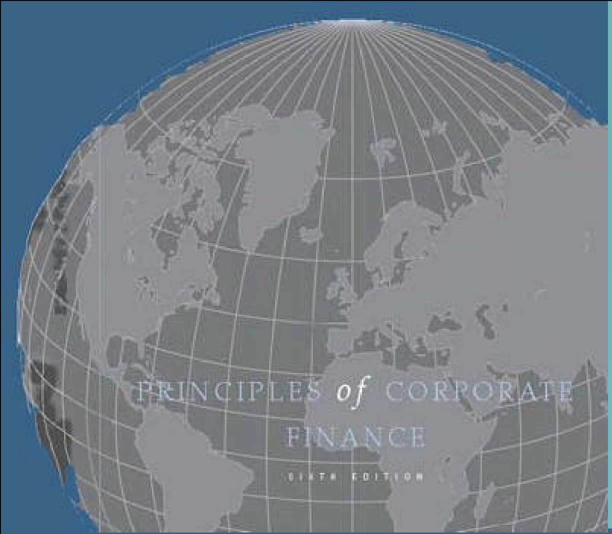


Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

Finance and the Financial Manager

Chapter 1

Topics Covered

- What Is A Corporation?
- The Role of The Financial Manager
- Who Is The Financial Manager?
- Separation of Ownership and Management
- Financial Markets

Corporate Structure

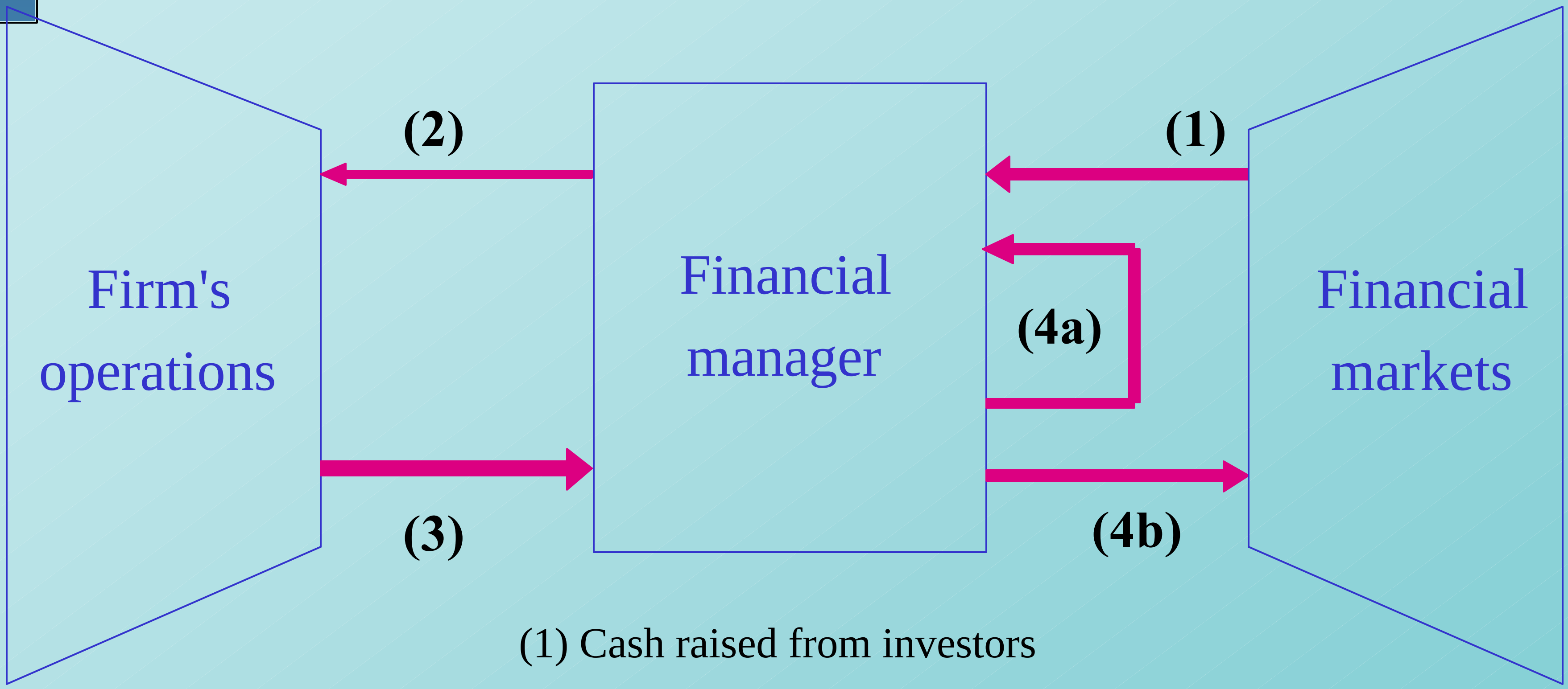
Sole Proprietorships → Unlimited Liability; Personal tax on profits

Partnerships → Unlimited Liability; Personal tax on profits

Corporations → Limited Liability; Corporate tax on profits + Personal tax on dividends

Form	Liability and tax
Sole Proprietorships	Unlimited Liability Personal tax on profits
Partnerships	Unlimited Liability Personal tax on profits
Corporations	Limited Liability Corporate tax on profits + Personal tax on dividends

Role of The Financial Manager



(1) Cash raised from investors

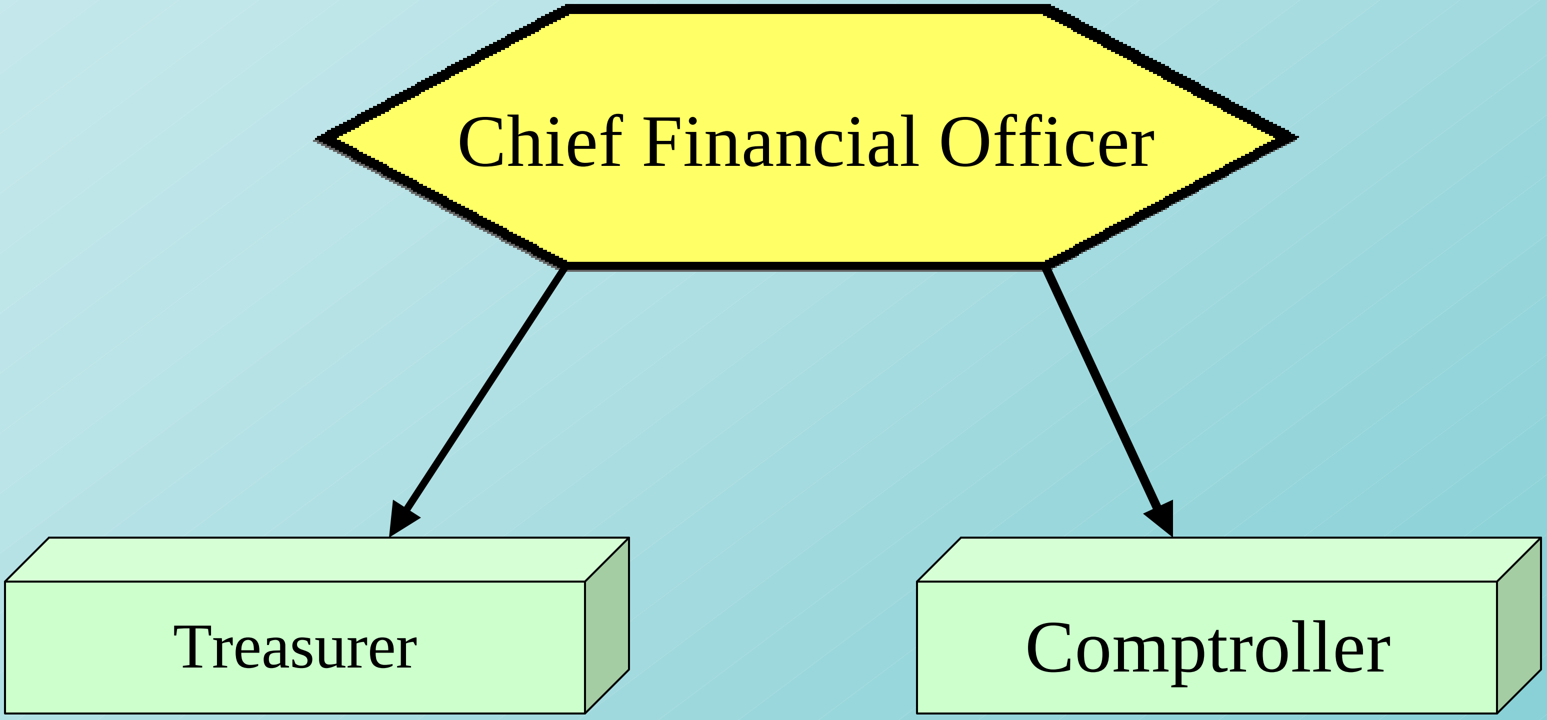
(2) Cash invested in firm

(3) Cash generated by operations

(4a) Cash reinvested

(4b) Cash returned to investors

Who is The Financial Manager?



Ownership vs. Management

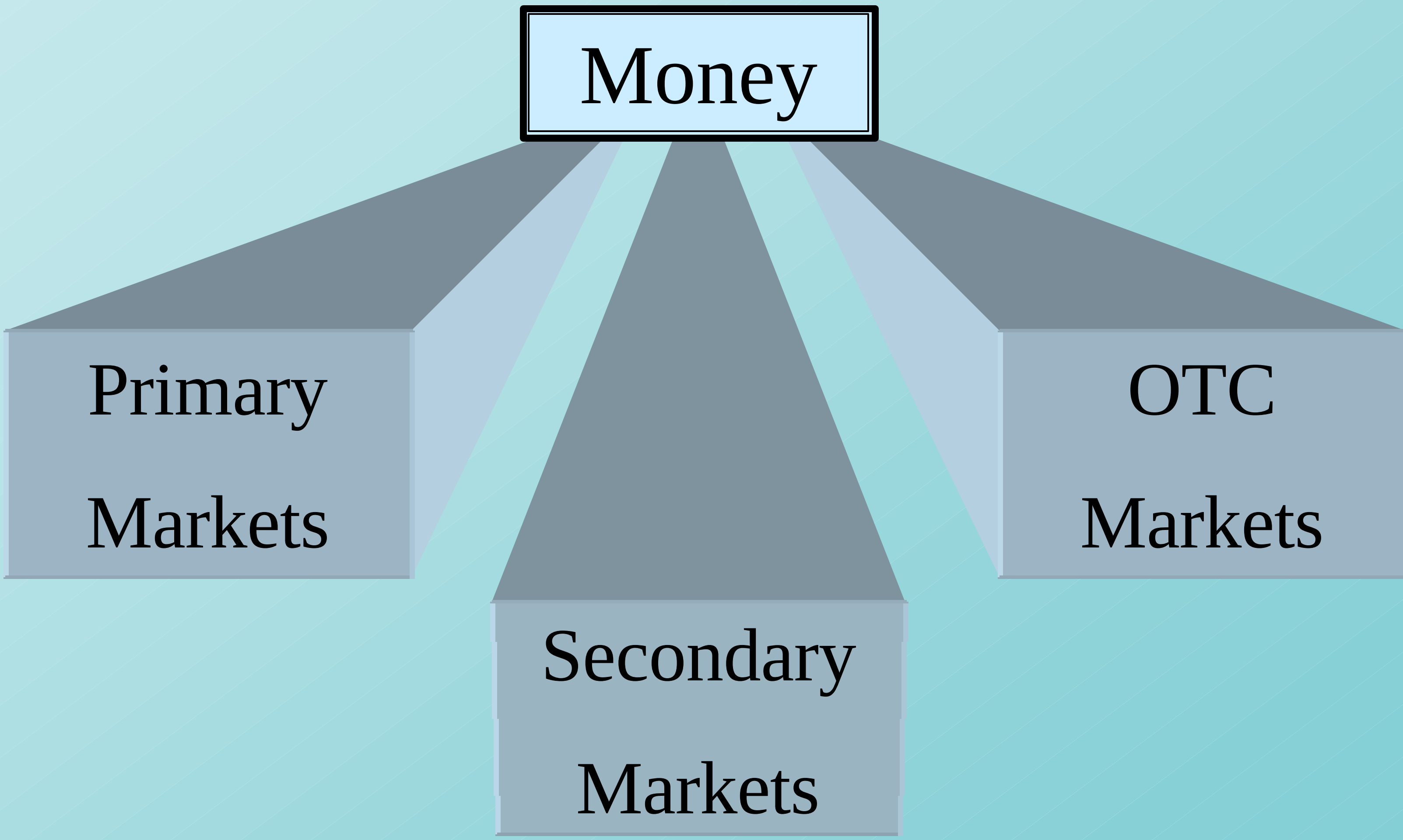
Difference in Information

- Stock prices and returns
- Issues of shares and other securities
- Dividends
- Financing

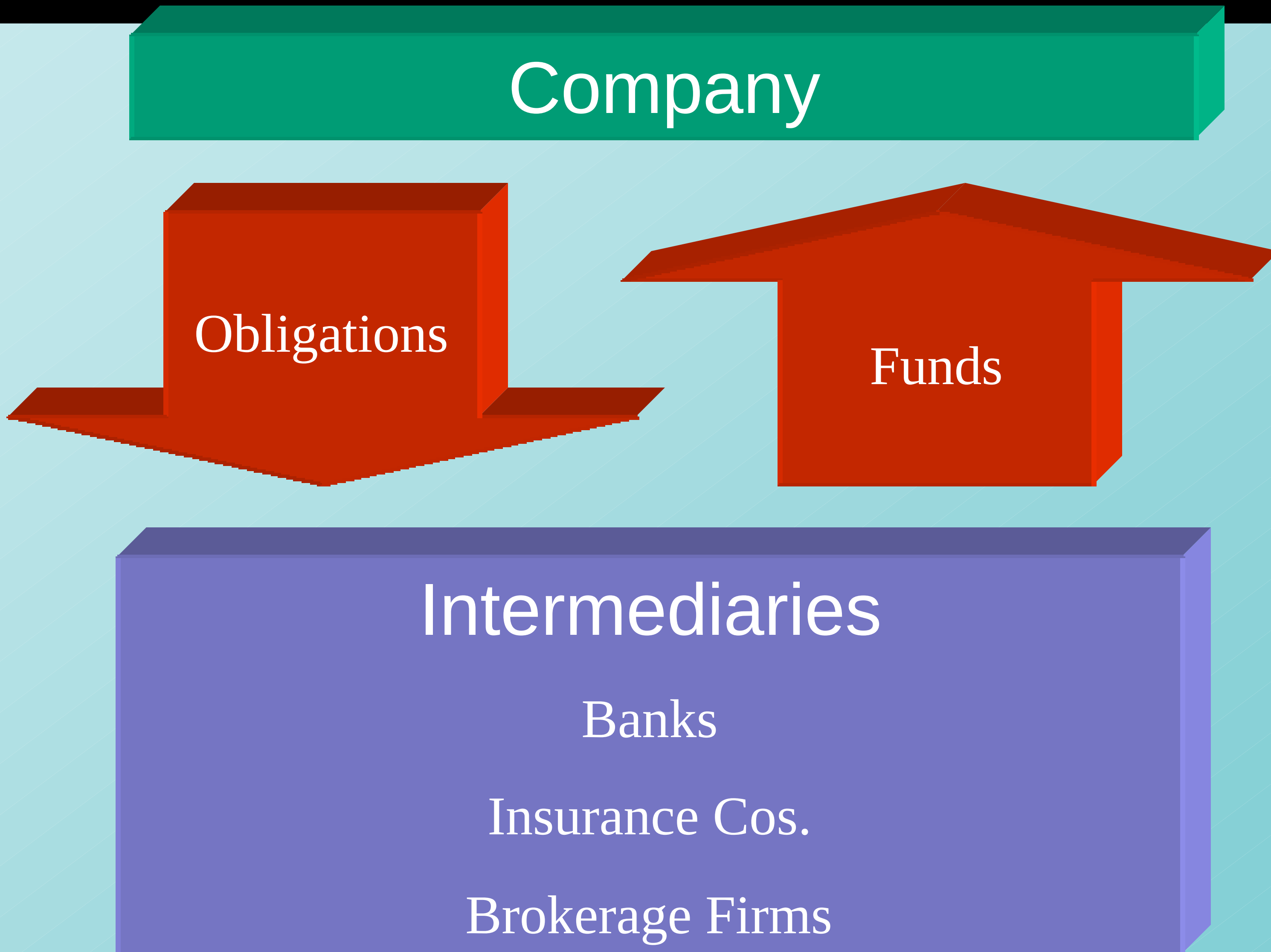
Different Objectives

- Managers vs. stockholders
- Top mgmt vs. operating mgmt
- Stockholders vs. banks and lenders

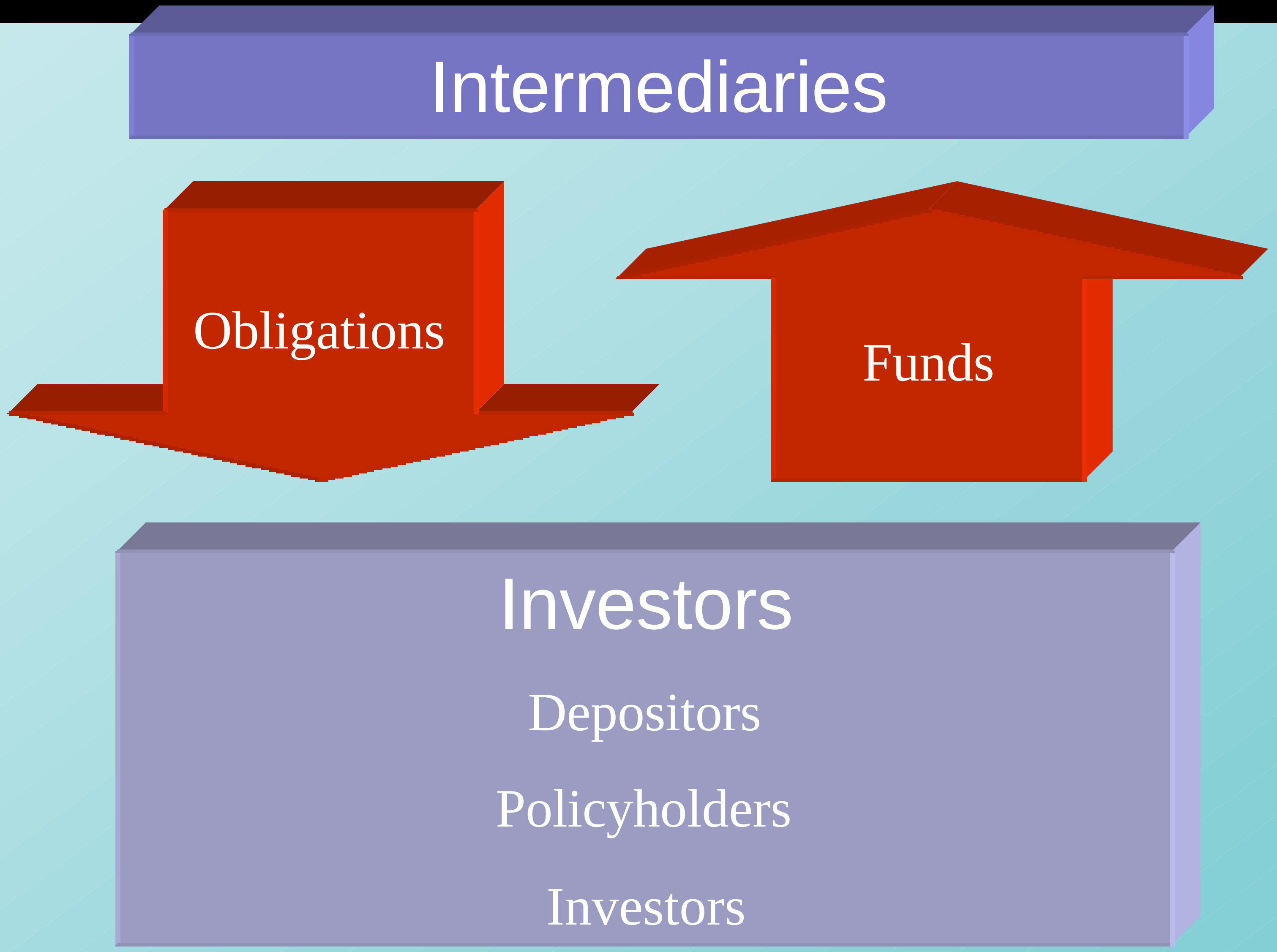
Financial Markets

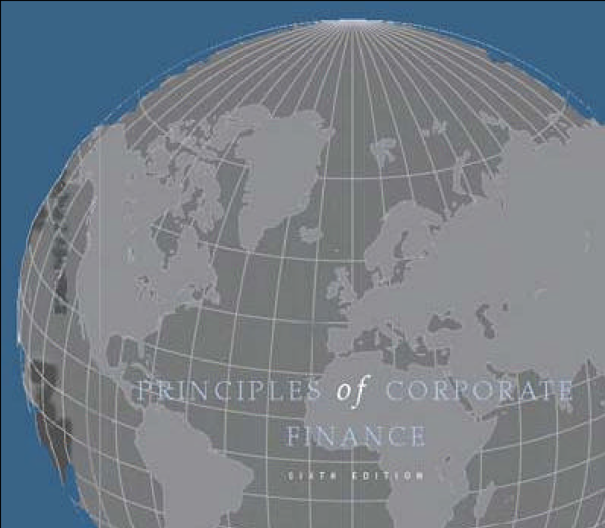


Financial Institutions



Financial Institutions





Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

Present Value and The Opportunity Cost of Capital

Chapter 2

Topics Covered

- Present Value
- Net Present Value
- NPV Rule
- ROR Rule
- Opportunity Cost of Capital
- Managers and the Interests of Shareholders

Present Value

Present Value

Value today of a future cash flow.

Discount Factor

Present value of a $1 future payment.

Discount Rate

Interest rate used to compute present values of future cash flows.

Present Value

$$\text{Present Value} = \text{PV}$$

$$\boxed{\text{PV} = \text{discount factor} \times C_1}$$

Present Value

Discount Factor = DF = PV of $1

$$\boxed{DF = \frac{1}{(1+r)^t}}$$

Discount Factors can be used to compute the present value of any cash flow.

Valuing an Office Building

Step 1: Forecast cash flows

Cost of building $= C_0 = 350$

Sale price in Year 1 $= C_1 = 400$

Step 2: Estimate opportunity cost of capital

If equally risky investments in the capital market offer a return of 7%, then

Cost of capital $= r = 7\%$

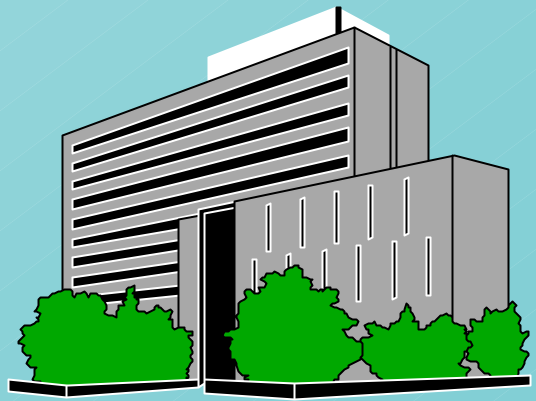
Valuing an Office Building

Step 3: Discount future cash flows

$$PV = \frac{C_1}{(1+r)} = \frac{400}{(1+.07)} = 374$$

Step 4: Go ahead if PV of payoff exceeds investment

$$NPV = -350 + 374 = 24$$



Net Present Value

NPV = PV - required investment

$$\text{NPV} = \text{C}_0 + \frac{C_1}{1+r}$$

Risk and Present Value

- Higher risk projects require a higher rate of return.
- Higher required rates of return cause lower PVs.

$$\text{PV of } C_1 = \$400 \text{ at } 7\%$$

$$PV = \frac{400}{1+.07} = 374$$

Risk and Present Value

$$\text{PV of } C_1 = \$400 \text{ at } 12\%$$

$$PV = \frac{400}{1+.12} = 357$$

$$\text{PV of } C_1 = \$400 \text{ at } 7\%$$

$$PV = \frac{400}{1+.07} = 374$$

Rate of Return Rule

- Accept investments that offer rates of return in excess of their opportunity cost of capital.

<u>*Example*</u>

In the project listed below, the foregone investment opportunity is 12%. Should we do the project?

$$\text{Return} = \frac{\text{profit}}{\text{investment}} = \frac{400{,}000 - 350{,}000}{350{,}000} = .14 \text{ or } 14\%$$

Net Present Value Rule

- Accept investments that have positive net present value.

<u>*Example*</u>

Suppose we can invest \$50 today and receive \$60 in one year. Should we accept the project given a 10% expected return?

$$NPV = -50 + \frac{60}{1.10} = \$4.55$$

Opportunity Cost of Capital

Example

You may invest $100,000 today. Depending on the state of the economy, you may get one of three possible cash payoffs:

Economy	Slump	Normal	Boom
Payoff	$80,000	110,000	140,000

$$\text{Expected payoff} = C_1 = \frac{80{,}000 + 100{,}000 + 140{,}000}{3} = \$110{,}000$$

Opportunity Cost of Capital

Example - continued

The stock is trading for $95.65. Depending on the state of the economy, the value of the stock at the end of the year is one of three possibilities:

Economy	Slump	Normal	Boom
Stock Price	$80	110	140

Opportunity Cost of Capital

Example - continued

The stocks expected payoff leads to an expected return.

$$\text{Expected payoff} = C_1 = \frac{80+100+140}{3} = \$110$$

$$\text{Expected return} = \frac{\text{expected profit}}{\textit{investment}} = \frac{110-95.65}{95.65} = .15 \text{ or } 15\%$$

Opportunity Cost of Capital

Example - continued

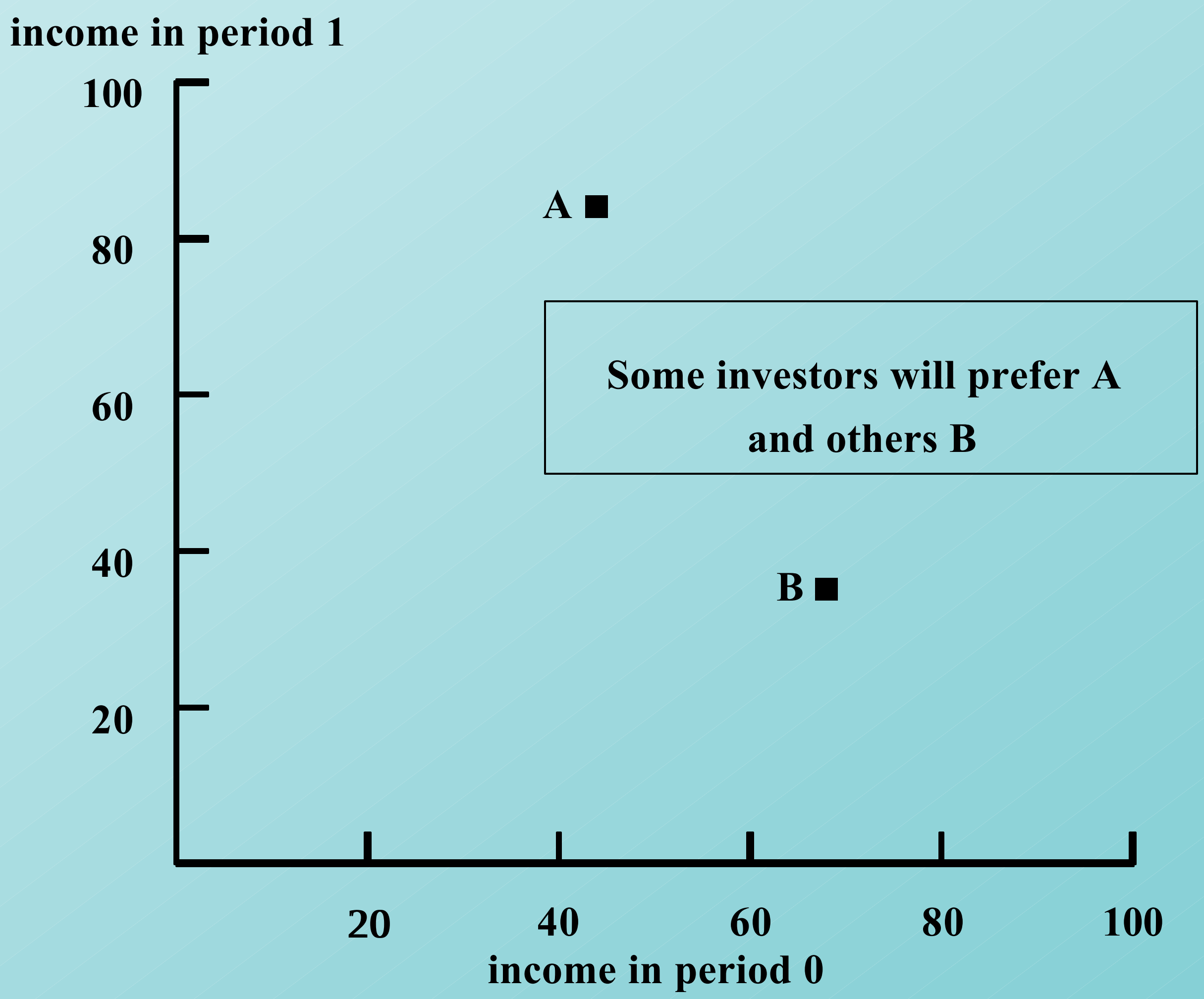
Discounting the expected payoff at the expected return leads to the PV of the project.

$$PV = \frac{110{,}000}{1.15} = \$95{,}650$$

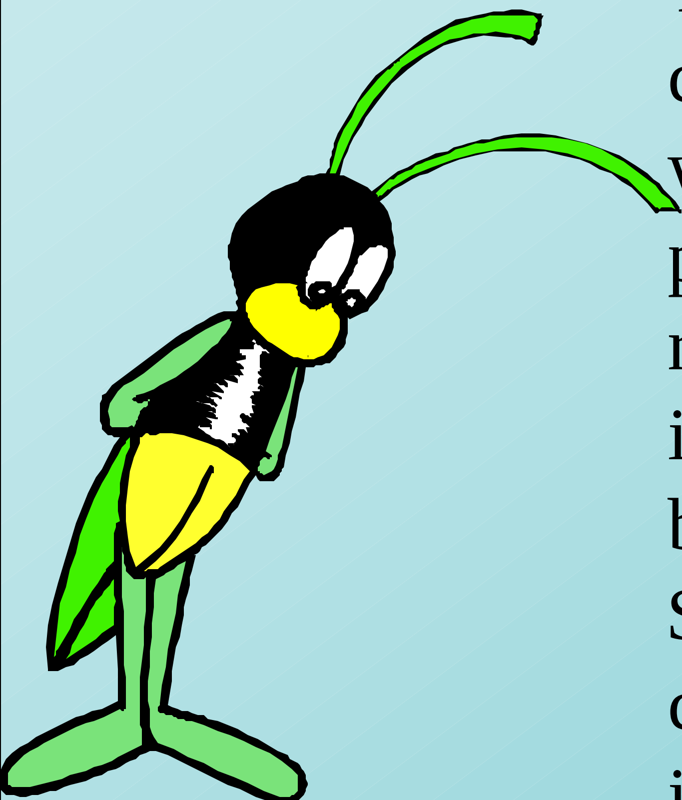
Investment vs. Consumption

- Some people prefer to consume now. Some prefer to invest now and consume later. Borrowing and lending allows us to reconcile these opposing desires which may exist within the firm’s shareholders.

Investment vs. Consumption

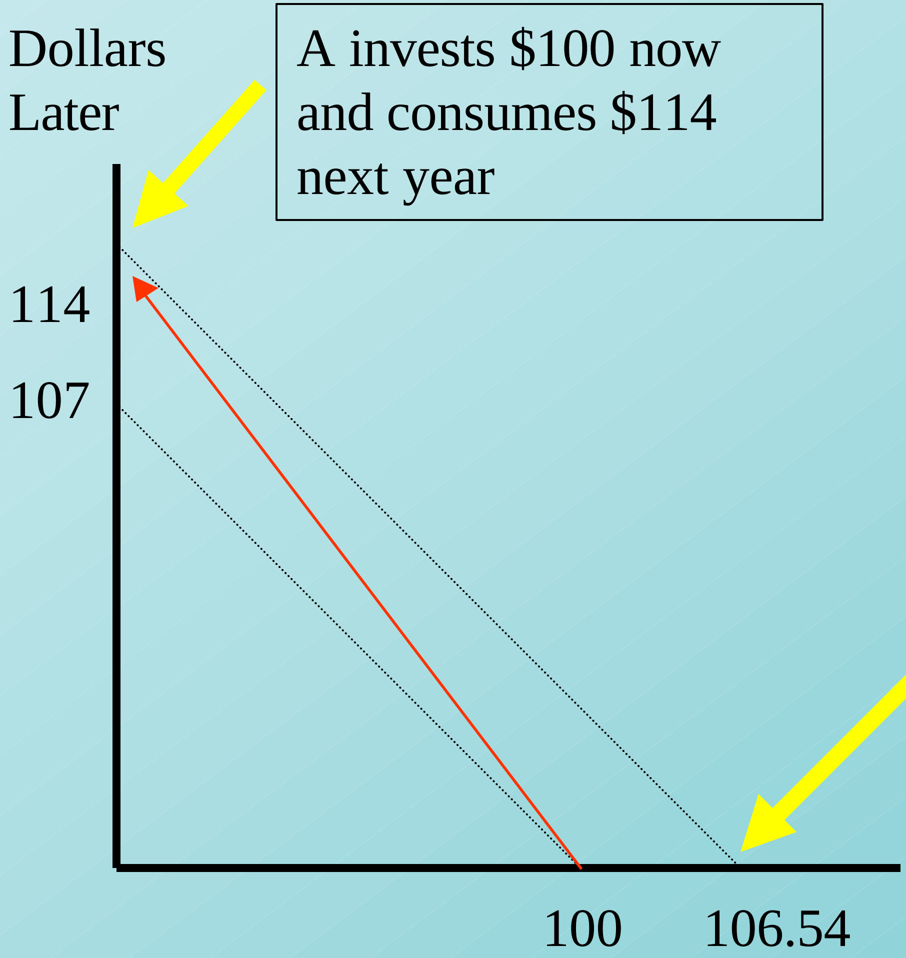


Investment vs. Consumption



The grasshopper (G) wants to consume now. The ant (A) wants to wait. But each is happy to invest. A prefers to invest 14%, moving up the red arrow, rather than at the 7% interest rate. G invests and then borrows at 7%, thereby transforming \$100 into \$106.54 of immediate consumption. Because of the investment, G has \$114 next year to pay off the loan. The investment's NPV is \$106.54-100 = +6.54

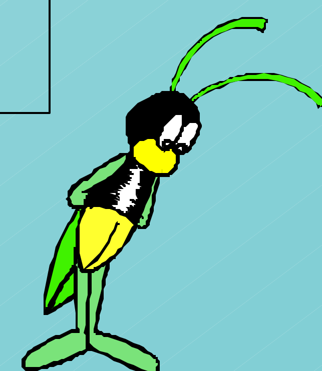
Investment vs. Consumption



- The grasshopper (G) wants to consume now. The ant (A) wants to wait. But each is happy to invest. A prefers to invest 14%, moving up the red arrow, rather than at the 7% interest rate. G invests and then borrows at 7%, thereby transforming $100 into $106.54 of immediate consumption. Because of the investment, G has $114 next year to pay off the loan. The investment's NPV is $106.54-100 = +6.54

G invests $100 now, borrows $106.54 and consumes now.

Dollars
Now



Managers and Shareholder Interests

- Tools to Ensure Management Responsiveness
  - Subject managers to oversight and review by specialists.
  - Internal competition for top level jobs that are appointed by the board of directors.
  - Financial incentives such as stock options.

Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

How to Calculate Present Values

Chapter 3

Topics Covered

- Valuing Long-Lived Assets
- PV Calculation Short Cuts
- Compound Interest
- Interest Rates and Inflation
- Example: Present Values and Bonds

Present Values

Discount Factor = DF = PV of $1

$$\boxed{DF = \frac{1}{(1+r)^t}}$$

- Discount Factors can be used to compute the present value of any cash flow.

Present Values

$$PV = DF \times C_1 = \frac{C_1}{1 + r_1}$$

$$DF = \frac{1}{(1+r)^t}$$

- Discount Factors can be used to compute the present value of any cash flow.

Present Values

$$PV = DF \times C_t = \frac{C_t}{1 + r_t}$$

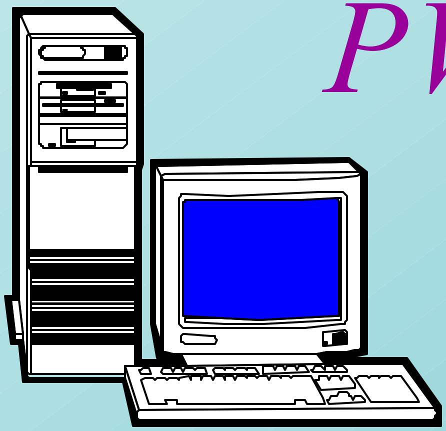
- Replacing “1” with “t” allows the formula to be used for cash flows that exist at any point in time.

Present Values

Example

You just bought a new computer for \$3,000. The payment terms are 2 years same as cash. If you can earn 8% on your money, how much money should you set aside today in order to make the payment when due in two years?

$$PV = \frac{3000}{(1.08)^2} = \$2,572.02$$



Present Values

- PVs can be added together to evaluate multiple cash flows.

$$PV = \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \ldots .$$

Present Values

- Given two dollars, one received a year from now and the other two years from now, the value of each is commonly called the Discount Factor. Assume $r_1 = 20\%$ and $r_2 = 7\%$.

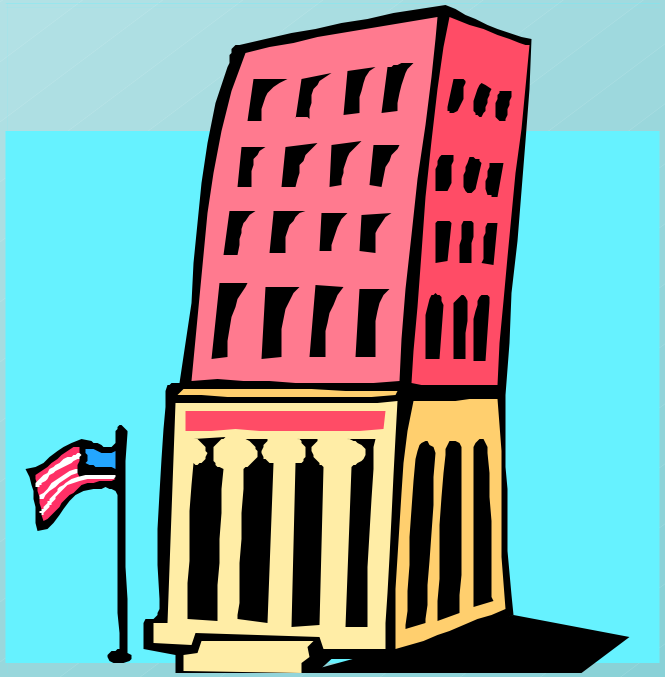
$$DF_1 = \frac{1.00}{(1+.20)^1} = .83$$

$$DF_2 = \frac{1.00}{(1+.07)^2} = .87$$

Present Values

Example

Assume that the cash flows from the construction and sale of an office building is as follows. Given a 7% required rate of return, create a present value worksheet and show the net present value.



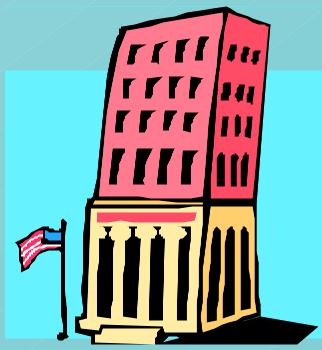
Year 0	Year 1	Year 2
–150,000	–100,000	+300,000

Present Values

Example - continued

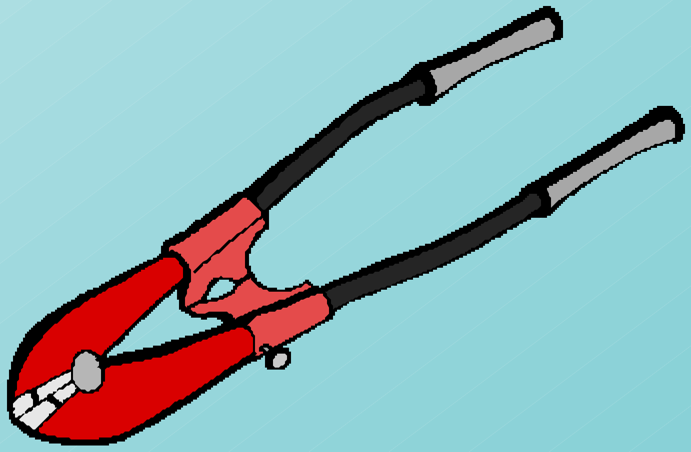
Assume that the cash flows from the construction and sale of an office building is as follows. Given a 7% required rate of return, create a present value worksheet and show the net present value.

Period	Discount Factor	Cash Flow	Present Value
0	1.0	$-150,000$	$-150,000$
1	$\frac{1}{1.07} = .935$	$-100,000$	$-93,500$
2	$\frac{1}{(1.07)^2} = .873$	$+300,000$	$+261,900$
		$NPV = Total =$	$18,400



Short Cuts

- Sometimes there are shortcuts that make it very easy to calculate the present value of an asset that pays off in different periods. These tolls allow us to cut through the calculations quickly.



Short Cuts

<u>Perpetuity</u> - Financial concept in which a cash flow is theoretically received forever.

$$\text{Return} = \frac{\text{cash flow}}{\text{present value}}$$

$$r = \frac{C}{PV}$$

Short Cuts

Perpetuity - Financial concept in which a cash flow is theoretically received forever.

$$\text{PV of Cash Flow} = \frac{\text{cash flow}}{\text{discount rate}}$$

$$PV = \frac{C_1}{r}$$

Short Cuts

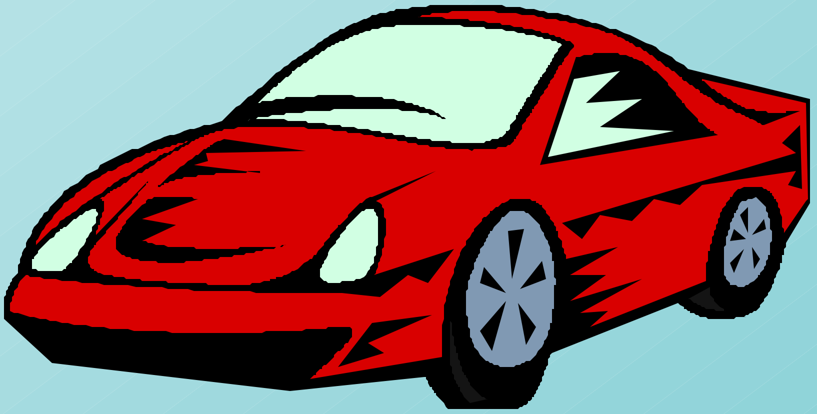
Annuity - An asset that pays a fixed sum each year for a specified number of years.

$$\text{PV of annuity} = C \times \left[\frac{1}{r} - \frac{1}{r(1+r)^t} \right]$$

Annuity Short Cut

Example

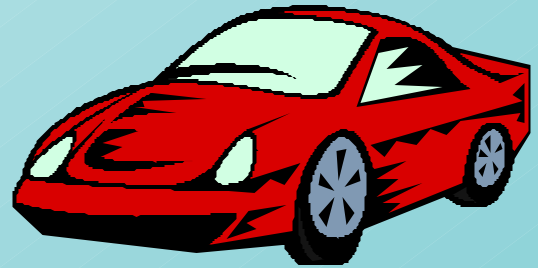
You agree to lease a car for 4 years at $300 per month. You are not required to pay any money up front or at the end of your agreement. If your opportunity cost of capital is 0.5% per month, what is the cost of the lease?



Annuity Short Cut

Example - continued

You agree to lease a car for 4 years at $300 per month. You are not required to pay any money up front or at the end of your agreement. If your opportunity cost of capital is 0.5% per month, what is the cost of the lease?



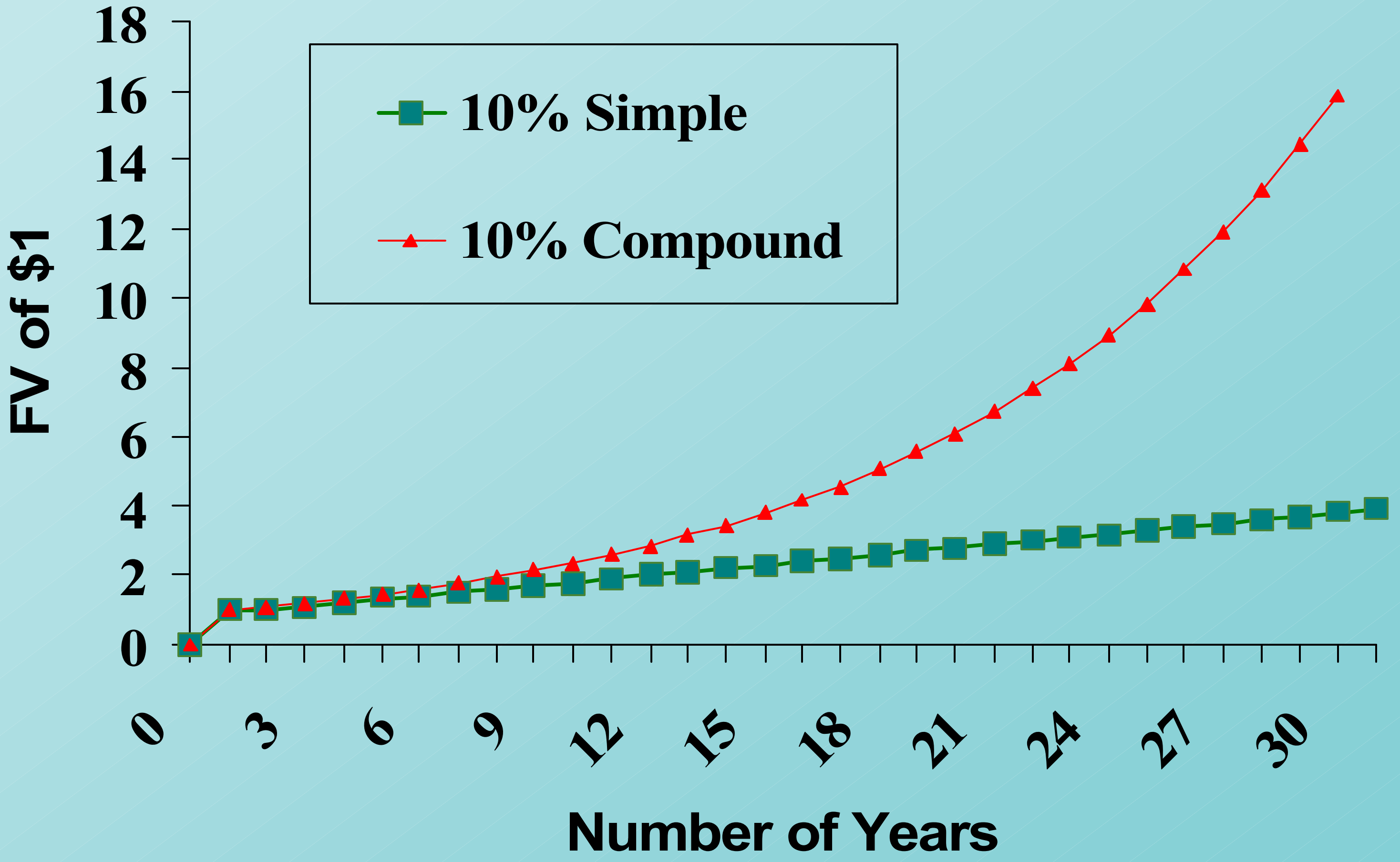
$$\text{Lease Cost} = 300 \times \left[\frac{1}{.005} - \frac{1}{.005(1+.005)^{48}} \right]$$

$$Cost = \$12{,}774.10$$

Compound Interest

i Periods per year	ii Interest per period	iii APR (i x ii)	iv Value after one year	v Annually compounded interest rate
1	6%	6%	1.06	6.000%
2	3	6	$1.03^2 = 1.0609$	6.090
4	1.5	6	$1.015^4 = 1.06136$	6.136
12	.5	6	$1.005^{12} = 1.06168$	6.168
52	.1154	6	$1.001154^{52} = 1.06180$	6.180
365	.0164	6	$1.000164^{365} = 1.06183$	6.183

Compound Interest



Inflation

Inflation - Rate at which prices as a whole are increasing.

Nominal Interest Rate - Rate at which money invested grows.

Real Interest Rate - Rate at which the purchasing power of an investment increases.

Inflation

$$1 + \text{real interest rate} = \frac{1+\text{nominal interest rate}}{1+\text{inflation rate}}$$

Inflation

$$1 + \text{real interest rate} = \frac{1+\text{nominal interest rate}}{1+\text{inflation rate}}$$

approximation formula

$$\text{Real int. rate} \approx \text{nominal int. rate} - \text{inflation rate}$$

Inflation

Example

If the interest rate on one year govt. bonds is 5.9% and the inflation rate is 3.3%, what is the real interest rate?

Inflation

<u>*Example*</u>

If the interest rate on one year govt. bonds is 5.9% and the inflation rate is 3.3%, what is the real interest rate?

$$1 + \text{real interest rate} = \frac{1+.059}{1+.033}$$

$$1 + \text{real interest rate} = 1.025$$

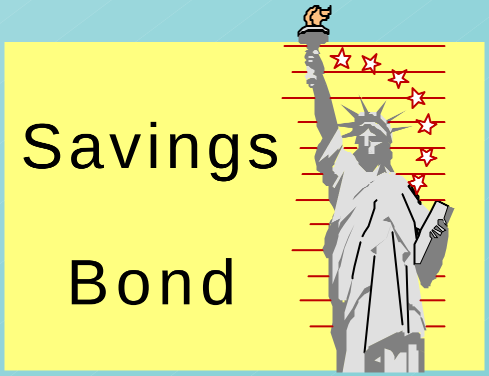
$$\text{real interest rate} = .025 \text{ or } 2.5\%$$

Inflation

<u>*Example*</u>

If the interest rate on one year govt. bonds is 5.9% and the inflation rate is 3.3%, what is the real interest rate?

$$1 + \text{real interest rate} = \frac{1+.059}{1+.033}$$



$$1 + \text{real interest rate} = 1.025$$

$$\text{real interest rate} = .025 \text{ or } 2.5\%$$

$$\text{Approximation} = .059 - .033 = .026 \text{ or } 2.6\%$$

Valuing a Bond

Example

If today is October 2000, what is the value of the following bond?

