1+i)^3}$$

Solve for i numerically.

YTM Example from a Three-Year Bond

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Coupon Payment: $1,000 \times 4.2\% = \$42$

YTM Formula:

$$965 = \frac{42}{(1+i)} + \frac{42}{(1+i)^2} + \frac{1042}{(1+i)^3}$$

Solve for i *numerically.*

Current Yield:

$$\frac{\$42}{\$965}$$

Read the info of 10 year US Note issued in April 2025, is the price of this bond greater or smaller than $100?

| Bills | CMBs | Notes | Bonds | TIPS | FRNs |

Security Term	CUSIP	Reopening	Issue Date	Maturity Date	High Yield	Interest Rate
10-Year	91282CMM0	Yes	04/15/2025	02/15/2035	4.435%	4.625%
3-Year	91282CMW8	No	04/15/2025	04/15/2028	3.784%	3.750%
7-Year	91282CMT5	No	03/31/2025	03/31/2032	4.233%	4.125%
5-Year	91282CMU2	No	03/31/2025	03/31/2030	4.100%	4.000%
2-Year	91282CMV0	No	03/31/2025	03/31/2027	3.984%	3.875%
10-Year	91282CMM0	Yes	03/17/2025	02/15/2035	4.310%	4.625%
3-Year	91282CMS7	No	03/17/2025	03/15/2028	3.908%	3.875%
7-Year	91282CMR9	No	02/28/2025	02/29/2032	4.194%	4.125%

https://treasurydirect.gov/auctions/
announcements-data-results/

Latest Rates

10-Year Notes

4.625%

Issued 04/15/2025. Price per $100: 101.490492. CUSIP 91282CMM0.

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https://treasurydirect.gov/marketable-securities/
treasury-notes/
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Class Activity: Arbitrage with different rates

Given:

- One-year loan/saving interest rate: $r_1 = 20\%$, so $\frac{1}{1.20} = 0.833$
- Two-year loan/saving interest rate: $r_2 = 7\%$, so $\frac{1}{1.07^2} = 0.873$

Question: Can you identify the arbitrage?

Strategy:

- Borrows the PV of \$1,000 over 2 years: $\frac{1000}{(1.07)^2} = 873$
    - that is borrows 873 through a two-year loan program and prepay 1000 in two years
- Saving in a 1-year program of \$873 and put the interest again in this program next year.
    - earning $873 * (1 + 20\%)^2 = 1257.12$ in two years
- profit in two years!

What happens if she borrows millions instead?
Activity: Work in pairs-why do you think "future money worth less than today" does not happen in reality?

wealth effect: due to lowered interest rate on impact of higher money supply, HH become less wealthy– shift bond D downwards– Price of bond falls– i rises price level/inflation effect: M*V=P*Y when money supply rises, price level/inflation rises

Econ 135: Week 03

Jeremy

Spring 2025

Deriving the Formula for a One-Year Discount Bond

A one-year discount bond makes no coupon payments and repays face value F at maturity. If the current price is P, then:

$$P = \frac{F}{1+i}$$

Solving for the yield to maturity i:

$$1 + i = \frac{F}{P} \quad \Rightarrow \quad i = \frac{F - P}{P}$$

Problem I: Discount Bond Interest Rates

Suppose that a one-year discount bond with a face value of $100 can be purchased for $92.59.

A. Determine the nominal interest rate on the bond.

$$i = \frac{100 - 92.59}{92.59} = \frac{7.41}{92.59} \approx 0.08 = 8\%$$

B. Calculate the real interest rate on this bond if the expected inflation rate is 3 percent.

$$r = i - \pi^e = 8\% - 3\% = 5\%$$

Problem II: Present Value and Yield to Maturity

Suppose that the interest rate is 5%.

A. Determine the present value of a security that pays you $1,050 next year and $1,102.50 two years from now.

$$PV = \frac{1050}{(1+0.05)} + \frac{1102.5}{(1+0.05)^2} = \frac{1050}{1.05} + \frac{1102.5}{1.1025} = 1000 + 1000 = 2000$$

B. If this security sold for $2,200, is the yield to maturity greater or less than 5%? Why?

▶ The present value at a 5% interest rate is $2,000.

▶ The market price is higher ($2,200), so the interest rate must be **lower**.

▶ **Conclusion:** Yield to maturity is **less than 5%**. (negative relationship between YTM and Price).

Factors Affecting Bond and Money Markets

Factor	Bond Demand	Bond Supply	Money Demand
Increase in Wealth/Income	↑		↑
Increase in Expected Bond Returns	↑		
Increase in Expected Inflation	↓	↑	
Increase in Bond Risk	↓		
Increase in Bond Liquidity	↑		
Increase in Expected Profitability of Investment		↑	
Increase in Government Budget Deficit		↑	
Increase in Price Level			↑

Problem IV-A: Bond Market Stronger Economy

Suppose that the economic forecasts project a stronger economy.

A. Use the supply and demand model for the market for bonds to show the shifts.

Both supply and demand for bonds increase.

Problem V-A: Liquidity Preference Model Decline in Income

Suppose that income has declined in the economy.
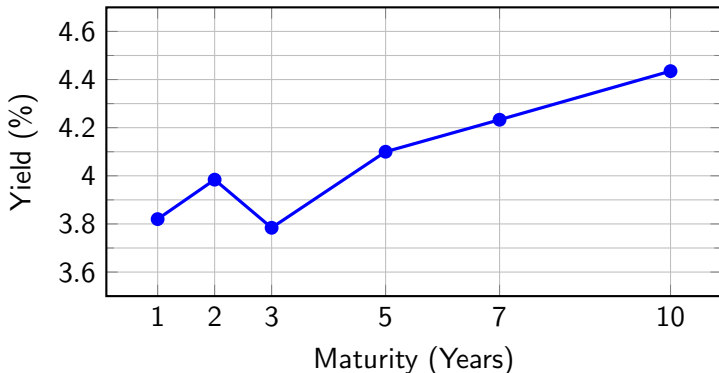**A.** Use the Liquidity Preference Model to show the shifts in the money market.
A decrease in income reduces money demand, lowering the equilibrium interest rate.

| | Bills | CMBs | **Notes** | Bonds | TIPS | FRNs |

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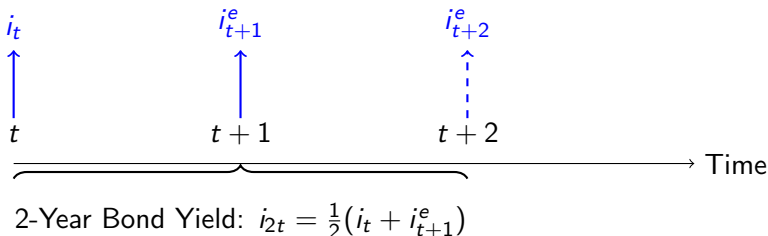
U.S. Treasury Yield Curve

Yields by Maturity (April 2025)

The yield curve is slightly upward-sloping with a dip at the 3-year point.

Expectations Theory of the Term Structure

Concept: The interest rate on a long-term bond is the average of current and expected future short-term interest rates.

2-Year Bond Yield: $i_{2t} = \frac{1}{2}(i_t + i_{t+1}^e)$

i_{t+1}^e: the expected return of an one-period bond purchased at the beginning of $t+1$ and matured at the end of $t+1$.

i_{2t}: the return (i.e. yield) of a two-period bond purchased at the beginning of t and matured at the end of $t+2$.

Liquidity Premium Theory

Formula (expectations theory + liquidity premium):

$$i_{nt} = l_{nt} + \frac{1}{n}\sum_{t=1}^{n}(i_t^e)$$

Problem VI-A: Calculating Liquidity Premiums

Expected returns on one-year bonds (next 6 years):

Exp. $i_1 = 4\%$, 4.5%, 5%, 5.5%, 6%, 6.5%

Observed yields:

$$i_2 = 4.75\%$$
$$i_3 = 5.5\%$$
$$i_4 = 6.25\%$$

Problem VI-A: Calculating Liquidity Premiums

Expected returns on one-year bonds (next 6 years):

$$\text{Exp. } i_1 = 4\%,\ 4.5\%,\ 5\%,\ 5.5\%,\ 6\%,\ 6.5\%$$

Observed yields:

$$i_2 = 4.75\%$$
$$i_3 = 5.5\%$$
$$i_4 = 6.25\%$$

Liquidity Premium:

$$4.75 = l_2 + \frac{4 + 4.5}{2} \rightarrow 4.75 - 4.25$$
$$5.5 = l_3 + \frac{4 + 4.5 + 5}{3} \rightarrow 5.5 - 4.5$$

Problem VI-B: Yield Curve

Observed Yields by Maturity
The yield curve is upward-sloping, reflecting rising expected rates and positive liquidity premiums.

Problem VI-C: Updated Long-Term Interest Rates

New expected one-year returns: 0%, 0.5%, 1%, 1.5%, 2%, 2.5%

$$i_2 = \frac{0 + 0.5}{2} + 0.50 = 0.25 + 0.50 = 0.75\%$$

$$i_3 = \frac{0 + 0.5 + 1}{3} + 1.00 = 0.5 + 1.00 = 1.50\%$$

$$i_4 = \frac{0 + 0.5 + 1 + 1.5}{4} + 1.50 = 0.75 + 1.50 = 2.25\%$$

$$i_5 = \frac{0 + 0.5 + 1 + 1.5 + 2}{5} + 2.00 = 1.0 + 2.00 = 3.00\%$$

$$i_6 = \frac{0 + 0.5 + 1 + 1.5 + 2 + 2.5}{6} + 2.50 = 1.25 + 2.50 = 3.75\%$$

Problem VI-D: New Yield Curve

Yields with revised expectations

The yield curve shifts down due to lower expected short-term rates.