- An IBM Bond pays $115 every Sept for 5 years. In Sept 2005 it pays an additional $1000 and retires the bond.
- The bond is rated AAA (WSJ AAA YTM is 7.5%).

Cash Flows

Sept 01	02	03	04	05
115	115	115	115	1115

Valuing a Bond

Example continued

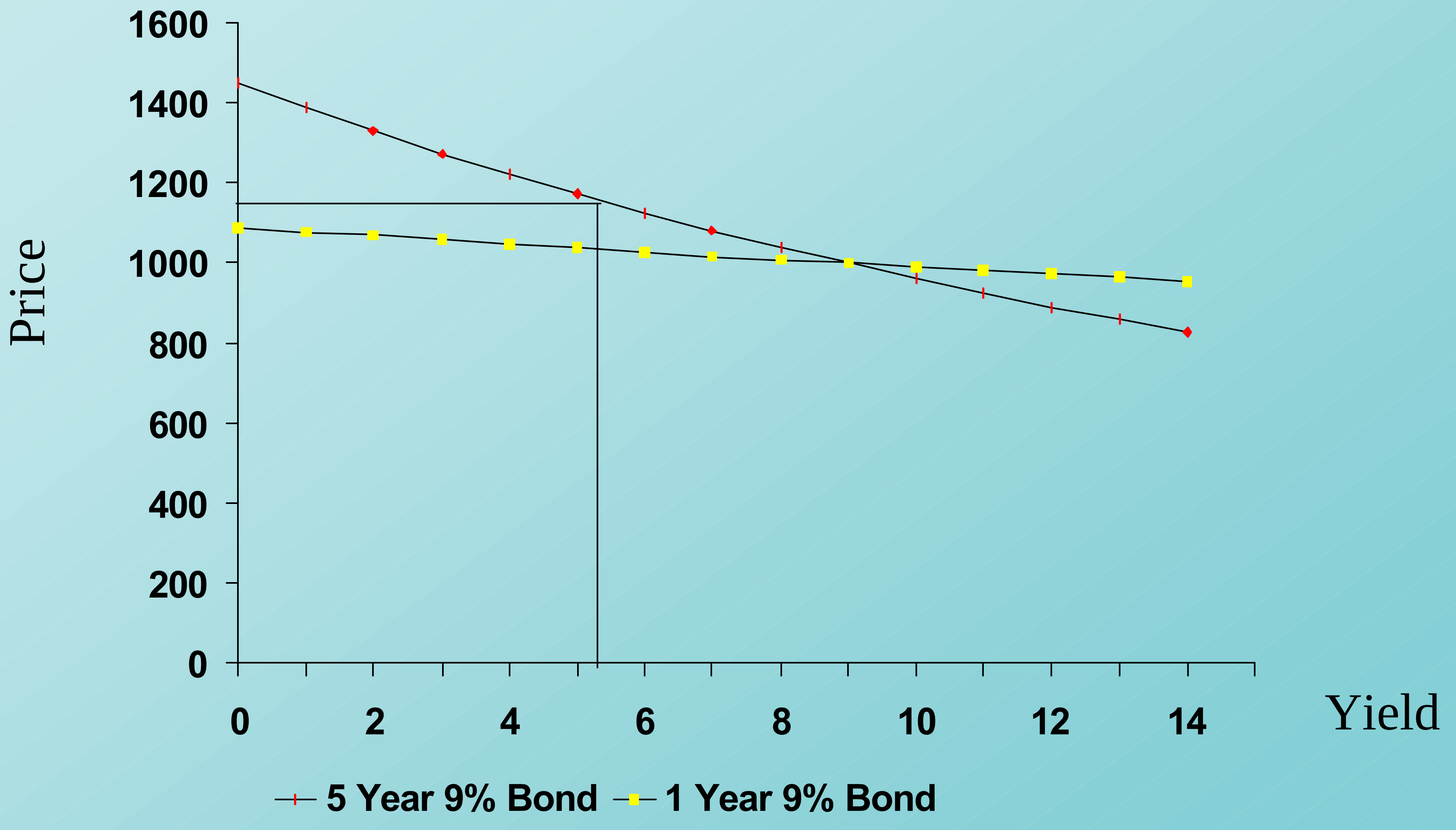
If today is October 2000, what is the value of the following bond?

- An IBM Bond pays \$115 every Sept for 5 years. In Sept 2005 it pays an additional \$1000 and retires the bond.
- The bond is rated AAA (WSJ AAA YTM is 7.5%).

$$PV = \frac{115}{1.075} + \frac{115}{(1.075)^2} + \frac{115}{(1.075)^3} + \frac{115}{(1.075)^4} + \frac{1{,}115}{(1.075)^5}$$

$$= \$1{,}161.84$$

Bond Prices and Yields



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

◆ The Value of Common Stocks

Chapter 4

Topics Covered

- How To Value Common Stock
- Capitalization Rates
- Stock Prices and EPS
- Cash Flows and the Value of a Business

Stocks & Stock Market

Common Stock - Ownership shares in a publicly held corporation.

Secondary Market - market in which already issued securities are traded by investors.

Dividend - Periodic cash distribution from the firm to the shareholders.

P/E Ratio - Price per share divided by earnings per share.

Stocks & Stock Market

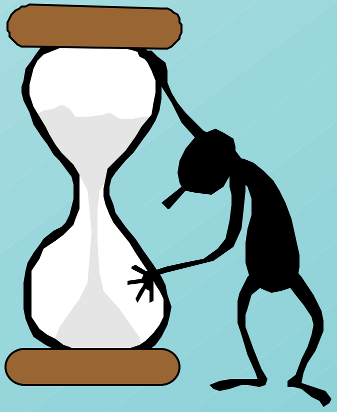
Book Value - Net worth of the firm according to the balance sheet.

Liquidation Value - Net proceeds that would be realized by selling the firm's assets and paying off its creditors.

Market Value Balance Sheet - Financial statement that uses market value of assets and liabilities.

Valuing Common Stocks

Expected Return - The percentage yield that an investor forecasts from a specific investment over a set period of time. Sometimes called the ***market capitalization rate***.



Valuing Common Stocks

Expected Return - The percentage yield that an investor forecasts from a specific investment over a set period of time. Sometimes called the ***market capitalization rate***.

$$\text{Expected Return} = r = \frac{Div_1 + P_1 - P_0}{P_0}$$

Valuing Common Stocks

The formula can be broken into two parts.

Dividend Yield + Capital Appreciation

Valuing Common Stocks

The formula can be broken into two parts.

Dividend Yield + Capital Appreciation

$$\text{Expected Return} = r = \frac{Div_1}{P_0} + \frac{P_1 - P_0}{P_0}$$

Valuing Common Stocks

Capitalization Rate can be estimated using the perpetuity formula, given minor algebraic manipulation.

Valuing Common Stocks

Capitalization Rate can be estimated using the perpetuity formula, given minor algebraic manipulation.

$$\text{Capitalization Rate} = P_0 = \frac{Div_1}{r - g}$$

$$= r = \frac{Div_1}{P_0} + g$$

Valuing Common Stocks

Return Measurements

$$\text{Dividend Yield} = \frac{\text{Div}_1}{P_0}$$

$$\text{Return on Equity} = ROE$$

$$ROE = \frac{\text{EPS}}{\text{Book Equity Per Share}}$$

Valuing Common Stocks

Dividend Discount Model - Computation of today's stock price which states that share value equals the present value of all expected future dividends.

Valuing Common Stocks

<u>Dividend Discount Model</u> - Computation of today's stock price which states that share value equals the present value of all expected future dividends.

$$P_0 = \frac{Div_1}{(1+r)^1} + \frac{Div_2}{(1+r)^2} + \ldots + \frac{Div_H + P_H}{(1+r)^H}$$

H - Time horizon for your investment.

Valuing Common Stocks

Example

Current forecasts are for XYZ Company to pay dividends of $3, $3.24, and $3.50 over the next three years, respectively. At the end of three years you anticipate selling your stock at a market price of $94.48. What is the price of the stock given a 12% expected return?

Valuing Common Stocks

Example

Current forecasts are for XYZ Company to pay dividends of \$3, \$3.24, and \$3.50 over the next three years, respectively. At the end of three years you anticipate selling your stock at a market price of \$94.48. What is the price of the stock given a 12% expected return?

$$PV = \frac{3.00}{(1+.12)^1} + \frac{3.24}{(1+.12)^2} + \frac{3.50 + 94.48}{(1+.12)^3}$$

$$PV = \$75.00$$

Valuing Common Stocks

If we forecast no growth, and plan to hold out stock indefinitely, we will then value the stock as a **PERPETUITY**.

Valuing Common Stocks

If we forecast no growth, and plan to hold out stock indefinitely, we will then value the stock as a **PERPETUITY**.

$$Perpetuity = P_0 = \frac{Div_1}{r} \; or \; \frac{EPS_1}{r}$$

Assumes all earnings are paid to shareholders.

Valuing Common Stocks

Constant Growth DDM - A version of the dividend growth model in which dividends grow at a constant rate *(Gordon Growth Model)*.

Valuing Common Stocks

Example- continued

If the same stock is selling for $100 in the stock market, what might the market be assuming about the growth in dividends?

$$\$100 = \frac{\$3.00}{.12 - g}$$

$$g = .09$$

Answer

The market is assuming the dividend will grow at 9% per year, indefinitely.

Valuing Common Stocks

- If a firm elects to pay a lower dividend, and reinvest the funds, the stock price may increase because future dividends may be higher.

Payout Ratio - Fraction of earnings paid out as dividends

Plowback Ratio - Fraction of earnings retained by the firm.

Valuing Common Stocks

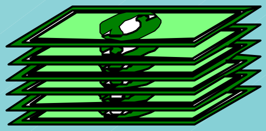
Growth can be derived from applying the return on equity to the percentage of earnings plowed back into operations.

g = return on equity X plowback ratio

Valuing Common Stocks

Example

Our company forecasts to pay a $5.00 dividend next year, which represents 100% of its earnings. This will provide investors with a 12% expected return. Instead, we decide to plow back 40% of the earnings at the firm's current return on equity of 20%. What is the value of the stock before and after the plowback decision?



Valuing Common Stocks

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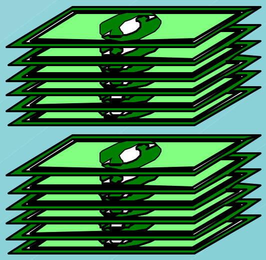
<u>No Growth</u>

<u>With Growth</u>



$$P_0 = \frac{5}{.12} = \$41.67$$

Valuing Common Stocks

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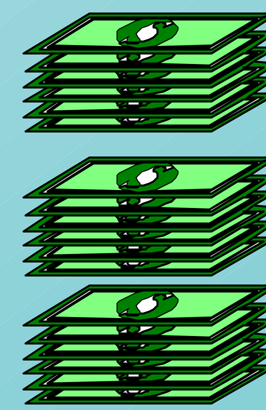


<u>No Growth</u>

$$P_0 = \frac{5}{.12} = \$41.67$$

<u>With Growth</u>

$$g = .20 \times .40 = .08$$

$$P_0 = \frac{3}{.12 - .08} = \$75.00$$

Valuing Common Stocks

Example - continued

If the company did not plowback some earnings, the stock price would remain at $41.67. With the plowback, the price rose to $75.00.

The difference between these two numbers (75.00-41.67=33.33) is called the Present Value of Growth Opportunities (PVGO).

Valuing Common Stocks

Present Value of Growth Opportunities (PVGO) - Net present value of a firm's future investments.

Sustainable Growth Rate - Steady rate at which a firm can grow: plowback ratio X return on equity.

FCF and PV

- Free Cash Flows (FCF) should be the theoretical basis for all PV calculations.
- FCF is a more accurate measurement of PV than either Div or EPS.
- The market price does not always reflect the PV of FCF.
- When valuing a business for purchase, always use FCF.

FCF and PV

Valuing a Business

The value of a business is usually computed as the discounted value of FCF out to a ***valuation horizon (H).***

- The ***valuation horizon*** is sometimes called the terminal value and is calculated like ***PVGO.***

$$PV = \frac{FCF_1}{(1+r)^1} + \frac{FCF_2}{(1+r)^2} + \ldots + \frac{FCF_H}{(1+r)^H} + \frac{PV_H}{(1+r)^H}$$

FCF and PV

Valuing a Business

$$PV = \underbrace{\frac{FCF_1}{(1+r)^1} + \frac{FCF_2}{(1+r)^2} + \ldots + \frac{FCF_H}{(1+r)^H}}_{\text{PV (free cash flows)}} + \underbrace{\frac{PV_H}{(1+r)^H}}_{\text{PV (horizon value)}}$$

FCF and PV

Example

Given the cash flows for Concatenator Manufacturing Division, calculate the PV of near term cash flows, PV (horizon value), and the total value of the firm. r=10% and g= 6%

	Year									
	1	2	3	4	5	6	7	8	9	10
AssetValue	10.00	12.00	14.40	17.28	20.74	23.43	26.47	28.05	29.73	31.51
Earnings	1.20	1.44	1.73	2.07	2.49	2.81	3.18	3.36	3.57	3.78
Investment	2.00	2.40	2.88	3.46	2.69	3.04	1.59	1.68	1.78	1.89
FreeCashFlow	-.80	-.96	-1.15	-1.39	-.20	-.23	1.59	1.68	1.79	1.89
.EPSgrowth (%)	20	20	20	20	20	13	13	6	6	6

FCF and PV

Example - continued

Given the cash flows for Concatenator Manufacturing Division, calculate the PV of near term cash flows, PV (horizon value), and the total value of the firm. r=10% and g= 6%

.

$$\text{PV(horizon value)} = \frac{1}{(1.1)^6}\left(\frac{1.59}{.10-.06}\right) = 22.4$$

$$\text{PV(FCF)} = -\frac{.80}{1.1} - \frac{.96}{(1.1)^2} - \frac{1.15}{(1.1)^3} - \frac{1.39}{(1.1)^4} - \frac{.20}{(1.1)^5} - \frac{.23}{(1.1)^6}$$

$$= -3.6$$

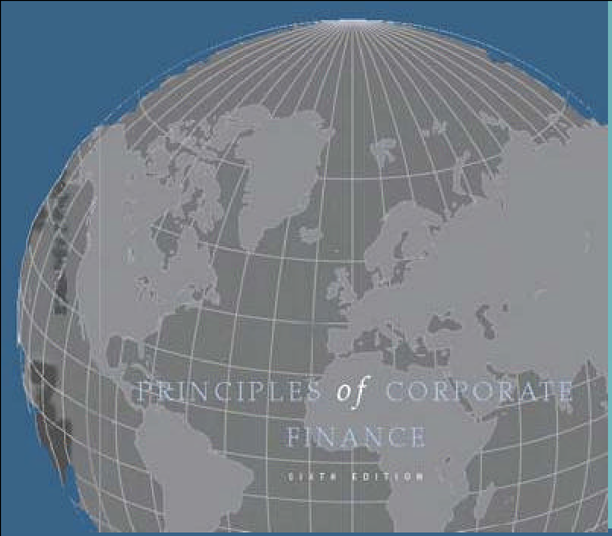
FCF and PV

Example - continued

Given the cash flows for Concatenator Manufacturing Division, calculate the PV of near term cash flows, PV (horizon value), and the total value of the firm. r=10% and g= 6%

.

$$\begin{aligned} \text{PV(business)} &= \text{PV(FCF)} + \text{PV(horizon value)} \\ &= -3.6 + 22.4 \\ &= \$18.8 \end{aligned}$$



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

- Why Net Present Value Leads to Better Investment Decisions than Other Criteria

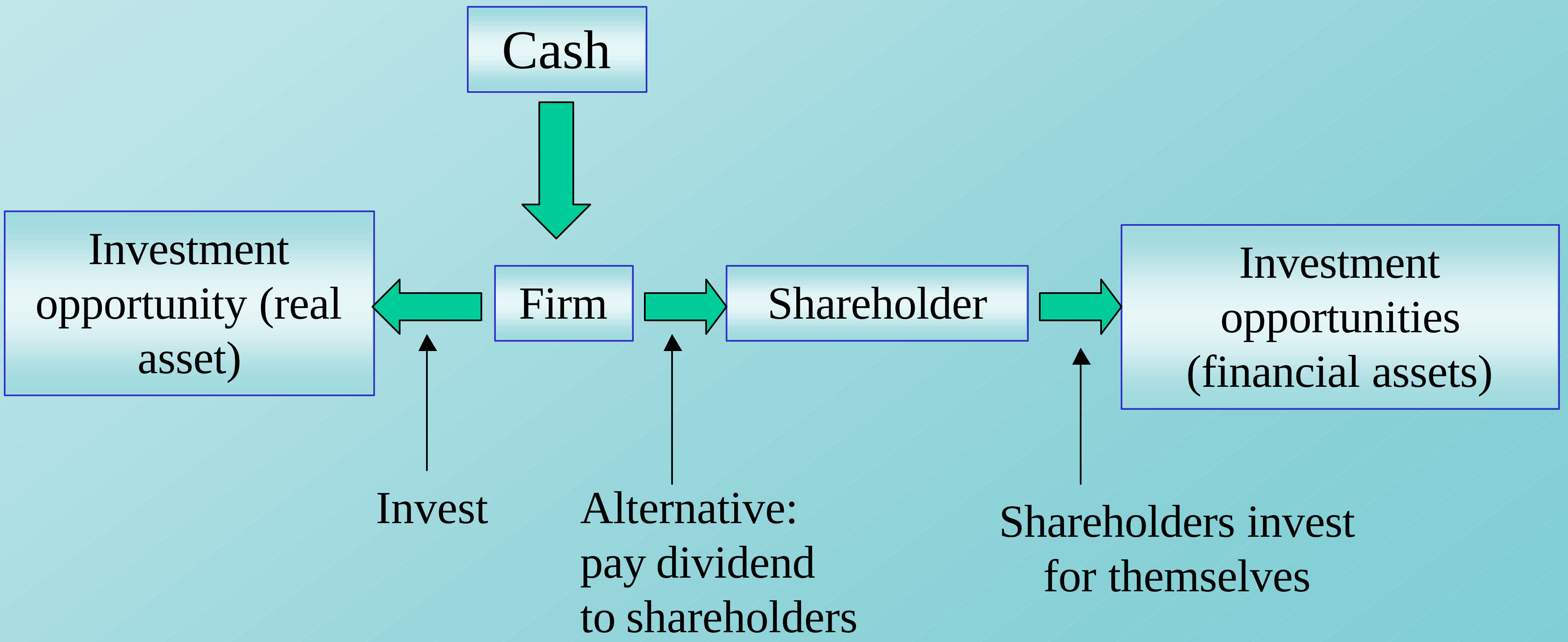
Chapter 5

Topics Covered

- NPV and its Competitors
- The Payback Period
- The Book Rate of Return
- Internal Rate of Return
- Capital Rationing

NPV and Cash Transfers

- Every possible method for evaluating projects impacts the flow of cash about the company as follows.



Payback

- The payback period of a project is the number of years it takes before the cumulative forecasted cash flow equals the initial outlay.
- The payback rule says only accept projects that “payback” in the desired time frame.
- This method is very flawed, primarily because it ignores later year cash flows and the the present value of future cash flows.

Payback

Example

Examine the three projects and note the mistake we would make if we insisted on only taking projects with a payback period of 2 years or less.

Project	C_0	C_1	C_2	C_3	Payback Period	NPV@ 10%
A	-2000	500	500	5000		
B	-2000	500	1800	0		
C	-2000	1800	500	0		

Payback

Example

Examine the three projects and note the mistake we would make if we insisted on only taking projects with a payback period of 2 years or less.

Project	C_0	C_1	C_2	C_3	Payback Period	NPV@ 10%
A	-2000	500	500	5000	3	+2,624
B	-2000	500	1800	0	2	-58
C	-2000	1800	500	0	2	+50

Book Rate of Return

Book Rate of Return - Average income divided by average book value over project life. Also called *accounting rate of return*.

$$\text{Book rate of return} = \frac{\text{book income}}{\text{book assets}}$$

Managers rarely use this measurement to make decisions. The components reflect tax and accounting figures, not market values or cash flows.

Internal Rate of Return

Example

You can purchase a turbo powered machine tool gadget for $4,000. The investment will generate $2,000 and $4,000 in cash flows for two years, respectively. What is the IRR on this investment?

Internal Rate of Return

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$$NPV = -4,000 + \frac{2,000}{(1+IRR)^1} + \frac{4,000}{(1+IRR)^2} = 0$$

Internal Rate of Return

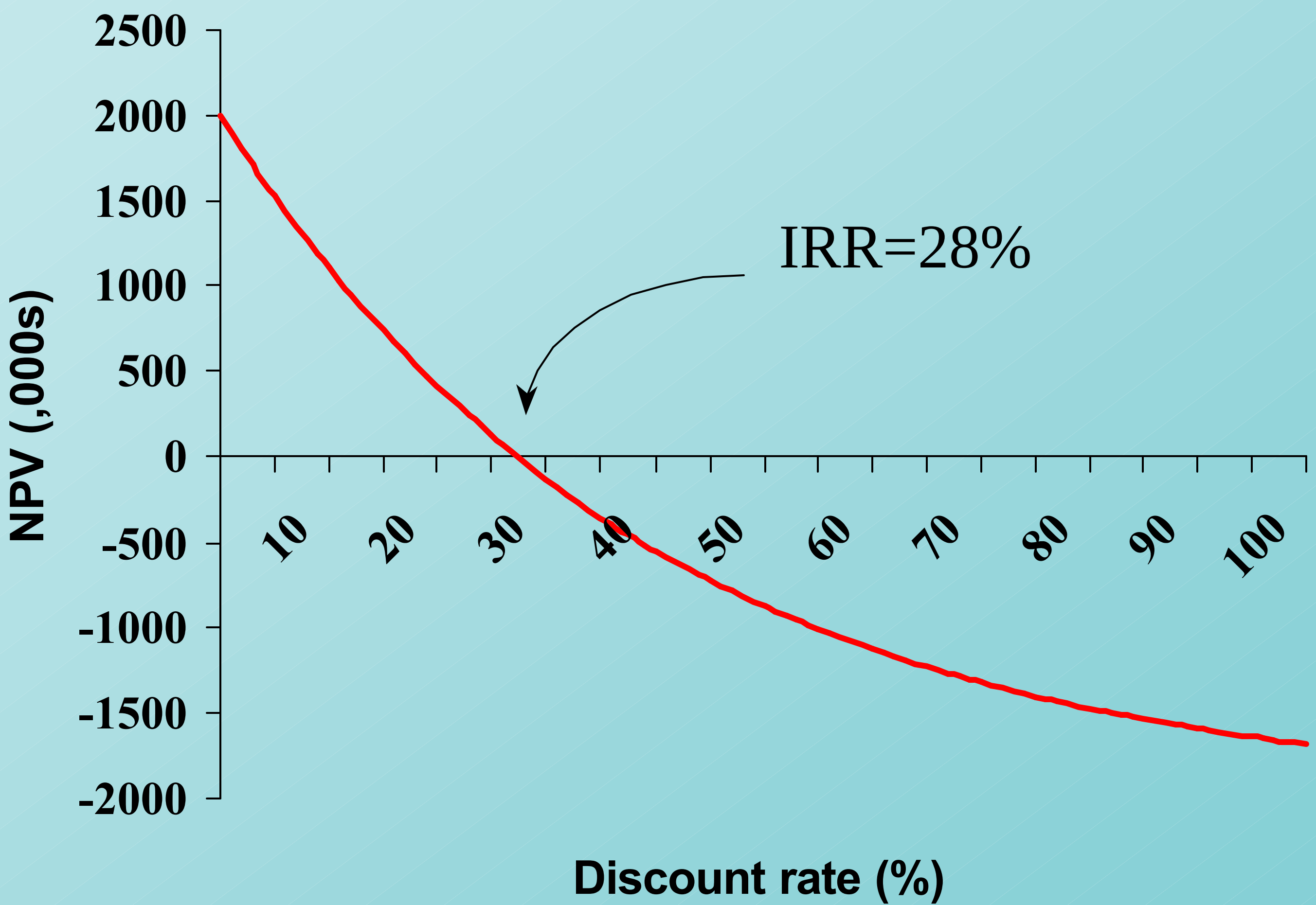
Example

You can purchase a turbo powered machine tool gadget for $4,000. The investment will generate $2,000 and $4,000 in cash flows for two years, respectively. What is the IRR on this investment?

$$NPV = -4{,}000 + \frac{2{,}000}{(1+IRR)^1} + \frac{4{,}000}{(1+IRR)^2} = 0$$

$$IRR = 28.08\%$$

Internal Rate of Return



Internal Rate of Return

Pitfall 1 - Lending or Borrowing?

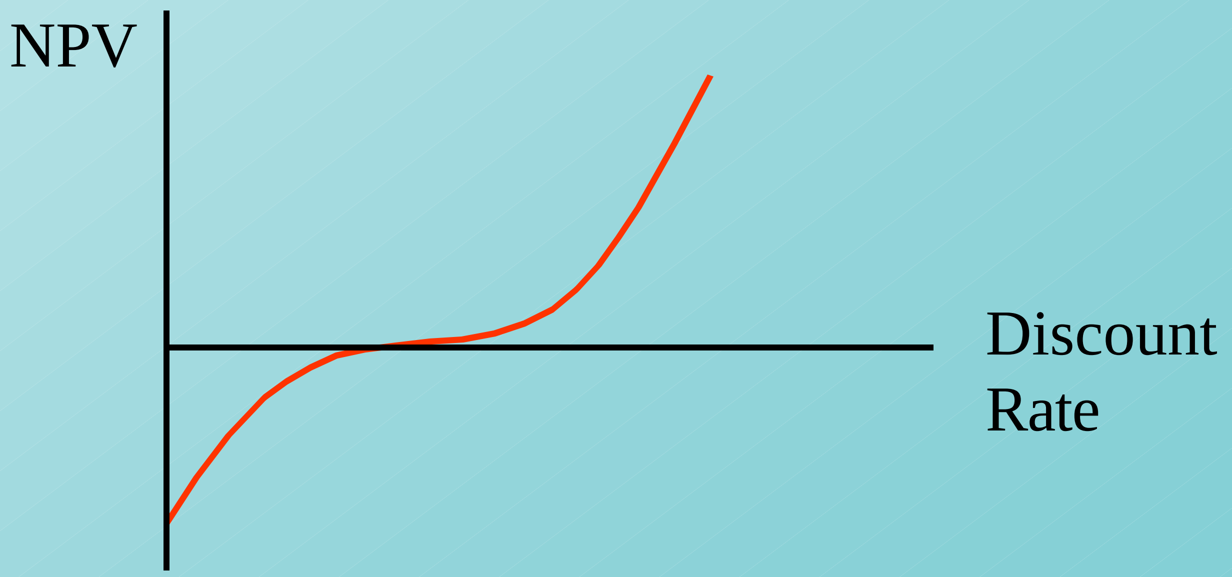
- With some cash flows (as noted below) the NPV of the project increases s the discount rate increases.
- This is contrary to the normal relationship between NPV and discount rates.

C_0	C_1	C_2	C_3	IRR	$NPV\ @10\%$
$+1{,}000$	$-3{,}600$	$-4{,}320$	$-1{,}728$	$+20\%$	$-.75$

Internal Rate of Return

Pitfall 1 - Lending or Borrowing?

- With some cash flows (as noted below) the NPV of the project increases s the discount rate increases.
- This is contrary to the normal relationship between NPV and discount rates.



Internal Rate of Return

Pitfall 2 - Multiple Rates of Return

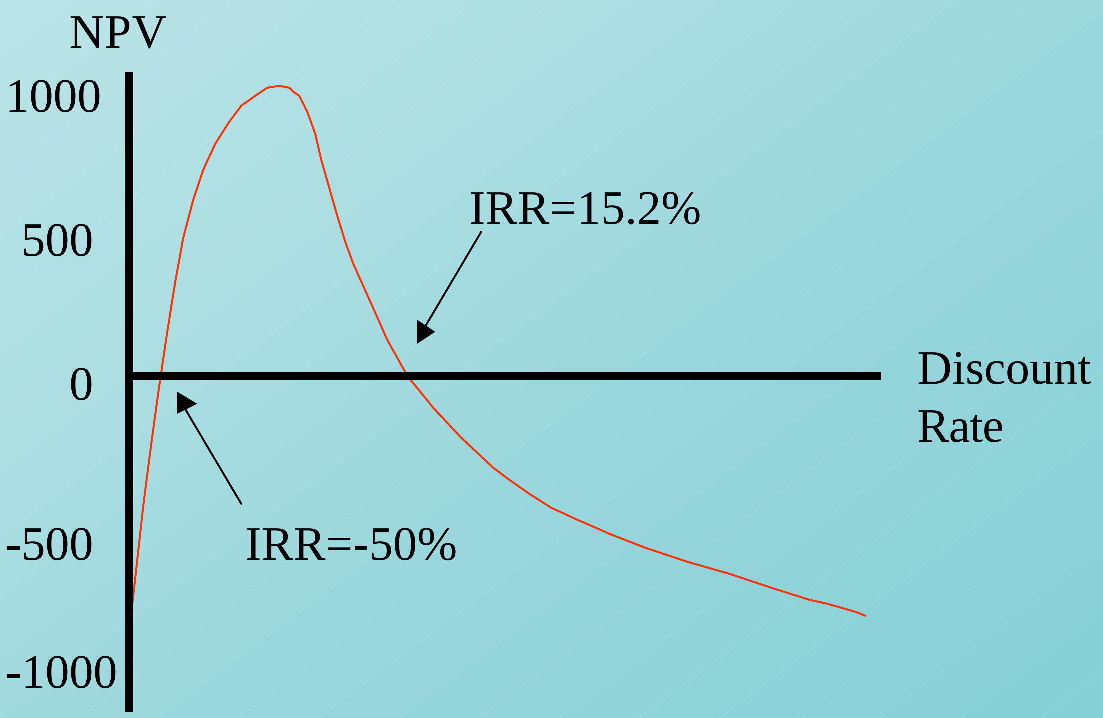
- Certain cash flows can generate NPV=0 at two different discount rates.
- The following cash flow generates NPV=0 at both (-50%) and 15.2%.

C_0	C_1	C_2	C_3	C_4	C_5	C_6
$-1{,}000$	$+800$	$+150$	$+150$	$+150$	$+150$	-150

Internal Rate of Return

Pitfall 2 - Multiple Rates of Return

- Certain cash flows can generate NPV=0 at two different discount rates.
- The following cash flow generates NPV=0 at both (-50%) and 15.2%.



Internal Rate of Return

Pitfall 3 - Mutually Exclusive Projects

- IRR sometimes ignores the magnitude of the project.
- The following two projects illustrate that problem.

Project	C_0	C_t	IRR	NPV @10%
E	$-10{,}000$	$+20{,}000$	100	$+8.182$
F	$-20{,}000$	$+35{,}000$	75	$+11{,}818$

Internal Rate of Return

Pitfall 4 - Term Structure Assumption

- We assume that discount rates are stable during the term of the project.
- This assumption implies that all funds are reinvested at the IRR.
- This is a false assumption.

Internal Rate of Return

Calculating the IRR can be a laborious task. Fortunately, financial calculators can perform this function easily. Note the previous example.

Internal Rate of Return

Calculating the IRR can be a laborious task. Fortunately, financial calculators can perform this function easily. Note the previous example.

HP-10B		EL-733A		BAII Plus	
-350,000	CFj	-350,000	CFi	CF	
16,000	CFj	16,000	CFfi	2nd	{CLR Work}
16,000	CFj	16,000	CFi	-350,000	ENTER ↓
466,000	CFj	466,000	CFi	16,000	ENTER ↓
	{IRR/YR}	IRR		16,000	ENTER ↓
				466,000	ENTER ↓
				IRR	CPT

All produce IRR=12.96

Profitability Index

- When resources are limited, the profitability index (PI) provides a tool for selecting among various project combinations and alternatives.
- A set of limited resources and projects can yield various combinations.
- The highest weighted average PI can indicate which projects to select.

Profitability Index

$$\boxed{\text{Profitability Index} = \frac{\text{NPV}}{\text{Investment}}}$$

Example

We only have $300,000 to invest. Which do we select?

Proj	NPV	Investment	PI
A	230,000	200,000	1.15
B	141,250	125,000	1.13
C	194,250	175,000	1.11
D	162,000	150,000	1.08

Profitability Index

Example - continued

Proj	NPV	Investment	PI
A	230,000	200,000	1.15
B	141,250	125,000	1.13
C	194,250	175,000	1.11
D	162,000	150,000	1.08

Select projects with highest Weighted Avg PI

$$\text{WAPI (BD)} = \frac{1.13(125)}{(300)} + \frac{1.08(150)}{(300)} + \frac{1.0\ (25)}{(300)}$$

$$= 1.09$$

Profitability Index

Example - continued

Proj	NPV	Investment	PI
A	230,000	200,000	1.15
B	141,250	125,000	1.13
C	194,250	175,000	1.11
D	162,000	150,000	1.08

Select projects with highest Weighted Avg PI

WAPI (BD) = 1.09

WAPI (A) = 1.10

WAPI (BC) = 1.12

Linear Programming

- Maximize Cash flows or NPV
- Minimize costs

<u>Example</u>

Max NPV = 21Xn + 16 Xb + 12 Xc + 13 Xd

subject to

10Xa + 5Xb + 5Xc + 0Xd <= 10

-30Xa - 5Xb - 5Xc + 40Xd <= 12

Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

Making Investment Decisions with the Net Present Value Rule

Chapter 6

Topics Covered

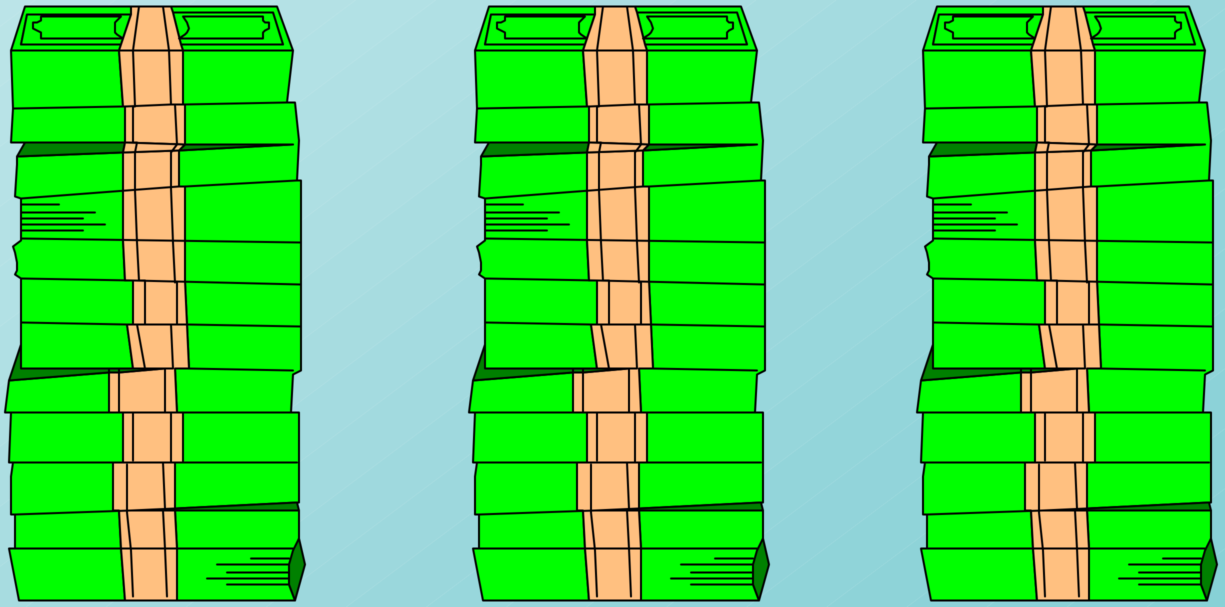
- What To Discount
- IM&C Project
- Project Interaction
  - Timing
  - Equivalent Annual Cost
  - Replacement
  - Cost of Excess Capacity
  - Fluctuating Load Factors

What To Discount

Only Cash Flow is Relevant

What To Discount

Only Cash Flow is Relevant



What To Discount

<u>Points to "Watch Out For"</u>

- Do not confuse average with incremental payoff.
- Include all incidental effects.
- Do not forget working capital requirements.
- Forget sunk costs.
- Include opportunity costs.
- Beware of allocated overhead costs.

Inflation

INFLATION RULE

- Be consistent in how you handle inflation!!
- Use nominal interest rates to discount nominal cash flows.
- Use real interest rates to discount real cash flows.
- You will get the same results, whether you use nominal or real figures.

Inflation

Example

You own a lease that will cost you $8,000 next year, increasing at 3% a year (the forecasted inflation rate) for 3 additional years (4 years total). If discount rates are 10% what is the present value cost of the lease?

Inflation

Example

You own a lease that will cost you $8,000 next year, increasing at 3% a year (the forecasted inflation rate) for 3 additional years (4 years total). If discount rates are 10% what is the present value cost of the lease?

$$1 + \text{real interest rate} = \frac{1+\text{nominal interest rate}}{1+\text{inflation rate}}$$

Inflation

Example - nominal figures

Year	Cash Flow	PV @ 10%
1	8000	$\frac{8000}{1.10} = 7272.73$
2	$8000 \text{x} 1.03 = 8240$	$\frac{8240}{1.10^2} = 6809.92$
3	$8000 \text{x} 1.03^2 = 8240$	$\frac{8487.20}{1.10^3} = 6376.56$
4	$8000 \text{x} 1.03^3 = 8487.20$	$\frac{8741.82}{1.10^4} = 5970.78$
		\$26,429.99

Inflation

Example - real figures

Year	Cash Flow	PV@6.7961%
1	$\frac{8000}{1.03} = 7766.99$	$\frac{7766.99}{1.068} = 7272.73$
2	$\frac{8240}{1.03^2} = 7766.99$	$\frac{7766.99}{1.068^2} = 6809.92$
3	$\frac{8487.20}{1.03^3} = 7766.99$	$\frac{7766.99}{1.068^3} = 6376.56$
4	$\frac{8741.82}{1.03^4} = 7766.99$	$\frac{7766.99}{1.068^4} = 5970.78$
		$= \$26,429.99$

IM&C's Guano Project

Revised projections ($1000s) reflecting inflation

	PERIOD							
	0	1	2	3	4	5	6	7
1. Capital investment	10,000							−1,949
2. Accumulated depreciation		1,583	3,167	4,750	6,333	7,917	9,500	0
3. Year-end book value	10,000	8,417	6,833	5,250	3,667	2,083	500	0
4. Working capital		550	1,289	3,261	4,890	3,583	2,002	0
5. Total book value (3 + 4)	10,000	8,967	8,122	8,511	8,557	5,666	2,502	0
6. Sales		523	12,887	32,610	48,901	35,834	19,717	
7. Cost of goods sold		837	7,729	19,552	29,345	21,492	11,830	
8. Other costs	4,000	2,200	1,210	1,331	1,464	1,611	1,772	
9. Depreciation		1,583	1,583	1,583	1,583	1,583	1,583	
10. Pretax profit (6 − 7 − 8 − 9)	−4,000	−4,097	2,365	10,144	16,509	11,148	4,532	1,449
11. Tax at 35%	−1,400	−1,434	828	3,550	5,778	3,902	1,586	507
12. Profit after tax (10 − 11)	−2,600	−2,663	1,537	6,594	10,731	7,246	2,946	942

IM&C's Guano Project

- NPV using nominal cash flows

$$NPV = -12{,}000 - \frac{1{,}630}{1.20} + \frac{2{,}381}{(1.20)^2} + \frac{6{,}205}{(1.20)^3} + \frac{10{,}685}{(1.20)^4} + \frac{10{,}136}{(1.20)^5}$$

$$+ \frac{6{,}110}{(1.20)^6} + \frac{3{,}444}{(1.20)^7} = 3{,}519 \text{ or } \$3{,}519{,}000$$

IM&C's Guano Project

Cash flow analysis ($1000s)

	PERIOD							
	0	1	2	3	4	5	6	7
1. Sales		523	12,887	32,610	48,901	35,834	19,717	
2. Cost of goods sold		837	7,729	19,552	29,345	21,492	11,830	
3. Other costs	4,000	2,200	1,210	1,331	1,464	1,611	1,772	
4. Tax on operations	−1,400	−1,434	828	3,550	5,778	3,902	1,586	
5. Cash flow from operations (1 − 2 − 3 − 4)	−2,600	−1,080	3,120	8,177	12,314	8,829	4,529	
6. Change in working capital		−550	−739	−1,972	−1,629	1,307	1,581	2,002
7. Capital investment and disposal	−10,000							1,442
8. Net cash flow (5 + 6 + 7)	−12,600	−1,630	2,381	6,205	10,685	10,136	6,110	3,444
9. Present value at 20%	−12,600	−1,358	1,654	3,591	5,153	4,074	2,046	961
Net present value = +3,519								

IM&C's Guano Project

Details of cash flow forecast in year 3 ($1000s)

Cash Flows		Data from Forecasted Income Statement		Working-Capital Changes
Cash inflow	=	Sales	−	Increase in accounts receivable
$31,110	=	32,610	−	1,500
Cash outflow	=	Cost of goods sold, other costs, and taxes	+	Increase in inventory net of increase in accounts payable
$24,905	=	(19,552 + 1,331 + 3,550)	+	(972 − 500)

Net cash flow	=	cash inflow	−	cash outflow
$6,205	=	31,110	−	24,905

IM&C's Guano Project

Tax depreciation allowed under the modified accelerated cost recovery system (MACRS) - (Figures in percent of depreciable investment).

Tax Depreciation Schedules by Recovery-Period Class

Year(s)	3-Year	5-Year	7-Year	10-Year	15-Year	20-Year
1	33.33	20.00	14.29	10.00	5.00	3.75
2	44.45	32.00	24.49	18.00	9.50	7.22
3	14.81	19.20	17.49	14.40	8.55	6.68
4	7.41	11.52	12.49	11.52	7.70	6.18
5		11.52	8.93	9.22	6.93	5.71
6		5.76	8.93	7.37	6.23	5.28
7			8.93	6.55	5.90	4.89
8			4.45	6.55	5.90	4.52
9				6.55	5.90	4.46
10				6.55	5.90	4.46
11				3.29	5.90	4.46
12					5.90	4.46
13					5.90	4.46
14					5.90	4.46
15					5.90	4.46
16					2.99	4.46
17–20						4.46
21						2.25

IM&C's Guano Project

Tax Payments ($1000s)

	PERIOD							
	0	1	2	3	4	5	6	7
1. Sales*		523	12,887	32,610	48,901	35,834	19,717	
2. Cost of goods sold*		837	7,729	19,552	29,345	21,492	11,830	
3. Other costs*	4,000	2,200	1,210	1,331	1,464	1,611	1,772	
4. Tax depreciation		2,000	3,200	1,920	1,152	1,152	576	
5. Pretax profit (1 − 2 − 3 − 4)	−4,000	−4,514	748	9,807	16,940	11,579	5,539	1,949†
6. Taxes at 35%‡	−1,400	−1,580	262	3,432	5,929	4,053	1,939	682

IM&C's Guano Project

Revised cash flow analysis ($1000s)

	PERIOD							
	0	1	2	3	4	5	6	7
1. Sales*		523	12,887	32,610	48,901	35,834	19,717	
2. Cost of goods sold*		837	7,729	19,552	29,345	21,492	11,830	
3. Other costs*	4,000	2,200	1,210	1,331	1,464	1,611	1,772	
4. Tax†	−1,400	−1,580	262	3,432	5,929	4,053	1,939	682
5. Cash flow from operations (1 − 2 − 3 − 4)	−2,600	−934	3,686	8,295	12,163	8,678	4,176	−682
6. Change in working capital		−550	−739	−1,972	−1,629	1,307	1,581	2,002
7. Capital investment and disposal	−10,000							1,949*
8. Net cash flow (5 + 6 + 7)	−12,600	−1,484	2,947	6,323	10,534	9,985	5,757	3,269
9. Present value at 20%	−12,600	−1,237	2,047	3,659	5,080	4,013	1,928	912
Net present value = +3,802								

Timing

- Even projects with positive NPV may be more valuable if deferred.
- The actual NPV is then the current value of some future value of the deferred project.

$$\boxed{\text{Current NPV} = \frac{\text{Net future value as of date } t}{(1+r)^t}}$$

Timing

Example

You may harvest a set of trees at anytime over the next 5 years. Given the FV of delaying the harvest, which harvest date maximizes current NPV?

	Harvest Year					
	0	1	2	3	4	5
Net FV ($1000s)	50	64.4	77.5	89.4	100	109.4
% change in value		28.8	20.3	15.4	11.9	9.4

Timing

Example - continued

You may harvest a set of trees at anytime over the next 5 years. Given the FV of delaying the harvest, which harvest date maximizes current NPV?

$$NPV \text{ if harvested in year } 1 = \frac{64.4}{1.10} = 58.5$$

Timing

Example - continued

You may harvest a set of trees at anytime over the next 5 years. Given the FV of delaying the harvest, which harvest date maximizes current NPV?

$$NPV \text{ if harvested in year } 1 = \frac{64.4}{1.10} = 58.5$$

	Harvest	*Year*				
	0	1	2	3	4	5
NPV ($1000s)	50	58.5	64.0	67.2	68.3	67.9

Equivalent Annual Cost

Equivalent Annual Cost - The cost per period with the same present value as the cost of buying and operating a machine.

Equivalent Annual Cost

Equivalent Annual Cost - The cost per period with the same present value as the cost of buying and operating a machine.

$$\text{Equivalent annual cost} = \frac{\text{present value of costs}}{\text{annuity factor}}$$

Equivalent Annual Cost

Example

Given the following costs of operating two machines and a 6% cost of capital, select the lower cost machine using equivalent annual cost method.

Equivalent Annual Cost

Example

Given the following costs of operating two machines and a 6% cost of capital, select the lower cost machine using equivalent annual cost method.

	Year					
Machine	1	2	3	4	PV@6%	EAC
A	15	5	5	5	28.37	
B	10	6	6		21.00	

Equivalent Annual Cost

Example

Given the following costs of operating two machines and a 6% cost of capital, select the lower cost machine using equivalent annual cost method.

	Year					
Machine	1	2	3	4	PV@6%	EAC
A	15	5	5	5	28.37	10.61
B	10	6	6		21.00	11.45

Machinery Replacement

Annual operating cost of old machine = 8

Cost of new machine

Year:	0	1	2	3	NPV @ 10%
	15	5	5	5	27.4

Equivalent annual cost of new machine =
27.4/(3-year annuity factor) = 27.4/2.5 = 11

MORAL: Do not replace until operating cost of old machine exceeds 11.

Cost of Excess Capacity

A project uses existing warehouse and requires a new one to be built in Year 5 rather than Year 10. A warehouse costs 100 & lasts 20 years.