Econ 135: Week 05

Jeremy

Spring 2025

Initial Bank Balance Sheet

Assets	Liabilities and Capital
Reserves: $20	Deposits: $90
Loans: $60	Borrowings: $20
Securities: $40	Bank Capital: $10

Total Assets = Total Liabilities + Capital = $120

Question: Suppose that Jennifer opens a checking account with a $100 bill. Show how the balance sheet changes?

- ▶ Jennifer opens a checking account with a $100 bill.
- ▶ Reserves increase by $100.
- ▶ Deposits increase by $100.
- ▶ The increase in the bank's reserves equal to the increase in checkable deposits.

Assets	Liabilities and Capital
Reserves: $120	Deposits: $190
Loans: $60	Borrowings: $20
Securities: $40	Bank Capital: $10

Required and Excess Reserves

Assets	Liabilities and Capital
Reserves: $120	Deposits: $190
Loans: $60	Borrowings: $20
Securities: $40	Bank Capital: $10

Question: The bank is obliged to keep a certain fraction of its checkable deposits as required reserves. If the fraction (the required reserve ratio) is 10%, calculate the amount of excess reserves (reserves-required reserves).

Required and Excess Reserves

Assets	Liabilities and Capital
Reserves: $120	Deposits: $190
Loans: $60	Borrowings: $20
Securities: $40	Bank Capital: $10

Question: The bank is obliged to keep a certain fraction of its checkable deposits as required reserves. If the fraction (the required reserve ratio) is 10%, calculate the amount of excess reserves (reserves-required reserves).

▶ Required reserve ratio $= 10\%$

▶ Required reserves $= 10\%$ of $190 = \$19$

▶ Excess reserves $=$ Total reserves - Required reserves $= \$120 - \$19 = \$\mathbf{101}$

Bank Makes Loans with Excess Reserves

Assets	Liabilities and Capital
Reserves: $120	Deposits: $190
Loans: $60	Borrowings: $20
Securities: $40	Bank Capital: $10

Question: The bank chooses not to hold any excess reserves but to make loans instead. Show the new balance sheet.

Bank Makes Loans with Excess Reserves

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Reserves: $120	Deposits: $190
Loans: $60	Borrowings: $20
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Question: The bank chooses not to hold any excess reserves but to make loans instead. Show the new balance sheet.

- ▶ Bank makes new loans worth $101.
- ▶ Reserves decrease to $19, the required amount.

Assets	Liabilities and Capital
Reserves: $19	Deposits: $190
Loans: $161	Borrowings: $20
Securities: $40	Bank Capital: $10

Liquidity Management

We discussed liquidity management, asset management, liability management, capital adequacy management. Let us examine an example of liquidity management.

Assets	Liabilities and Capital
Reserves: $9	Deposits: $90
Loans: $71	Borrowings: $20
Securities: $40	Bank Capital: $10

Question: If someone withdraws $30 from the bank. The liquidity requirement is 10%. The bank does not have enough reserves. Explain the change in the balance sheet in each of these 4 cases.

- ▶ borrowing from other banks or corporations
- ▶ selling securities
- ▶ borrowing from the Fed (aka discount loans and interest rate is discount rate)
- ▶ calling in or selling off loans

Strategy 1: Borrowing from Banks/Corporations

- Deposits: $90 - 30 = 60$, and reserves is $9 - 30 = -21$ right after the deposit outflows.
- The required reserves are $60 * 10\% = 6$
- Borrow $27
- Reserves restored to 6$
- Borrowings increase from $20 to $47

Strategy 2: Selling Securities

▶ Deposits: $90 - 30 = 60$, and reserves is $9 - 30 = -21$ right after the deposit outflows.
▶ The required reserves are $60 * 10\% = 6$
▶ Sell $27 worth of securities.
▶ Reserves increase to $6
▶ Securities decrease from $40 to $13.

Strategy 3: Borrowing from the Fed

- Borrow $27 from the Federal Reserve (discount loan).
- Reserves increase to $6

Strategy 4: Call in/Sell Off Loans

- Call in or sell $27 worth of loans.

Capital Management and Interest Rate Sensitivity

Banks have to make decisions about the amount of capital they need to hold for three reasons.