Equivalent annual cost @ 10% = 100/8.5 = 11.7

	0	. . . 5	6	. . . 10	11 . . .
With project	0	0	11.7	11.7	11.7
Without project	0	0	0	0	11.7
Difference	0	0	11.7	11.7	0

$$\text{PV extra cost} = \frac{11.7}{(1.1)^6} + \frac{11.7}{(1.1)^7} + \ldots + \frac{11.7}{(1.1)^{10}} = 27.6$$

Fluctuating Load Factors

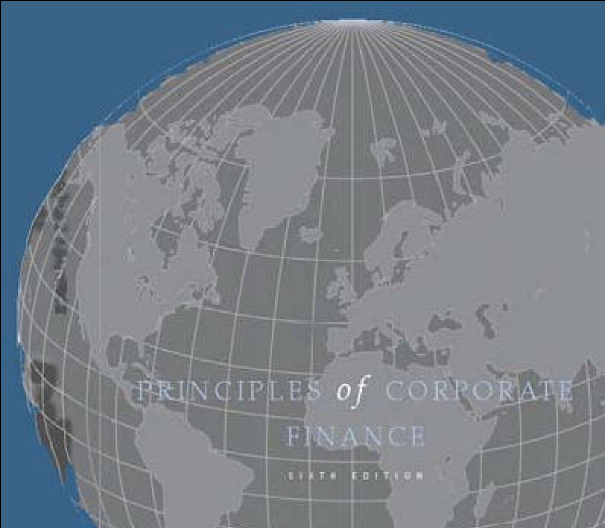
	Two Old Machines
Annual output per machine	750 units
Operating cost per machine	$2 \times 750 = \$1{,}500$
PV operating cost per pachine	$1{,}500/.10 = \$15{,}000$
PV operating cost of two machines	$2 \times 15{,}000 = \$30{,}000$

Fluctuating Load Factors

	Two New Machines
Annual output per machine	750 units
Capital cost pe machine	\$6,000
Operating cost per machine	$1 \times 750 = \$750$
PV operating cost per pachine	$6{,}000 + 750/.10 = \$13{,}500$
PV operating cost of two machines	$2 \times 13{,}500 = \$27{,}000$

Fluctuating Load Factors

	One Old Machine	One New Machine
Annual output per machine	500 units	1,000 units
Capital cost pe machine	0	$6,000
Operating cost per machine	$2 \times 500 = \$1,000$	$1 \times 1,000 = \$1,000$
PV operating cost per pachine	$1,000/.10 = \$10,000$	$6,000 + 1,000 / .10 = \$16,000$
PV operating cost of two machines	..............................$26,000	



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

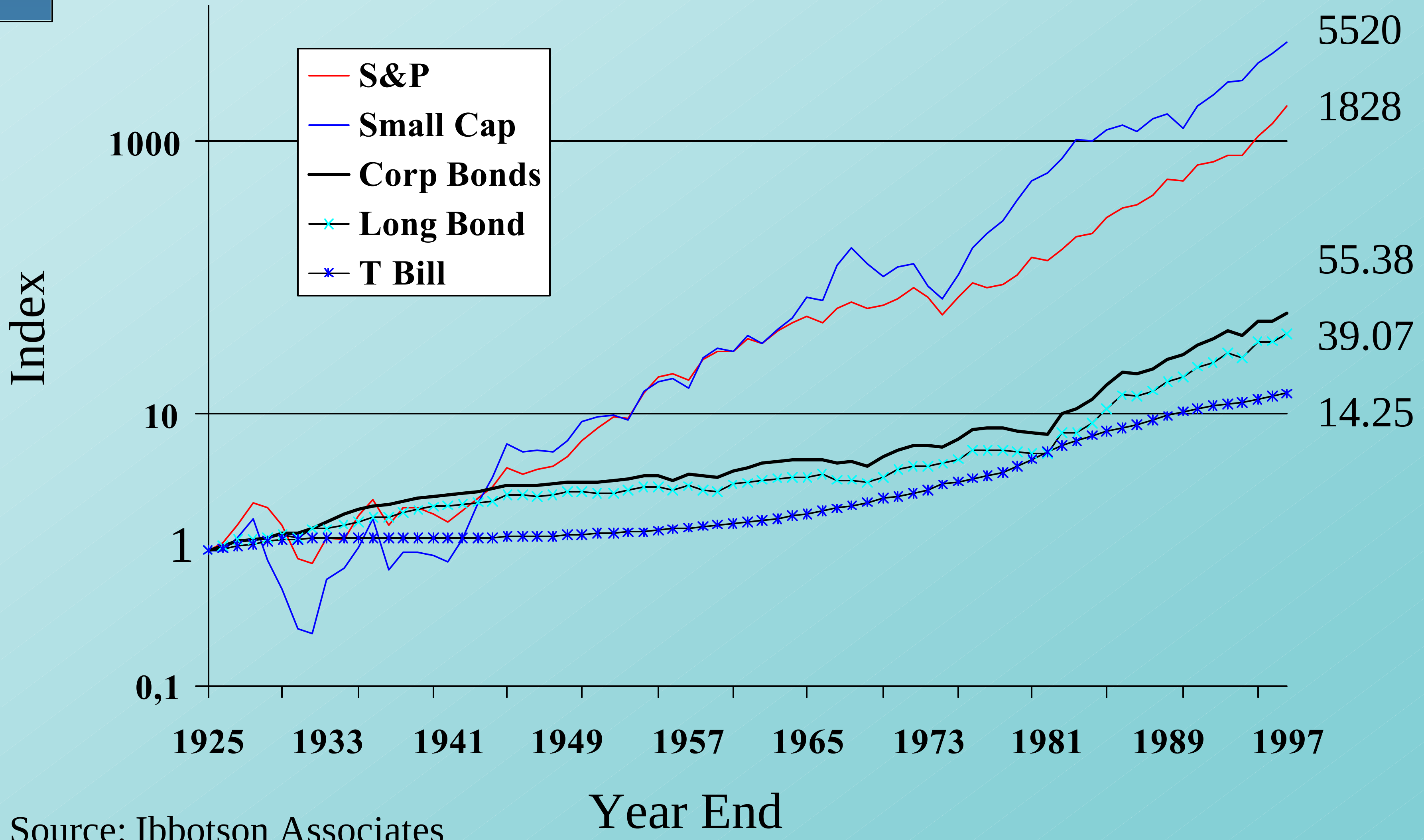
- Introduction to Risk, Return, and the Opportunity Cost of Capital

Chapter 7

Topics Covered

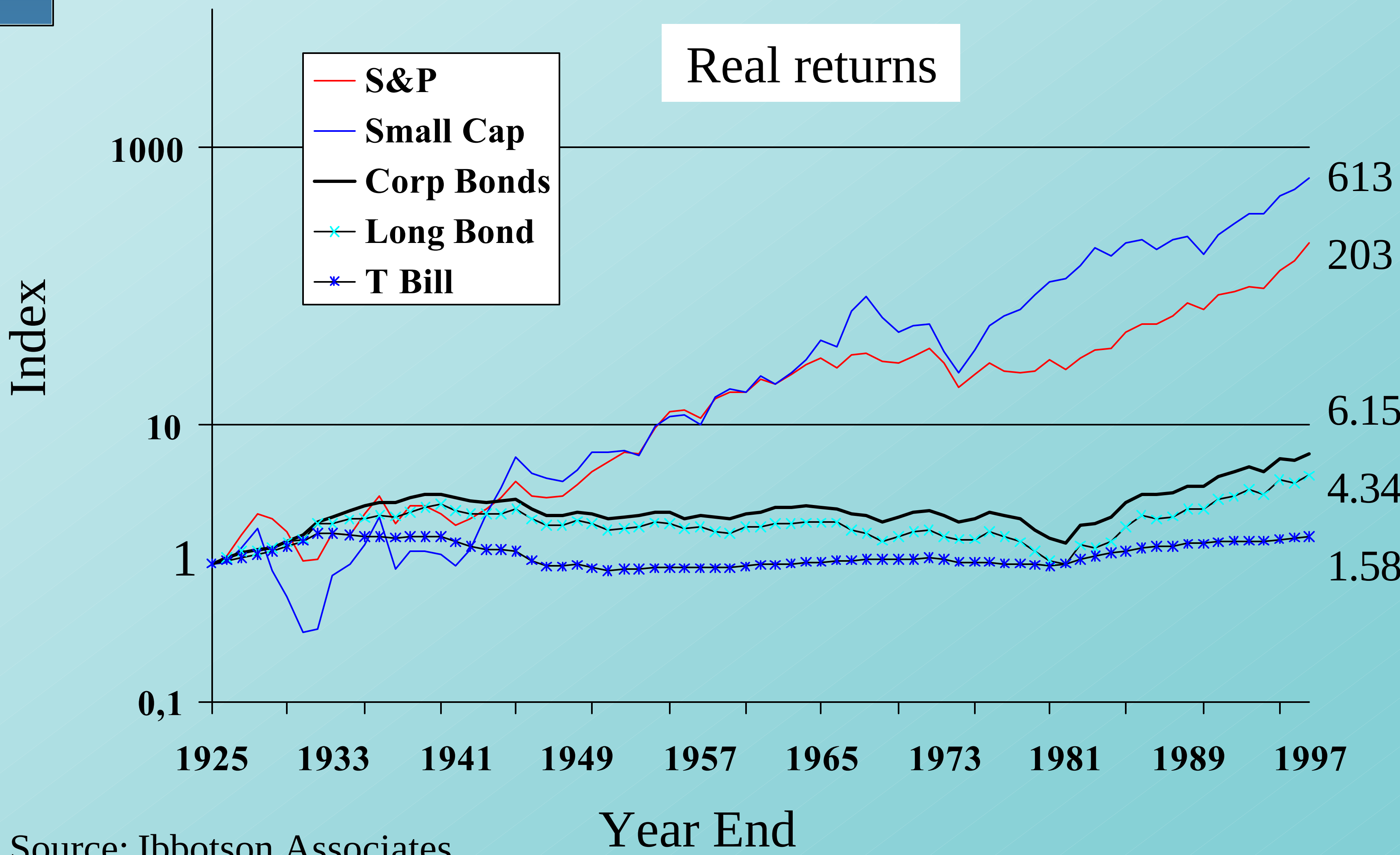
- 72 Years of Capital Market History
- Measuring Risk
- Portfolio Risk
- Beta and Unique Risk
- Diversification

The Value of an Investment of $1 in 1926



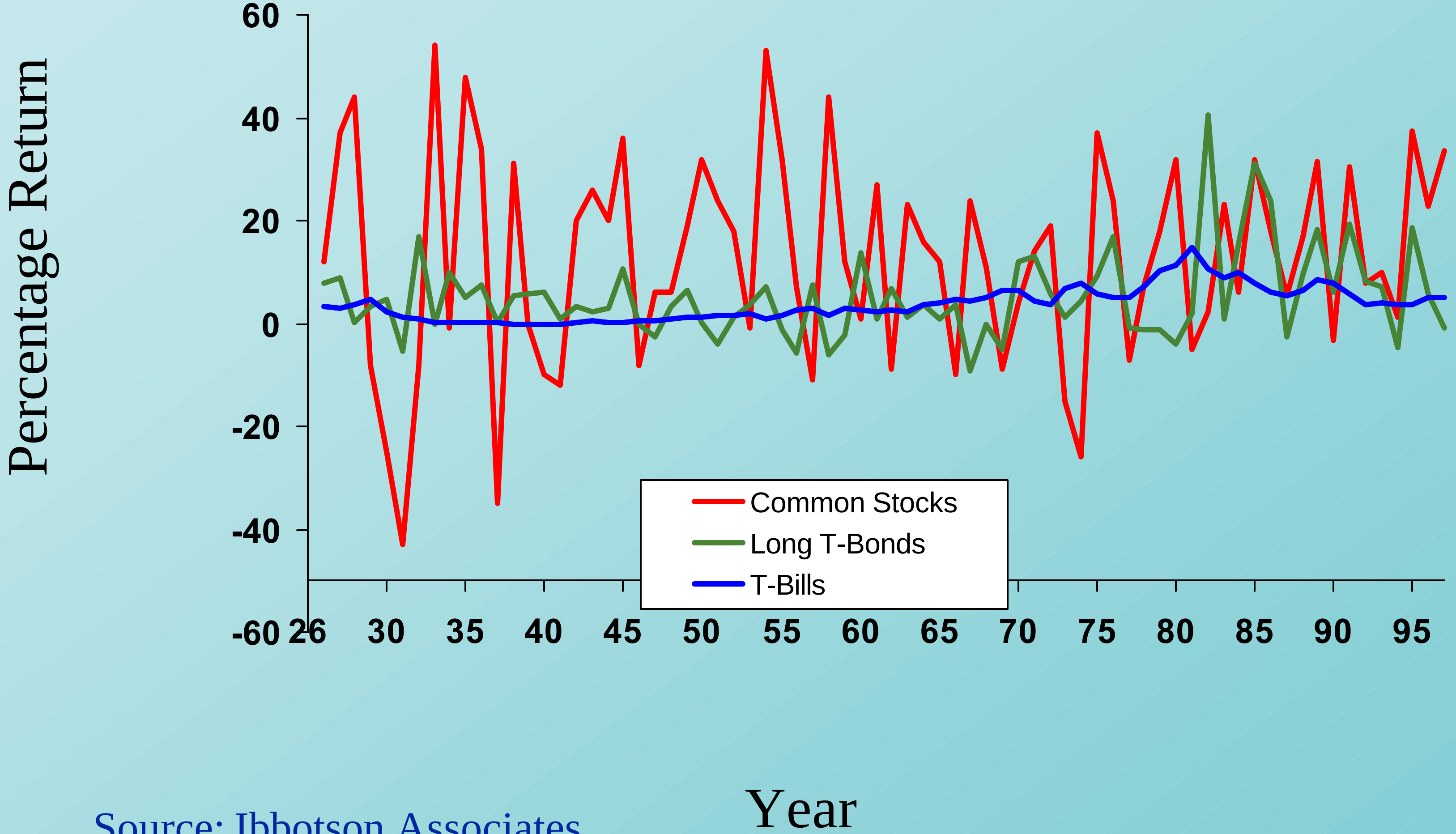
Source: Ibbotson Associates

The Value of an Investment of $1 in 1926



Source: Ibbotson Associates

Rates of Return 1926-1997



Source: Ibbotson Associates

Measuring Risk

Variance - Average value of squared deviations from mean. A measure of volatility.

Standard Deviation - Average value of squared deviations from mean. A measure of volatility.

Measuring Risk

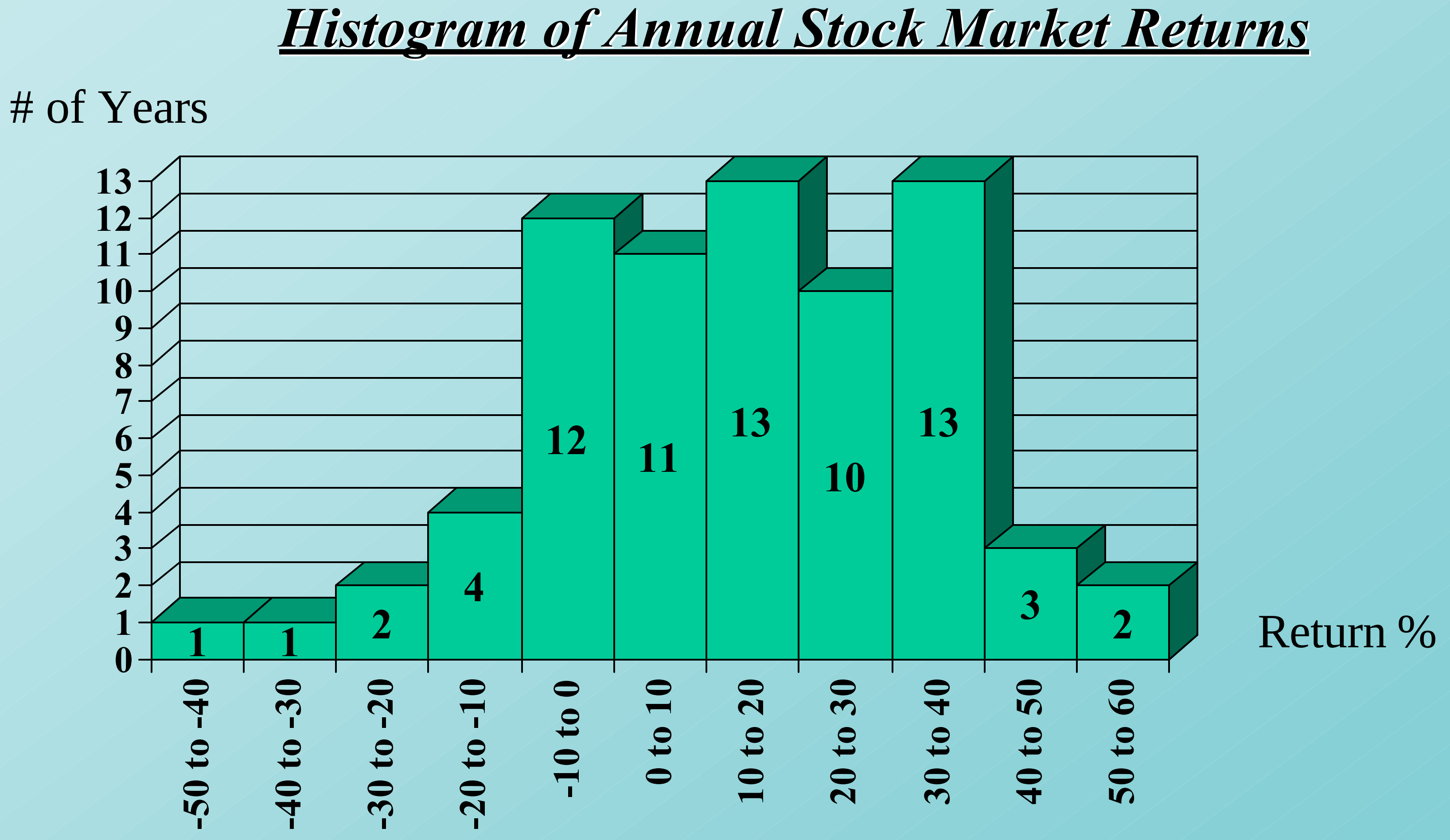
Coin Toss Game-calculating variance and standard deviation

(1) Percent Rate of Return	(2) Deviation from Mean	(3) Squared Deviation
+ 40	+ 30	900
+ 10	0	0
+ 10	0	0
- 20	- 30	900

Variance = average of squared deviations = 1800 / 4 = 450

Standard deviation = square of root variance = $\sqrt{450}$ = 21.2%

Measuring Risk



Measuring Risk

<u>Diversification</u> - Strategy designed to reduce risk by spreading the portfolio across many investments.

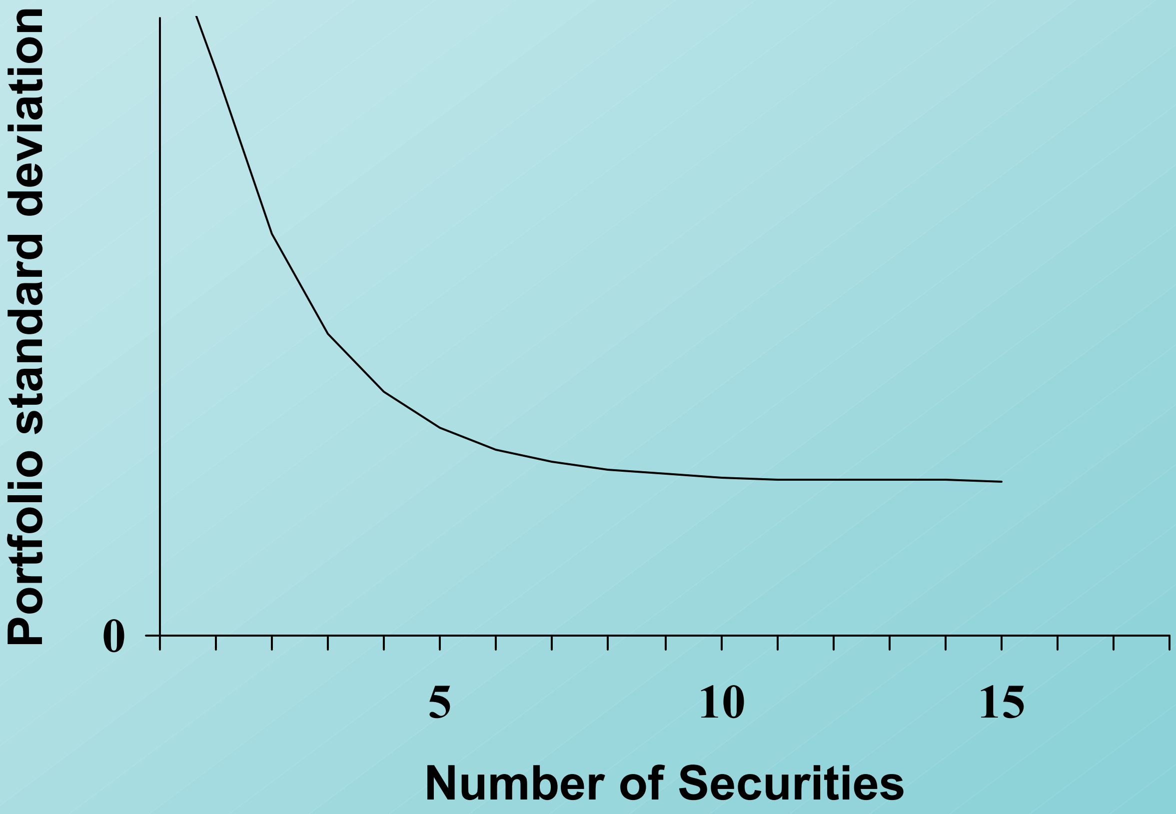
<u>Unique Risk</u> - Risk factors affecting only that firm. Also called "diversifiable risk."

<u>Market Risk</u> - Economy-wide sources of risk that affect the overall stock market. Also called "systematic risk."

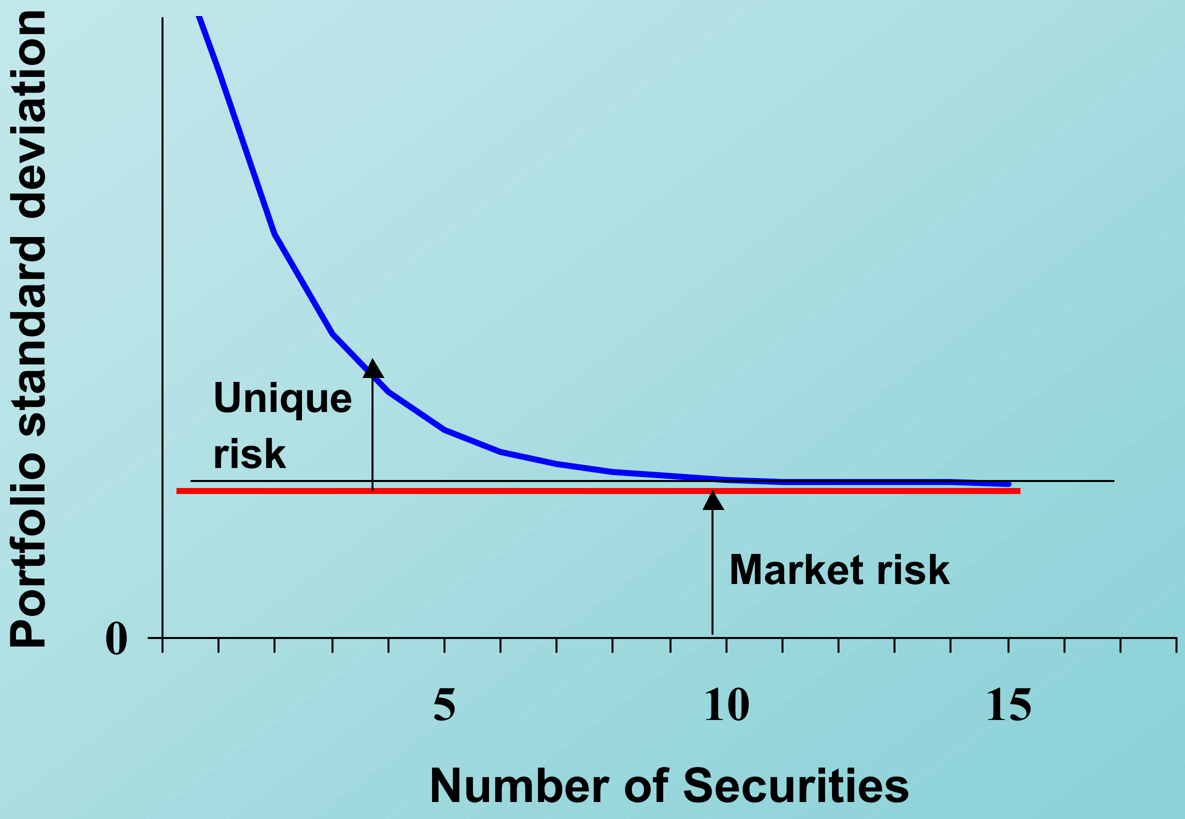
Measuring Risk

$$\text{Portfolio rate of return} = \left(\begin{array}{c}\text{fraction of portfolio}\\\text{in first asset}\end{array}\right) \times \left(\begin{array}{c}\text{rate of return}\\\text{on first asset}\end{array}\right) + \left(\begin{array}{c}\text{fraction of portfolio}\\\text{in second asset}\end{array}\right) \times \left(\begin{array}{c}\text{rate of return}\\\text{on second asset}\end{array}\right)$$

Measuring Risk



Measuring Risk



Portfolio Risk

The variance of a two stock portfolio is the sum of these four boxes:

	Stock 1	Stock 2
Stock 1	$x_1^2 \text{ó}_1^2$	$x_1 x_2 \text{ó}_{12} = x_1 x_2 \text{ñ}_{12} \text{ó}_1 \text{ó}_2$
Stock 2	$x_1 x_2 \text{ó}_{12} = x_1 x_2 \text{ñ}_{12} \text{ó}_1 \text{ó}_2$	$x_2^2 \text{ó}_2^2$

Portfolio Risk

Example

Suppose you invest $55 in Bristol-Myers and $45 in McDonald's. The expected dollar return on your BM is .10 x 55 = 5.50 and on McDonald's it is .20 x 45 = 9.90. The expected dollar return on your portfolio is 5.50 + 9300 = 14.50. The portfolio rate of return is 14.50/100 = .145 or 14.5%. Assume a correlation coefficient of 1.

Portfolio Risk

Example

Suppose you invest \$55 in Bristol-Myers and \$45 in McDonald’s. The expected dollar return on your BM is .10 x 55 = 5.50 and on McDonald’s it is .20 x 45 = 9.90. The expected dollar return on your portfolio is 5.50 + 9300 = 14.50. The portfolio rate of return is 14.50/100 = .145 or 14.5%. Assume a correlation coefficient of 1.

	Bristol - Myers	McDonald' s
Bristol - Myers	$x_1^2\sigma_1^2 = (.55)^2 \times (17.1)^2$	$x_1 x_2 \rho_{12}\sigma_1\sigma_2 = .55 \times .45 \times 1 \times 17.1 \times 20.8$
McDonald' s	$x_1 x_2 \rho_{12}\sigma_1\sigma_2 = .55 \times .45 \times 1 \times 17.1 \times 20.8$	$x_2^2\sigma_2^2 = (.45)^2 \times (20.8)^2$

Portfolio Risk

Example

Suppose you invest $55 in Bristol-Myers and $45 in McDonald's. The expected dollar return on your BM is .10 x 55 = 5.50 and on McDonald's it is .20 x 45 = 9.90. The expected dollar return on your portfolio is 5.50 + 9300 = 14.50. The portfolio rate of return is 14.50/100 = .145 or 14.5%. Assume a correlation coefficient of 1.

$$\text{Portfolio Valriance} = [(.55)^2 x(17.1)^2] + [(.45)^2 x(20.8)^2] + 2(.55x.45x1x17.1x20.8) = 352.10$$

$$\text{Standard Deviation} = \sqrt{352.1} = 18.7\,\%$$

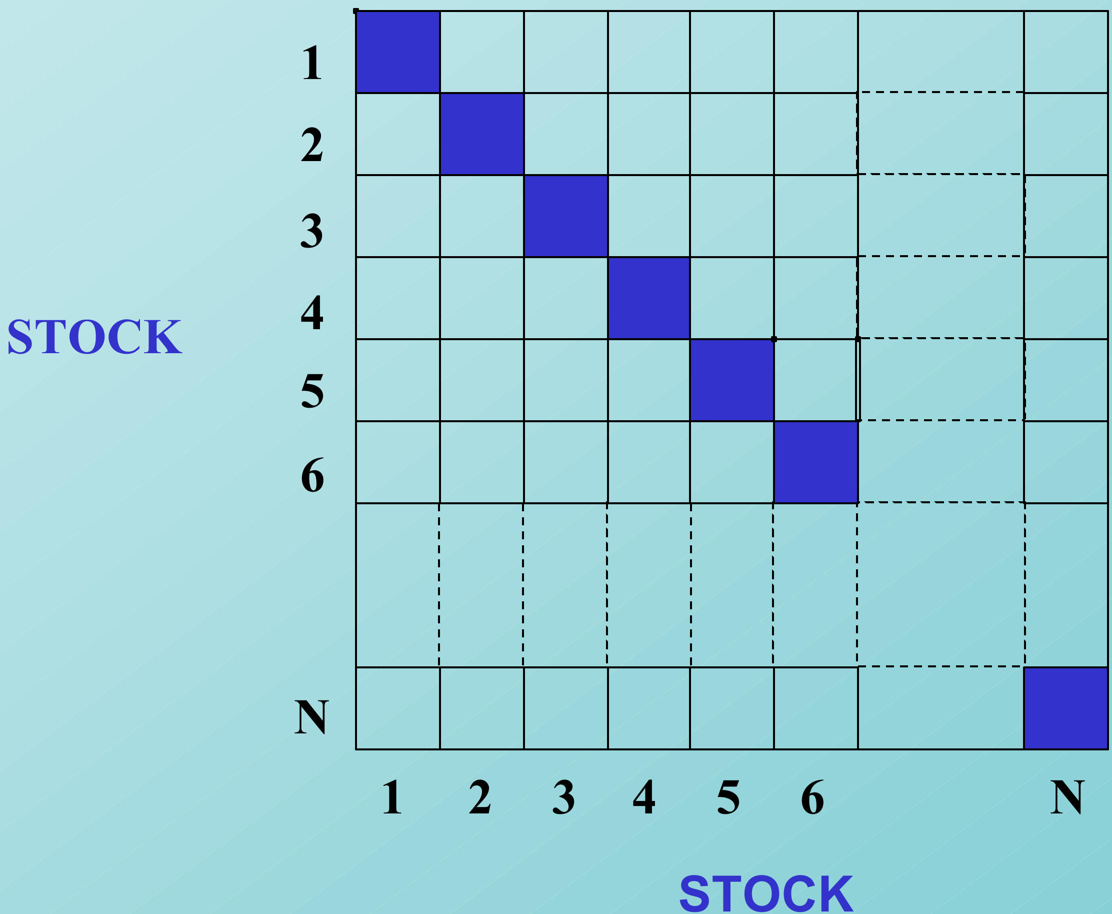
Portfolio Risk

$$\text{Expected Portfolio Return} = (x_1 r_1) + (x_2 r_2)$$

$$\text{Portfolio Variance} = x_1^2 \text{ó}_1^2 + x_2^2 \text{ó}_2^2 + 2(x_1 x_2 \text{ñ}_{12} \text{ó}_1 \text{ó}_2)$$

Portfolio Risk

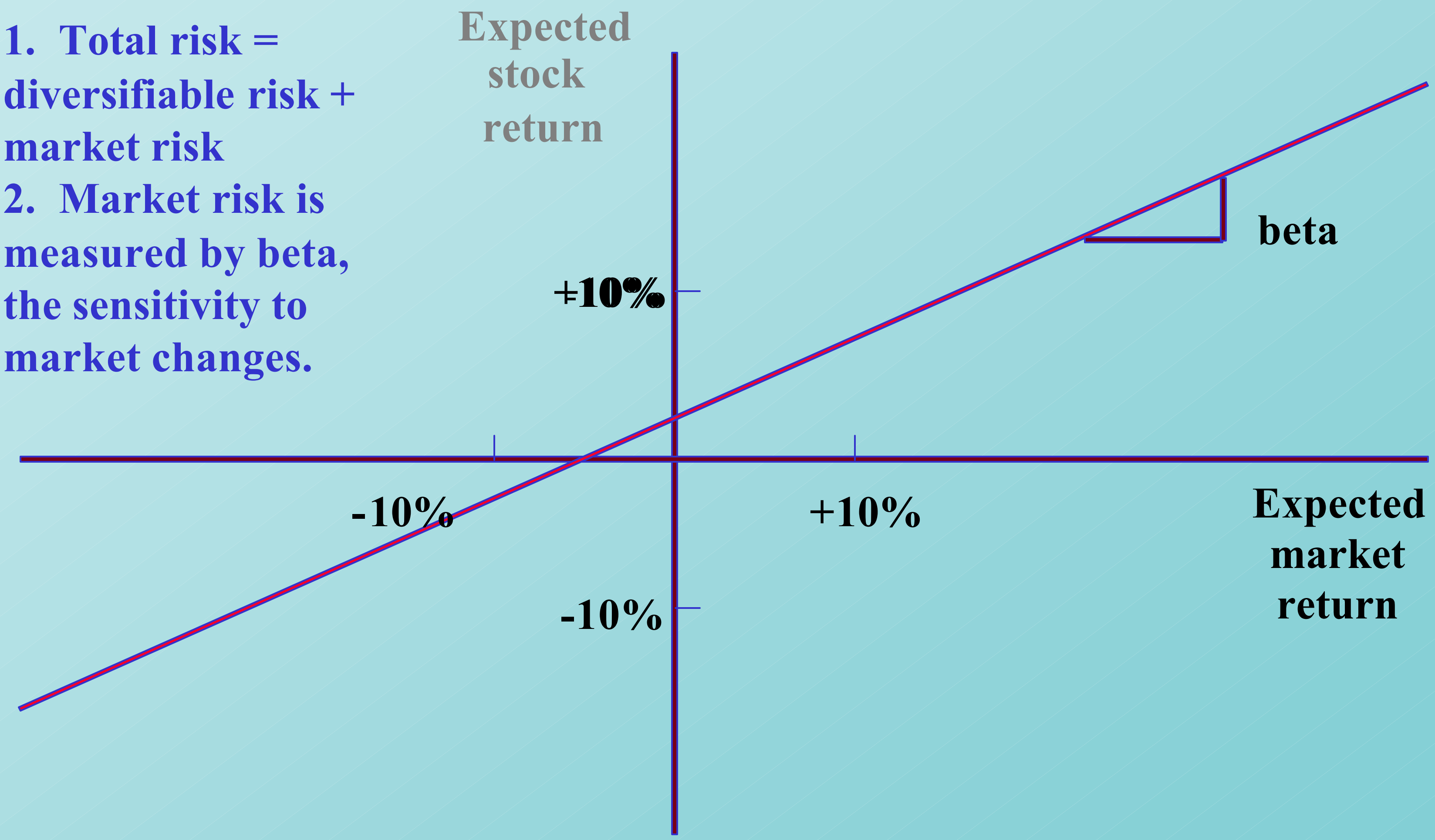
The shaded boxes contain variance terms; the remainder contain covariance terms.



To calculate portfolio variance add up the boxes

Beta and Unique Risk

1. Total risk = diversifiable risk + market risk
2. Market risk is measured by beta, the sensitivity to market changes.



Beta and Unique Risk

Market Portfolio - Portfolio of all assets in the economy. In practice a broad stock market index, such as the S&P Composite, is used to represent the market.

Beta - Sensitivity of a stock's return to the return on the market portfolio.

Beta and Unique Risk

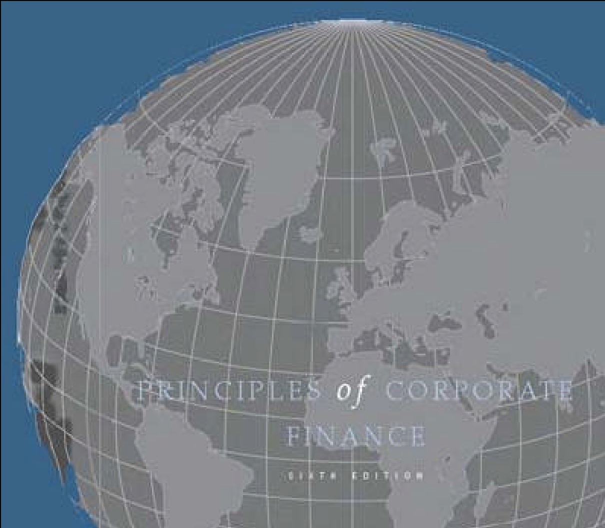
$$B_i = \frac{s_{im}}{s_m^2}$$

Beta and Unique Risk

$$B_i = \frac{s_{im}}{s_m^2}$$

Covariance with the market

Variance of the market



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

◆ Risk and Return

Chapter 8

Topics Covered

- Markowitz Portfolio Theory
- Risk and Return Relationship
- Testing the CAPM
- CAPM Alternatives

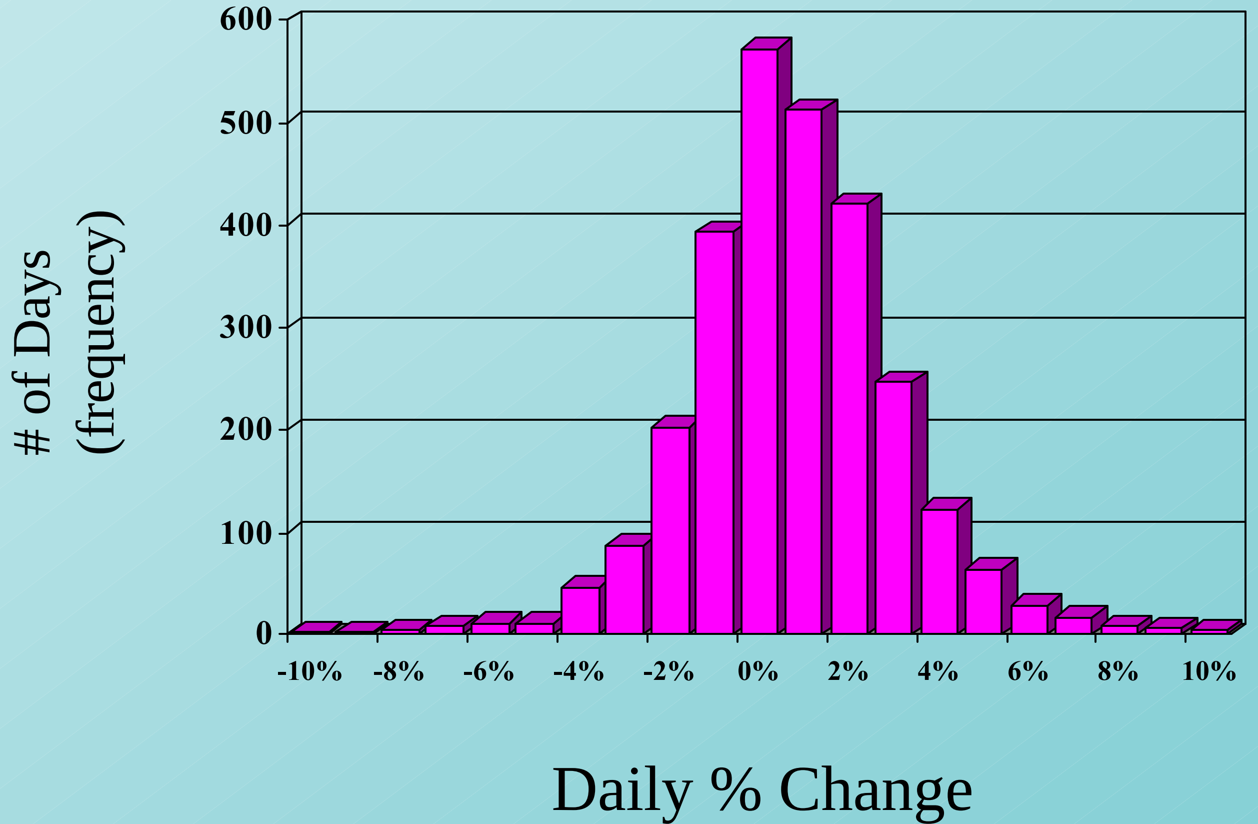
Markowitz Portfolio Theory

- Combining stocks into portfolios can reduce standard deviation below the level obtained from a simple weighted average calculation.
- Correlation coefficients make this possible.
- The various weighted combinations of stocks that create this standard deviations constitute the set of ***efficient portfolios***.

Markowitz Portfolio Theory

Price changes vs. Normal distribution

Microsoft - Daily % change 1986-1997



Markowitz Portfolio Theory

Price changes vs. Normal distribution

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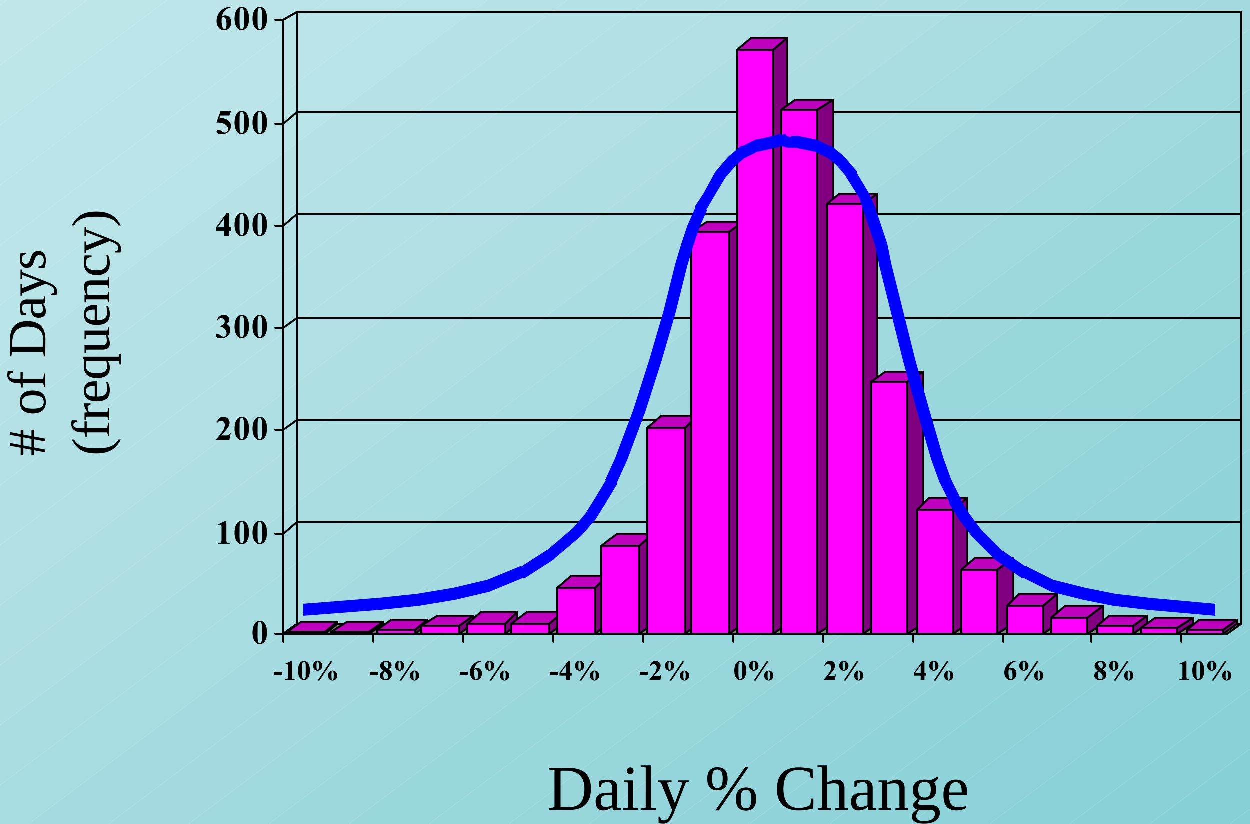
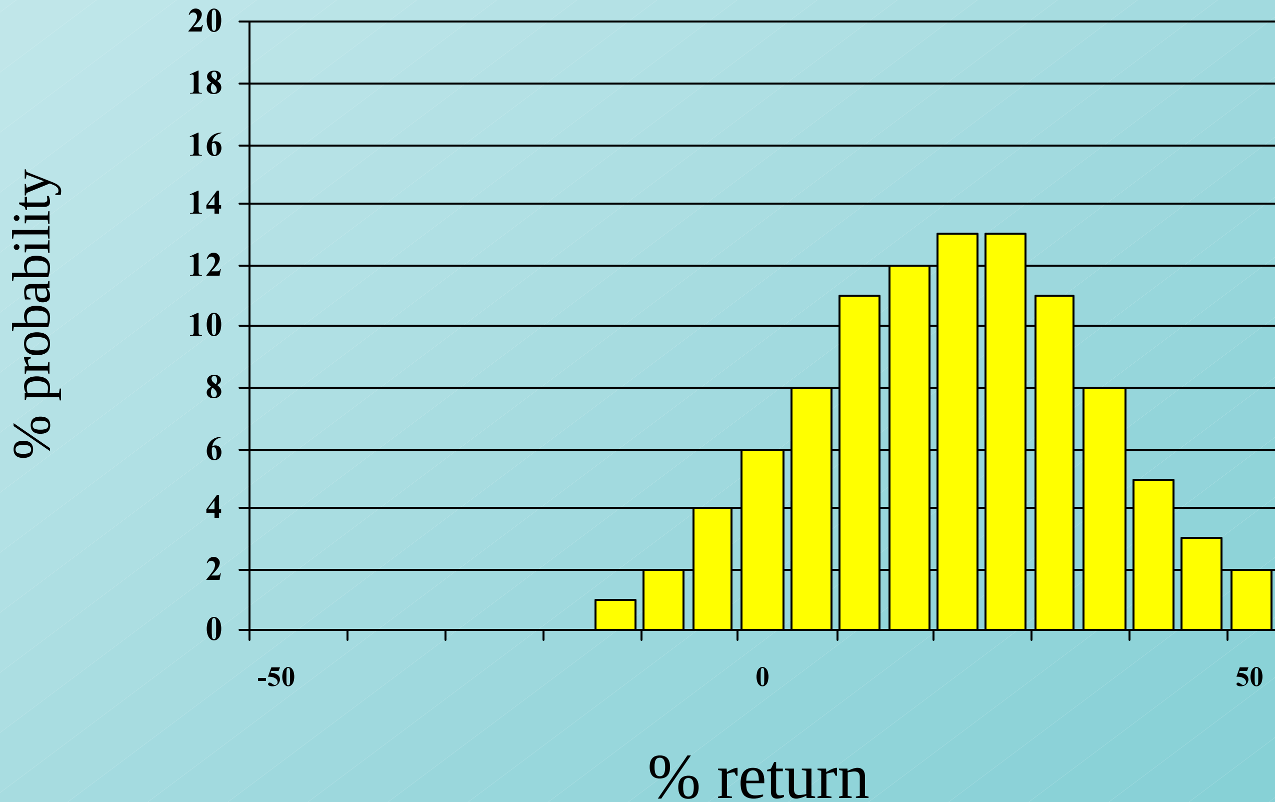


Markowitz Portfolio Theory

Standard Deviation VS. Expected Return

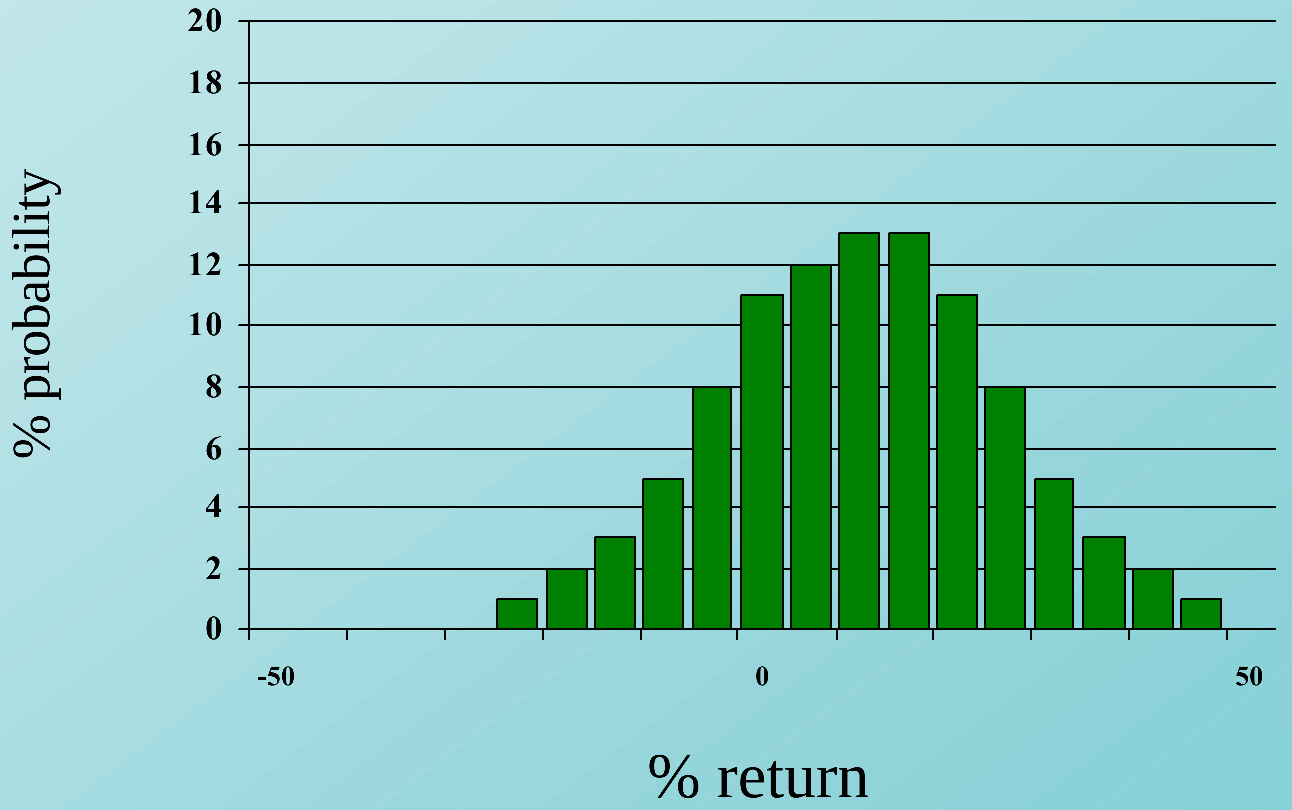
Investment C



Markowitz Portfolio Theory

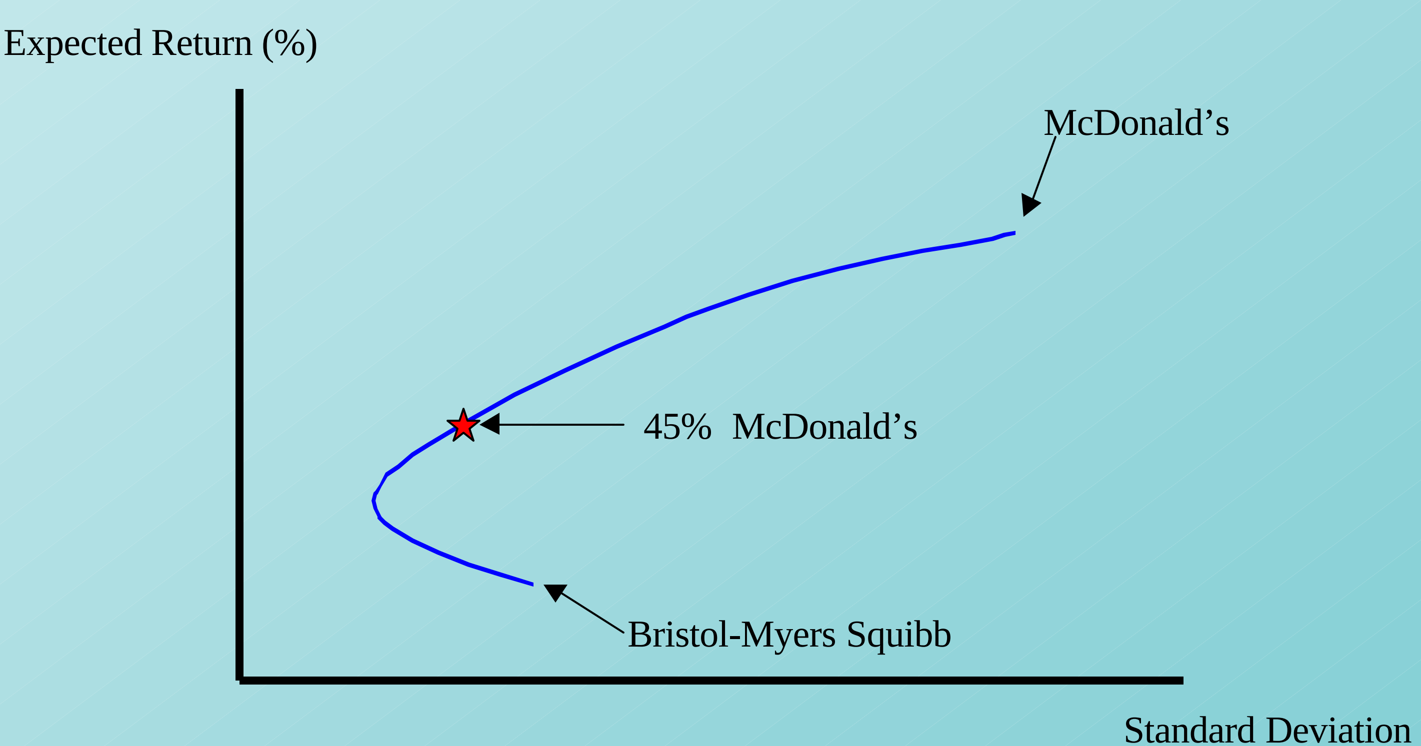
Standard Deviation VS. Expected Return

Investment D



Markowitz Portfolio Theory

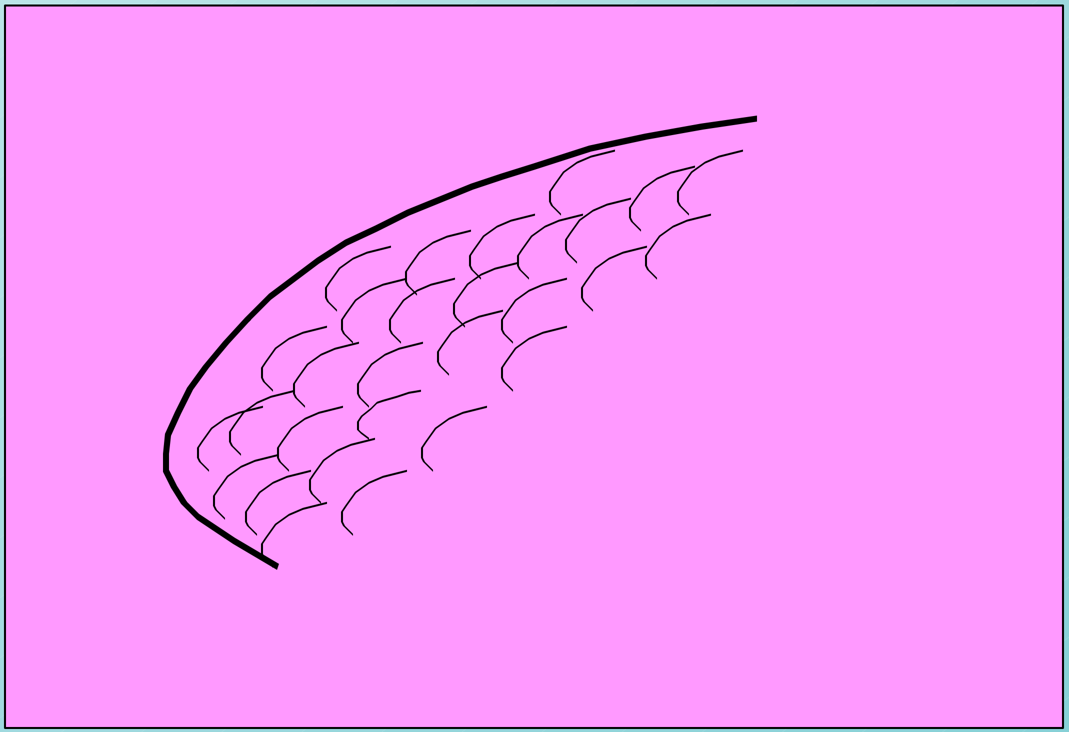
- Expected Returns and Standard Deviations vary given different weighted combinations of the stocks.



Efficient Frontier

- Each half egg shell represents the possible weighted combinations for two stocks.
- The composite of all stock sets constitutes the efficient frontier.

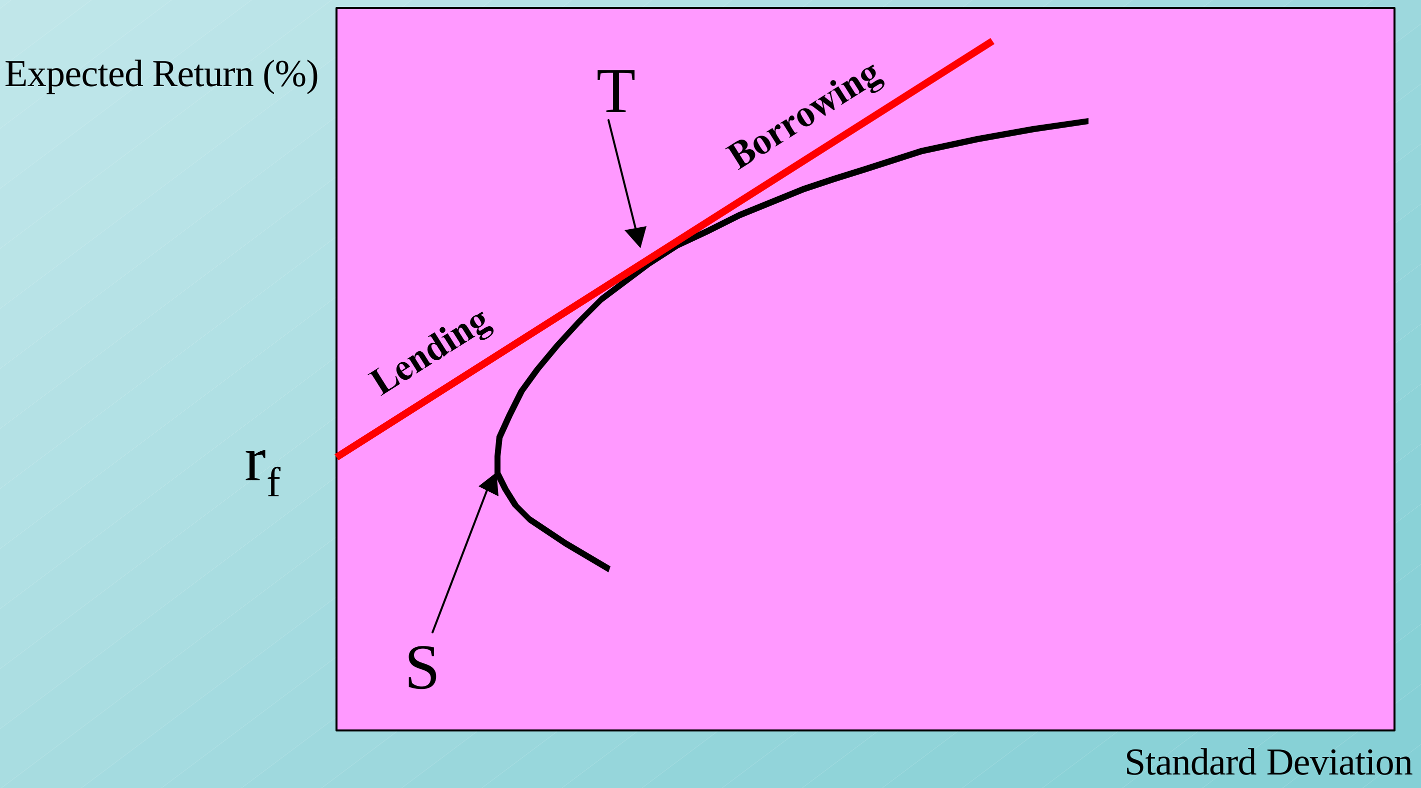
Expected Return (%)



Standard Deviation

Efficient Frontier

•Lending or Borrowing at the risk free rate (r_f) allows us to exist outside the efficient frontier.



Efficient Frontier

Example		Correlation Coefficient = .4	
Stocks	*s*	% of Portfolio	Avg Return
ABC Corp	28	60%	15%
Big Corp	42	40%	21%

Standard Deviation = weighted avg = 33.6

Standard Deviation = Portfolio = 28.1

Return = weighted avg = Portfolio = 17.4%

Efficient Frontier

<u>Example</u> Correlation Coefficient = .4

<u>Stocks</u>	<u>*s*</u>	<u>% of Portfolio</u>	<u>Avg Return</u>
ABC Corp	28	60%	15%
Big Corp	42	40%	21%

Standard Deviation = weighted avg = <u>33.6</u>

Standard Deviation = Portfolio = <u>28.1</u>

Return = weighted avg = Portfolio = <u>17.4%</u>

<u>Let's Add stock New Corp to the portfolio</u>

Efficient Frontier

Example Correlation Coefficient = .3

Stocks	s	% of Portfolio	Avg Return
Portfolio	28.1	50%	17.4%
New Corp	***30***	***50%***	***19%***

NEW Standard Deviation = weighted avg = 31.80

NEW Standard Deviation = Portfolio = 23.43

NEW Return = weighted avg = Portfolio = 18.20%

Efficient Frontier

Example Correlation Coefficient = .3

Stocks	*s*	% of Portfolio	Avg Return
Portfolio	28.1	50%	17.4%
New Corp	30	50%	19%

NEW Standard Deviation = weighted avg = 31.80

NEW Standard Deviation = Portfolio = 23.43

NEW Return = weighted avg = Portfolio = 18.20%

NOTE: Higher return & Lower risk

Efficient Frontier

Example		Correlation Coefficient = .3	
Stocks	*s*	% of Portfolio	Avg Return
Portfolio	28.1	50%	17.4%
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NEW Standard Deviation = weighted avg = 31.80

NEW Standard Deviation = Portfolio = 23.43

NEW Return = weighted avg = Portfolio = 18.20%

NOTE: Higher return & Lower risk

How did we do that?

Efficient Frontier

Example Correlation Coefficient = .3

Stocks	*s*	% of Portfolio	Avg Return
Portfolio	28.1	50%	17.4%
New Corp	30	50%	19%

NEW Standard Deviation = weighted avg = 31.80

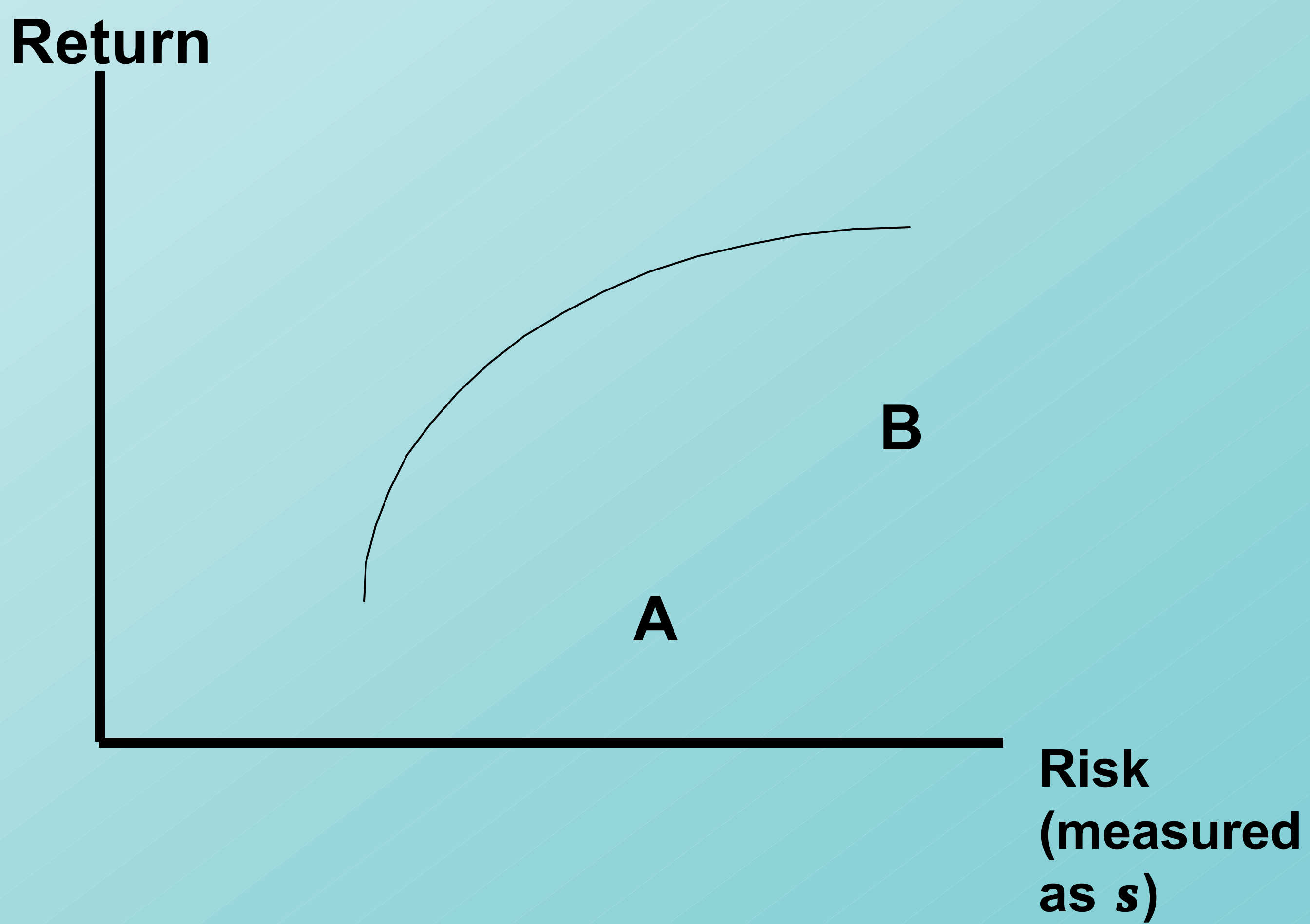
NEW Standard Deviation = Portfolio = 23.43