1. Bank capital helps prevent bank failure, a situation in which the bank cannot satisfy its obligations to pay its depositors and other creditors and so goes out of business.
2. The amount of capital held affects returns for the owners (equity holders) of the bank.
3. A minimum amount of bank capital (bank capital requirements) is required by regulatory authorities.

Initial Balance Sheet with Interest Rate Sensitivity:

Assets	Liabilities and Capital
Rate-sensitive Loans: $30	Rate-sensitive Deposits: $70
Fixed-rate Loans: $30	Fixed-rate Borrowings: $20
Securities: $30	Bank Capital: $10
Reserves: $10	

Bad Loans Written Off

Suppose the bank finds that $20 of its loans have become worthless. When these bad loans are written off (valued at zero), the balance sheet becomes:

Assets	Liabilities and Capital
Rate-sensitive Loans: $20	Rate-sensitive Deposits: $70
Fixed-rate Loans: $20	Fixed-rate Borrowings: $20
Securities: $30	Bank Capital: $-10
Reserves: $10	

Bank capital becomes negative, which means the bank is insolvent.

Return on Assets vs. Return on Equity

Definitions:

▶ Return on Assets (ROA) $= \frac{\text{net profit after taxes}}{\text{Total Assets}}$

▶ Return on Equity (ROE) $= \frac{\text{net profit after taxes}}{\text{Equity Capital}}$

Relationship:

$$ROE = ROA \times \frac{Assets}{Equity\ Capital}$$

Note: Given a fixed ROA, the lower the equity capital, the higher the ROE. Do banks have incentives to increase or decrease capital to max. the profitability?

Return on Assets vs. Return on Equity

Definitions:

▶ Return on Assets (ROA) = $\frac{\text{net profit after taxes}}{\text{Total Assets}}$

▶ Return on Equity (ROE) = $\frac{\text{net profit after taxes}}{\text{Equity Capital}}$

Relationship:

$$ROE = ROA \times \frac{Assets}{Equity\ Capital}$$

Note: Given a fixed ROA, the lower the equity capital, the higher the ROE. Do banks have incentives to increase or decrease capital to max. the profitability?

Banks have incentives to minimize capital, but also increases risk.

Effect of Expansionary Monetary Policy on Bank Profitability

Question: The interest rates are lowered by 1%. What happens to this bank's profitability?

Assets	Liabilities and Capital
Rate-sensitive Loans: $30	Rate-sensitive Deposits: $70
Fixed-rate Loans: $30	Fixed-rate Borrowings: $20
Securities: $30	Bank Capital: $10
Reserves: $10	

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Gap Analysis:

▶ Gap analysis: the amount of rate-sensitive assets − rate sensitive liabilities

▶ Rate-sensitive assets: $30

▶ Rate-sensitive liabilities: $70

▶ Gap = $30 - $70 = -**$40**

▶ If a bank has more rate-sensitive liabilities than assets, a rise in interest rates will reduce bank profits, and a decline in interest rates will raise bank profits

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Reserves: $10	

Gap Analysis:

- ▶ Gap analysis: the amount of rate-sensitive assets − rate sensitive liabilities
- ▶ Rate-sensitive assets: $30
- ▶ Rate-sensitive liabilities: $70
- ▶ Gap = $30 - $70 = **-$40**
- ▶ If a bank has more rate-sensitive liabilities than assets, a rise in interest rates will reduce bank profits, and a decline in interest rates will raise bank profits
- ▶ **Profitability increases. (GAP $\times \Delta i$)**

Econ 135: Week 06

Jeremy

Spring 2025

Stages of Financial Crisis

- ▶ Imagine a person inherits a family business during the height of the financial crisis.
- ▶ The business has $2 million in revenue from importing household goods from Asia, processing, and selling them in the U.S.
- ▶ The economic environment is rapidly changing.
- ▶ **How does macroeconomic policy during a crisis affect this business?**
- ▶ Let us critically analyze the process of crisis through the lens of this business owner.

Reading the Economy

- ▶ The owner checks the unemployment report:
  - ▶ Despite bank failures, unemployment hasn't declined much.
- ▶ Inflation report shows 0.5% – well below the Fed's 2% target.
- ▶ The owner wonders: **What stage of the crisis are we in? Will the crisis be over soon?**

Initial Stage: Credit Boom Story

- **Credit Boom:** lenders may not have the expertise, or the incentives, to manage risk appropriately in these new lines of business $\rightarrow$ overly risky lending.

- **Unexpected loss**: losses on loans begin to mount$\rightarrow$ the value of the loans falls relative to liabilities$\rightarrow$ bank equity falls$\rightarrow$ with less capital, banks cut back on their lending (aka deleveraging).