NEW Return = weighted avg = Portfolio = 18.20%

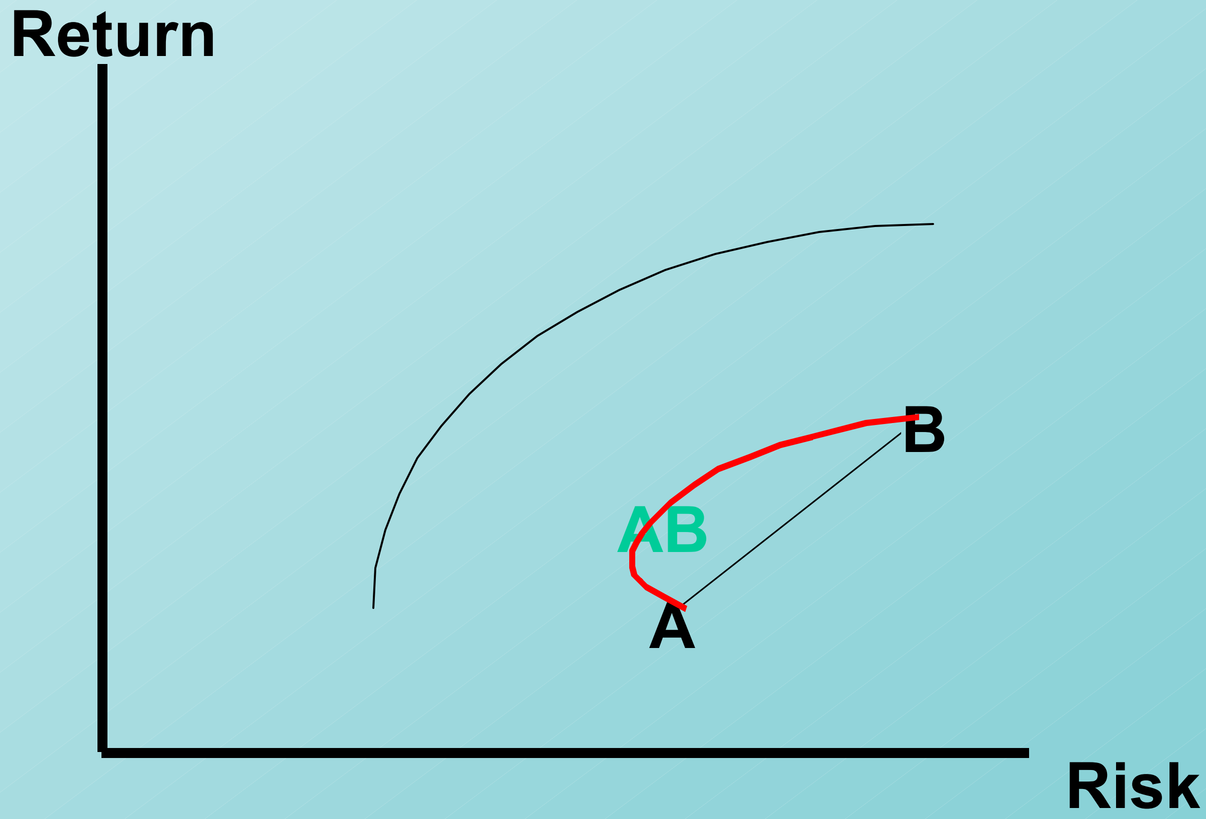
NOTE: Higher return & Lower risk

How did we do that? DIVERSIFICATION

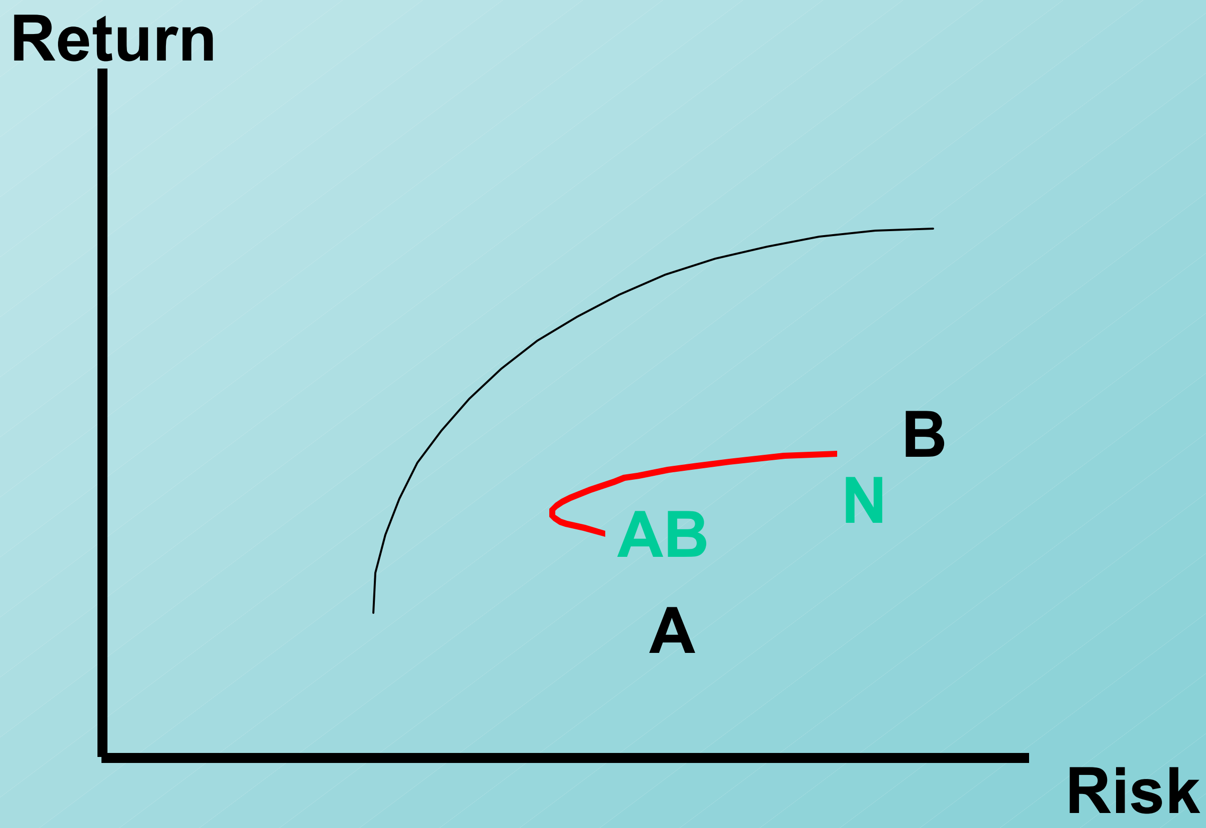
Efficient Frontier



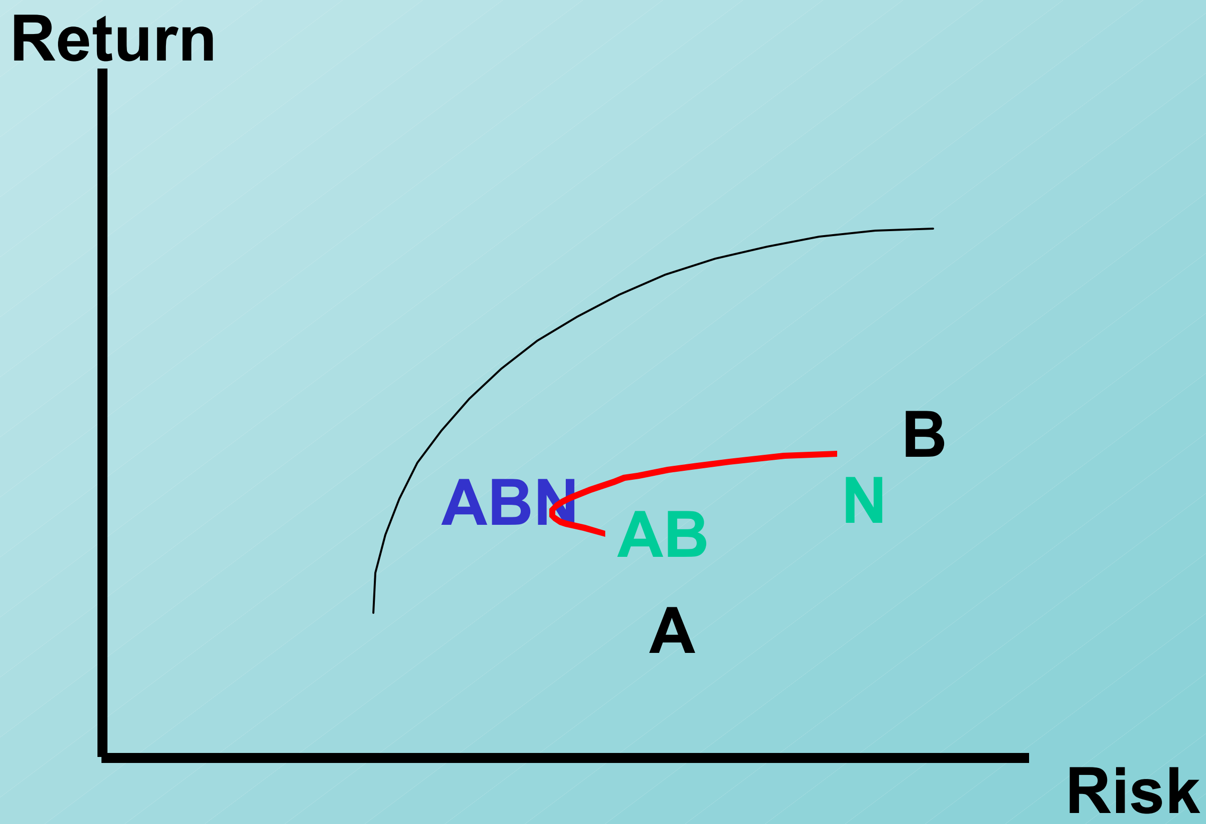
Efficient Frontier



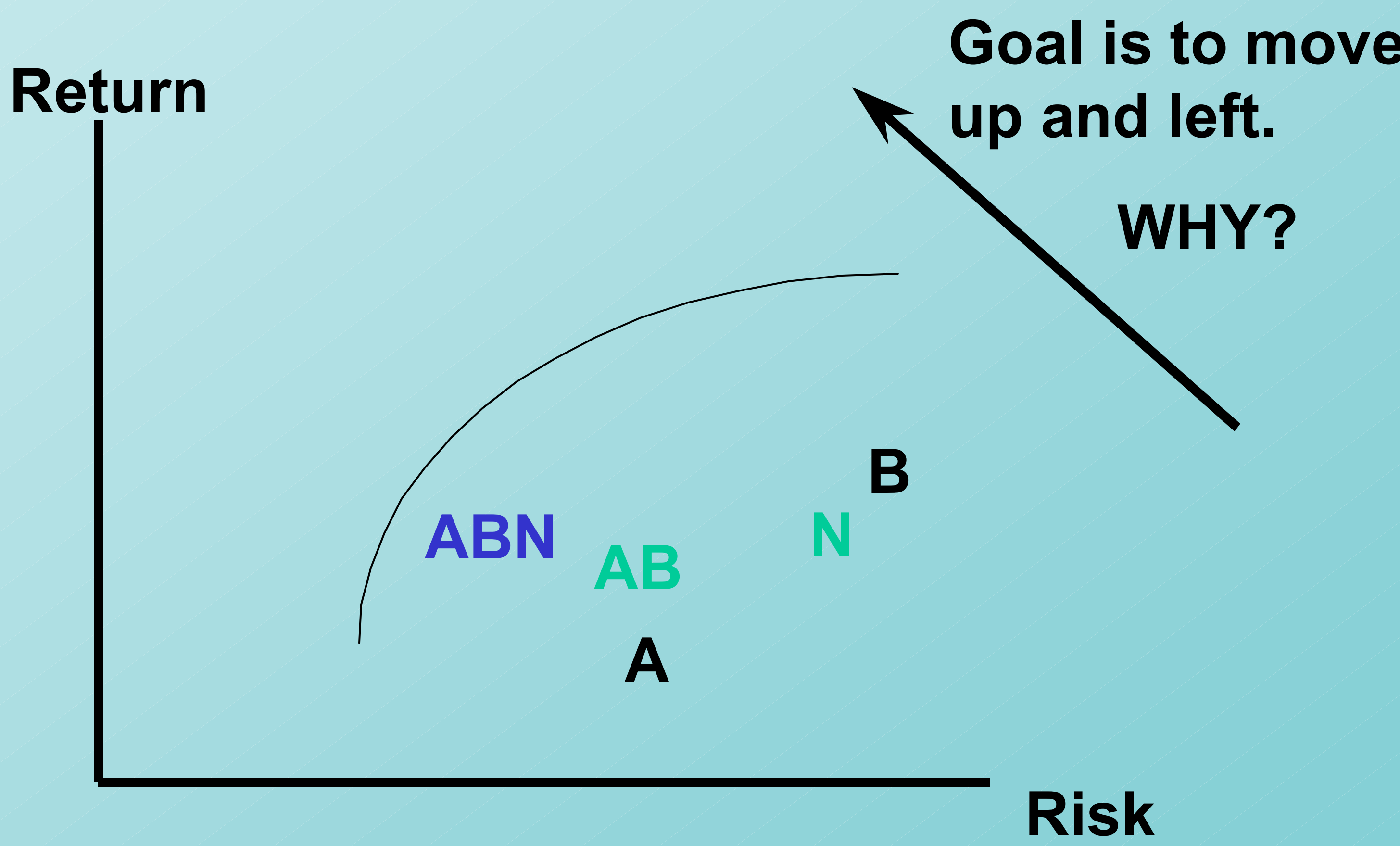
Efficient Frontier



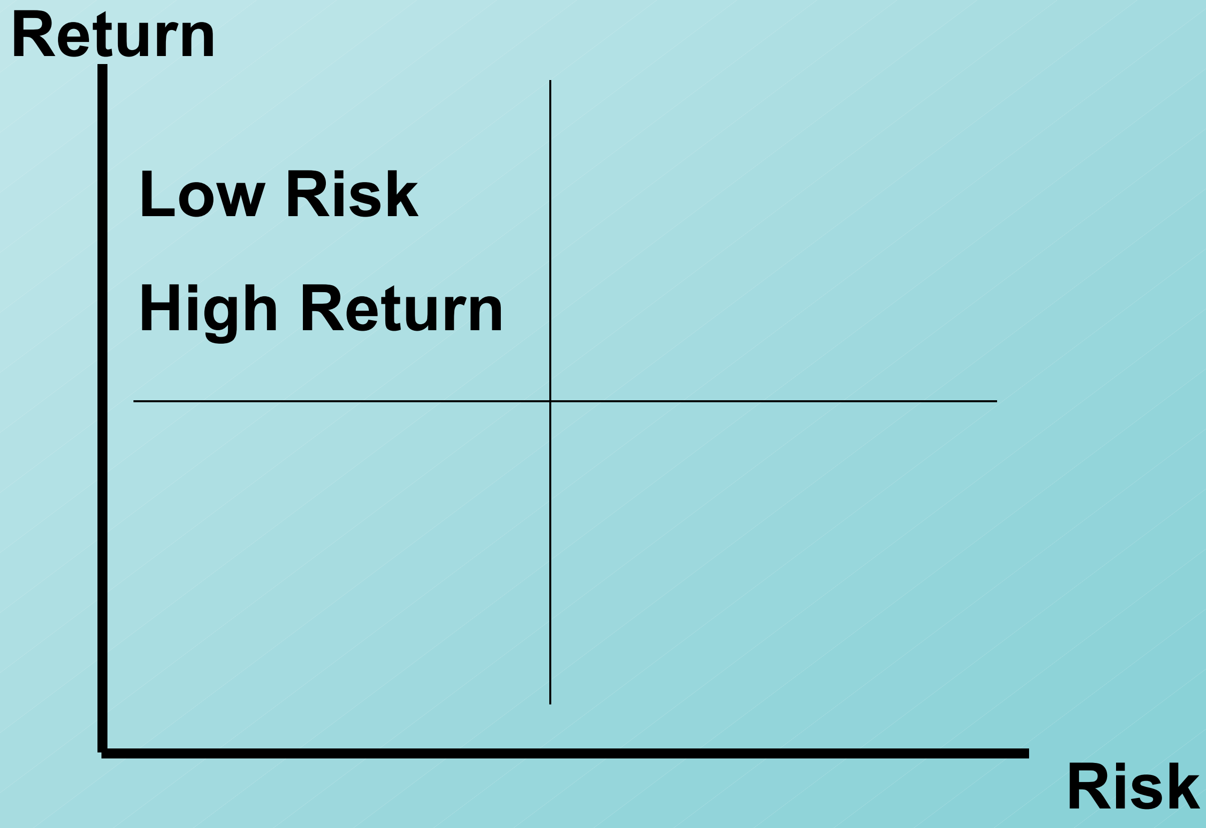
Efficient Frontier



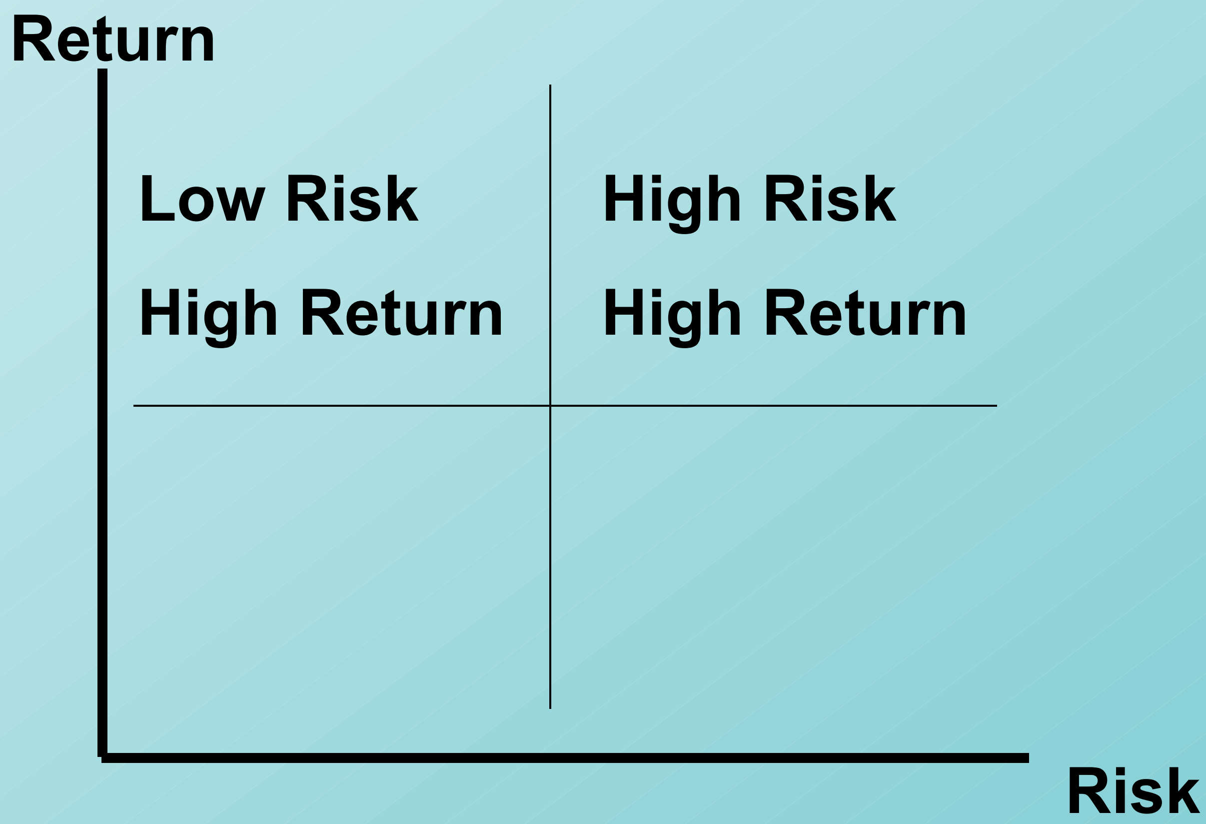
Efficient Frontier



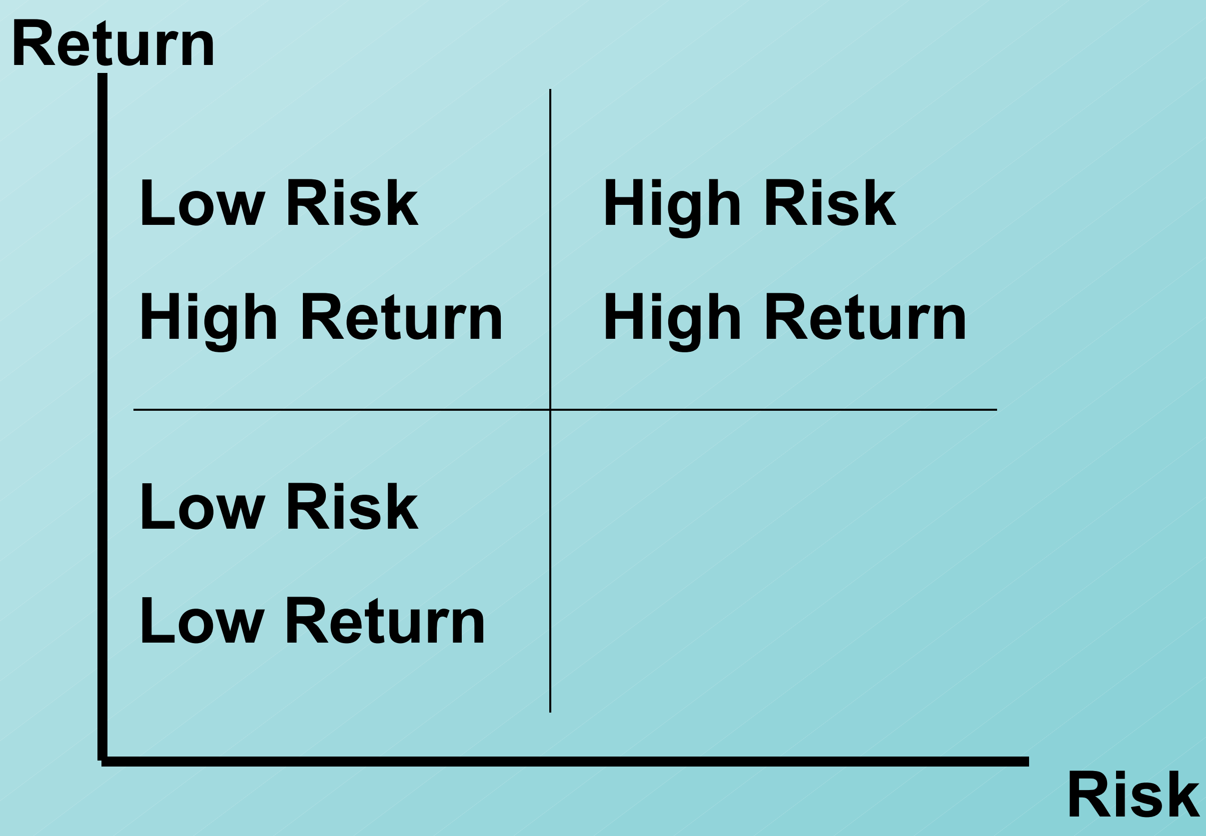
Efficient Frontier



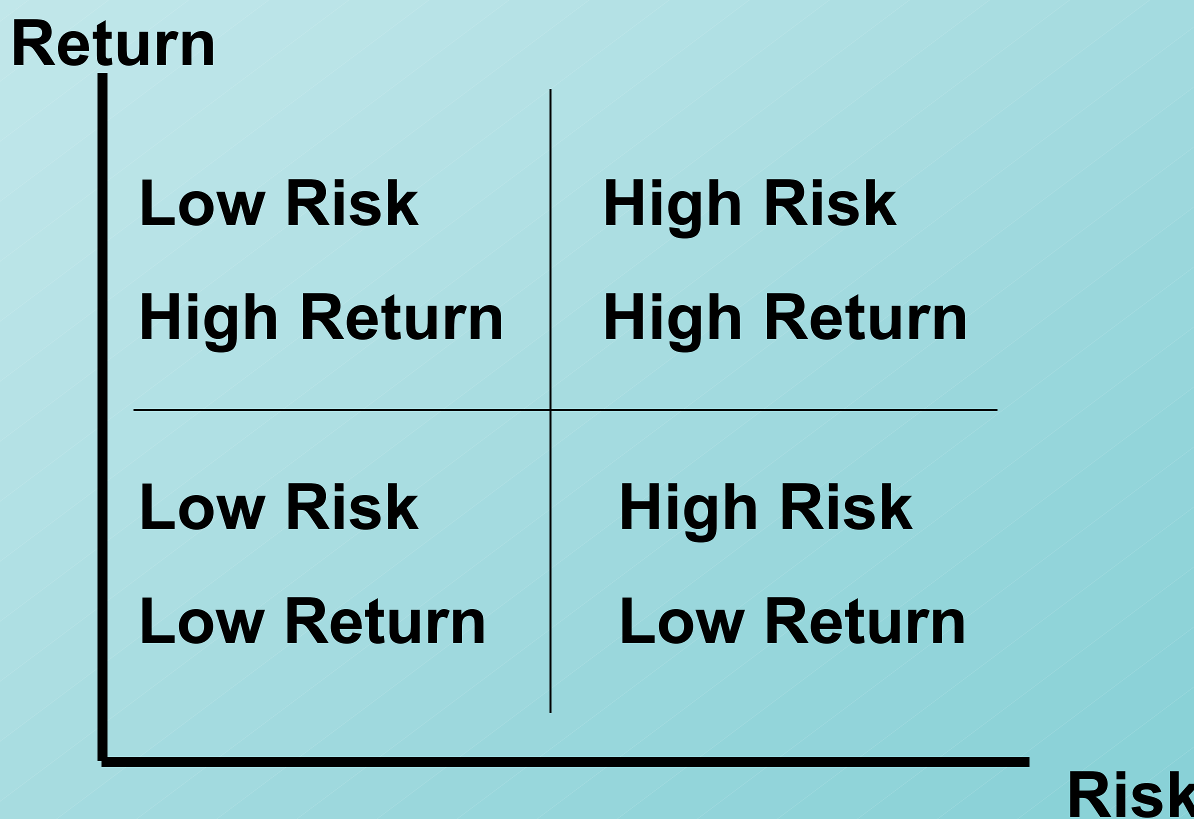
Efficient Frontier



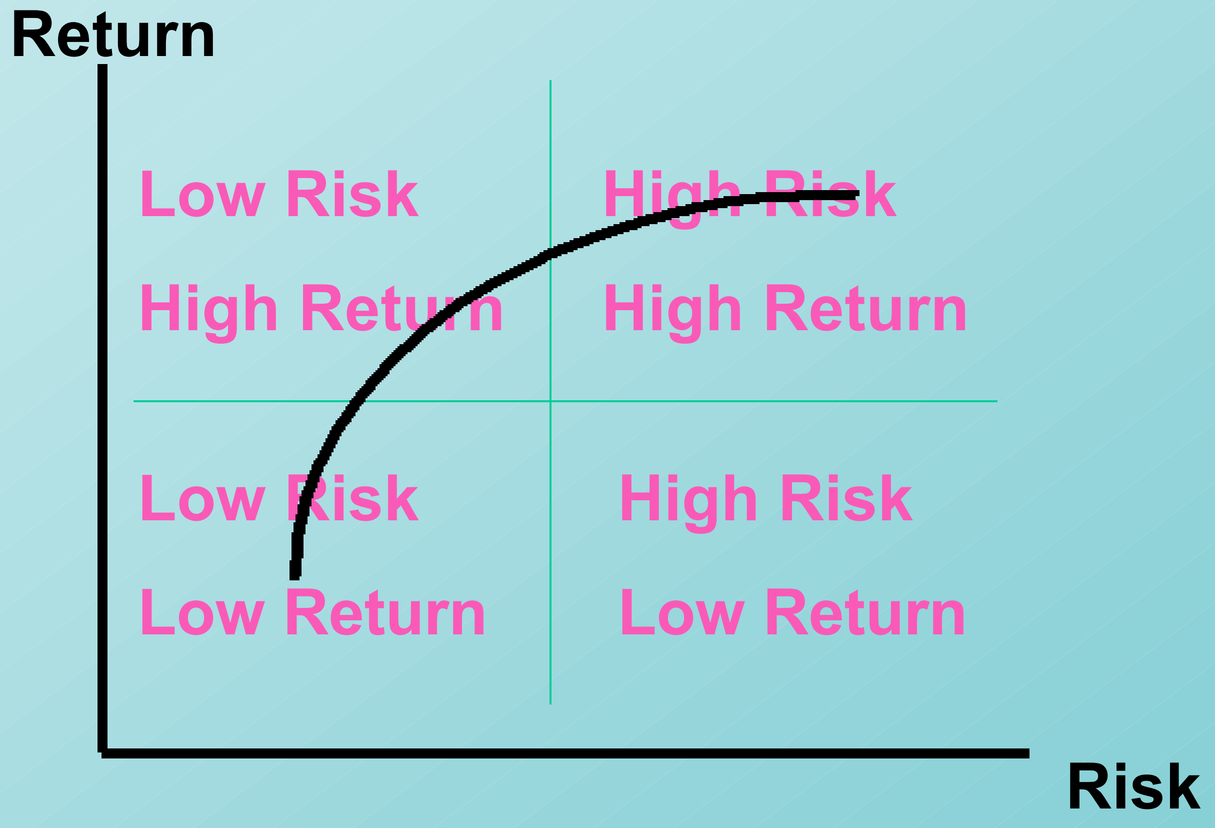
Efficient Frontier



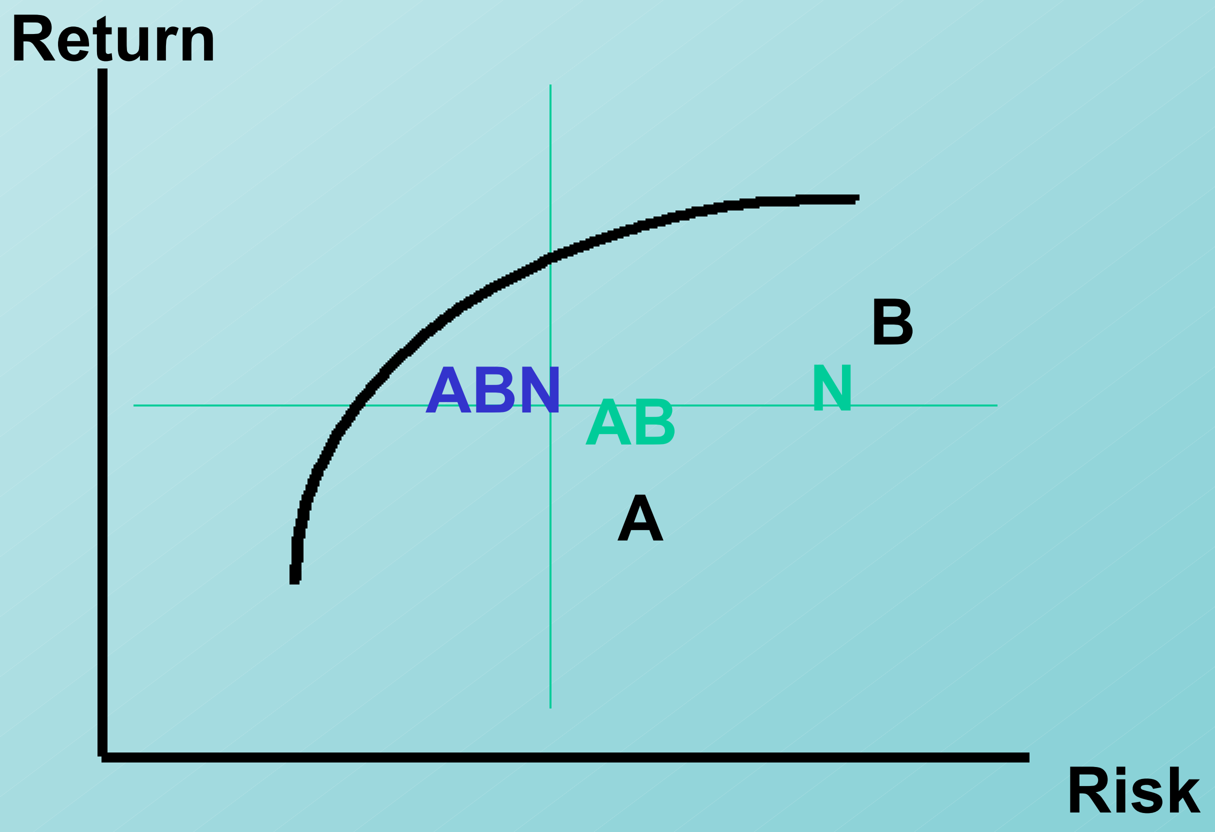
Efficient Frontier



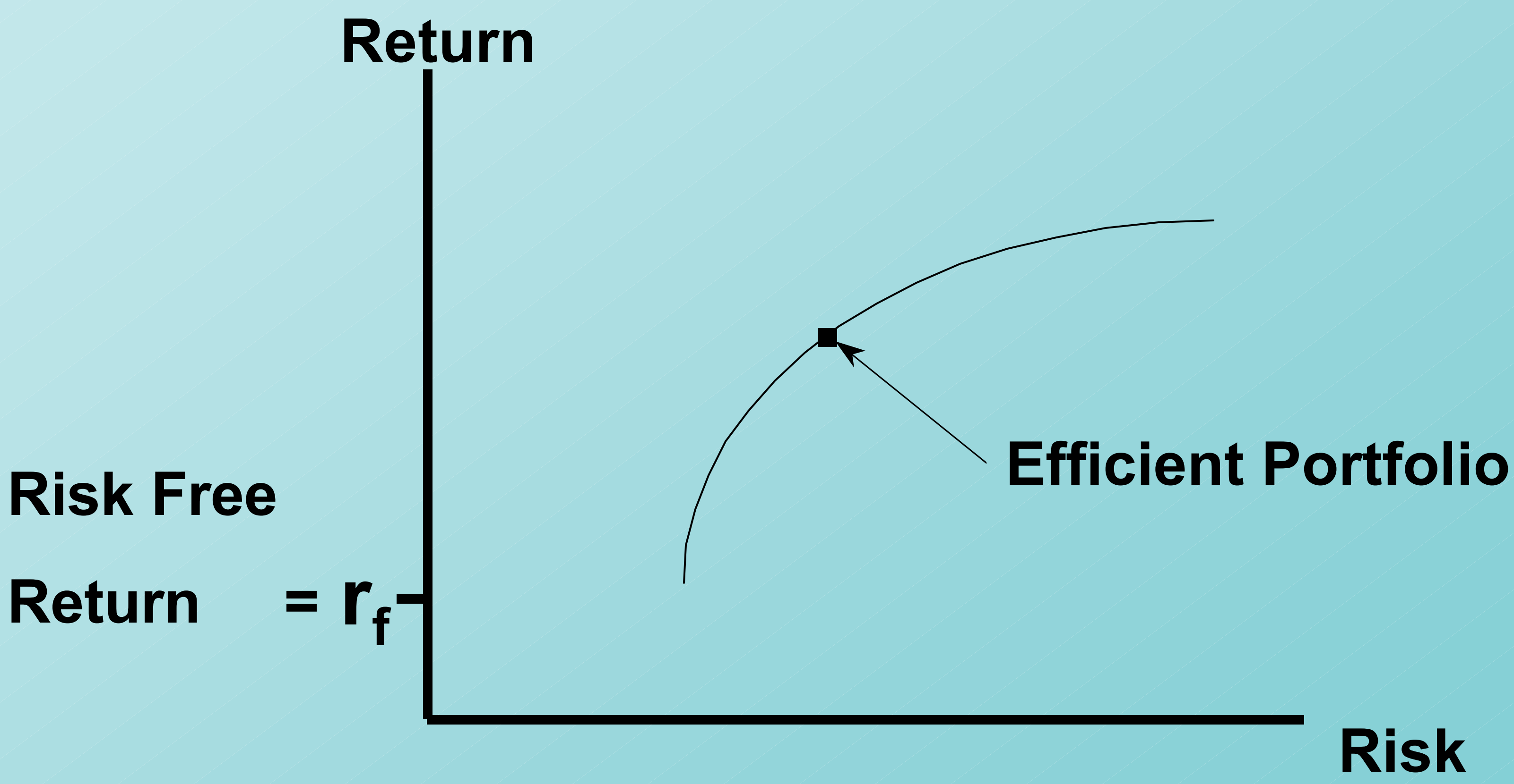
Efficient Frontier



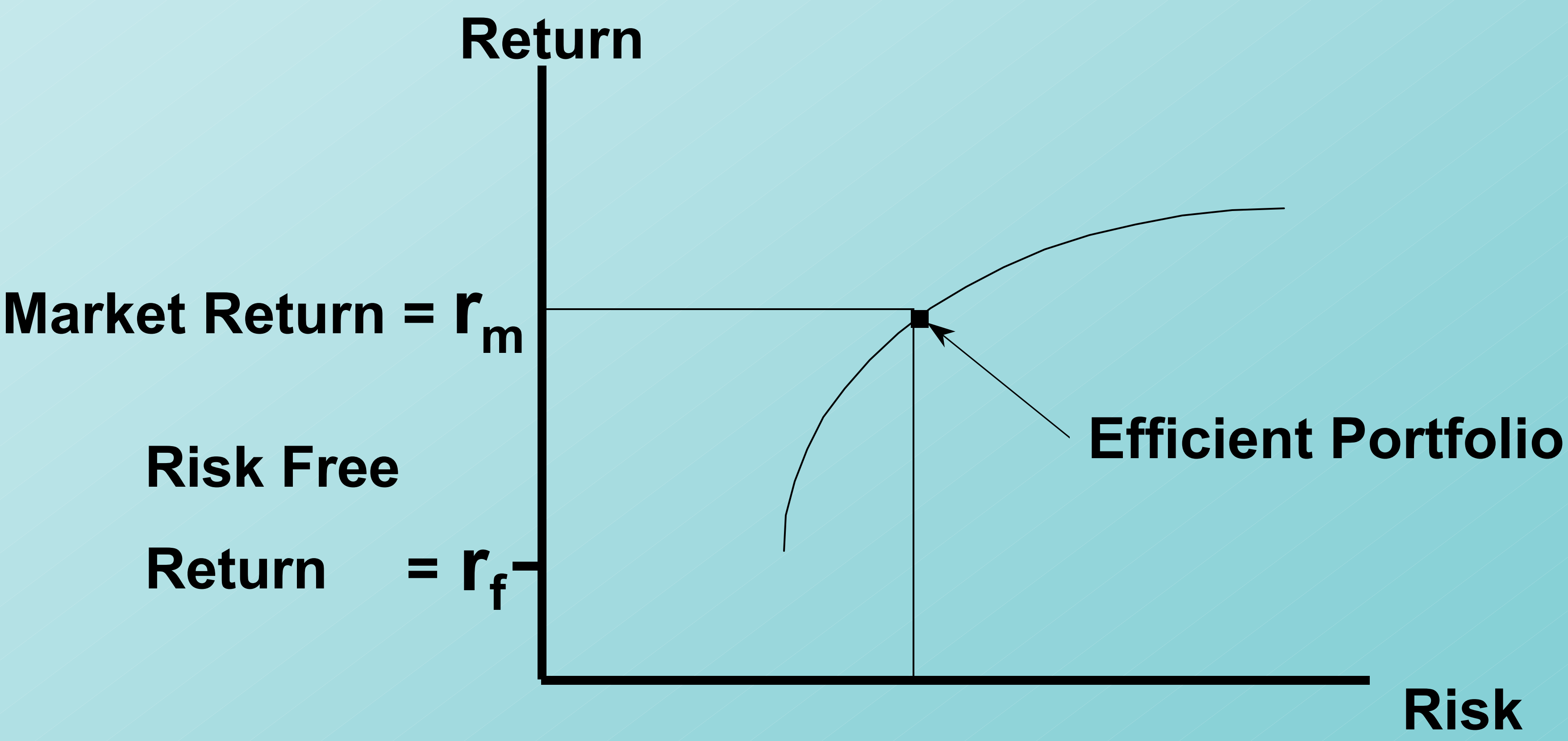
Efficient Frontier



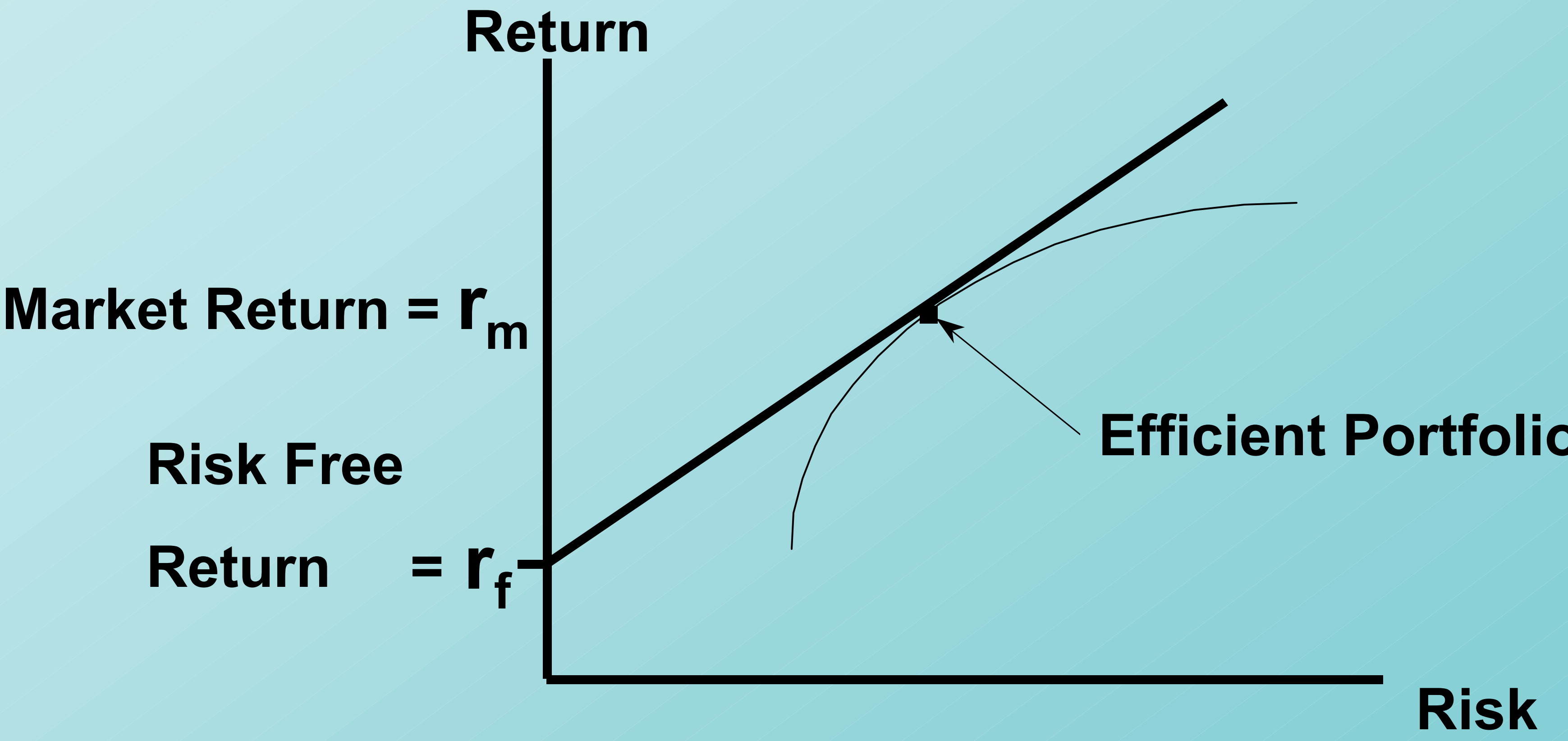
Security Market Line



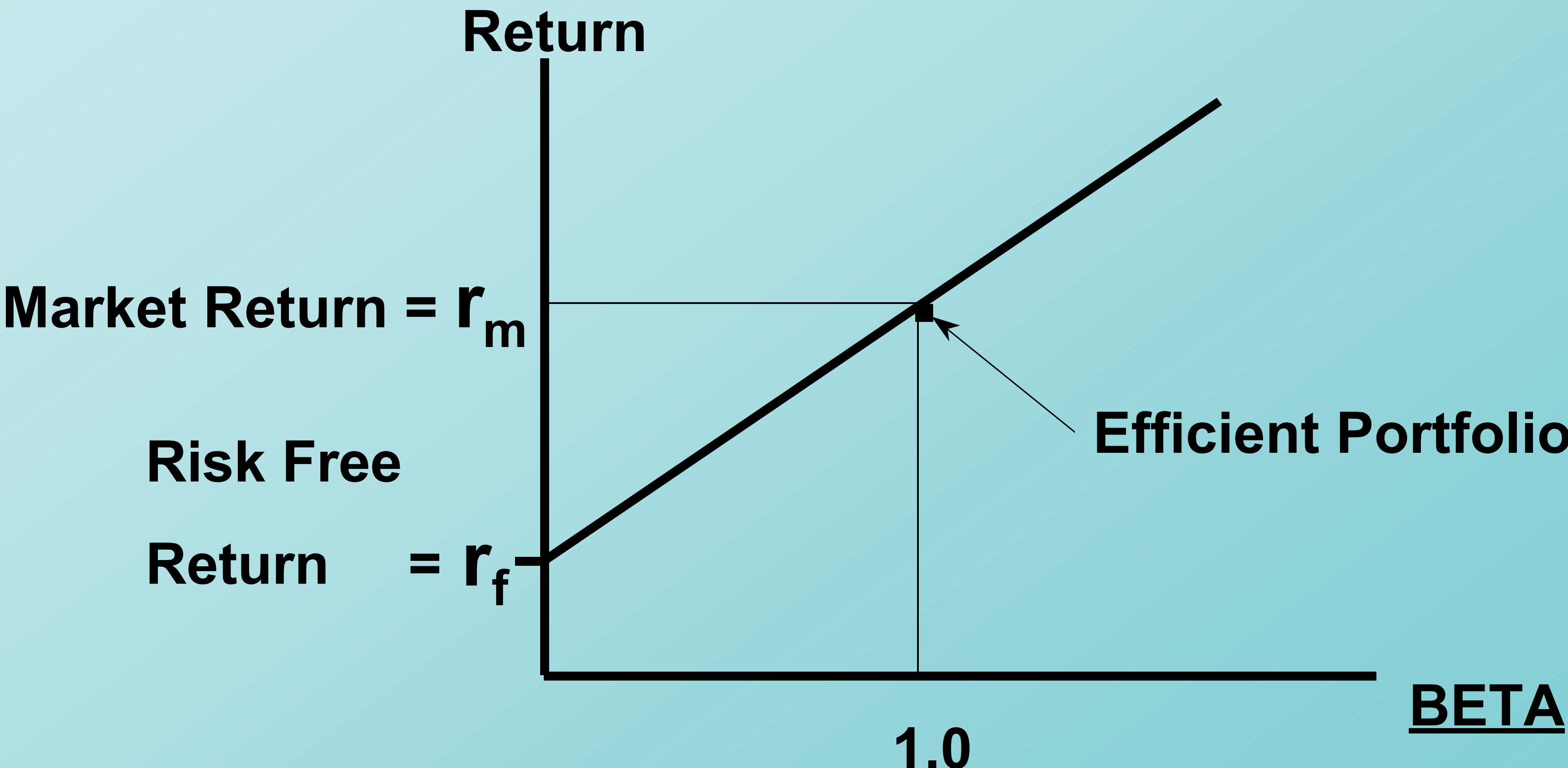
Security Market Line



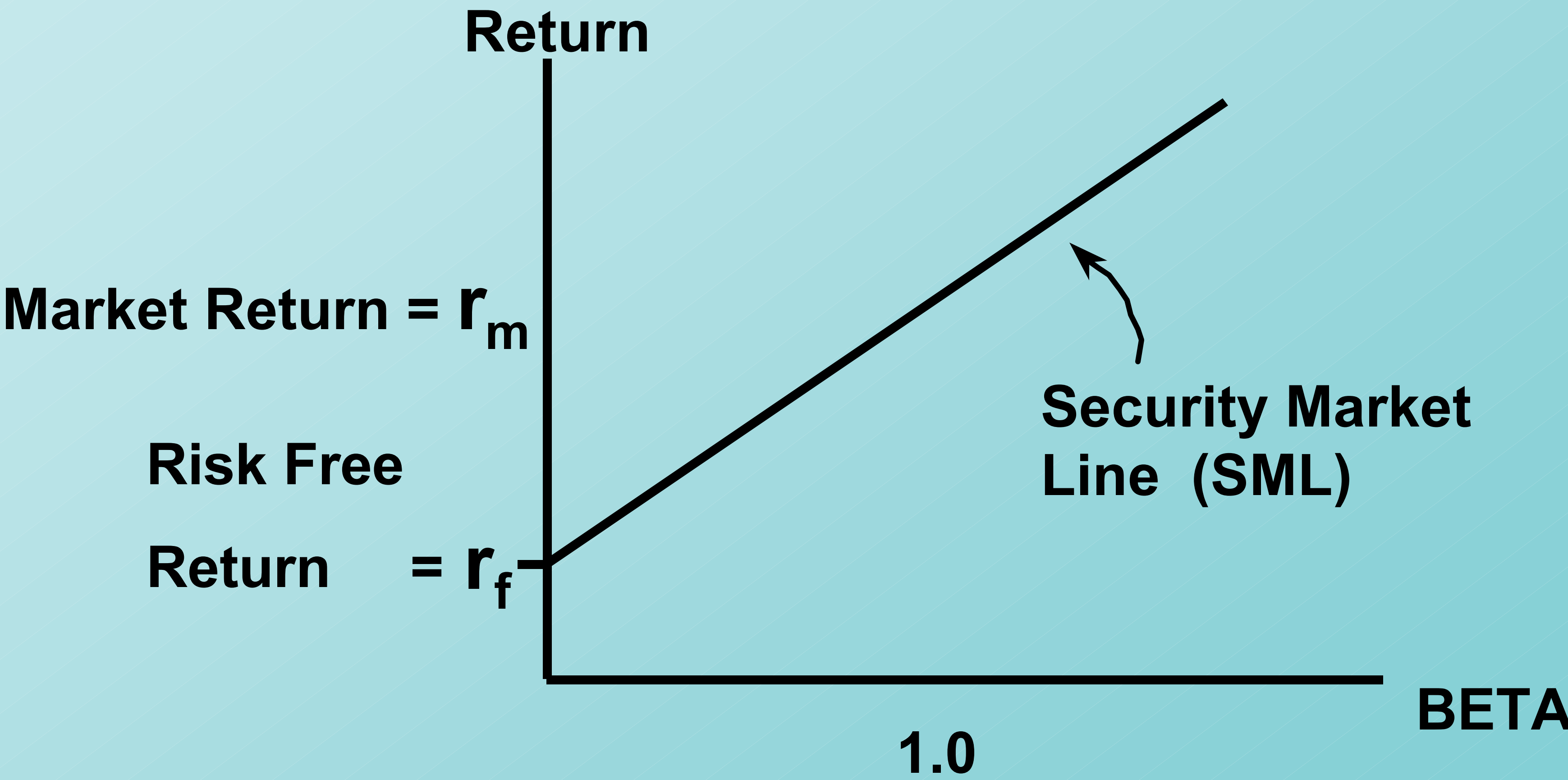
Security Market Line



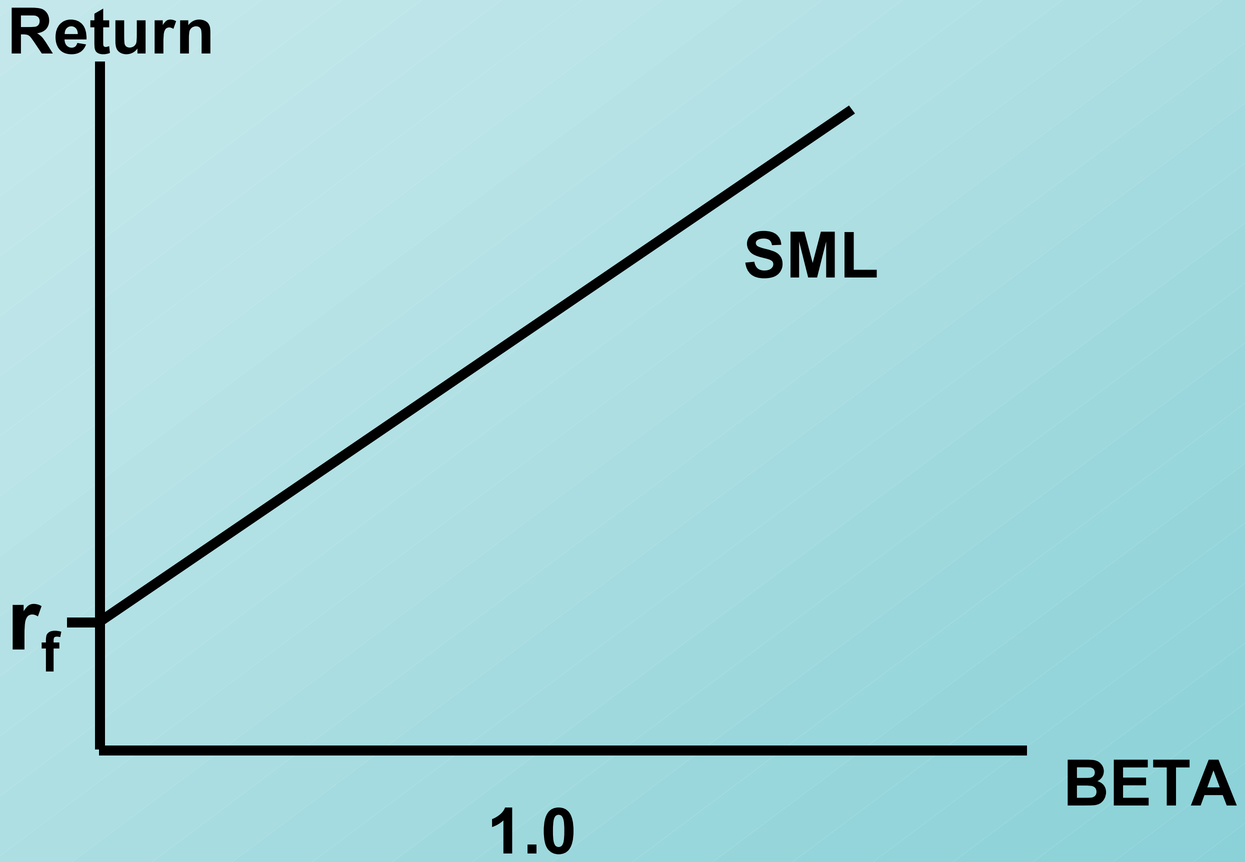
Security Market Line



Security Market Line



Security Market Line



SML Equation = $r_f + B\ (r_m - r_f)$

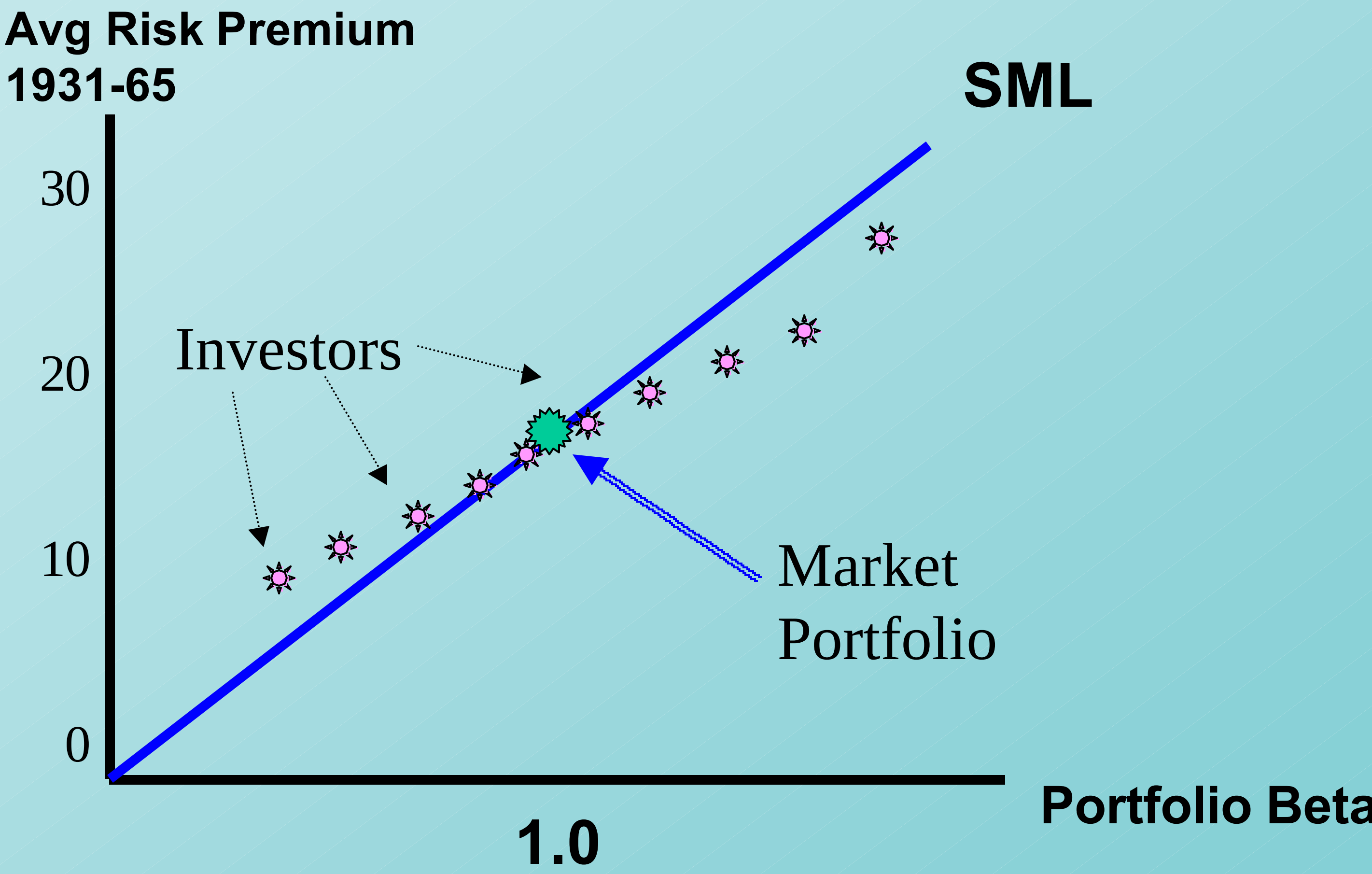
Capital Asset Pricing Model

$$R = r_f + B\,(r_m - r_f)$$

CAPM

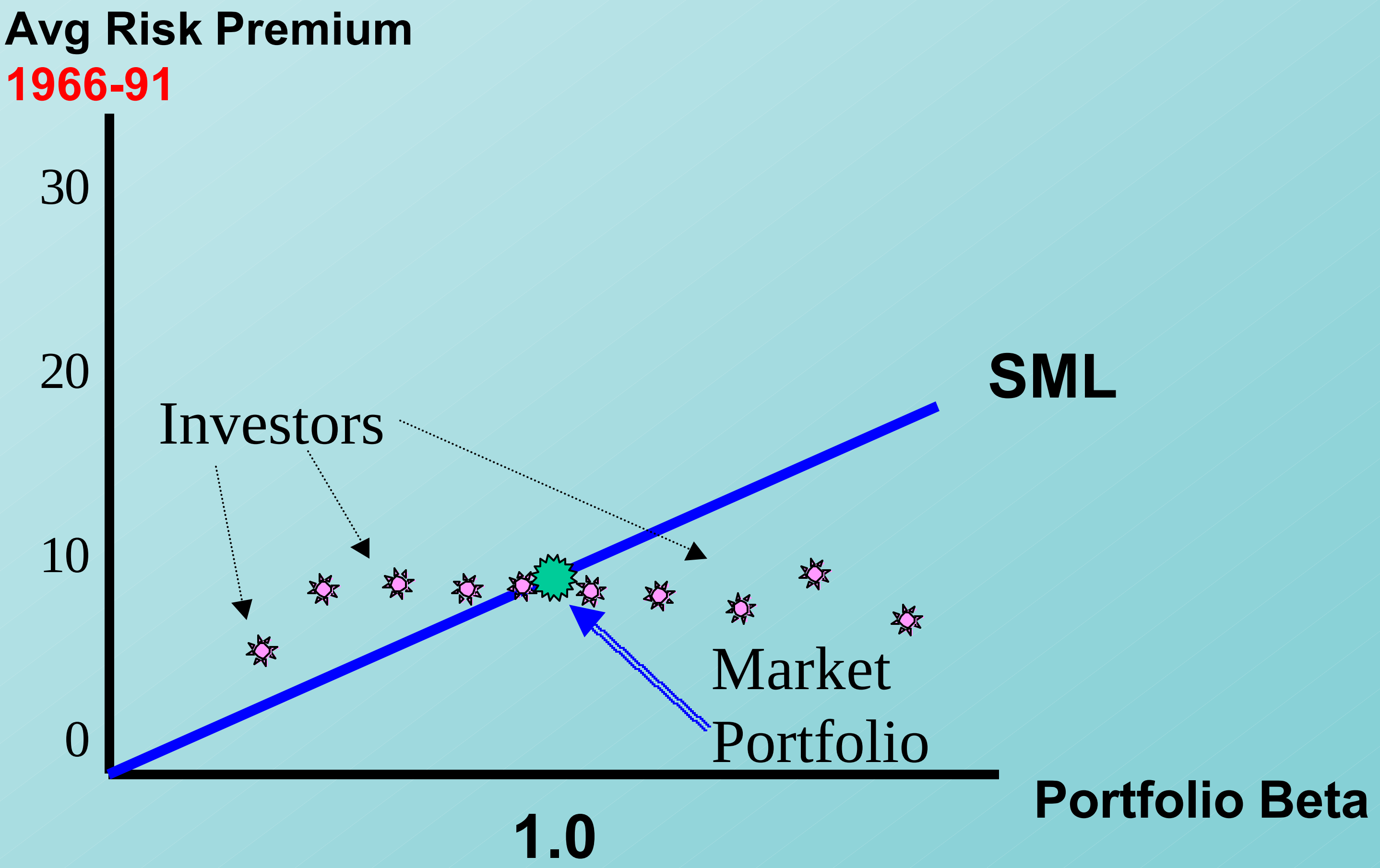
Testing the CAPM

Beta vs. Average Risk Premium



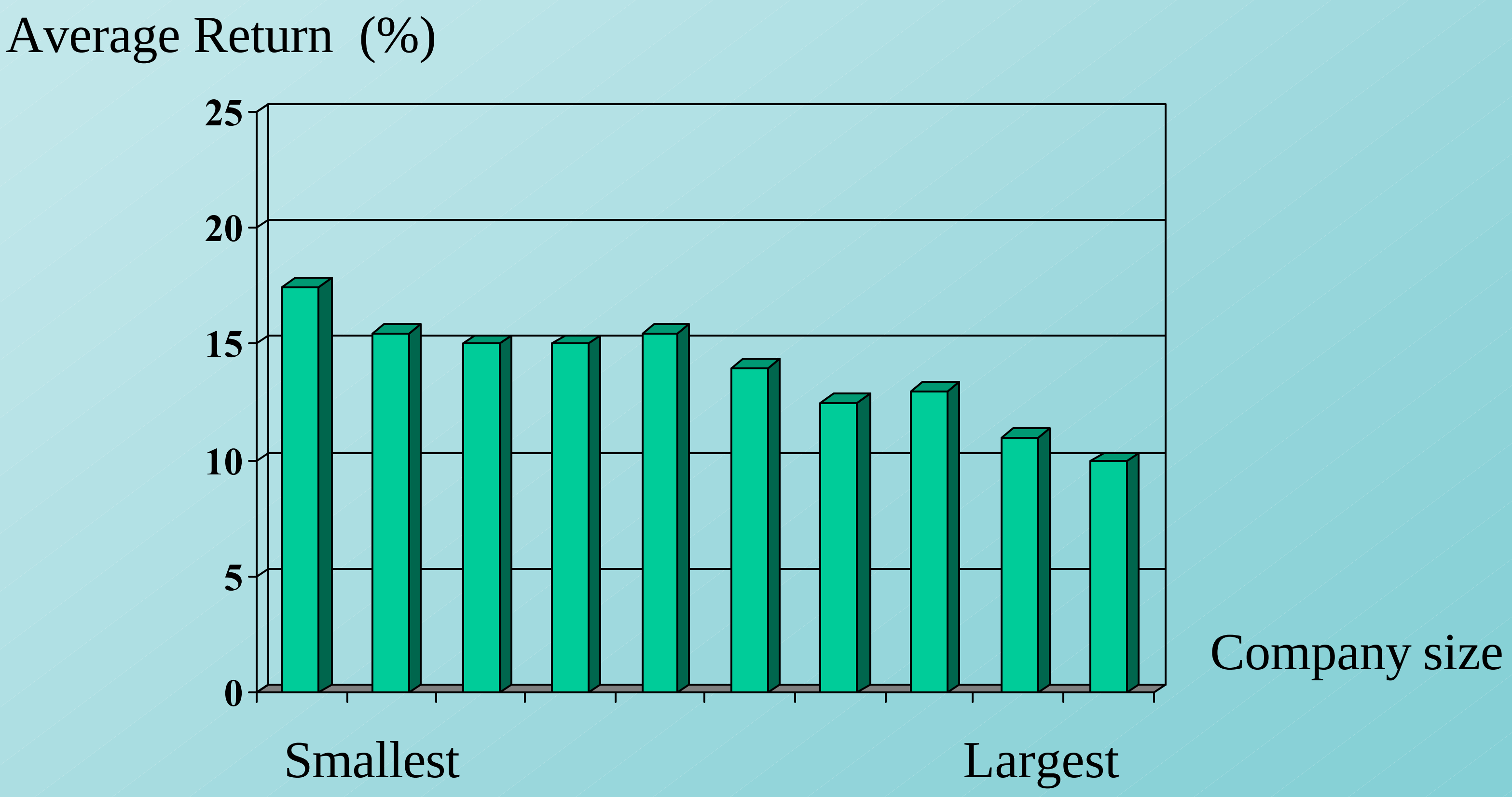
Testing the CAPM

Beta vs. Average Risk Premium



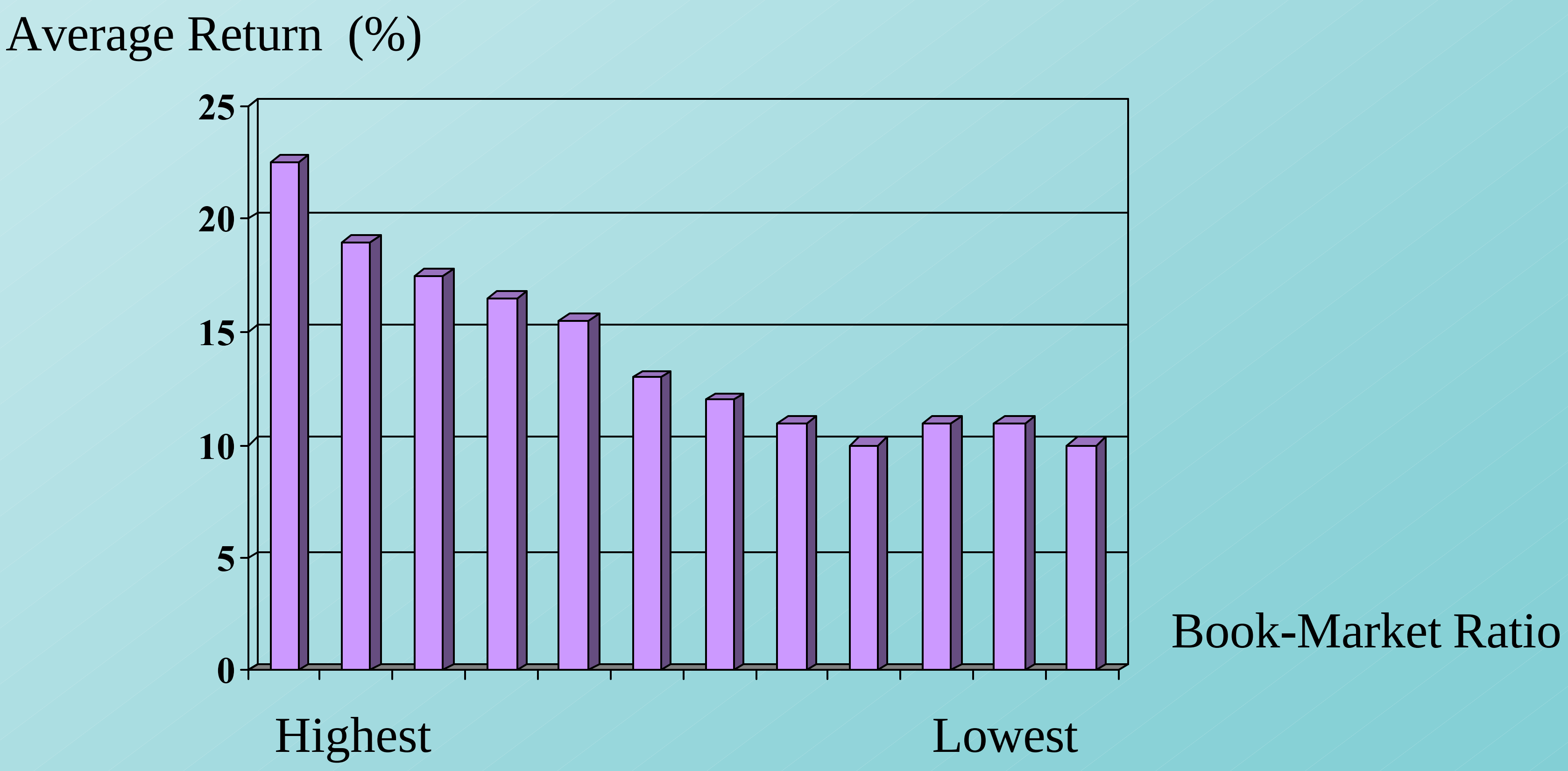
Testing the CAPM

Company Size vs. Average Return



Testing the CAPM

Book-Market vs. Average Return

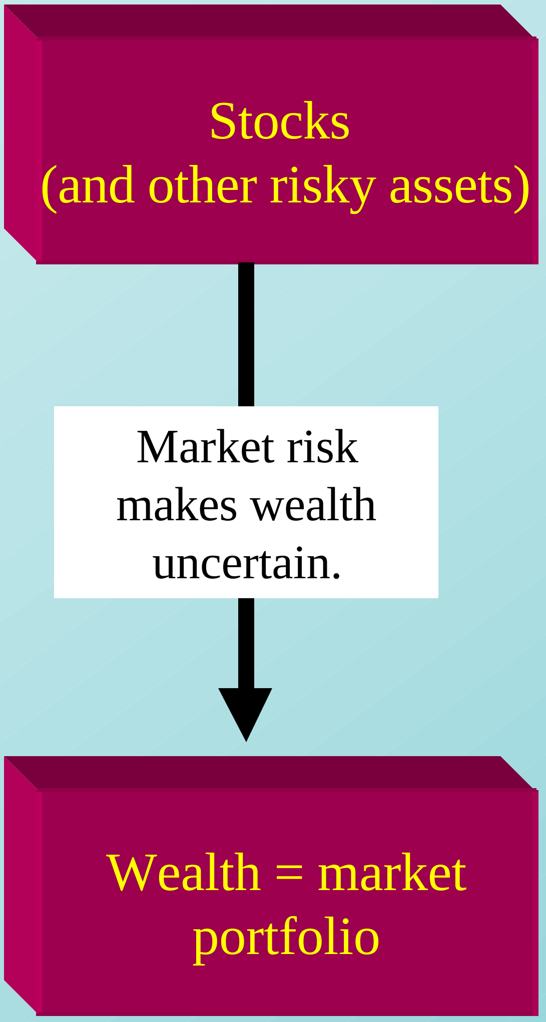


Consumption Betas vs Market Betas

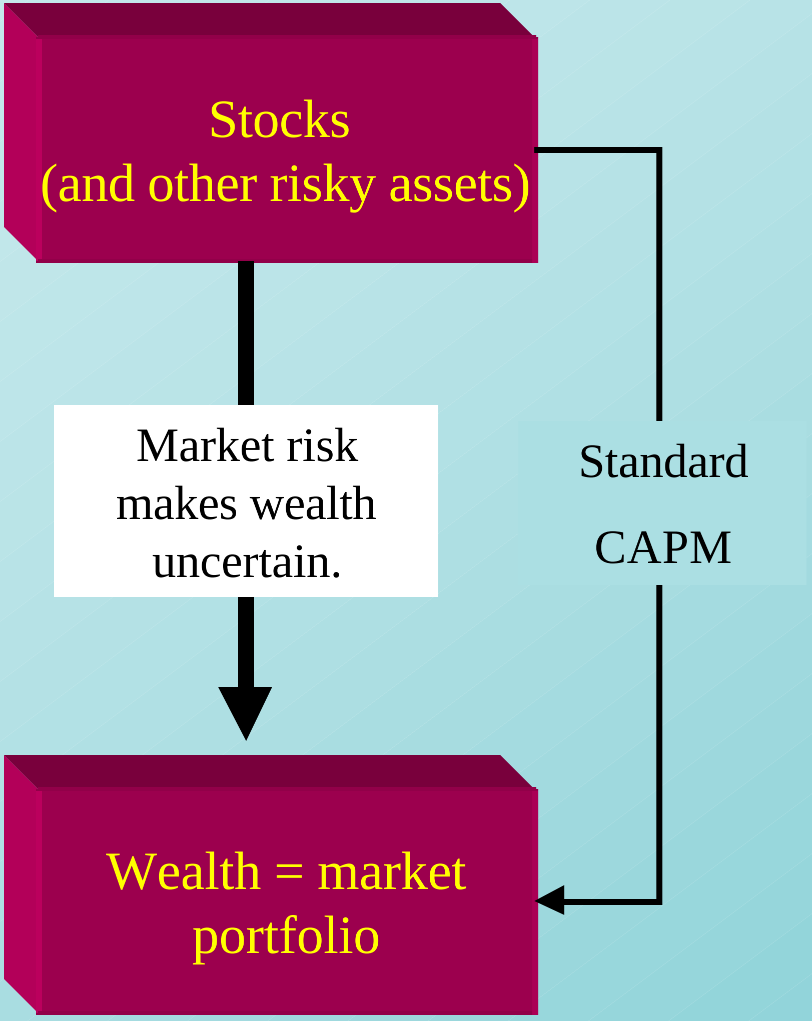
Stocks
(and other risky assets)

Wealth = market portfolio

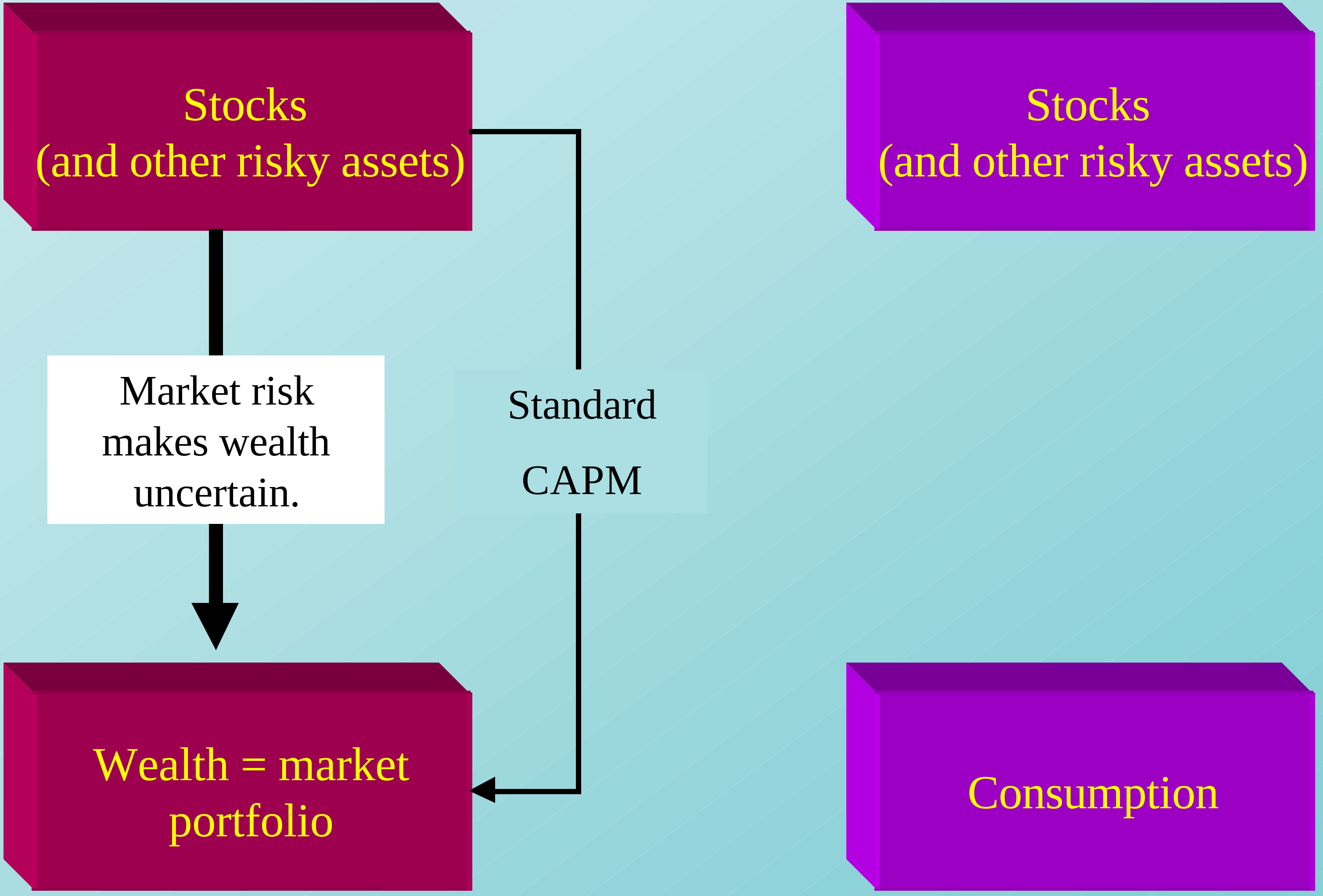
Consumption Betas vs Market Betas



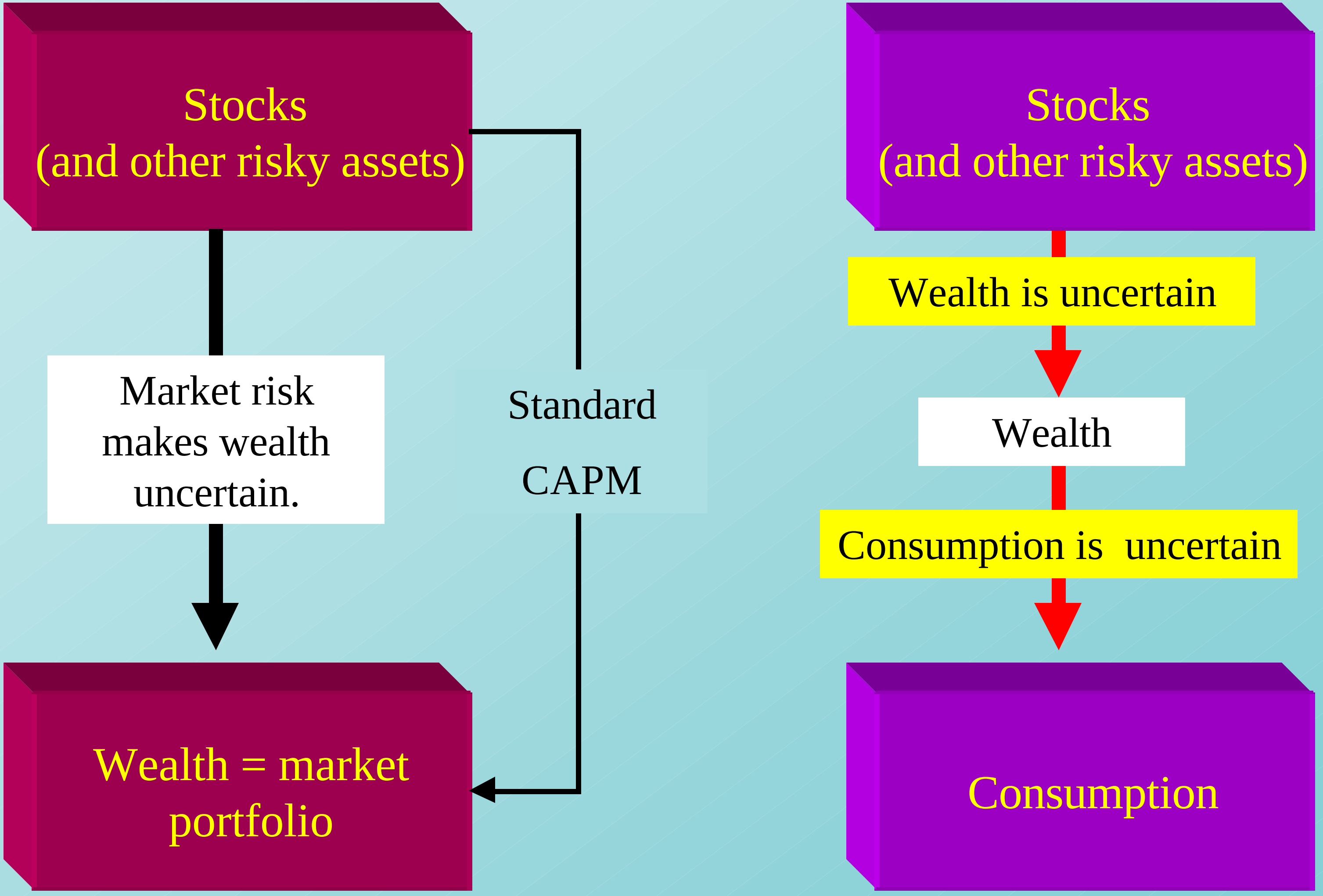
Consumption Betas vs Market Betas



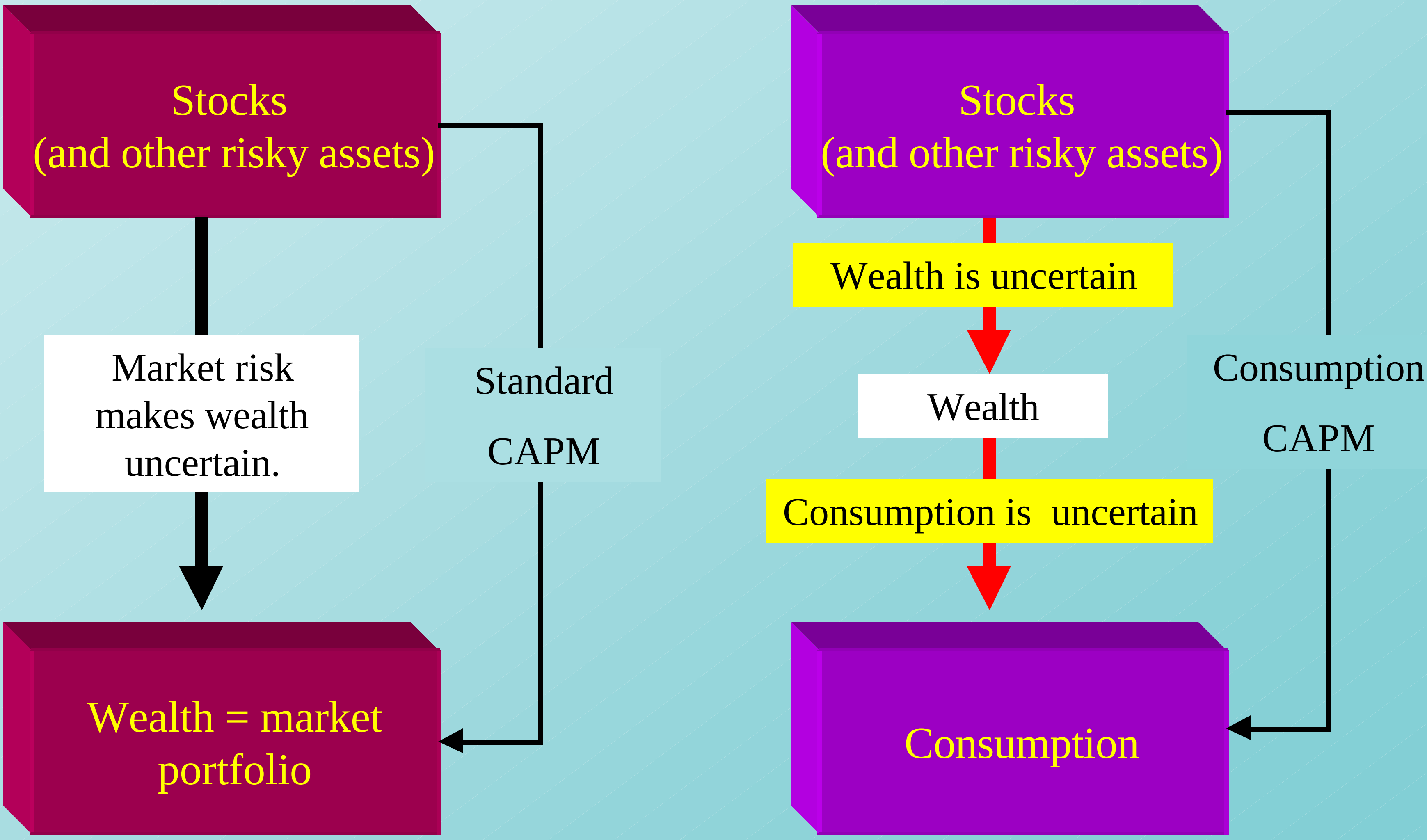
Consumption Betas vs Market Betas



Consumption Betas vs Market Betas



Consumption Betas vs Market Betas



Arbitrage Pricing Theory

Alternative to CAPM

Expected Risk

Premium = $r - r_f$

$= B_{factor1}(r_{factor1} - r_f) + B_{f2}(r_{f2} - r_f) + \ldots$

Arbitrage Pricing Theory

Alternative to CAPM

Expected Risk

$$\text{Premium} = r - r_f$$

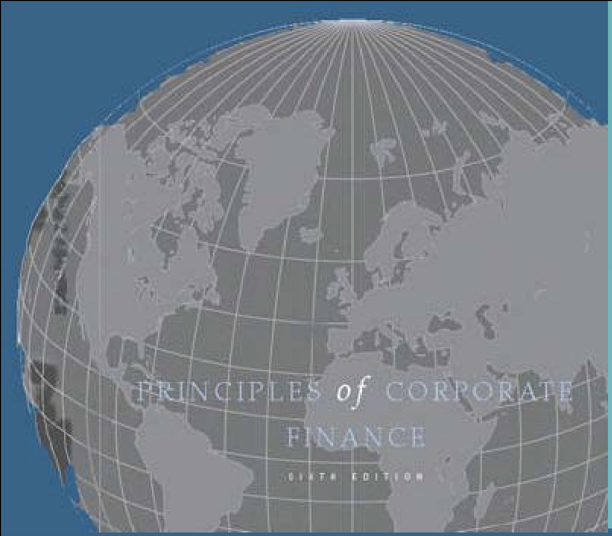
$$= B_{factor1}(r_{factor1} - r_f) + B_{f2}(r_{f2} - r_f) + \ldots$$

$$\text{Return} = a + b_{factor1}(r_{factor1}) + b_{f2}(r_{f2}) + \ldots$$

Arbitrage Pricing Theory

Estimated risk premiums for taking on risk factors (1978-1990)

Factor	Estimated Risk Premium $(r_{factor} - r_f)$
Yield spread	5.10%
Interest rate	-.61
Exchange rate	-.59
Real GNP	.49
Inflation	-.83
Mrket	6.36



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

Capital Budgeting and Risk

Chapter 9

Topics Covered

- Measuring Betas
- Capital Structure and COC
- Discount Rates for Intl. Projects
- Estimating Discount Rates
- Risk and DCF

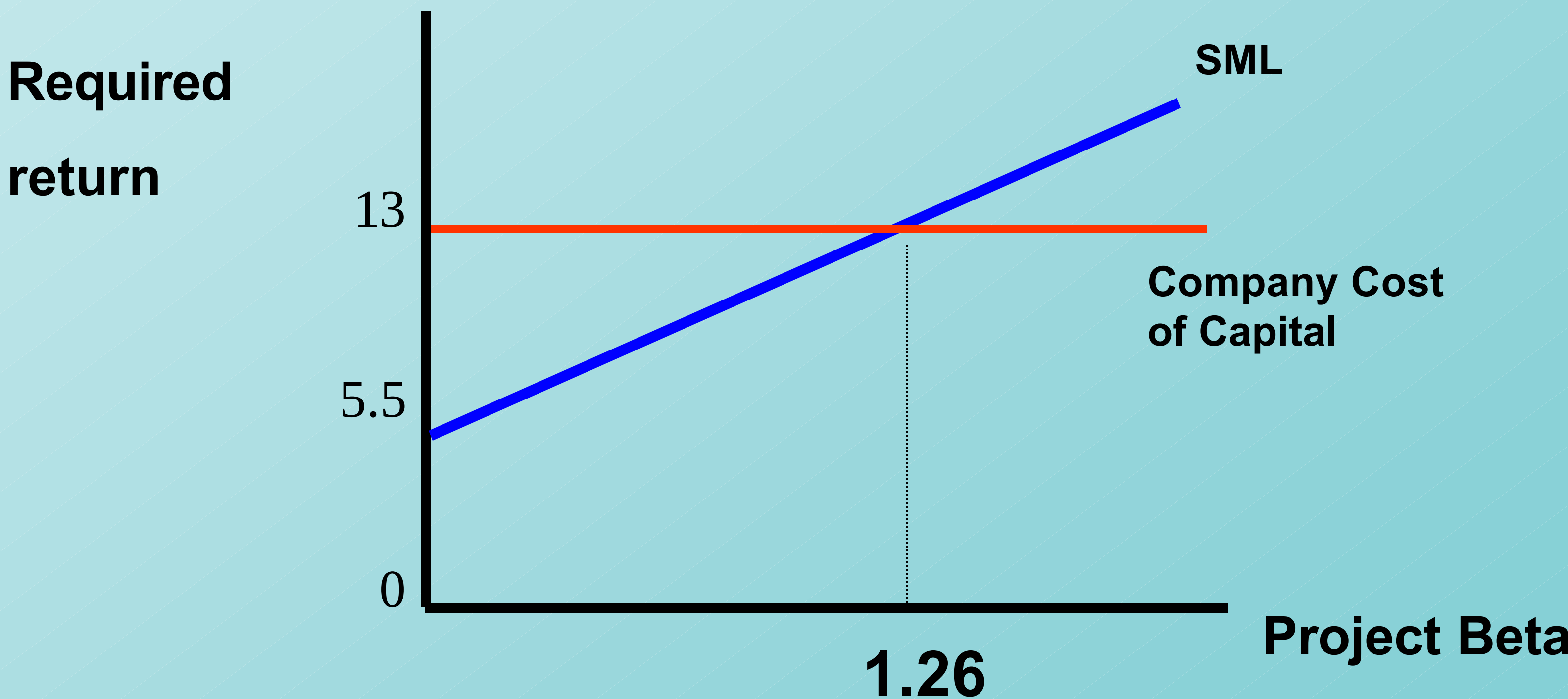
Company Cost of Capital

- A firm’s value can be stated as the sum of the value of its various assets.

$$\text{Firm value} = PV(AB) = PV(A) + PV(B)$$

Company Cost of Capital

- A company's cost of capital can be compared to the CAPM required return.



Measuring Betas

- The SML shows the relationship between return and risk.
- CAPM uses Beta as a proxy for risk.
- Beta is the slope of the SML, using CAPM terminology.
- Other methods can be employed to determine the slope of the SML and thus Beta.
- Regression analysis can be used to find Beta.

Measuring Betas

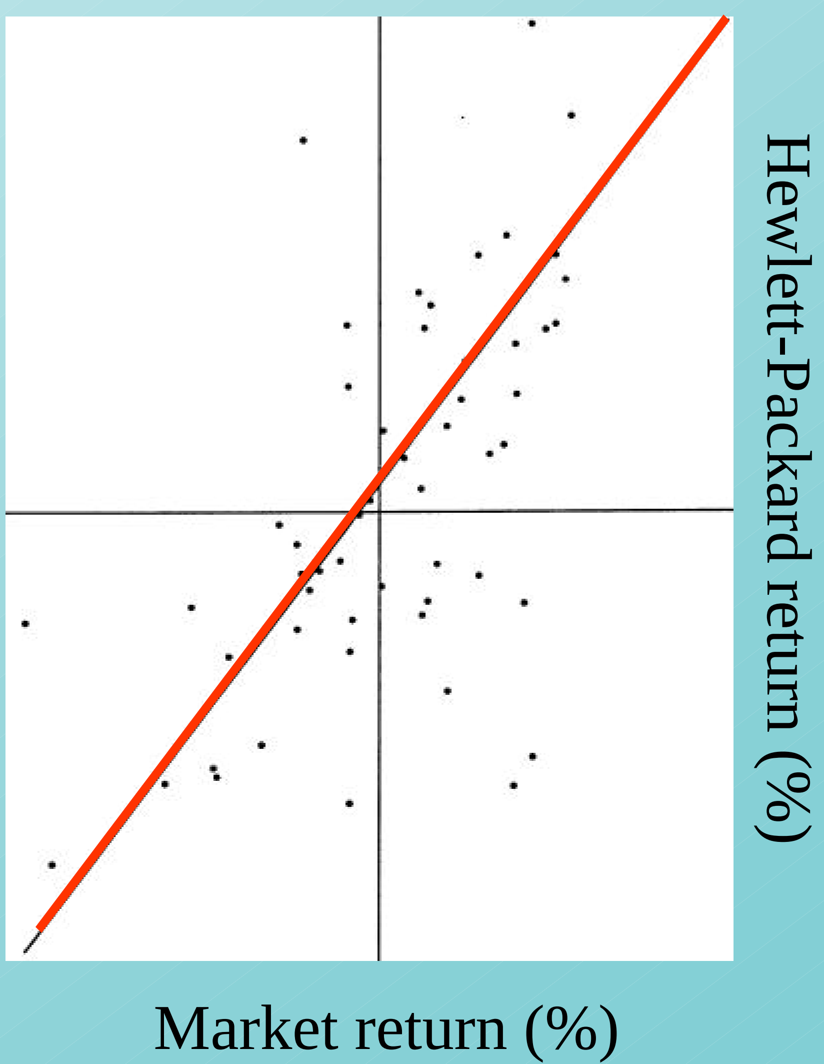
Hewlett Packard Beta

Price data - Jan 78 - Dec 82

$R^2 = .53$

B = 1.35

Slope determined from 60 months of prices and plotting the line of best fit.



Measuring Betas

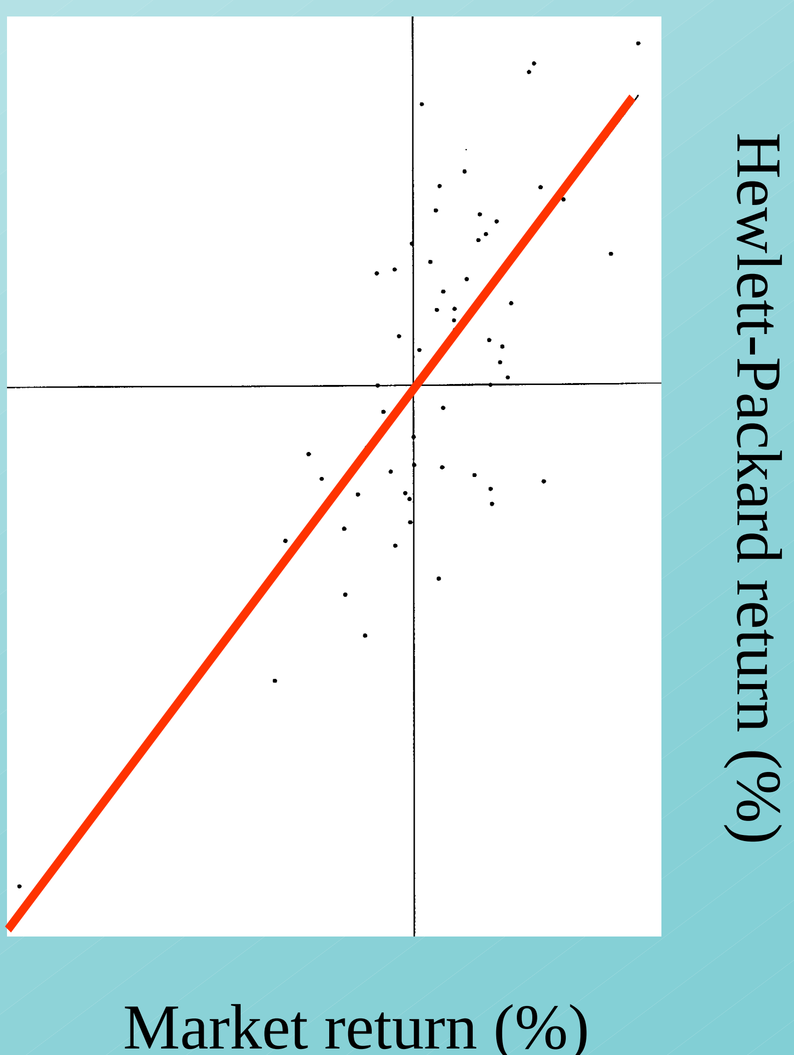
Hewlett Packard Beta

Price data - Jan 83 - Dec 87

$R^2 = .49$

B = 1.33

Slope determined from 60 months of prices and plotting the line of best fit.



Measuring Betas

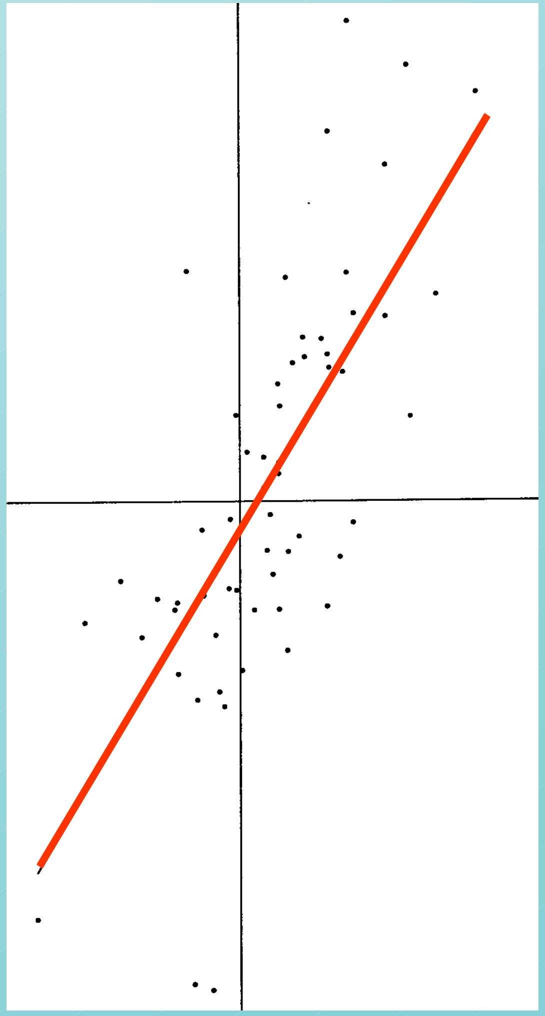
Hewlett Packard Beta

Price data - Jan 88 - Dec 92

$R^2 = .45$

B = 1.70

Slope determined from 60 months of prices and plotting the line of best fit.



Measuring Betas

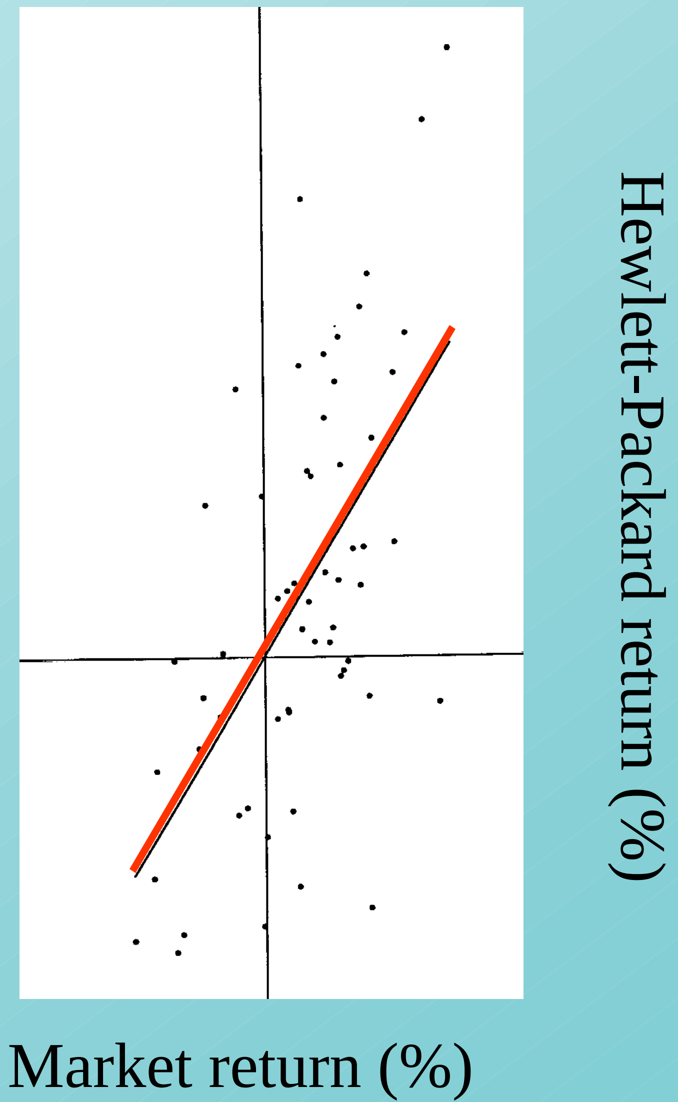
Hewlett Packard Beta

Price data - Jan 93 - Dec 97

$R^2 = .35$

B = 1.69

Slope determined from 60 months of prices and plotting the line of best fit.



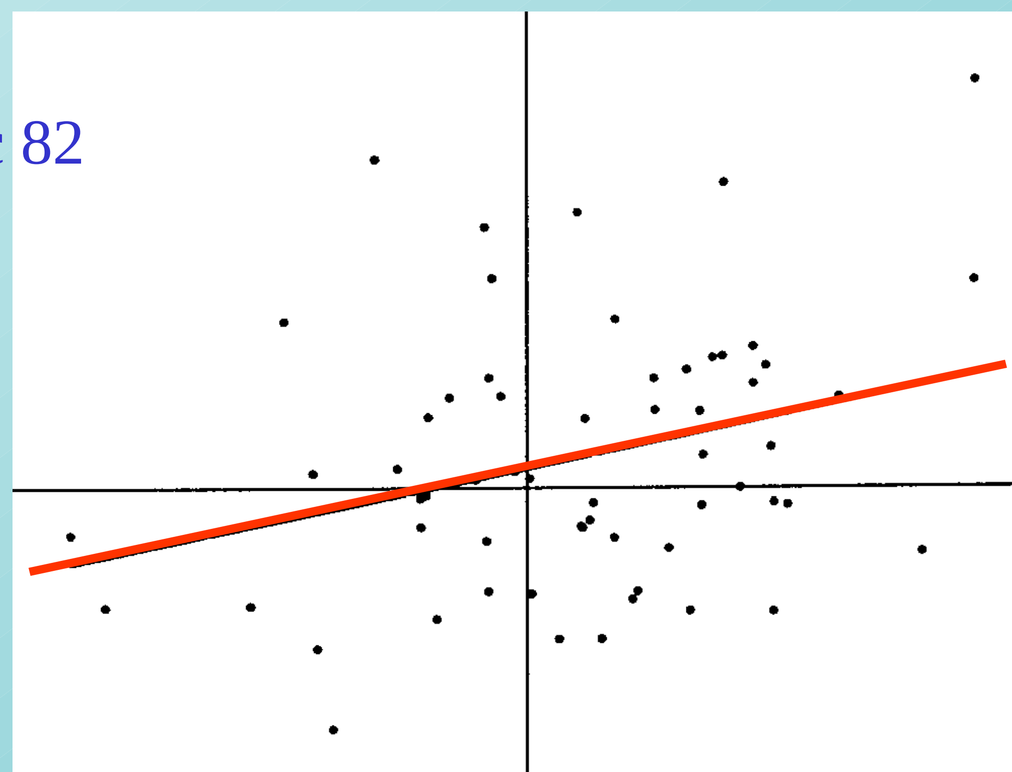
Measuring Betas

A T & T Beta

Price data - Jan 78 - Dec 82

$R^2 = .28$

B = 0.21



A T & T (%)

Market return (%)

Slope determined from 60 months of prices and plotting the line of best fit.

Measuring Betas

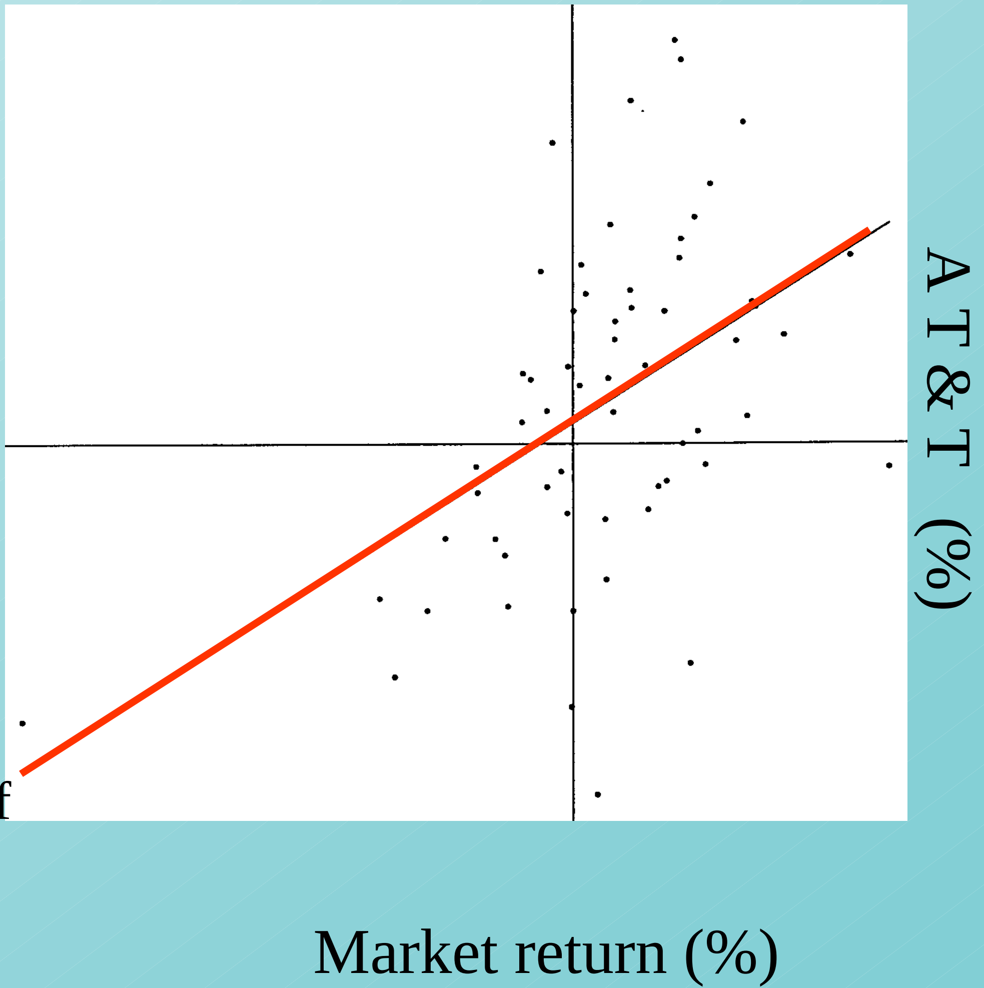
A T & T Beta

Price data - Jan 83 - Dec 87

$R^2 = .23$

B = 0.64

Slope determined from 60 months of prices and plotting the line of best fit.



Measuring Betas

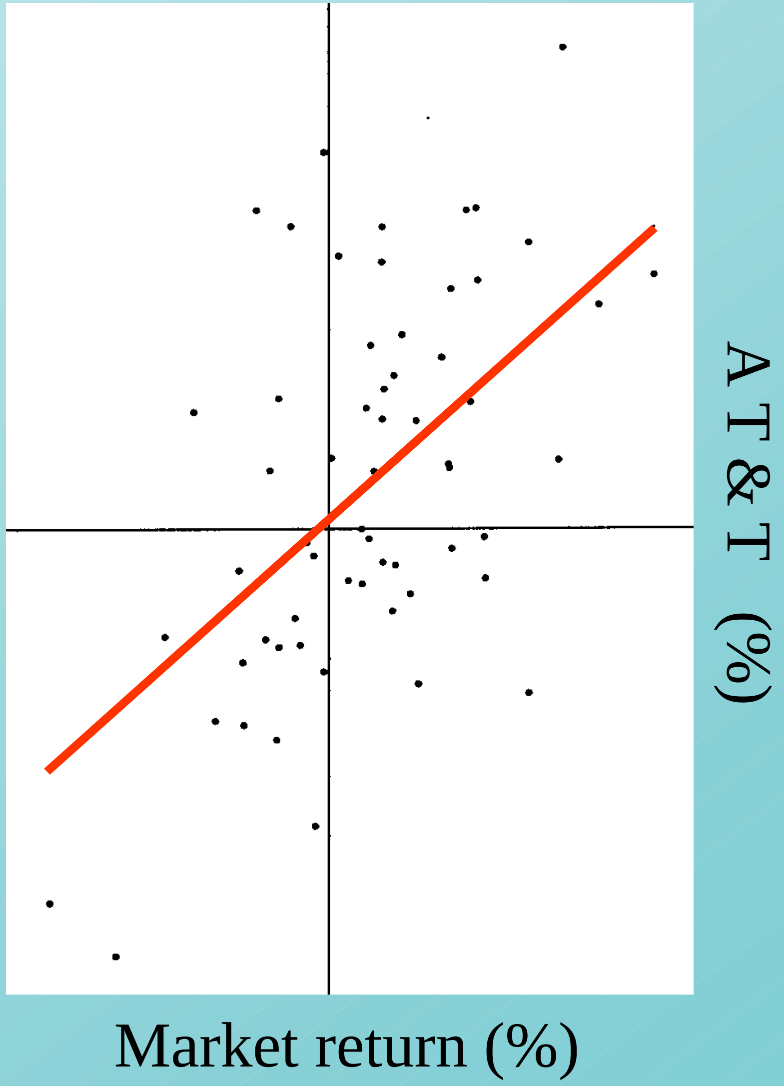
A T & T Beta

Price data - Jan 88 - Dec 92

$R^2 = .28$

B = 0.90

Slope determined from 60 months of prices and plotting the line of best fit.



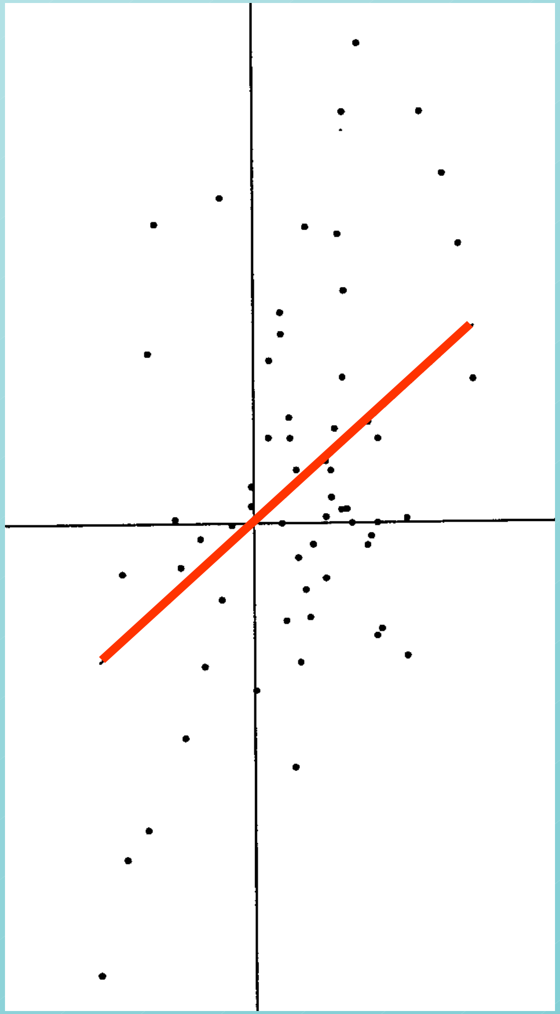
Measuring Betas

A T & T   Beta

Price data - Jan 93 - Dec 97

$R^2 = ..17$

B = .90



A T & T (%)

Market return (%)

Slope determined from 60 months of prices and plotting the line of best fit.

Beta Stability

RISK CLASS	% IN SAME CLASS 5 YEARS LATER	% WITHIN ONE CLASS 5 YEARS LATER
10 (High betas)	35	69
9	18	54
8	16	45
7	13	41
6	14	39
5	14	42
4	13	40
3	16	45
2	21	61
1 (Low betas)	40	62

Source: Sharpe and Cooper (1972)

Capital Budgeting & Risk

Modify CAPM
(account for proper risk)

- Use COC unique to project, rather than Company COC

- Take into account Capital Structure

Company Cost of Capital
simple approach

- Company Cost of Capital (COC) is based on the average beta of the assets.

- The average Beta of the assets is based on the % of funds in each asset.

Company Cost of Capital
simple approach

Company Cost of Capital (COC) is based on the average beta of the assets.

The average Beta of the assets is based on the % of funds in each asset.

<u>Example</u>

1/3 New Ventures B=2.0

1/3 Expand existing business B=1.3

1/3 Plant efficiency B=0.6

AVG B of assets = 1.3

Capital Structure

Capital Structure - the mix of debt & equity within a company

Expand CAPM to include CS

$$R = r_f + B (r_m - r_f)$$

becomes

$$R_{equity} = r_f + B (r_m - r_f)$$

Capital Structure & COC

$$COC = r_{portfolio} = r_{assets}$$

Capital Structure & COC

$$COC = r_{portfolio} = r_{assets}$$

$$\boxed{r_{assets} = WACC = r_{debt}\frac{(D)}{(V)} + r_{equity}\frac{(E)}{(V)}}$$

Capital Structure & COC

$$COC = r_{portfolio} = r_{assets}$$

$$r_{assets} = WACC = r_{debt}\frac{(D)}{(V)} + r_{equity}\frac{(E)}{(V)}$$

$$\boxed{B_{assets} = B_{debt}\frac{(D)}{(V)} + B_{equity}\frac{(E)}{(V)}}$$

Capital Structure & COC

$$COC = r_{portfolio} = r_{assets}$$

$$r_{assets} = WACC = r_{debt}\frac{(D)}{(V)} + r_{equity}\frac{(E)}{(V)}$$

$$B_{assets} = B_{debt}\frac{(D)}{(V)} + B_{equity}\frac{(E)}{(V)}$$

$$\boxed{r_{equity} = r_f + B_{equity}\,(r_m - r_f)}$$

Capital Structure & COC

$$COC = r_{portfolio} = r_{assets}$$

$$r_{assets} = WACC = r_{debt}\frac{(D)}{(V)} + r_{equity}\frac{(E)}{(V)}$$

$$B_{assets} = B_{debt}\frac{(D)}{(V)} + B_{equity}\frac{(E)}{(V)}$$

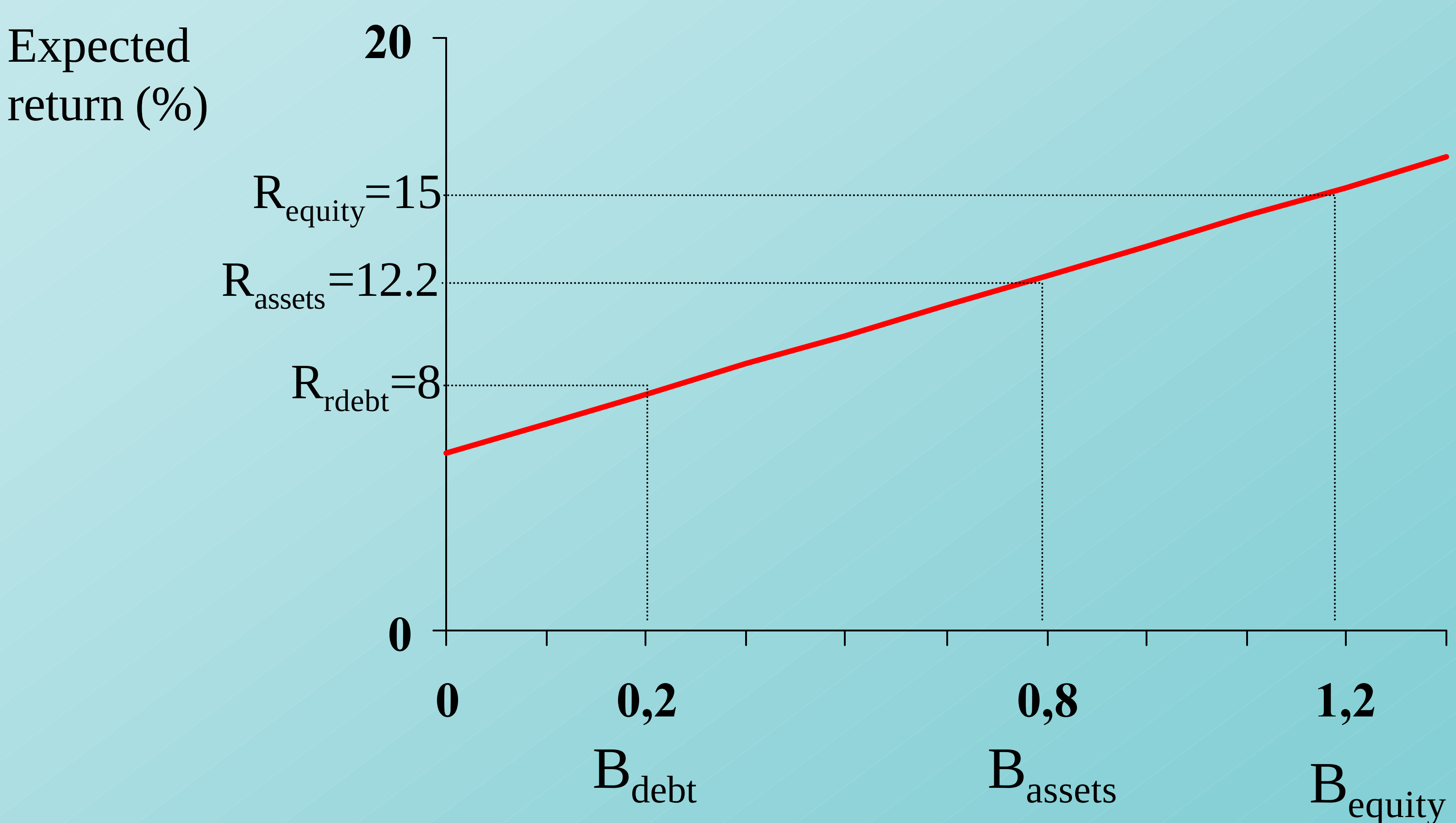
IMPORTANT

E, D, and V are all market values

$$\mathbf{r_{equity} = r_f + B_{equity}\,(\,r_m - r_f\,)}$$

Capital Structure & COC

Expected Returns and Betas prior to refinancing



Pinnacle West Corp.

$$R_{equity} = r_f + B\,(\,r_m - r_f\,)$$

$$= .045 + .51(.08) = .0858 \text{ or } 8.6\%$$

$$R_{debt} = \text{YTM on bonds}$$

$$= 6.9\ \%$$

Pinnacle West Corp.

	Beta	Standard. Error
Boston Electric	.60	.19
Central HUdson	.30	.18
Consolidated Edison	.65	.20
DTE Energy	.56	.17
Eastern Utilities Assoc	.66	.19
GPU Inc	.65	.18
NE Electric System	.35	.19
OGE Energy	.39	.15
PECO Energy	.70	.23
Pinnacle West Corp	.43	.21
PP & LResources	.37	.21
Portfolio Average	.51	.15

Pinnacle West Corp.

$$COC = r_{assets} = \frac{D}{V} r_{debt} + \frac{E}{V} r_{equity}$$

$$= .35(.08) + .65(.10)$$

$$= .093 \text{ or } 9.3\%$$

International Risk

	s Ratio	Correlation coefficient	Beta
Argentina	3.52	.416	1.46
Brazil	3.80	.160	.62
Kazakhstan	2.36	.147	.35
Taiwan	3.80	.120	.47

Source: The Brattle Group, Inc.

s Ratio - Ratio of standard deviations, country index vs. S&P composite index

Unbiased Forecast

- Given three outcomes and their related probabilities and cash flows we can determine an unbiased forecast of cash flows.

Possible cash flow	Probability	Prob weighted cash flow	Unbiased forecast
1.2	.25	.3	
1.0	.50	.5	$1.0 million
0.8	.25	.2	

Asset Betas

Cash flow = revenue - fixed cost - variable cost

PV(asset) = PV(revenue) - PV(fixed cost) - PV(variable cost)

or

PV(revenue) = PV(fixed cost) + PV(variable cost) + PV(asset)

Asset Betas

$$B_{\text{revenue}} = B_{\text{fixed cost}} \frac{PV(\text{fixed cost})}{PV(\text{revenue})} + B_{\text{variable cost}} \frac{PV(\text{variable cost})}{PV(\text{revenue})} + B_{\text{asset}} \frac{PV(\text{asset})}{PV(\text{revenue})}$$

Asset Betas

$$B_{asset} = B_{revenue} \frac{PV(revenue) - PV(variable\ cost)}{PV(asset)}$$

$$= B_{revenue}\left[1 - \frac{PV(fixed\ cost)}{PV(asset)}\right]$$

Risk,DCF and CEQ

Example

Project A is expected to produce CF = $100 mil for each of three years. Given a risk free rate of 6%, a market premium of 8%, and beta of .75, what is the PV of the project?

Risk,DCF and CEQ

Example

Project A is expected to produce CF = $100 mil for each of three years. Given a risk free rate of 6%, a market premium of 8%, and beta of .75, what is the PV of the project?

$$r = r_f + B(r_m - r_f)$$

$$= 6 + .75(8)$$

$$= 12\%$$

Risk,DCF and CEQ

Example

Project A is expected to produce CF = $100 mil for each of three years. Given a risk free rate of 6%, a market premium of 8%, and beta of .75, what is the PV of the project?

$$r = r_f + B(r_m - r_f)$$
$$= 6 + .75(8)$$
$$= 12\%$$

Project A

Year	Cash Flow	PV @ 12%
1	100	89.3
2	100	79.7
3	100	71.2
	Total PV	240.2

Risk,DCF and CEQ

Example

Project A is expected to produce CF = $100 mil for each of three years. Given a risk free rate of 6%, a market premium of 8%, and beta of .75, what is the PV of the project?

Project A		
Year	Cash Flow	PV @ 12%
1	100	89.3
2	100	79.7
3	100	71.2
	Total PV	240.2

$$r = r_f + B(r_m - r_f)$$
$$= 6 + .75(8)$$
$$= 12\%$$

Now assume that the cash flows change, but are RISK FREE. What is the new PV?

Risk,DCF and CEQ

Example

Project A is expected to produce CF = $100 mil for each of three years. Given a risk free rate of 6%, a market premium of 8%, and beta of .75, what is the PV of the project?.. Now assume that the cash flows change, but are RISK FREE. What is the new PV?

Project A

Year	Cash Flow	PV @ 12%
1	100	89.3
2	100	79.7
3	100	71.2
	Total PV	240.2

Project B

Year	Cash Flow	PV @ 6%
1	94.6	89.3
2	89.6	79.7
3	84.8	71.2
	Total PV	240.2

Risk,DCF and CEQ

Example

Project A is expected to produce CF = $100 mil for each of three years. Given a risk free rate of 6%, a market premium of 8%, and beta of .75, what is the PV of the project?.. Now assume that the cash flows change, but are RISK FREE. What is the new PV?

Project A

Year	Cash Flow	PV @ 12%
1	$\boxed{100}$	89.3
2	100	79.7
3	100	71.2
	Total PV	240.2

Project B

Year	Cash Flow	PV @ 6%
1	$\boxed{94.6}$	89.3
2	89.6	79.7
3	84.8	71.2
	Total PV	240.2

Since the 94.6 is risk free, we call it a ***Certainty Equivalent*** of the 100.

Risk,DCF and CEQ

Example

Project A is expected to produce CF = $100 mil for each of three years. Given a risk free rate of 6%, a market premium of 8%, and beta of .75, what is the PV of the project?.. Now assume that the cash flows change, but are RISK FREE. What is the new PV?

The difference between the 100 and the certainty equivalent (94.6) is 5.4%…this % can be considered the annual premium on a risky cash flow

$$\frac{\text{Risky cash flow}}{1.054} = \text{certainty equivalent cash flow}$$

Risk,DCF and CEQ

Example

Project A is expected to produce CF = $100 mil for each of three years. Given a risk free rate of 6%, a market premium of 8%, and beta of .75, what is the PV of the project?.. Now assume that the cash flows change, but are RISK FREE. What is the new PV?

$$\text{Year } 1 = \frac{100}{1.054} = 94.6$$

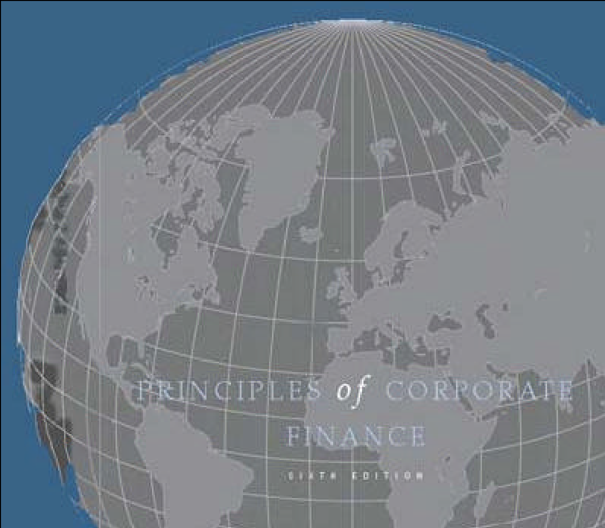
$$\text{Year } 2 = \frac{100}{1.054^2} = 89.6$$

$$\text{Year } 3 = \frac{100}{1.054^3} = 84.8$$

Risk,DCF and CEQ

- The prior example leads to a generic certainty equivalent formula.

$$PV = \frac{C_t}{(1+r)^t} = \frac{CEQ_t}{(1+r_f)^t}$$



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

◆ A Project Is Not a Black Box

Chapter 10

Topics Covered

- Sensitivity Analysis
- Break Even Analysis
- Monte Carlo Simulation
- Decision Trees

How To Handle Uncertainty

Sensitivity Analysis - Analysis of the effects of changes in sales, costs, etc. on a project.

Scenario Analysis - Project analysis given a particular combination of assumptions.

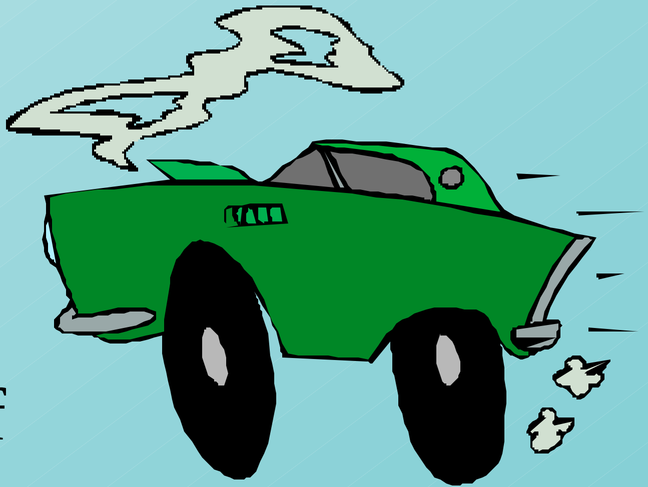
Simulation Analysis - Estimation of the probabilities of different possible outcomes.

Break Even Analysis - Analysis of the level of sales (or other variable) at which the company breaks even.

Sensitivity Analysis

Example

Given the <u>expected cash flow forecasts</u> for Otoban Company's Motor Scooter project, listed on the next slide, determine the NPV of the project given changes in the cash flow components using a 10% cost of capital. Assume that all variables remain constant, except the one you are changing.



Sensitivity Analysis

Example - continued

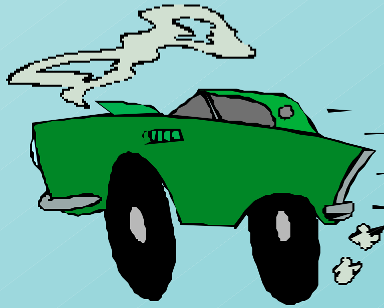
	Year 0	Years 1 - 10
Investment	-15	
Sales		37.5
Variable Costs		30
Fixed Costs		3
Depreciation		1.5
Pretax profit		3
.Taxes @ 50%		1.5
Profit after tax		1.5
Operating cash flow		3.0
Net Cash Flow	-15	3

¥

NPV= 3.43 billion Yen

Sensitivity Analysis

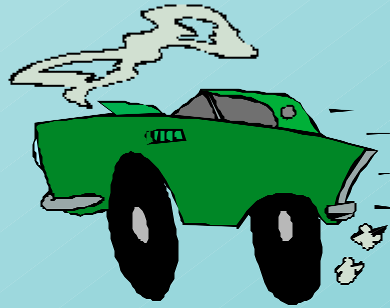
Example - continued



Possible Outcomes

	Range		
Variable	*Pessimistic*	*Expected*	*Optimistic*
Market Size	.9 mil	51 mil	1.1 mil
Market Share	.04	.1	.16
Unit price	350,000	375,000	380,000
Unit Var Cost	360,000	300,000	275,000
Fixed Cost	4 bil	3 bil	2 bil

Sensitivity Analysis



Example - continued

NPV Calculations for Pessimistic Market Size Scenario

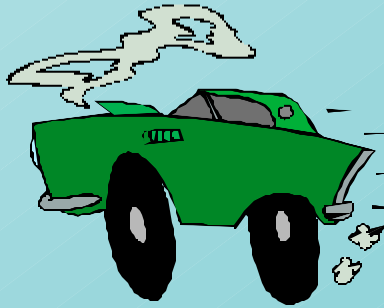
	Year 0	Years 1 - 10
Investment	-15	
Sales		41.25
Variable Costs		33
Fixed Costs		3
Depreciation		1.5
Pretax profit		3.75
.Taxes @ 50%		1.88
Profit after tax		1.88
Operating cash flow		3.38
Net Cash Flow	-15	+ 3.38

¥

<u>NPV= +5.7 bil yen</u>

Sensitivity Analysis

Example - continued

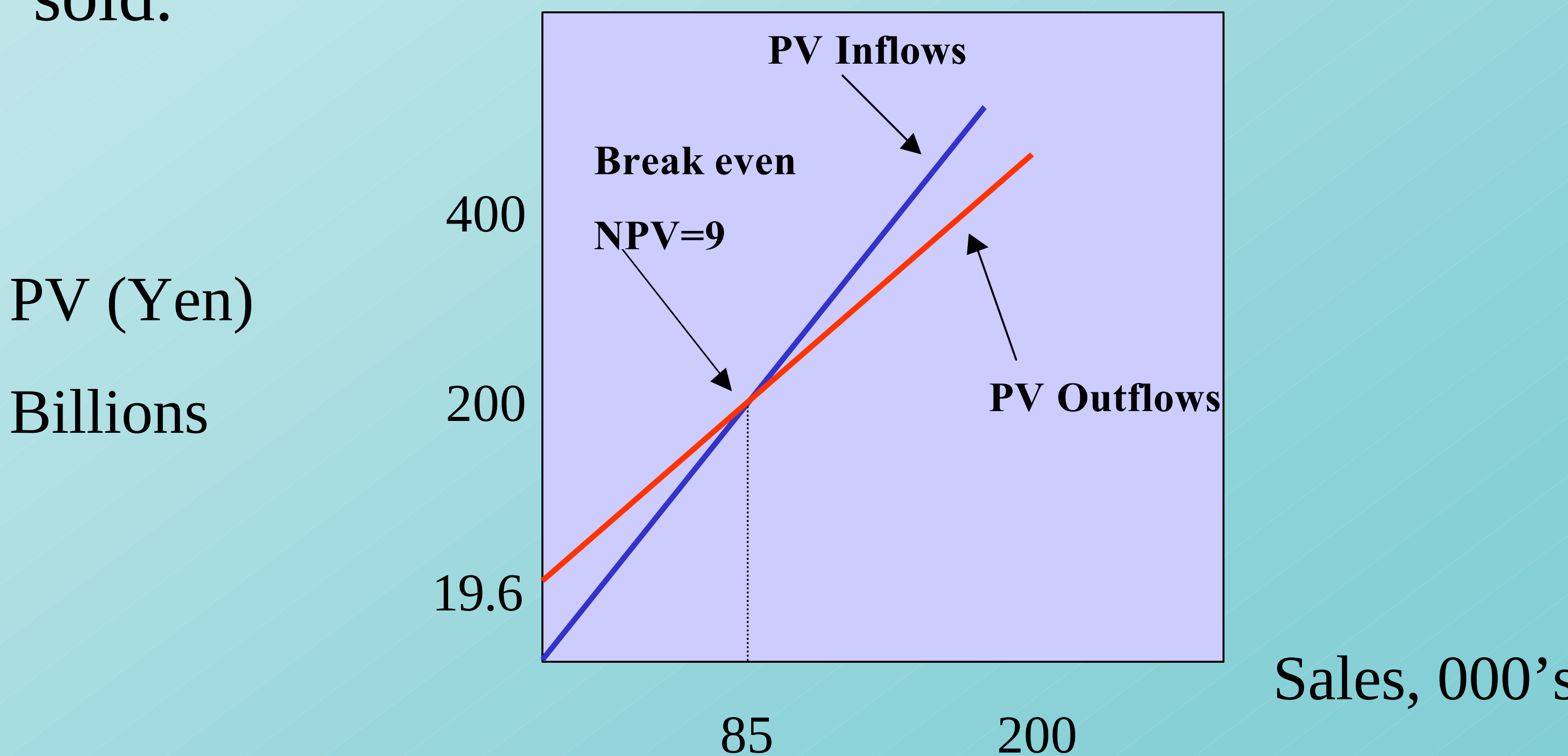


NPV Possibilities (Billions Yen)

	Range		
Variable	*Pessimistic*	*Expected*	*Optimistic*
Market Size	1.1	3.4	5.7
Market Share	-10.4	3.4	17.3
Unit price	-4.2	3.4	5.0
Unit Var Cost	-15.0	3.4	11.1
Fixed Cost	0.4	3.4	6.5

Break Even Analysis

- Point at which the NPV=0 is the break even point.
- Otoban Motors has a breakeven point of 8,000 units sold.

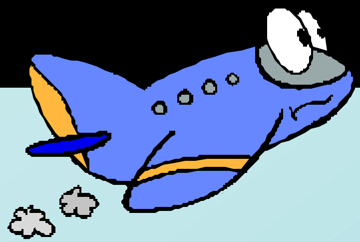


Monte Carlo Simulation

Modeling Process

- Step 1: Modeling the Project
- Step 2: Specifying Probabilities
- Step 3: Simulate the Cash Flows

Decision Trees



Turboprop

-550

NPV= ?

+150(.6)

960 (.8)

220(.2)

+30(.4)

930(.4)

140(.6)

Piston

-250

NPV= ?

+100(.6) or

-150

800(.8)

100(.2)

0

410(.8)

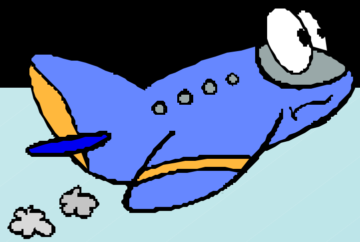
180(.2)

+50(.4)

220(.4)

100(.6)

Decision Trees



Turboprop

-550

NPV= ?

+150(.6)

960 (.8)

220(.2)

812

+30(.4)

930(.4)

140(.6)

456

Piston

-250

NPV= ?

+100(.6)

or

-150

800(.8)

100(.2)

660

0

410(.8)

180(.2)

364

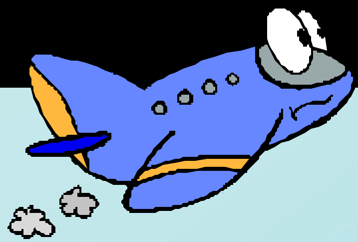
+50(.4)

220(.4)

100(.6)

148

Decision Trees



Turboprop

-550

NPV= ?

+150(.6)

960 (.8)

220(.2)

812

+30(.4)

930(

Piston

-250

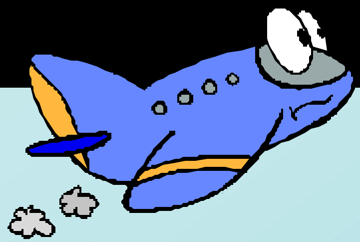
NPV= ?