- **Deposit outflows**: with less capital, banking business becomes risky$\rightarrow$ savers withdraw funds$\rightarrow$ banks profitability fall$\rightarrow$ even riskier

Asset Price Example: Gamestop

The GameStop pop

A campaign by users on a Reddit message board led to wild price swings in the heavily shorted shares of GameStop Corp. in recent days
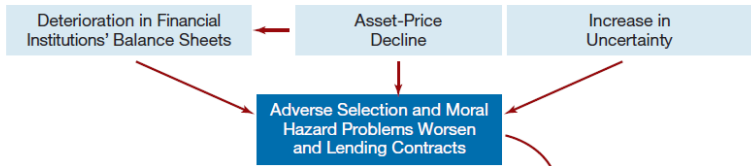
Source: MarketWatch

Initial Stage: Asset-Price Boom Story

- **Boom:** Asset prices$>>$ fundamental value (e.g., Dotcom, Gamestop).
- **Bust:** Net worth and collateral fall $\rightarrow$ firms see less at stake if the business fails$\rightarrow$ likelihood of risky investments rises because as they have less to lose$\rightarrow$ banks tighten lending (the problem of moral hazard)$\rightarrow$ firms less investment and profitability

Initial Stage: Uncertainty Story

- High uncertainty $\rightarrow$ difficult to get reliable information.
- Financial frictions increase.
- Lending and economic activity fall.

STAGE ONE Initial Phase

Deterioration in Financial Institutions' Balance Sheets	Asset-Price Decline	Increase in Uncertainty

Adverse Selection and Moral Hazard Problems Worsen and Lending Contracts
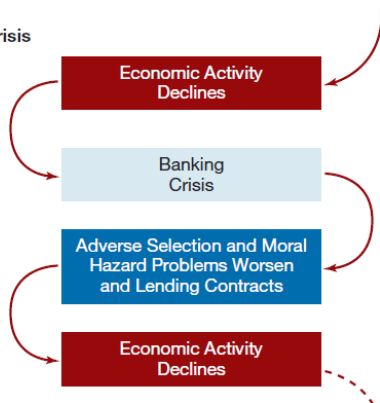
Second Stage: Banking Crisis

- ▶ Widespread bank failures.
- ▶ Credit markets freeze.

STAGE TWO Banking Crisis

Third Stage: Debt Deflation

debt deflation occurs when a substantial unanticipated decline in the price level sets in, leading to a further deterioration in firms' net worth because of the increased burden of indebtedness.

Owner's Concern: Is It Debt Deflation?

- ▶ Owner thinks it's still the initial stage.
- ▶ He is worried about debt deflation.
- ▶ He says: *"I pay $10,000 in nominal terms yearly, so my debt burden shouldn't change."*
- ▶ He asks for your help in evaluating this.

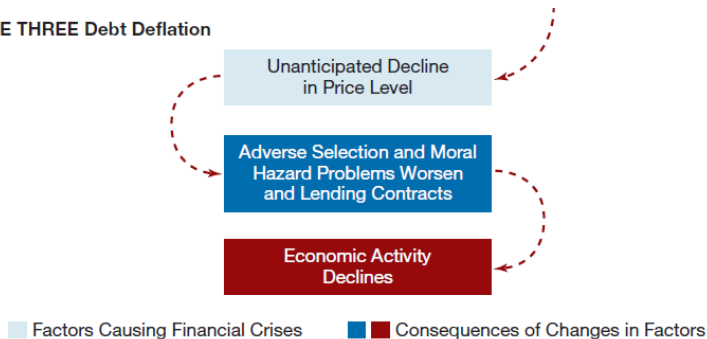## Why the Owner's Logic is Flawed

- As the price level falls → **real interest rate rises**.
- Price level drop doesn't change the real value of assets (e.g., machinery).
- But the **real burden of liabilities rises** → net worth in real terms falls.
- This increases **adverse selection and moral hazard**.
- Lenders pull back → lending and economic activity decline.

Stage three

- Substantial, unexpected price level decline.
- Real debt burden rises.
- Firms' net worth deteriorates $\rightarrow$ reduced investment and spending.

STAGE THREE Debt Deflation

Unanticipated Decline in Price Level

Adverse Selection and Moral Hazard Problems Worsen and Lending Contracts

Economic Activity Declines

Factors Causing Financial Crises   Consequences of Changes in Factors

Example of debt deflation

Suppose you are a farmer borrowing $1 from a bank to purchase an apple at the price of $1 and use its seeds to grow 1 apple tree. Each apple tree produces 10 apples.
You need to pay back $1.2 to the bank.

▶ Without debt deflation, the price of each of your 10 apples is still $1 and total worth in nominal terms of your apple is $10.

▶ With debt deflation, the price of each apple becomes $0.5 and the total value of your apples is $5.

▶ Debt burden in nominal terms is total liabilities over total nominal value of assets, that is 1.2/5 during debt deflation and 1.2/10 without debt deflation.

▶ the debt burden in nominal terms rises in debt deflation because the value in nominal term of assets falls

Debt deflation in real terms

- ▶ We can also describe the debt deflation in real terms.
- ▶ With and without debt deflation, you always get 10 apples so your **assets in real term** do not change
- ▶ To pay \$1.2 prior to debt deflation, you sell $1.2/1 = 1.2$ apples to pay; with debt deflation, you use $1.2/0.5 = 2.4$ apples.
- ▶ Let us calculate the debt burden in real terms. No debt deflation: $1.2/10 = 0.12$. With debt deflation, the debt burden in real term is $2.4/10 = 0.24$
- ▶ So the liabilities in real term rise!

Econ 135: Week 07

Jeremy

Spring 2025

Exam Prep Strategy

Material	Reviewed	Questions/challenges
Pset3 Q1		
Pset3 Q2		
Pset3 Q3		
Pset3 Q4		
Pset3 Q5		
Pset3 Q6		
Pset4 Q1		
Pset4 Q2		
Pset4 Q3		
Pset4 Q4		
Pset4 Q5		
Pset4 Q6		
Pset4 Q7		
Practice MT2		
Slide Chp8		
Slide Chp9		
Slide Chp10		
Slide Chp11		
Slide Chp12		
Slide Chp13		

U.S. Financial System and the Fed

- ▶ **Why is Jerome Powell, current Chairman of the Fed, arguably the most powerful man in the world?**
  - ▶ Controls U.S. monetary policy, influencing global interest rates, capital flows, and inflation expectations.
- ▶ **How does the Fed function?**
  - ▶ Through its tools, structure, and dual mandate: price stability and maximum employment.
- ▶ **Why has regulation of the U.S. financial system experienced tight–loose cycles?**
- ▶ **Watch:**
  `https://www.youtube.com/watch?v=M7nj2X-yl_U`

Paired Activity: The Fed

- **What are the four tools of monetary policy?**
- **Complete the following for each tool:** BOG sets 1)__and 2)__and determines 3)__; FOME controls __

Paired Activity: The Fed

- **What are the four tools of monetary policy?**
- **Complete the following for each tool:** BOG sets 1)__and 2)__and determines 3)__; FOME controls __
- Tools are
    - Interest paid on reserves
    - Open market operations
    - Discount rates
    - Reserve requirements
- Responsibility
    - **BOG** sets interest on reserves and reserve requirements; determines discount rate
    - **FOMC** controls open market operations
    - **FRBs** administer and make discount loans to banks in their districts

Class Debate: Should the Fed Be Independent?

With your partner, one supports and the other is against Fed's independent. Explain your argument to each other

Class Debate: Should the Fed Be Independent?

Arguments For:

1. **Political pressures create an inflationary bias to monetary policy**
   - a politically insulated Fed is more likely to be concerned with long-run objectives and thus more likely to maintain a stable price level.

2. **Avoid political business cycle**—just before an election, expansionary policies are pursued to lower unemployment and interest rates. After the election, the bad effects of these policies—high inflation and high interest rates—come home to roost, requiring contraction policies

Class Debate: Should the Fed Be Independent?

Arguments For:

1. Fed can be used to facilitate Treasury financing of large budget deficits by its purchases of Treasury bonds-¿ more inflation in the economy. **An independent Fed resists** this **pressure from the Treasury**.

2. Both the Federal Reserve and politicians are agents of the public (the principals), and both politicians and the Fed have incentives to act in their own interest rather than in the interest of the public. **The principal–agent problem is worse for politicians than for the Fed** because politicians have fewer incentives to act in the public interest.

Class Debate: Should the Fed Be Independent?

Arguments Against:

1. Undemocratic to have monetary policy (which affects almost everyone in the economy) controlled by an elite group responsible to no one.

   ▶ May be lack of accountability of the Federal Reserve. If the Fed performs badly, no provision is in place for replacing members (as there is with politicians).

   ▶ The public holds the president and Congress responsible, yet it lacks control over the Fed.

Class Debate: Should the Fed Be Independent?

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   ▶ The public holds the president and Congress responsible, yet it lacks control over the Fed.

2. Historically an independent Fed has not always used its freedom successfully

   ▶ The Fed failed in its stated role as lender of last resort during the Great Depression

   ▶ Pursued overly expansionary monetary policy in 1960s and 70s and high inflation thereafter

Class Debate: Should the Fed Be Independent?

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3. Others: policy too self-interest rather than in the public interest, such as coordinate with the fiscal policy.