364

148

$$\left(960\times.80\right)+\left(220\times.20\right)=812$$

Decision Trees



$$\frac{660}{1.10} - 150 = 450$$

Turboprop

-550

NPV= ?

960 (.8)

220(.2)

812

+30(.4)

930(.4)

140(.6)

456

***450**

800(.8)

100(.2)

-150

660

+100(.6)

or

410(.8)

180(.2)

0

364

331

Piston

-250

NPV= ?

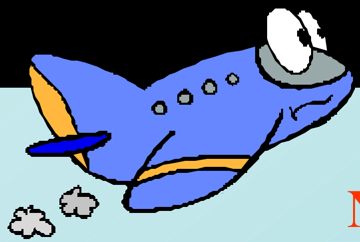
+50(.4)

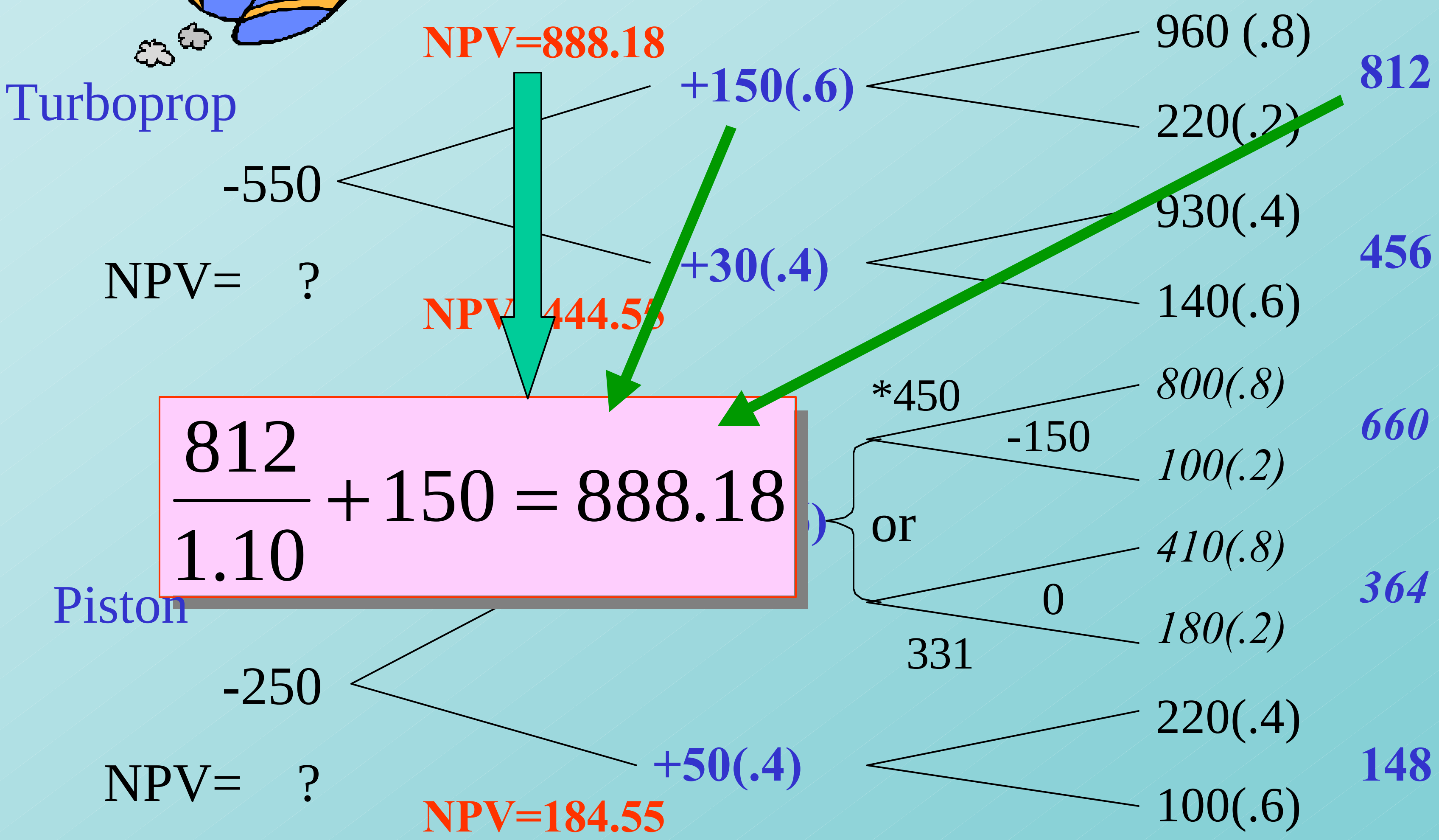
220(.4)

100(.6)

148

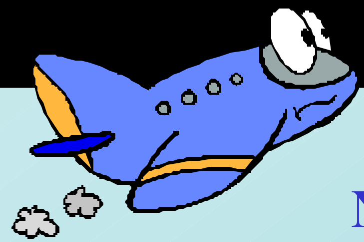
Decision Trees





$$\frac{812}{1.10}+150=888.18$$

Decision Trees



Turboprop

-550

NPV= ?

NPV=888.18

+150(.6)

960 (.8)

220(.2)

812

710.73

+30(.4)

930(.4)

140(.6)

456

NPV=444.55

*450

.50

800(.8)

100(.2)

660

NPV=550.00

+100(.6) or

410(.8)

$$= (888.18 \times .60) + (444.55 \times .40)$$

Piston

-250

NPV= ?

220(.4)

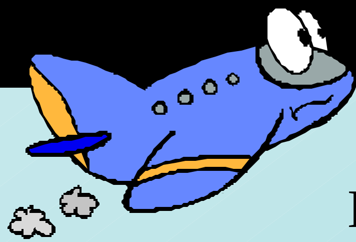
+50(.4)

148

100(.6)

NPV=184.55

Decision Trees



Turboprop

-550

NPV=96.12

NPV=888.18

+150(.6)

960 (.8)

220(.2)

812

710.73

+30(.4)

930(.4)

140(.6)

456

NPV=444.55

*450

-150

800(.8)

100(.2)

660

8)

364

2)

Piston

-250

NPV=117.00

.4)

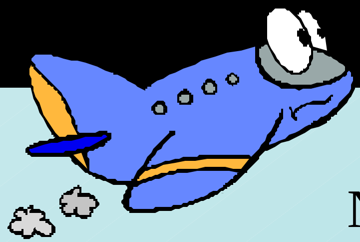
148

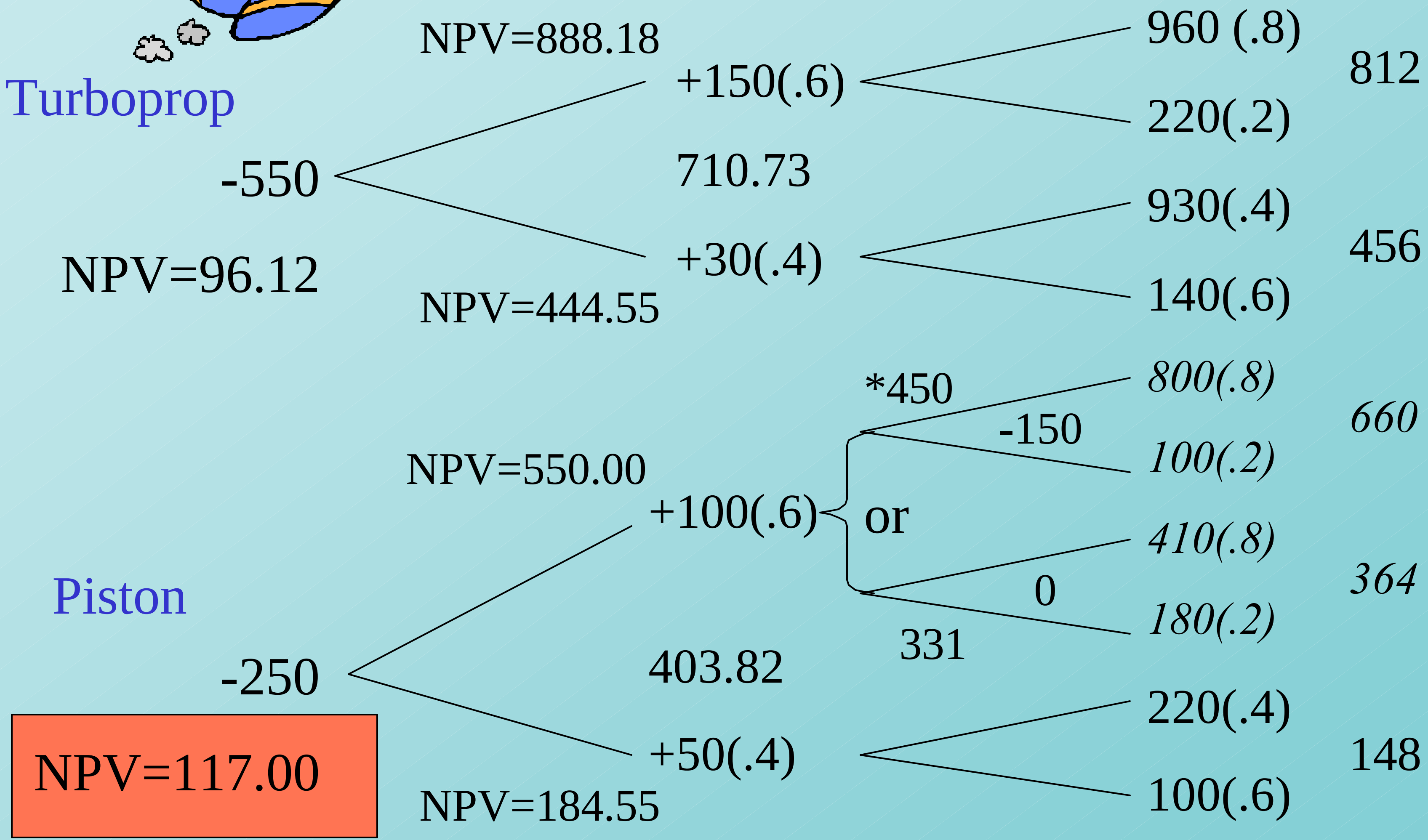
100(.6)

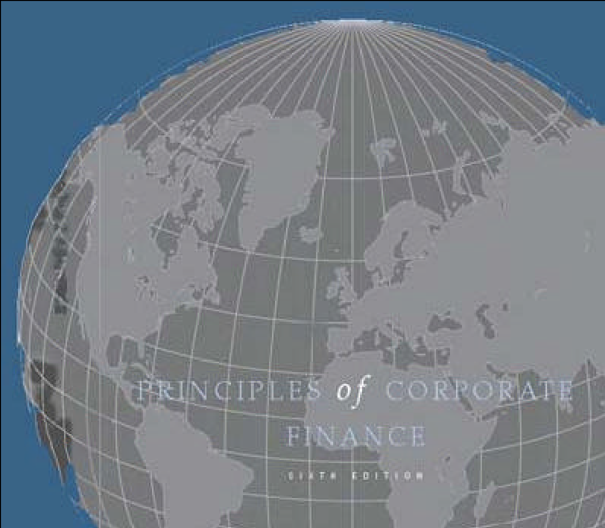
NPV=184.55

$$\frac{710.73}{1.10} - 550 = 96.12$$

Decision Trees







Principles of Corporate Finance

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Where Net Present Values Come From

Chapter 11

Topics Covered

- Look First To Market Values
- Forecasting Economic Rents
- Marvin Enterprises

Market Values

- **Smart investment decisions make MORE money than smart financing decisions**

Market Values

- Smart investments are worth more than they cost: they have positive NPVs

- Firms calculate project NPVs by discounting forecast cash flows, but . . .

Market Values

- **Projects may *appear* to have positive NPVs because of forecasting errors.**

  e.g. some acquisitions result from errors in a DCF analysis.

Market Values

- Positive NPVs stem from a comparative advantage.
- Strategic decision-making identifies this comparative advantage; it does *not* identify growth areas.

Market Values

- *Don't* make investment decisions on the basis of errors in your DCF analysis.
- Start with the market price of the asset and ask whether it is worth more to you than to others.

Market Values

- ***Don't*** **assume that other firms will watch passively.**

  Ask --
  How long a lead do I have over my rivals? What will happen to prices when that lead disappears?

  In the meantime how will rivals react to my move? Will they cut prices or imitate my product?

Department Store Rents

$$NPV = -100 + \frac{8}{1.10} + \ldots + \frac{8 + 134}{1.10^{10}} = \$\,1 \text{ million}$$

[assumes price of property appreciates by 3% a year]

Rental yield = 10 - 3 = 7%

$$NPV \quad \frac{8 - 7}{1.10} + \frac{8 - 7.21}{1.10^2} + \ldots + \frac{8 - 8.87}{1.10^9} + \frac{8 - 9.13}{1.10^{10}} = \$1 \text{ million}$$

Using Market Values

EXAMPLE: KING SOLOMON'S MINE

Investment	= $200 million
Life	= 10 years
Production	= .1 million oz. a year
Production cost	= $200 per oz.
Current gold price	= $400 per oz.
Discount rate	= 10%

Using Market Values

EXAMPLE: KING SOLOMON'S MINE - continued

If the gold price is forecasted to rise by 5% p.a.:

NPV = -200 + (.1(420 - 200))/1.10 + (.1(441 - 200))/1.10^2 + ... = - $10 m.

But if gold is fairly priced, you do not need to forecast future gold prices:

NPV = -investment + PV revenues - PV costs

= 200 + 400 - S ((.1 x 200)/1.10^t) = $77 million

Do Projects Have Positive NPVs?

- Rents = profits that more than cover the cost of capital.
- NPV = PV (rents)
- Rents come only when you have a better product, lower costs or some other competitive edge.
- Sooner or later competition is likely to eliminate rents.

Competitive Advantage

Proposal to manufacture specialty chemicals

- Raw materials were commodity chemicals imported from Europe.
- Finished product was exported to Europe.
- High early profits, but . . .
- . . . what happens when competitors enter?

Marvin Enterprises

	Capacity		Unit cost		
Technology	Industry	Marvin	Capital	Prodn.	Salvage value
1. 2011	120	-	17.5	5	2.5
2. 2019	120	24	17.5	5	2.5

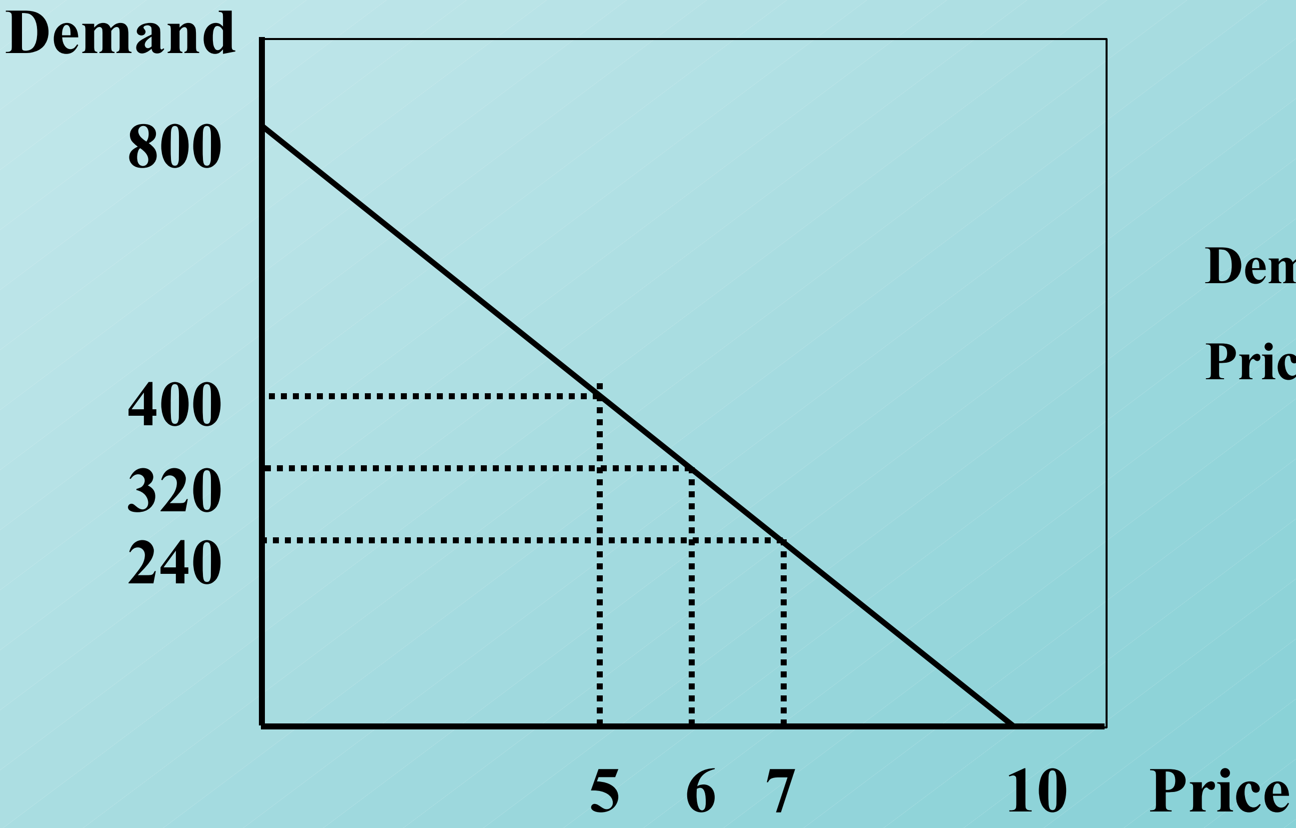
* Proposed

Marvin Enterprises

				Prices	
Technology	Production cost	Interest on capital	Interest on salvage	Invest above	Scrap below
1. 2011	5.5	3.5	.5	9	6
2. 2019	3.5	3,5	.5	7	4

Marvin Enterprises

Demand for Garbage Blasters



Demand = 80 (10 - Price)

Price = 10 x quantity/80

Marvin Enterprises

Value of Garbage Blaster Investment

NPV new plant $= 100 \times [-10 + \Sigma\ ((6 - 3)/1.2^t) + 10/1.25$

$= \$299$ million

Change PV existing plant $= 24 \times \Sigma\ (1/1.2^t) = \$72$ million

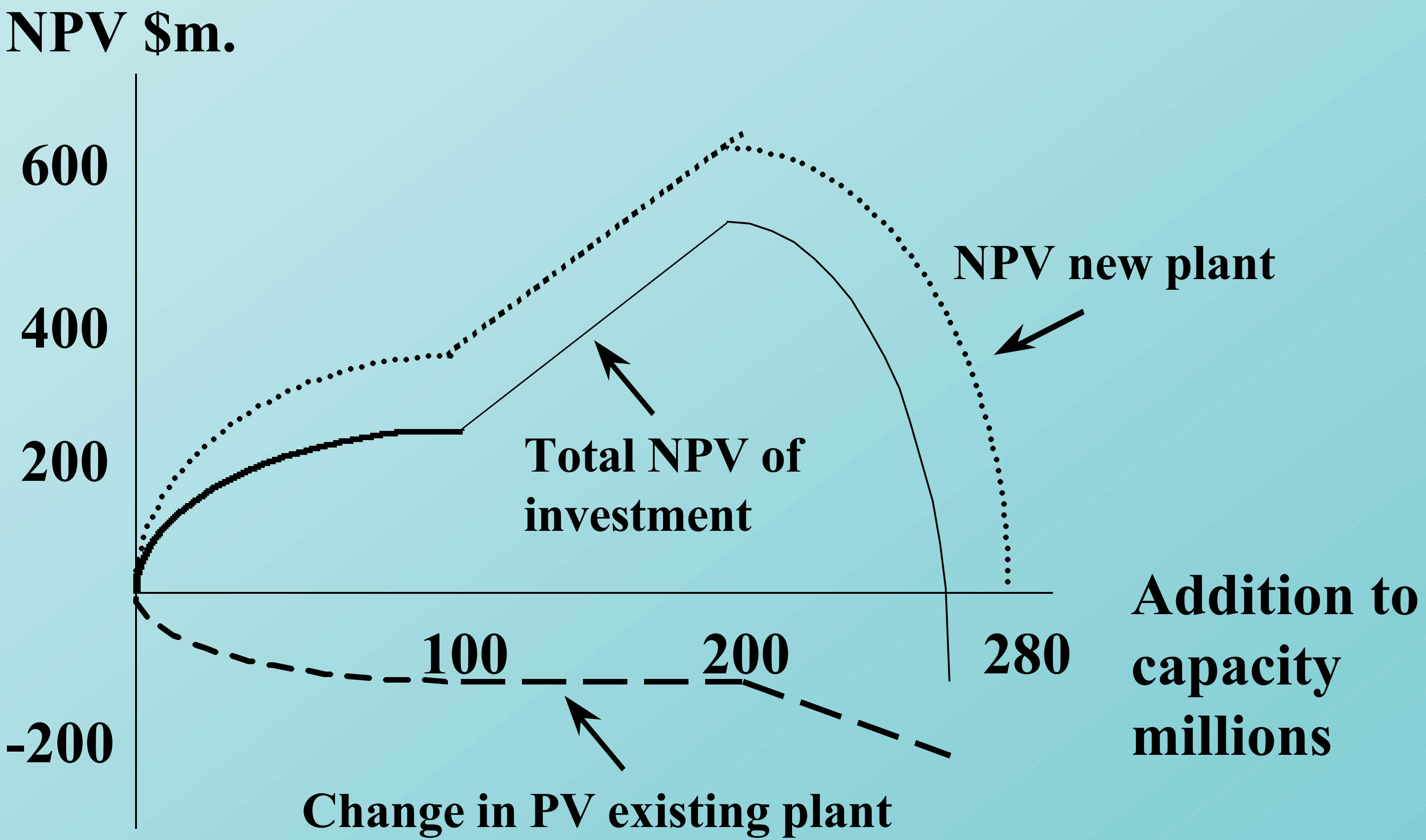
Net benefit $= 299 - 72 = \$227$ million

Marvin Enterprises

•***VALUE OF CURRENT BUSINESS:***		<u>**VALUE**</u>
At price of \$7 PV = 24 x 3.5/.20		420
•***WINDFALL LOSS:***		
Since price falls to \$5 after 5 years,		
Loss = - 24 x (2 / .20) x $(1 / 1.20)^5$		- 96
•***VALUE OF NEW INVESTMENT:***		
Rent gained on new investment = 100 x 1 for 5 years =	299	
Rent lost on old investment = - 24 x 1 for 5 years =	<u>- 72</u>	
	<u>227</u>	<u>227</u>
TOTAL VALUE:		<u>551</u>
<u>***CURRENT MARKET PRICE:***</u>		<u>***460***</u>

Marvin Enterprises

Alternative Expansion Plans



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

◆ Making Sure Managers Maximize NPV

Chapter 12

Topics Covered

- The capital investment process
- Decision Makers and Information
- Incentives
- Residual Income and EVA
- Accounting Performance Measures
- Economic Profit

The Principal Agent Problem

Shareholders = Owners

Managers = Employees

Question: Who has the power?

Answer: Managers

Capital Investment Decision

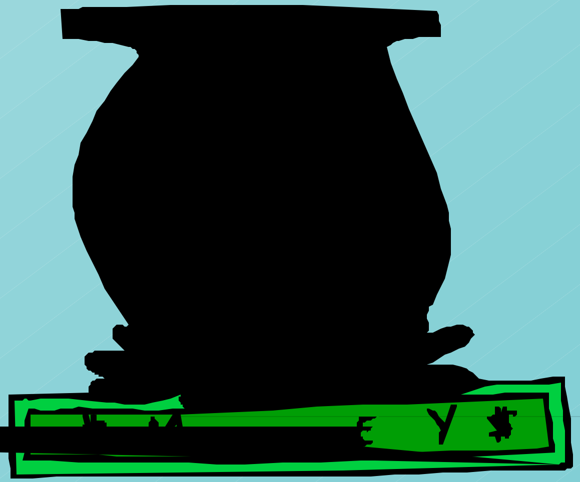
Strategic Planning
"Top Down"

Capital Investments

Project Creation
"Bottom Up"

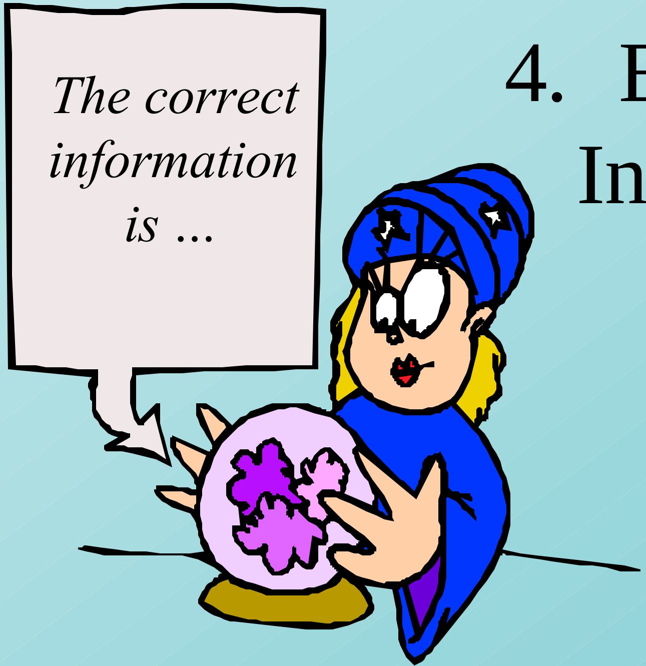
Off Budget Expenditures

- ➲Information Technology
- ➲Research and Development
- ➲Marketing
- ➲Training and Development

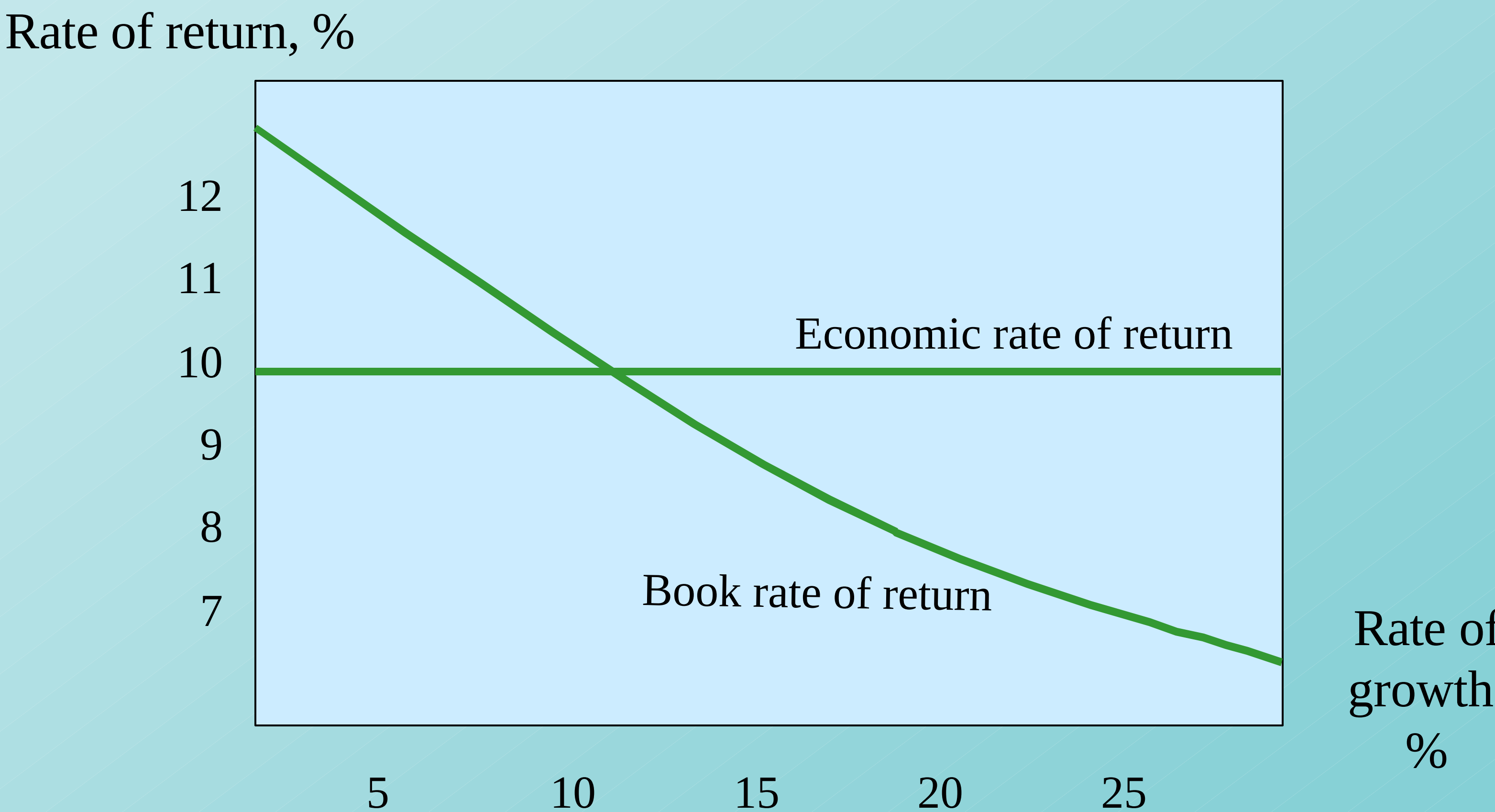


Information Problems

1. Consistent Forecasts
2. Reducing Forecast Bias
3. Getting Senior Management Needed Information
4. Eliminating Conflicts of Interest



Growth and Returns



Brealey & Myers Second Law

The proportion of proposed projects having a positive NPV at the official corporate hurdle rate is independent of the hurdle rate.

Incentives

Agency Problems in Capital Budgeting

- Reduced effort
- Perks
- Empire building
- Entrenching investment
- Avoiding risk

Incentive Issues

- **Monitoring** - Reviewing the actions of managers and providing incentives to maximize shareholder value.
- **Free Rider Problem** - When owners rely on the efforts of others to monitor the company.
- **Compensation** - How to pay managers so as to reduce the cost and need for monitoring and to maximize shareholder value.

Residual Income & EVA

- Techniques for overcoming errors in accounting measurements of performance.
- Emphasizes NPV concepts in performance evaluation over accounting standards.
- Looks more to long term than short term decisions.
- More closely tracks shareholder value than accounting measurements.

Residual Income & EVA

Quayle City Subduction Plant ($mil)

Income

Sales	550
COGS	275
Selling, G&A	75
	200
taxes @ 35%	70
Net Income	$130

Assets

Net W.C.	80
Property, plant and equipment	1170
less depr.	360
Net Invest..	810
Other assets	110
Total Assets	$1,000

Residual Income & EVA

Quayle City Subduction Plant ($mil)

$$ROI = \frac{130}{1{,}000} = .13$$

Given COC = 10%

$$NetROI = 13\% - 10\% = 3\%$$

Residual Income & EVA

Residual Income or EVA = Net Dollar return after deducting the cost of capital.

$$
\begin{aligned}
EVA &= \text{[illegible]sidual Income} \\
&= \text{Income Earned - income required} \\
&= \text{Income Earned - }\left[\text{Cost of Capital} \times \text{Investment}\right]
\end{aligned}
$$

Residual Income & EVA

<u>Quayle City Subduction Plant ($mil)</u>

Given COC = 12%

$$EV \quad = \quad \text{sidual Income}$$

$$= 130 - (.12 \times 1{,}000)$$

$$= +\$10\,\textit{million}$$

Economic Profit

Economic Profit = capital invested multiplied by the spread between return on investment and the cost of capital.

$$\boxed{\begin{aligned} EP &= \text{Economic Profit} \\ &= (ROI - r) \times \text{Capital Invested} \end{aligned}}$$

Economic Profit

<u>Quayle City Subduction Plant ($mil)</u>

Example at 12% COC continued.

$$EP = (ROI - r \times \text{[illegible]ital Invested}$$

$$= (.13 - .12) \times 1{,}000$$

$$= \$10\text{million}$$

Message of EVA

+ Managers are motivated to only invest in projects that earn more than they cost.
+ EVA makes cost of capital visible to managers.
+ Leads to a reduction in assets employed.
- EVA does not measure present value.
- Rewards quick paybacks and ignores time value of money.

EVA of US firms - 1997

$ in millions)	EVA	Capital Invested	Return on Capital	Cost of Capital
Coca Cola	$2,442	$10,814	36.0%	9.7%
Dow Chemical	6,81	23,024	12.2	9.0
Ford Motor	1,719	58,272	12.1	9.1
General Electric	2,515	53,567	17.7	12.7
General Motors	- 3,527	82,887	5.9	9.7
Hewlett - Packard	- 99	24,185	15.2	15.7
IBM	- 2,743	67,431	7.8	11.8
Johnson & Johnson	1,327	18,138	21.8	13.3
Merck	1,688	22,219	23.0	14.5
Microsoft	1,727	5,680	47.1	11.8
Philip Morris	3,119	42,885	20.1	12.5
Safeway	335	4,963	15.7	8.5
UAL	298	13,420	9.8	7.2
Walt Disney	- 347	30,702	11.0	12.6

Accounting Measurements

$$\text{Rate of return} = \frac{\text{cash receipts} + \text{change in price}}{\text{beginning price}}$$

$$= \frac{C_1 + (P_1 - P_0)}{P_0}$$

Accounting Measurements

$$\text{Rate of return} = \frac{\text{cash receipts} + \text{change in price}}{\text{beginning price}}$$

$$= \frac{C_1 + (P_1 - P_0)}{P_0}$$

Economic income = cash flow + change in present value

$$\text{Rate of return} = \frac{C_1 + (PV_1 - PV_0)}{PV_0}$$

Accounting Measurements

	ECONOMIC	ACCOUNTING
INCOME	Cash flow + change in PV = Cash flow - economic depreciation	Cash flow + change in book value = Cash flow - accounting depreciation
RETURN	$\frac{\text{Economic income}}{\text{PV at start of year}}$	$\frac{\text{Accounting income}}{\text{BV at start of year}}$

Nodhead Store Forecastes

	YEAR					
	1	2	3	4	5	6
Cash flow	100	200	250	298	298	298
PV at start of year (r = 10%)	1000	1000	901	741	517	271
PV at end of year (r = 10%)	1000	901	741	517	271	0
Change in value	0	-99	-160	-224	-246	-271
Economic income	100	101	90	74	52	27
Rate of return %	10	10	10	10	10	10
Economic depn.	0	99	160	224	246	271

Nodhead Book Income & ROI

	YEAR					
	1	2	3	4	5	6
Cash flow	100	200	250	298	298	298
BV at start of year, strt line depn	1000	833	667	500	333	167
BV at end of year, strt line depn	833	667	500	333	167	0
Change in BV	-167	-167	-167	-167	-167	-167
Book income	-67	+33	+83	+131	+131	+131
Book ROI %	-6.7	4.0	12.4	26.2	39.3	78.4
Book depn.	167	167	167	167	167	167

Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

◆ Corporate Financing and the Six Lessons of Market Efficiency

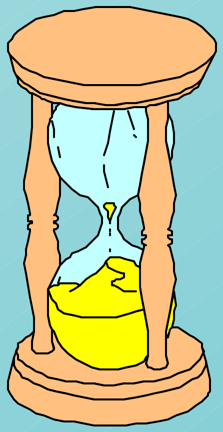
Chapter 13

Topics Covered

- We Always Come Back to NPV
- What is an Efficient Market?
  - ➔ Random Walk
- Efficient Market Theory
- The Evidence on Market Efficiency
- Six Lessons of Market Efficiency

Return to NPV

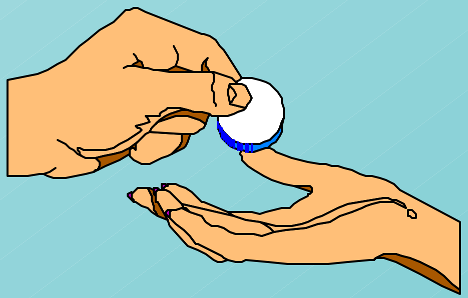
- NPV employs discount rates.
- These discount rates are risk adjusted.
- The risk adjustment is a byproduct of market established prices.
- Adjustable discount rates change asset values.



Return to NPV

Example

The government is lending you $100,000 for 10 years at 3% and only requiring interest payments prior to maturity. Since 3% is obviously below market, what is the value of the below market rate loan?



NPV = amount borrowed - PV of interest pmts

- PV of loan repayment

Return to NPV

Example

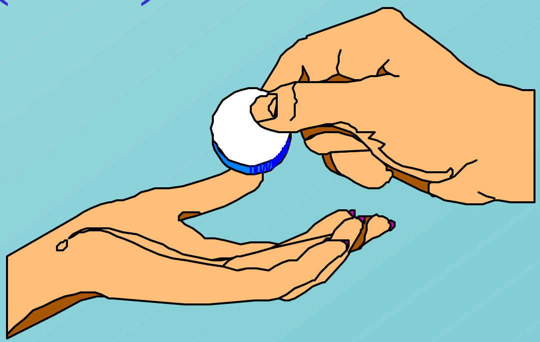
The government is lending you \$100,000 for 10 years at 3% and only requiring interest payments prior to maturity. Since 3% is obviously below market, what is the value of the below market rate loan?

Assume the market return on equivalent risk projects is 10%.

$$\text{NPV} = 100{,}000 - \left[\sum_{t=1}^{10} \frac{3{,}000}{(1.10)^t}\right] - \frac{100{,}000}{(1.10)^{10}}$$

$$= 100{,}000 - 56{,}988$$

$$= \$43{,}012$$

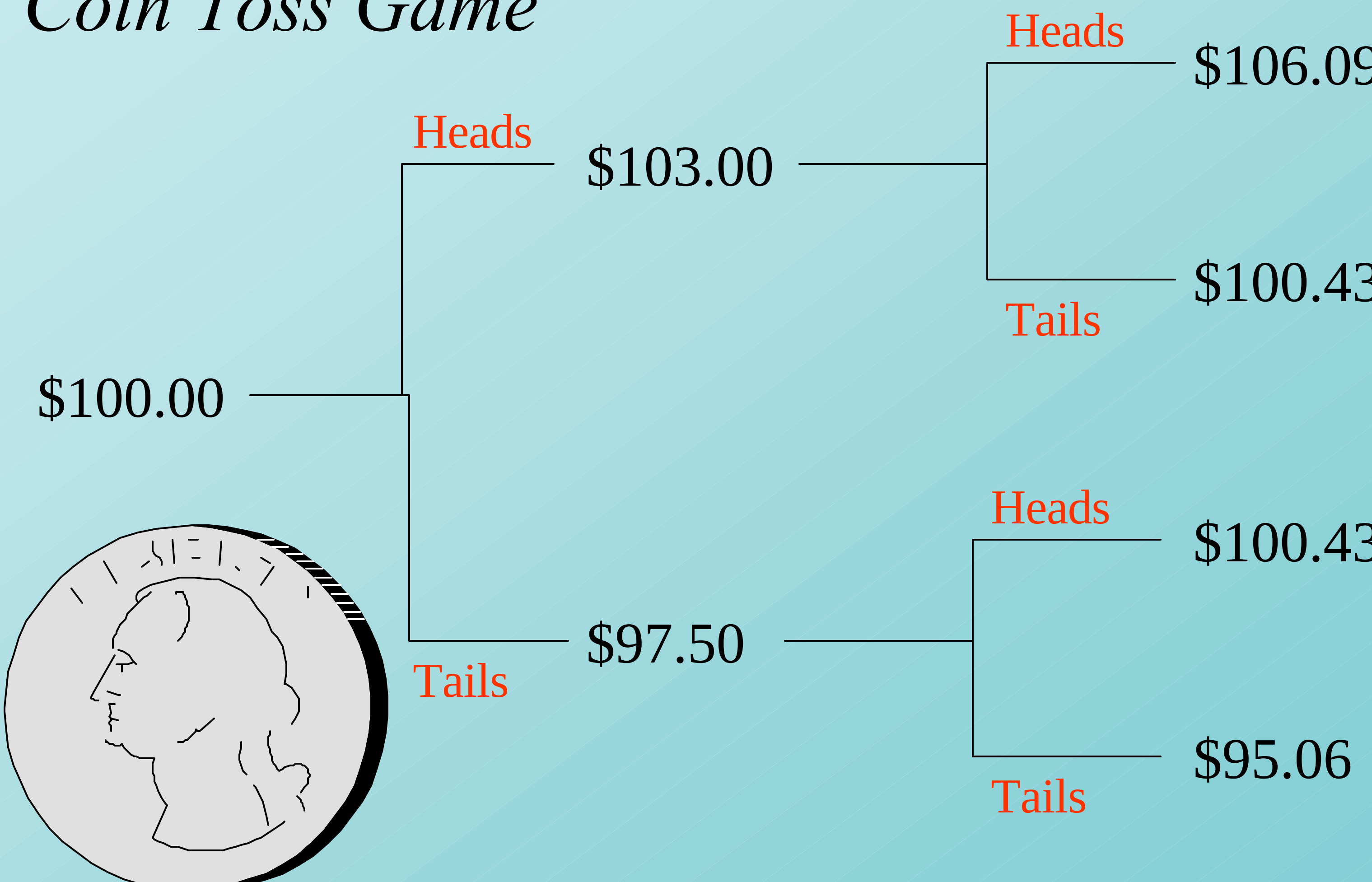


Random Walk Theory

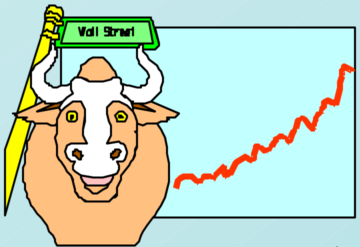
- The movement of stock prices from day to day DO NOT reflect any pattern.
- Statistically speaking, the movement of stock prices is random *(skewed positive over the long term)*.

Random Walk Theory

Coin Toss Game

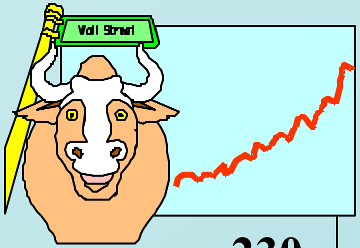


Random Walk Theory



S&P 500 Five Year Trend?
or
5 yrs of the Coin Toss Game?

Random Walk Theory

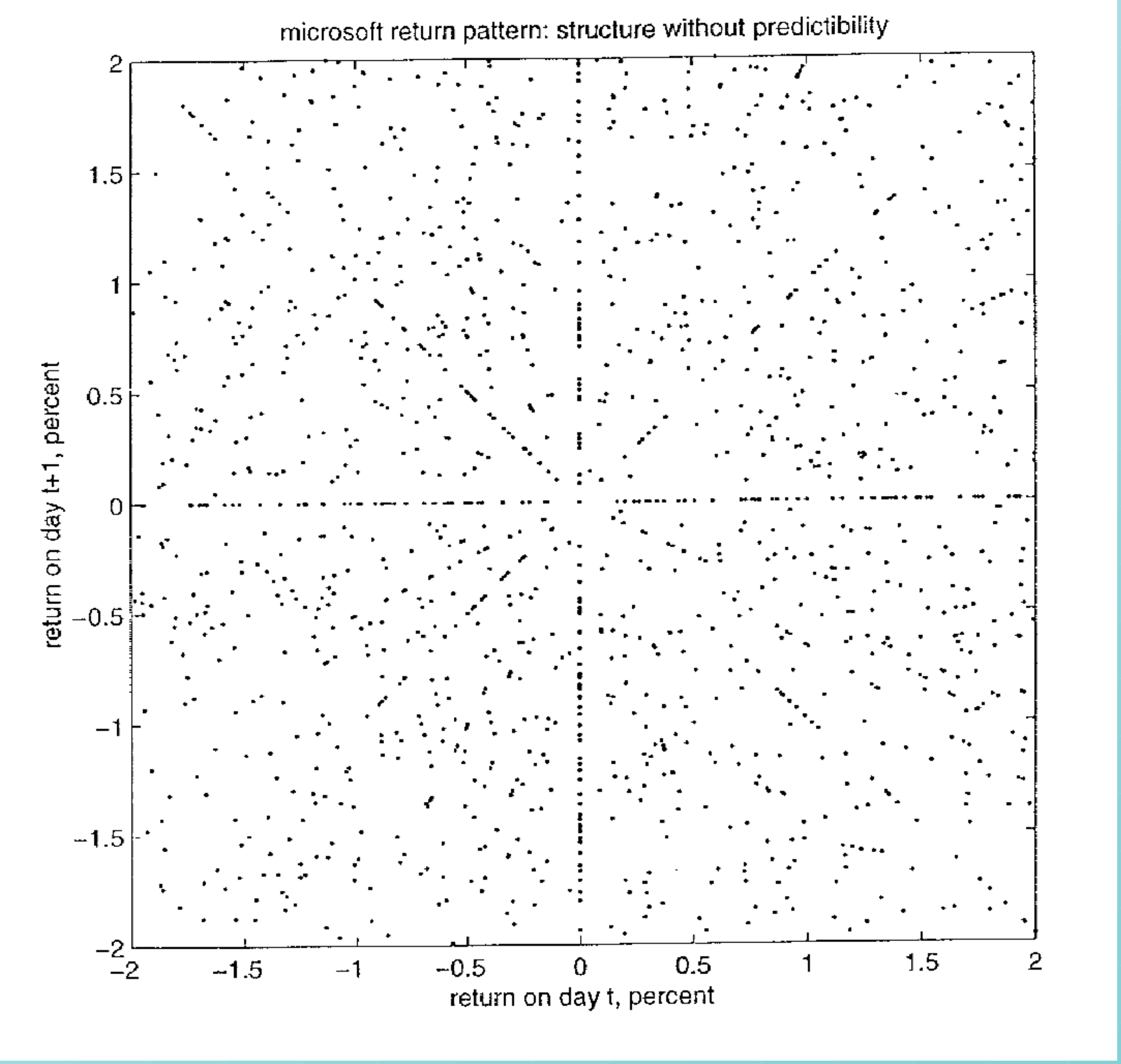


S&P 500 Five Year Trend?

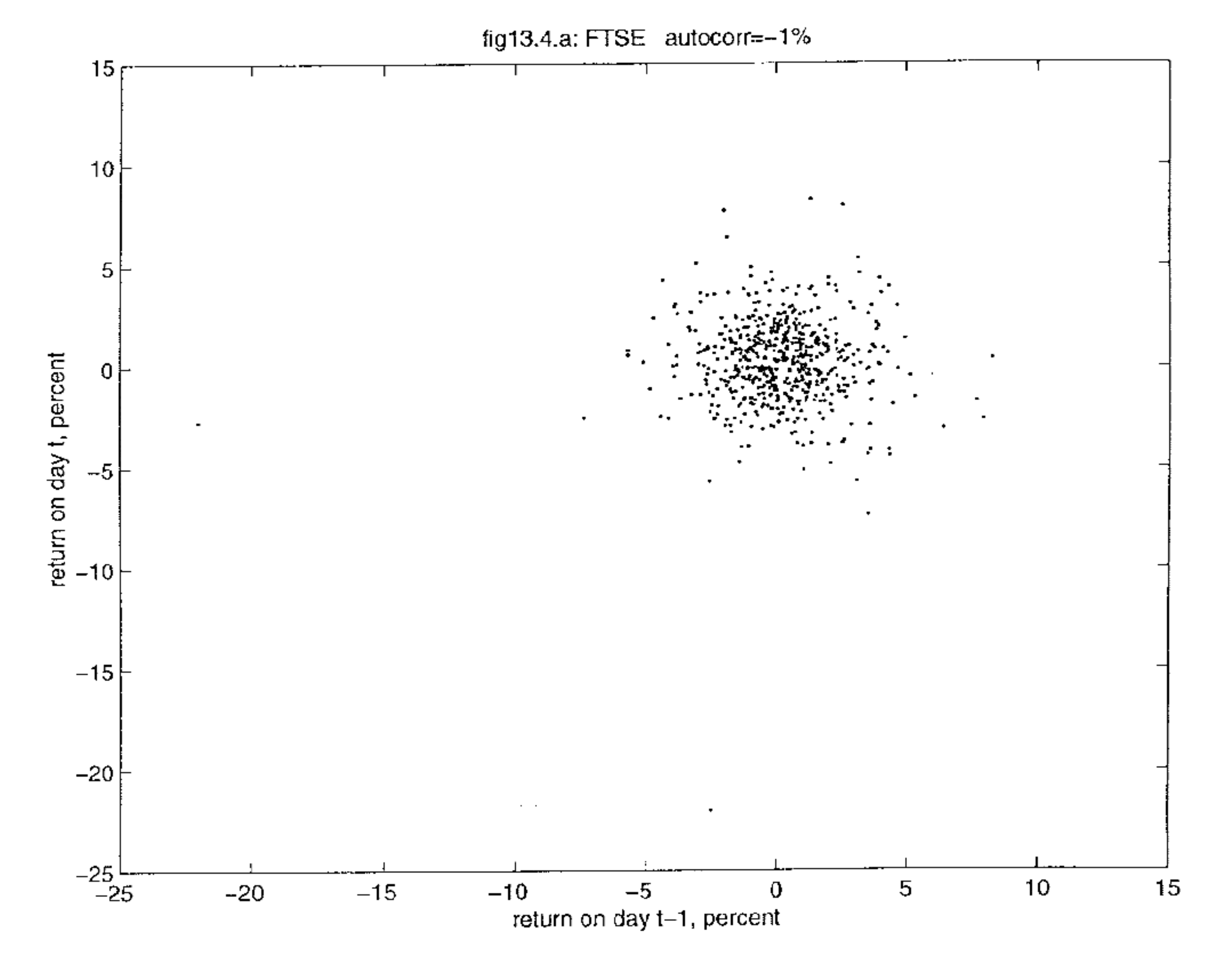
or

5 yrs of the Coin Toss Game?