Econ 135: Week 09

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Spring 2025

Roadmap: How the Central Bank Controls the Money Supply

Central Bank Actions (OMOs, Discount Rate)

$\Downarrow$

Monetary Base (MB = C + R)

$\Downarrow$

Impact on Individual Bank Reserves and Deposits

$\Downarrow$

Deposit Creation Process

$$\Delta D = \frac{1}{rr} \times \Delta R$$

$\Downarrow$

Total Deposits in the System Increase

$\Downarrow$

Money Supply $\quad (M = C + D)$

Banking System Balance Sheet

Banking System Balance Sheet:

Assets	Liabilities
Securities: 95	Deposits: 100
Reserves held at the Fed: 5	Loans from the Fed: 5
Reserves as vault Cash: 5	

Question:
If households hold $15 in currency and the Fed owns $20 in
securities, what does the central bank's balance sheet look like?

Central Bank (Fed) Balance Sheet

Federal Reserve Balance Sheet:

Assets	Liabilities
Securities: 20	Currency in Circulation (C): 15
Loans to Banks: 5	Reserves (R): 10
	(includes vault cash and reserves at Fed)

Controlling the Monetary Base

Monetary Base: $MB = C + R$

▶ **Tools the Fed uses to control MB:**

1. Open Market Operations (buying/selling securities)
2. Discount Rate (influences bank borrowing and hence loans to banks)

Question 1:
The Fed conducts an **open market purchase of $10** from banks. Show the balance sheet of the Fed and the bank.

Question 2:
In our example, banks borrow very little from the Fed, does this mean the Fed has more control over the monetary base?

Central Bank (Fed) Balance Sheet after open market purchases

Federal Reserve Balance Sheet:

Assets	Liabilities
Securities: 30	Currency in Circulation (C): 15
Loans to Banks: 5	Reserves (R): 20
	(includes vault cash and reserves at Fed)

Banking System Balance Sheet:

Assets	Liabilities
Securities: 85	Deposits: 100
Reserves: 20	Loans from the Fed: 5

Breakdown of the Monetary Base

Two Components of the Monetary Base:

- ▶ **Nonborrowed Monetary Base:** Created via open market operations

$$MB_{nb} = MB - \text{Borrowed Reserves}$$

- ▶ **Borrowed Reserves:** Created through loans to banks from the Fed

Implication of large MB_{nb}: Greater reliance on open market operations = greater Fed control over MB.

Effect of Deposit Shift on Balance Sheets

Initial Monetary Base: $\quad MB = C + R = 35$

Question:
Households shift $5 from bank deposits to currency holdings. How does the increase in currency affect the balance sheet of the bank and monetary base?

Effect of Deposit Shift on Balance Sheets

Initial Monetary Base: $\quad MB = C + R = 35$

Scenario:
Households shift \$5 from bank deposits to currency holdings.

New Balance Sheets (after the shift):
Banking System Balance Sheet:

Assets	Liabilities
Securities: 85	Deposits: 95
Reserves: 15	Loans from the Fed: 5

Does the Monetary Base Change?

$$MB = C + R = (15 + 5) + (20 - 5) = 20 + 15 = 35$$

Answer: No, the monetary base remains unchanged.

Deposit Creation Process

Process of Deposit Expansion:

- ▶ Open market purchase increases reserves.
- ▶ Banks lend out excess reserves.
- ▶ Borrowers deposit money in other banks.
- ▶ Those banks lend again, creating a multiplier effect.

$$\Delta D = \frac{1}{rr} \times \Delta R$$

Where:

- ▶ ΔD: Total change in deposits
- ▶ rr: Required reserve ratio
- ▶ ΔR: Initial change in reserves

Factors Influencing the Monetary Supply

- Money supply M is **defined** as M=C+D
- Its relationship to MB: $M = m \times MB$
  - $m = \frac{1+c}{rr+e+c}$

Complete the following table:

Increase in...	Monetary Supply
Non-borrowed MB	
Borrowed Reserves	
Required Reserve Ratio	
Excess Reserves	
Currency Holding	

Factors Influencing the Monetary Supply

- Money supply M is **defined** as M=C+D
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Complete the following table:

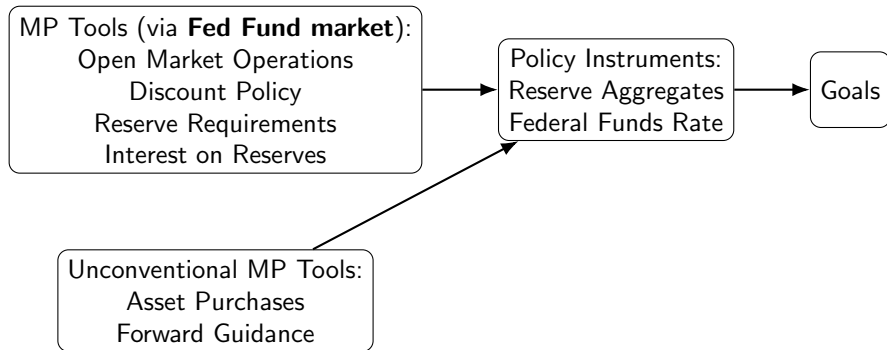| Increase in...	Monetary Supply
Non-borrowed MB	↑
Borrowed Reserves	↑
Required Reserve Ratio	↓
Excess Reserves	↓
Currency Holding	↓

Currency holding

1.
   - ▶ checkable deposits undergo multiple expansion, whereas currency does not.
   - ▶ when checkable deposits are converted into currency, as long as the amount of excess reserves are held constant, a switch is made from a component of the money supply that undergoes multiple expansion to one that does not. The overall level of multiple expansion declines, and the money supply falls.

2. Alternatively
   - ▶ $m = \frac{1+c}{rr+e+c} = \frac{rr+e+c+(1-rr-e)}{rr+e+c} = 1 + \frac{1-rr-e}{rr+e+c}$
   - ▶ previous reasoning is based on small excess reserves $(rr + e < 1)$

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Spring 2025

Overview of MP

Market for Reserves (i.e. Fed Fund market): Definitions and Description

Definitions

- ▶ Federal Funds Rate (FFR): Rate on loans from one bank to another
- ▶ Discount Rate: Rate on loans from the Fed
- ▶ Borrowed Reserves: Reserves borrowed from the Fed
- ▶ Nonborrowed Reserves: Reserves from Fed's open market operations
- ▶ Interest on Reserves (OR): Interest paid by the Fed on reserves

Market for Reserves

- ▶ Commercial banks must meet reserve requirements daily and can hold excess reserves
- ▶ Banks needing more reserves borrow from other banks or the Fed
- ▶ Banks with excess reserves lend to profit
- ▶ **FFR (i_{ff} cannot fall below i_{or} (banks would not lend below interests on reserves)**

Supply and Demand in the Federal Funds Market

In pairs, draw a graph for the supply and demand for reserves in the fed fund market. Explain to each other:

- ▶ why are there flat regions in supply and demand curves?
- ▶ why is the supply vertical before turning horizontal?
- ▶ where do I label the discount rate and interest rate on reserves?

Understanding Demand and Supply

Demand for Total Reserves

- ▶ As FFR falls, demand for reserves increases
- ▶ FFR will not fall below Interest on Reserves (IR)

Supply for Total Reserves

- ▶ If borrowing from other banks is cheaper than the discount rate, banks don't borrow from the Fed (borrowed reserves = 0)
- ▶ Reserves are entirely nonborrowed and depend on open market operations
- ▶ FFR cannot exceed the discount rate—banks would just borrow from the Fed

Effects of Monetary Policy Tools

Fill out this table. Note:

▶ Since there are flat regions of the Supply and Demand curves, up or left shifts are not the same

▶ You can choose the curve shifting up/down/left/down

Tools	Having direct impact on
Open Market Sale	non-borrowed reserves ↓
Rising Discount Rate	
Required Reserve Ratio Falls	
Falling Interest on Reserves	

Effects of Monetary Policy Tools

Fill out this table. Note:

▶ Since there are flat regions of the Supply and Demand curves, up or left shifts are not the same

▶ You can choose the curve shifting up/down/left/down

Tools	Having direct impact on
Open Market Sale	non-borrowed reserves ↓
Rising Discount Rate	$i_d \downarrow$
Required Reserve Ratio Falls	Reserve demand ↓
Falling Interest on Reserves	$i_{or} \downarrow$

Effects of Monetary Policy Tools

Fill out this table. Note:

- ▶ Since there are flat regions of the Supply and Demand curves, up or left shifts are not the same
- ▶ You can choose the curve shifting up/down/left/down

Tools	D Shift	S Shift	Equil. FFR	Equil. Reserves
Open Market Sale				
Rising Discount Rate				
Required Reserve Ratio Falls				
Falling Interest on Reserves				

Effects of Monetary Policy Tools

Tools	D Shift	S Shift	Equil. FFR	Equil. Reserves
Open Market Sale	-	Left	$\uparrow$ or at i_{or}	$\downarrow$
Discount Rate $\uparrow$	-	Up	Same or $\uparrow$ at new i_d	same or $\downarrow$
Required Reserve Ratio $\downarrow$	Left	-	Same or $\downarrow$	same
Interest on Reserves $\downarrow$	Down	-	Same or $\downarrow$ at new i_{or}	Same