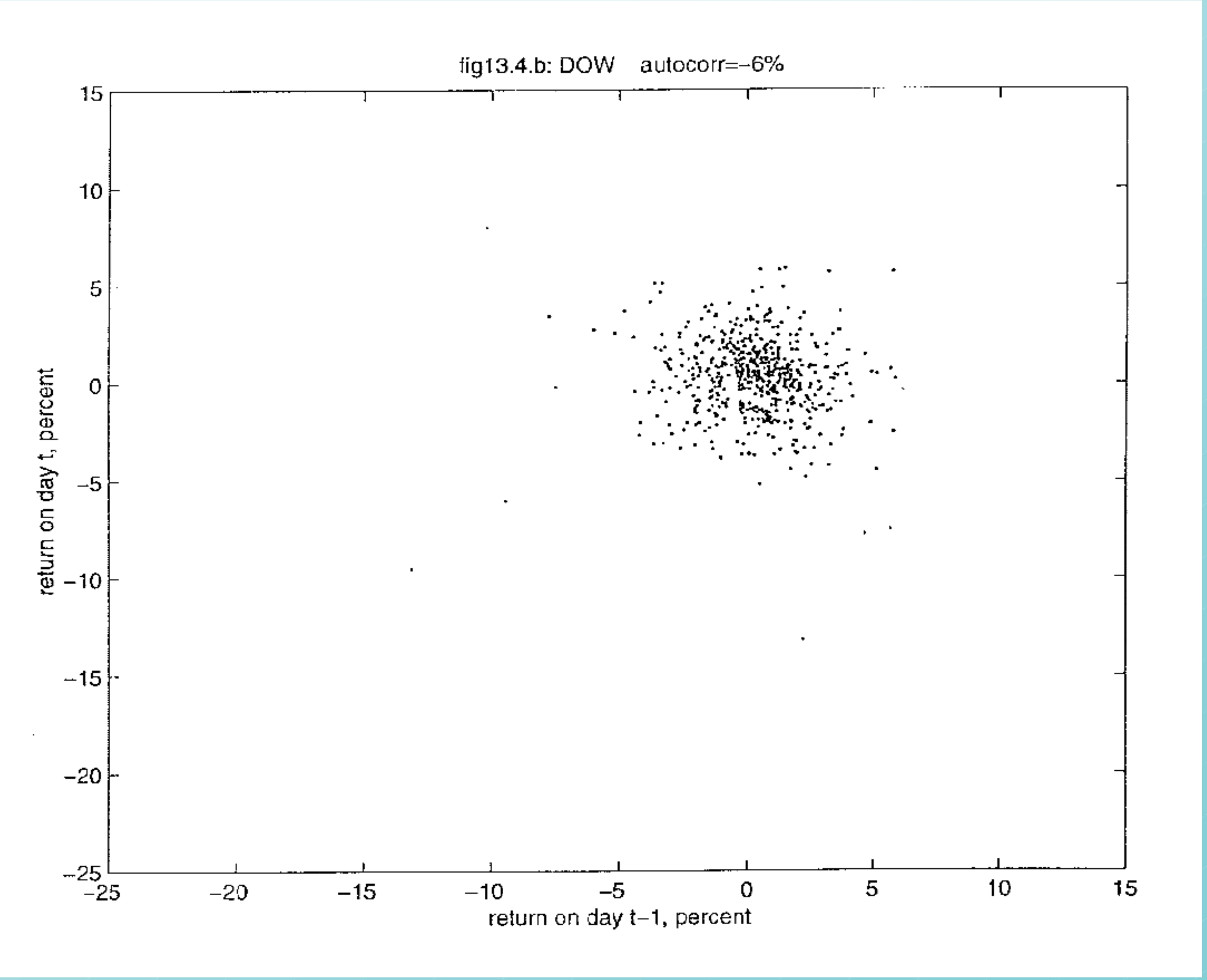
Random Walk Theory



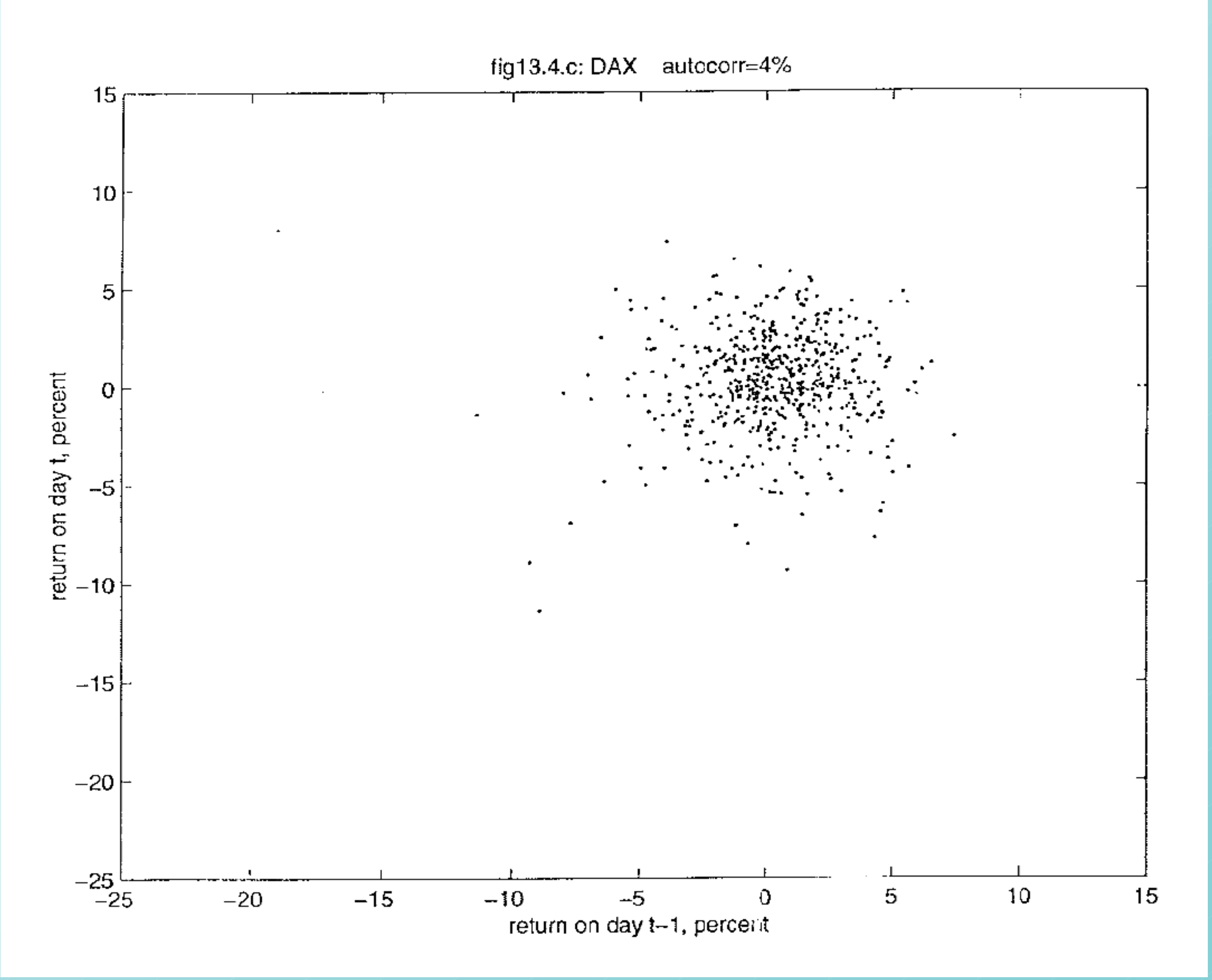
Random Walk Theory



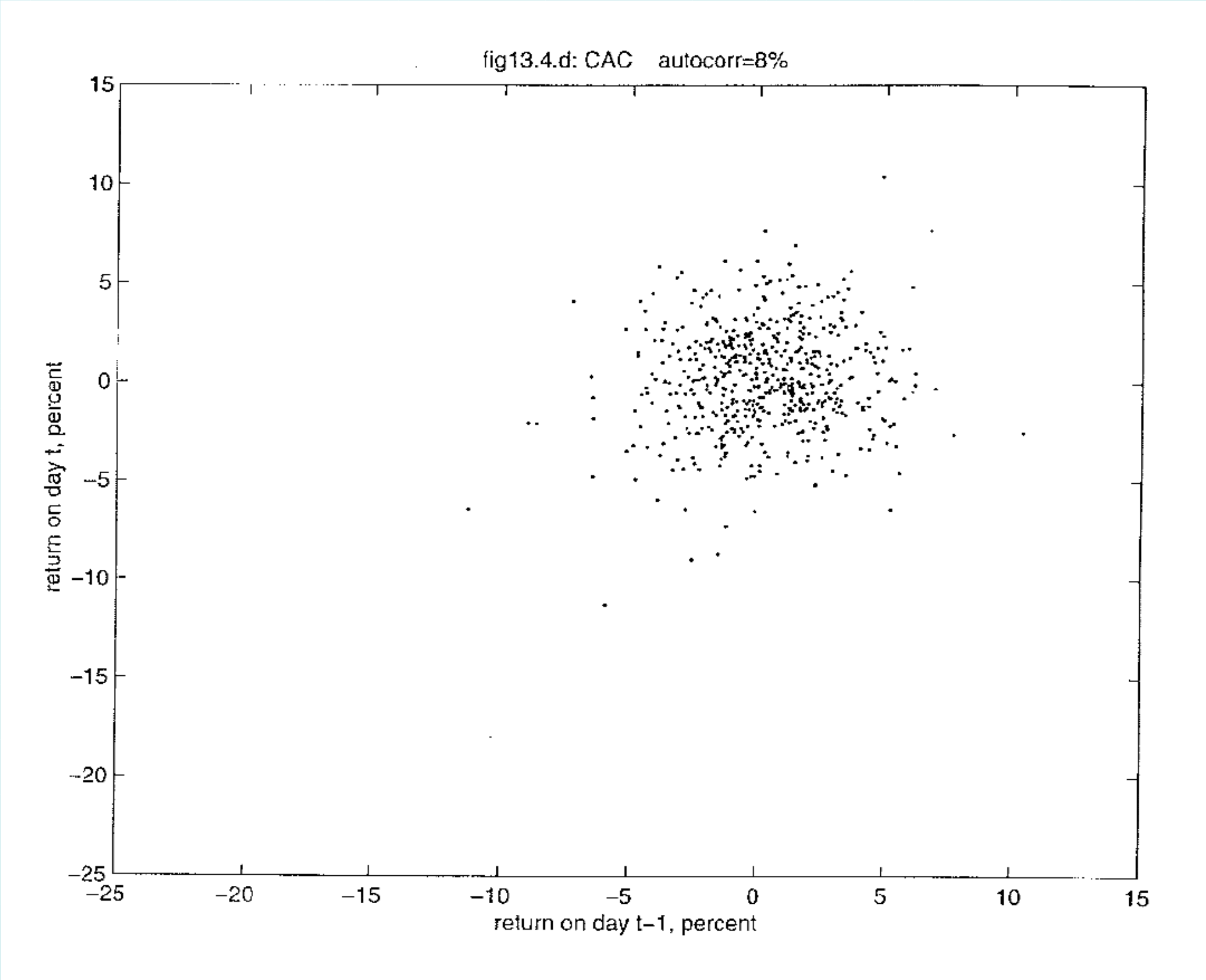
Random Walk Theory



Random Walk Theory



Random Walk Theory

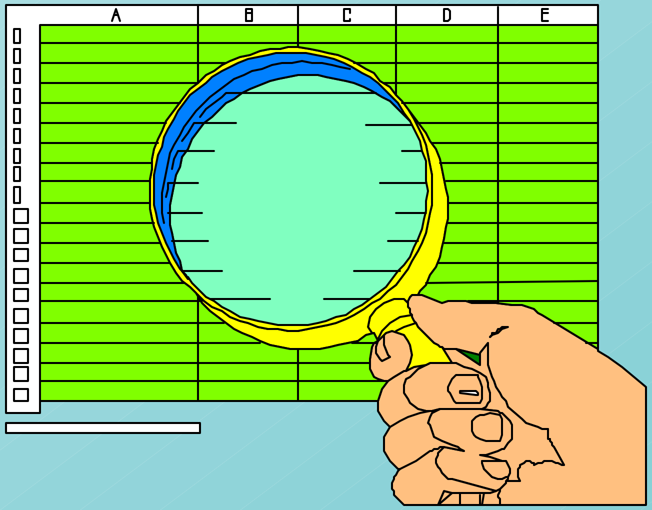


Efficient Market Theory

- Weak Form Efficiency
  - Market prices reflect all historical information.
- Semi-Strong Form Efficiency
  - Market prices reflect all publicly available information.
- Strong Form Efficiency
  - Market prices reflect all information, both public and private.

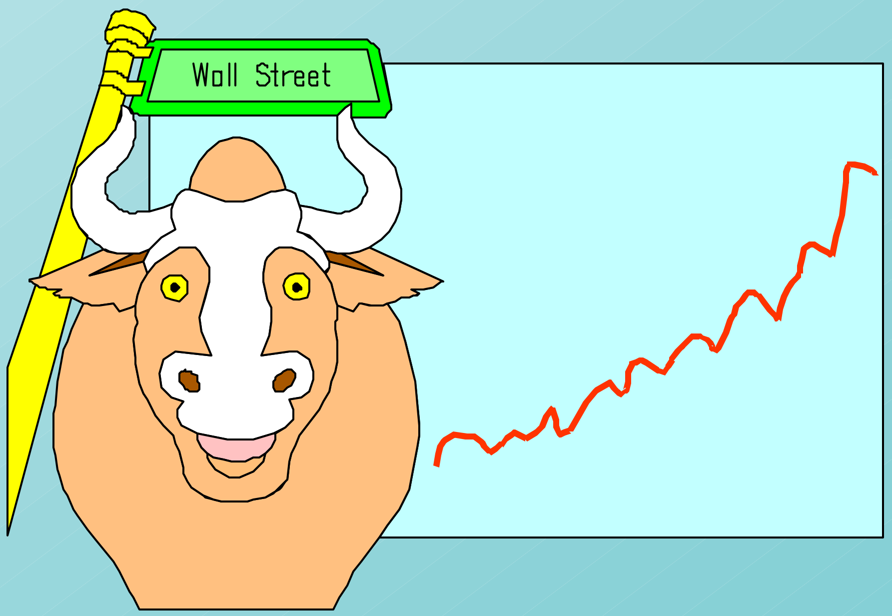
Efficient Market Theory

- **Fundamental Analysts**
  - ➔ Research the value of stocks using NPV and other measurements of cash flow.



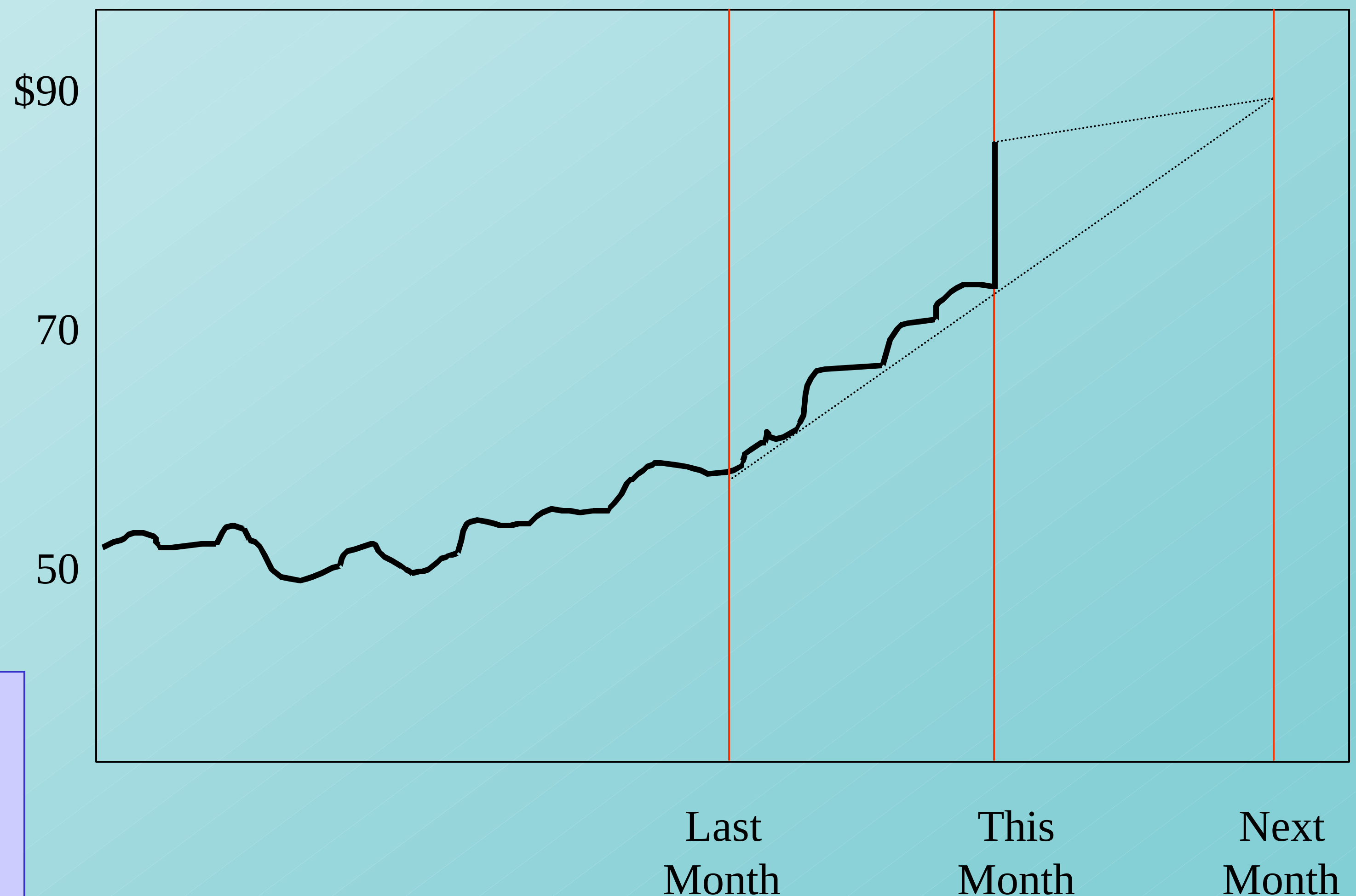
Efficient Market Theory

- **Technical Analysts**
  - ➔ Forecast stock prices based on the watching the fluctuations in historical prices (thus "***wiggle watchers***").



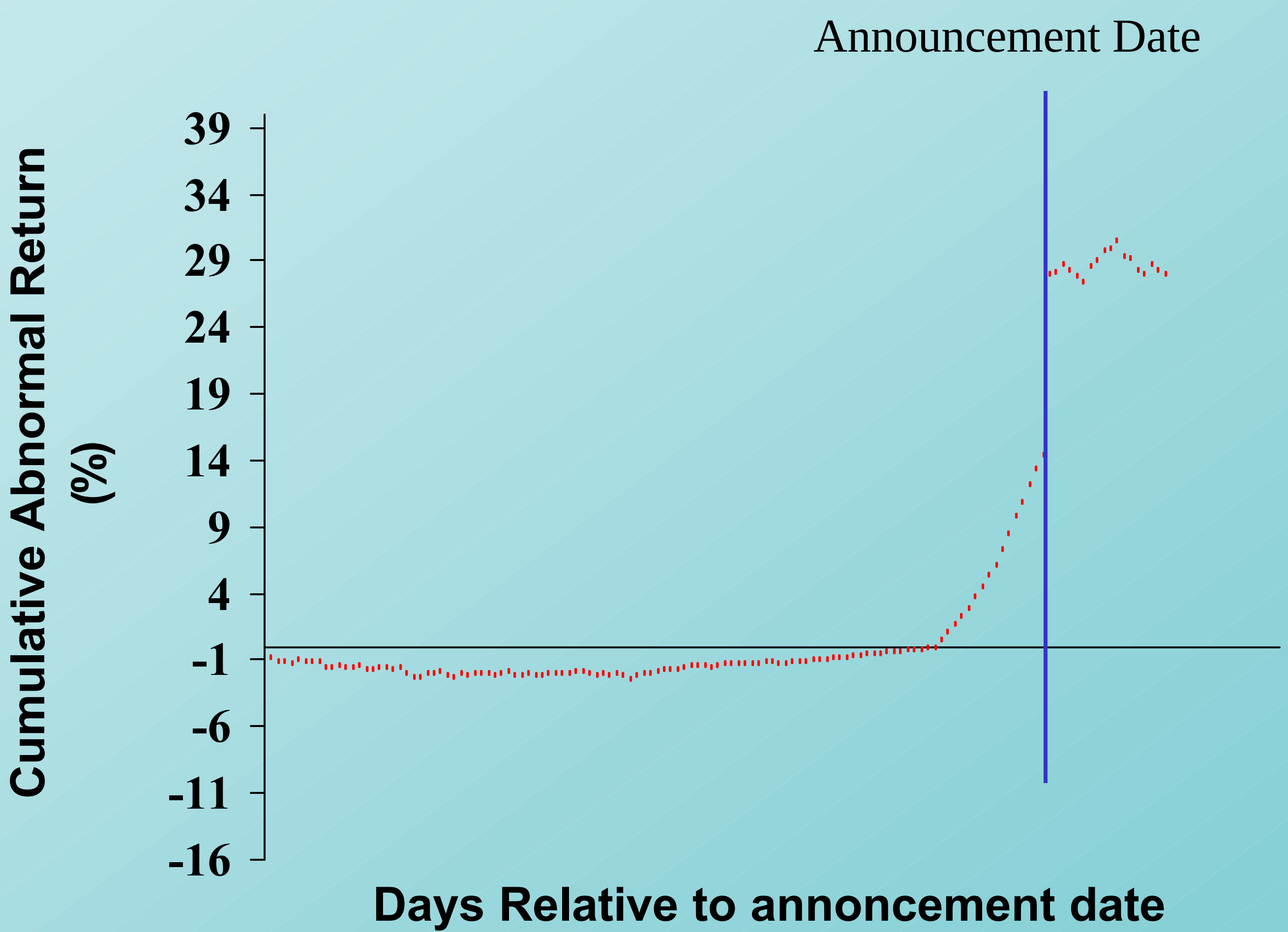
Efficient Market Theory

Microsoft Stock Price



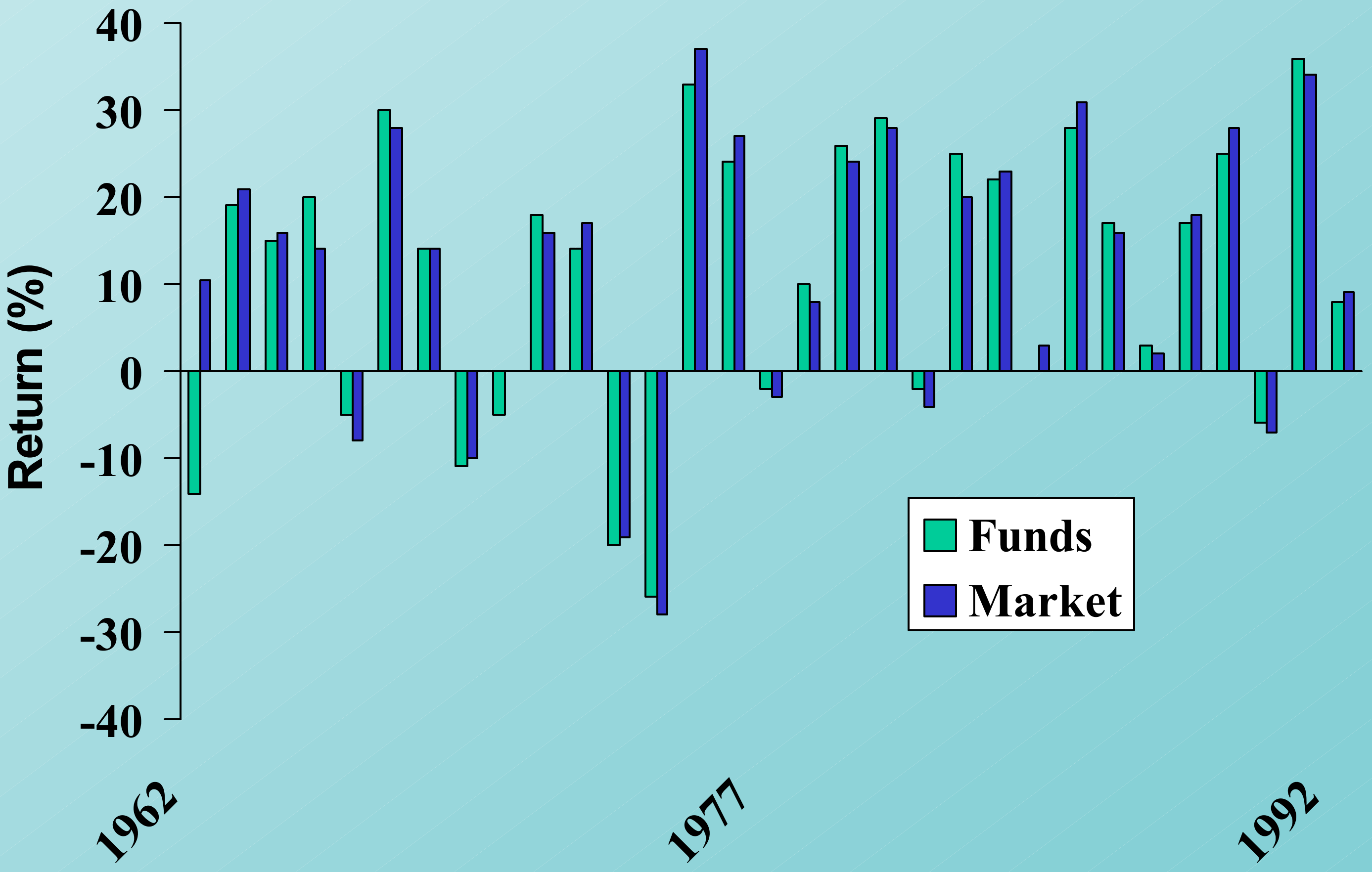
Cycles disappear once identified

Efficient Market Theory



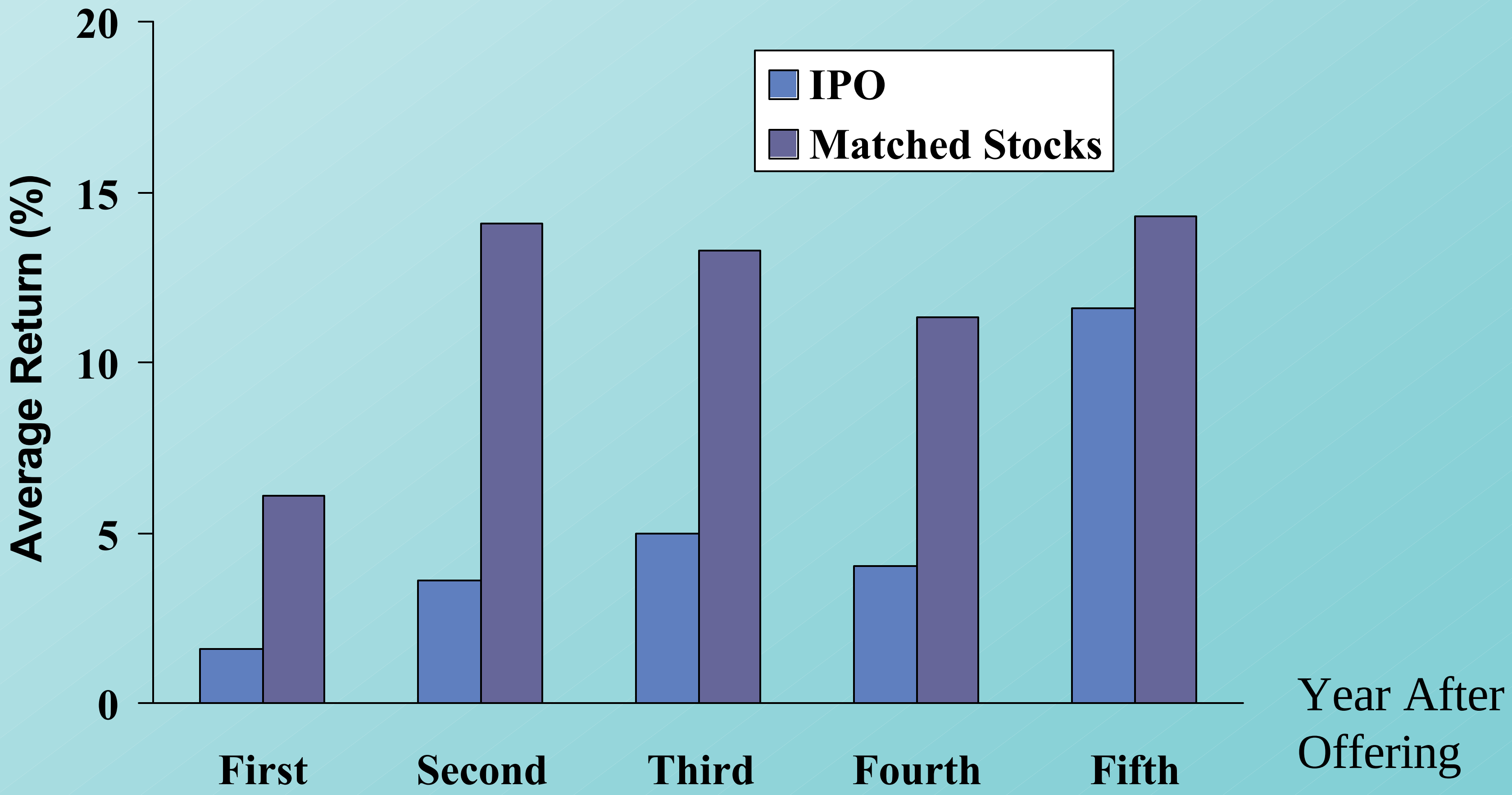
Efficient Market Theory

Average Annual Return on 1493 Mutual Funds and the Market Index



Efficient Market Theory

IPO Non-Excess Returns



Efficient Market Theory

1987 Stock Market Crash

$$PV(index)_{\text{pre crash}} = \frac{Div}{r-g} = \frac{16.7}{.114-.10} = 1193$$

Efficient Market Theory

1987 Stock Market Crash

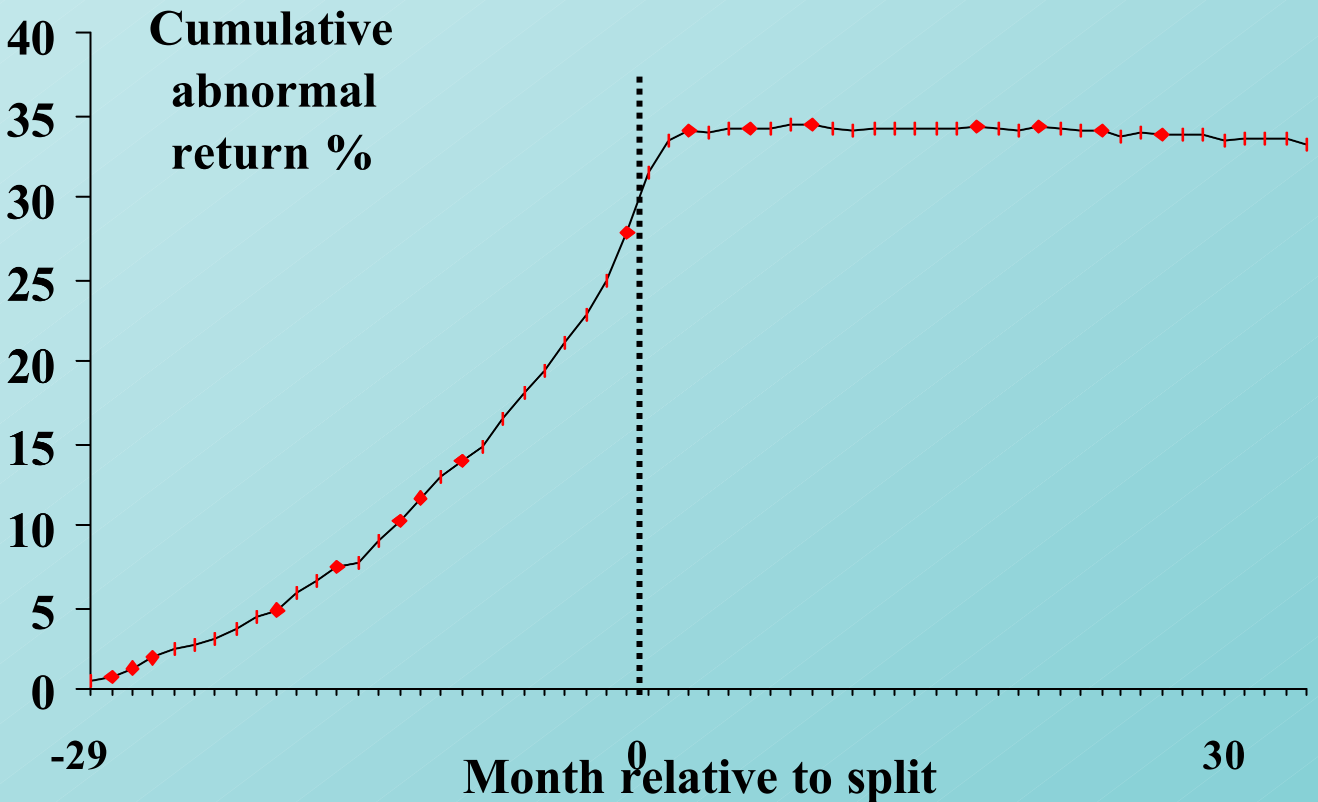
$$PV(index)_{\text{pre crash}} = \frac{Div}{r-g} = \frac{16.7}{.114-.10} = 1193$$

$$PV(index)_{\text{post crash}} = \frac{Div}{r-g} = \frac{16.7}{.114-.096} = 928$$

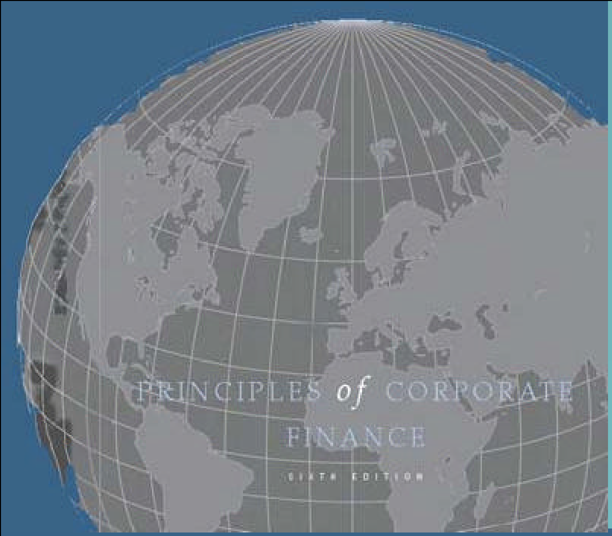
Lessons of Market Efficiency

- ➲Markets have no memory
- ➲Trust market prices
- ➲Read the entrails
- ➲There are no financial illusions
- ➲The *do it yourself* alternative
- ➲Seen one stock, seen them all

Example: How stock splits affect value



Source: Fama, Fisher, Jensen & Roll



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

An Overview of Corporate Financing

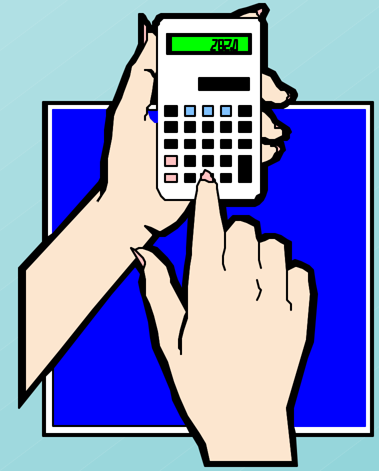
Chapter 14

Topics Covered

- Patterns of Corporate Financing
- Common Stock
- Preferred Stock
- Debt
- Derivatives

Patterns of Corporate Financing

- Firms may raise funds from external sources or plow back profits rather than distribute them to shareholders.
- Should a firm elect external financing, they may choose between debt or equity sources.



Patterns of Corporate Financing

TABLE 14-1 Sources and uses of funds in nonfinancial corporations expressed as percentage of each year's total investment.

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Uses.'										
1. Capital expenditures	74	87	87	98	73	89	92	77	81	83
2. Investment in net working capital and other usesa	26	13	13	2	27	19	20	23	19	17
3. Total investment	100	100	100	100	100	100	100	100	100	100
Sources:										
4. Internally generated cash b	81	87	90	112	88	88	86	78	89	85
5. Financial deficit (5 - 4); equals required external financing	19	13	10	-12	12	12	14	22	11	15
Financial deficit covered by:										
6. Net stock issues	-26	-27	-14	3	6	4	-7	-8	-9	-14
7. Net increase in debt	45	40	24	-14	7	8	21	30	20	30

a Changes in short-term borrowing are shown under net increase in debt. "Other uses" are net of any increase in miscellaneous liabilities and any statistical discrepancy.

b Net income plus depreciation less cash dividends paid to stockholders

Source: Board of Governors of the Federal Reserve System, Division of Research and Statistics, Flow of Funds Accounts, various issues.

Patterns of Corporate Financing

Aggregate balance sheet for manufacturing corporations in the United States, 1997 (figures in Billions).

Current assets		$ 1,320	Current liabilities		$ 997
Fixed assets	2,181		Long term debt	815	
Less depreciation	1,097		Other long term liabilities	576	
Net fixed assets		***1,085***	***Total long term liabilities***		***1,391***
Other long term		1,491	Stockholders' equity		1,508
Total assets		***3,896***	***Total liabilities and stockholders' equity***		***3,896***

Patterns of Corporate Financing

? How do we define debt ?

$$\frac{\text{Debt}}{\text{Total assets}} = \frac{997 + 1391}{3896} = .61$$

$$\frac{\text{Long term liabilities}}{\text{Long term liabilities} + \text{equity}} = \frac{1391}{1391 + 1508} = .48$$

Patterns of Corporate Financing

DEBT TO TOTAL CAPITAL				
	Book	**Book, Adjusted**	**Market**	**Market, Adjusted**
Canada	*39%*	*37%*	*35%*	*32%*
France	*48*	*34*	*41*	*28*
Germany	*38*	*18*	*23*	*15*
Italy	*47*	*39*	*46*	*36*
Japan	*53*	*37*	*29*	*17*
United Kingdom	*28*	*16*	*19*	*11*
United States	*37*	*33*	*28*	*23*

Common Stock

Book Value vs. Market Value

Book value is a backward looking measure. It tells us how much capital the firm has raised from shareholders in the past. It does not measure the value that shareholders place on those shares today. The market value of the firm is forward looking, it depends on the future dividends that shareholders expect to receive.

Common Stock

Example - Mobil Book Value vs. Market Value (12/97)

Total Shares outstanding = 783.4 million

Common Shares ($1 par)	894
Additional paid in capital	1,549
Retained earnings	20,661
Currency adjustment	-821
Treasury shares at cost	-3,158
Net common equity (Book Value)	19,125

Common Stock

Example - Mobil Book Value vs. Market Value (12/97)

Total Shares outstanding = 783.4 million

Dec 1997 Market price =	$72/sh
# of shares	x 783.4
Market Value	$56.4 billion

Preferred Stock

Preferred Stock - Stock that takes priority over common stock in regards to dividends.

Net Worth - Book value of common shareholder's equity plus preferred stock.

Floating-Rate Preferred - Preferred stock paying dividends that vary with short term interest rates.

Corporate Debt

- Debt has the unique feature of allowing the borrowers to walk away from their obligation to pay, in exchange for the assets of the company.
- "Default Risk" is the term used to describe the likelihood that a firm will walk away from its obligation, either voluntarily or involuntarily.
- "Bond Ratings"are issued on debt instruments to help investors assess the default risk of a firm.

Corporate Debt

TABLE 14-5 Large firms typically issue many different securities. This table shows some of the debt securities on Mobil Corporation's balance sheet at the end of 1996 and 1997 (figures in millions).

Debt Security	**1996**	**1997**
6 1/2% notes 1997	$148	
6 3/8% notes 1998	200	$200
7 1/4% notes 1999	162	148
8 3/8% notes 2001	200	180
8 5/8% notes 2006	250	250
8 5/8% debentures 2021	250	250
7 5/8% debentures 2033	240	216
8% debentures 2032	250	164
8 1/8% Canadian dollar eurobonds 1998 a	110	
9 % ECU eurobonds 1997 b	148	

Corporate Debt

continued

TABLE 14-5 Large firms typically issue many different securities. This table shows some of the debt securities on Mobil Corporation's balance sheet at the end of 1996 and 1997 (figures in millions).

Debt Security	1996	1997
9 5/8% sterling eurobonds 1999	187	182
Variable rate notes 1999	110	
Japanese yen loans 2003-2005	388	347
Variable rate project financing 1998	105	52
Industrial revenue bonds 1998-2030	491	484
Other foreign currencies due 1997-2030	1090	764
Other long-term debt	660	716
Capital leases	247	335
Commercial paper	1634	1097
Bank and other short	894	1168

Corporate Debt

Prime Rate - Benchmark interest rate charged by banks.

Funded Debt - Debt with more than 1 year remaining to maturity.

Sinking Fund - Fund established to retire debt before maturity.

Callable Bond - Bond that may be repurchased by firm before maturity at specified call price.

Corporate Debt

Subordinate Debt - Debt that may be repaid in bankruptcy only after senior debt is repaid.

Secured Debt - Debt that has first claim on specified collateral in the event of default.

Investment Grade - Bonds rated Baa or above by Moody’s or BBB or above by S&P.

Junk Bond - Bond with a rating below Baa or BBB.

Corporate Debt

Eurodollars - Dollars held on deposit in a bank outside the United States.

Eurobond - Bond that is marketed internationally.

Private Placement - Sale of securities to a limited number of investors without a public offering.

Protective Covenants - Restriction on a firm to protect bondholders.

Lease - Long-term rental agreement.

Corporate Debt

Warrant - Right to buy shares from a company at a stipulated price before a set date.

Convertible Bond - Bond that the holder may exchange for a specified amount of another security.

Convertibles are a combined security, consisting of both a bond and a call option.

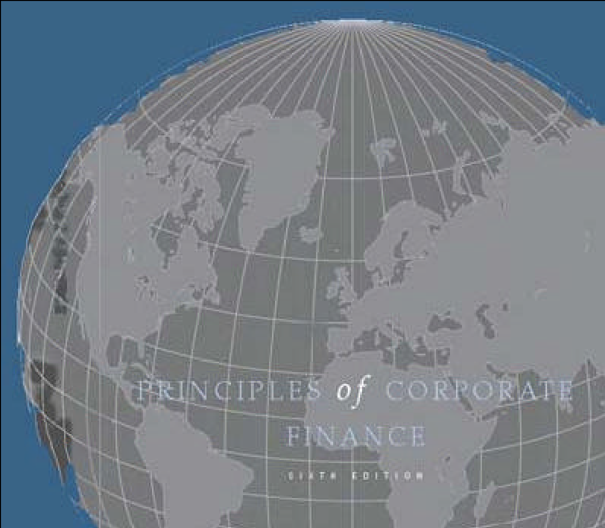
Derivatives

Traded Options - A derivative that gives the firm the right (but not the obligation) to buy or sell an asset in the future at a price that is agreed upon today.

Futures - A contractual obligation entered into in advance to buy or sell an asset or commodity.

Forwards - A tailor made contract for the purchase of an asset. Not traded on exchanges like futures.

Swaps - An agreement between two parties to exchange the interest rate characteristics of two loans.



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

How Corporations Issue Securities

Chapter 15

Topics Covered

- Venture Capital
- The Initial Public Offering
- The Underwriters
- General Cash Offers
- Rights Issue

Venture Capital

<u>Venture Capital</u>

Money invested to finance a new firm

Venture Capital

Venture Capital

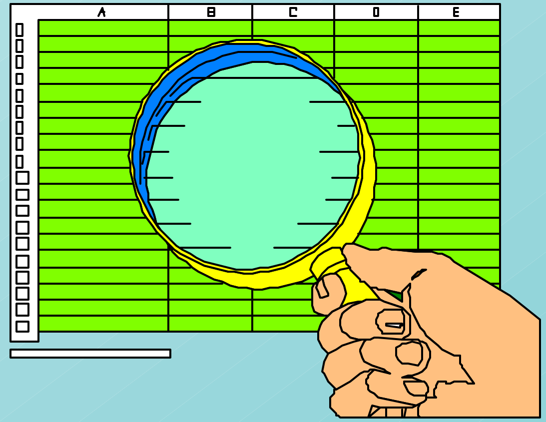
Money invested to finance a new firm

Since success of a new firm is highly dependent on the effort of the managers, restrictions are placed on management by the venture capital company and funds are usually dispersed in stages, after a certain level of success is achieved.

Venture Capital

First Stage Market Value Balance Sheet ($mil)

Assets		Liabilities and Equity	
Cash from new equity	1.0	New equity from venture capital	1.0
Other assets	1.0	Your original equity	1.0
Value	2.0	Value	2.0



Venture Capital

Second Stage Market Value Balance Sheet ($mil)

Assets		Liabilities and Equity	
Cash from new equity	4.0	New equity from 2nd stage	4.0
Fixed assets	1.0	Equity from 1st stage	5.0
Other assets	9.0	Your original equity	5.0
Value	14.0	Value	14.0

Initial Offering

Initial Public Offering (IPO) - First offering of stock to the general public.

Underwriter - Firm that buys an issue of securities from a company and resells it to the public.

Spread - Difference between public offer price and price paid by underwriter.

Prospectus - Formal summary that provides information on an issue of securities.

Underpricing - Issuing securities at an offering price set below the true value of the security.

The Underwriters

Top U.S. Underwriters in 1997

($bil of total issues)

Merrill Lynch	$208
Saloman Smith Barney	167
Morgan Stanley	140
Goldman Sachs	137
Lehman Brothers	121
JPMorgan	104
Credit Suisse First Boston	68
Bear Stearns	58
Donaldson Lufkin Jenrette	46
Chase	33
All Underwriters	1,293

The Underwriters

Top Intl. Underwriters in 1997

($bil of total issues)

Merrill Lynch	$37
Goldman Sachs	32
SBC Warburg	29
Deutsche Morgan	29
Credit Suisse First Boston	27
JPMorgan	24
Morgan Stanley	23
ABN AMRO Hoare	22
Lehman Brothers	18
Paribas	18
All Underwriters	496

Initial Offering

Average Expenses on 1767 IPOs from 1990-1994

Value of Issues ($mil)	Direct Costs (%)	Avg First Day Return (%)	Total Costs (%)
2 - 9.99	16.96	16.36	25.16
10 - 19.99	11.63	9.65	18.15
20 - 39.99	9.7	12.48	18.18
40 - 59.99	8.72	13.65	17.95
60 - 79.99	8.2	11.31	16.35
80 - 99.99	7.91	8.91	14.14
100 - 199.99	7.06	7.16	12.78
200 - 499.99	6.53	5.70	11.10
500 and up	5.72	7.53	10.36
All Issues	11.00	12.05	18.69

Tombstone

12,937,500 Shares

THE MONY GROUP

The MONY Group Inc.

Common Stock

(par value $0.01 per share)

Price $23.50 Per Share

Upon request, a copy of the Prospectus describing these securities and the business of the Company may be obtained within any State from any Underwriter who may legally distribute it within such State. The securities are offered only by means of the Prospectus, and this announcement is neither an offer to sell nor a solicitation of an offer to buy

10,925,000 Shares

This portion of the offering is being offered in the United States by the undersigned.

Goldman, Sachs & Co.
Donaldson, Lufkin & Jenrette
Morgan Stanley Dean Witter
Salomon Smith Barney

CIBC Oppenheimer
Conning & Company
A.G. Edwards & Sons, Inc.
Fox-Pitt, Kelton Inc.
Schroder & Co. Inc.
Allen & Company Incorporated
Robert W. Baird & Co. Incorporated
Chatsworth Securities LLC
Doley Securities, Inc.
Edward D. Jones & Co., L.P.
Legg Mason Wood Walker Incorporated
Stephens Inc.

2,012,500 Shares

This portion of the offering is being offered outside the United States by the undersigned.

Goldman Sachs International
Donaldson, Lufkin & Jenrette
Morgan Stanley Dean Witter
Salomon Smith Barney International

General Cash Offers

Seasoned Offering - Sale of securities by a firm that is already publicly traded.

General Cash Offer - Sale of securities open to all investors by an already public company.

Shelf Registration - A procedure that allows firms to file one registration statement for several issues of the same security.

Private Placement - Sale of securities to a limited number of investors without a public offering.

Underwriting Spreads

Gross underwriter spreads of selected issues, 1998

Type	Company	Issue amount, millions of dollars	Underwriter's spread, percent
IPO	Hypertension Diagnostics, Inc.	9.3	8.49
IPO	Actuate Software Corp.	33.0	7.00
IPO	Enterprise Product Partners	264.0	6.36
IPO	EquantNY	282.2	5.25
IPO	Conoco	4403.5	3.99
Seasoned	*Coulter Pharmaceuticals*	*60.0*	*5.48*
Seasoned	Stillwater Mining	61.5	5.00
Seasoned	Metronet Commuications Corp.	232.6	5.00
Seasoned	Staples, Inc.	446.6	3.25
Seasoned	Safeway, Inc.	1125.0	2.75
Seasoned	Media One Group	1511.3	2.74
Debt:			
2-year notes	General Motors Acceptance Corp.	100	0.18
30-year debentures	Bausch & Lornb, Inc.	200	0.88
6-year notes	Ararnark Corp.	300	0.63
15-year subordinated notes	B anque Paribas	400	0.75
Convertible zero-coupon bonds	Aspect Telecommunications	490	3.00
10-year notes	Federal Home Loan Mortgage Corp	1500	0.15

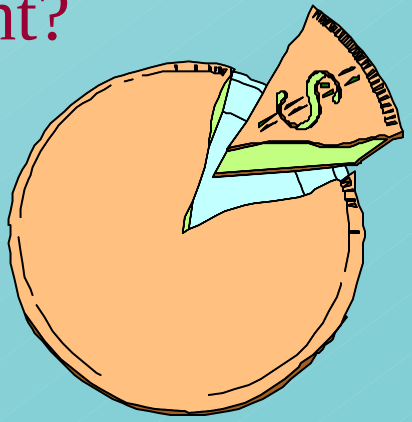
Rights Issue

Rights Issue - Issue of securities offered only to current stockholders.

Rights Issue

Rights Issue - Issue of securities offered only to current stockholders.

Example - AEP Corp currently has 11 million shares outstanding. The market price is $24/sh. AEP decides to raise additional funds via a 1 for 11 rights offer at $22 per share. If we assume 100% subscription, what is the value of each right?



Rights Issue

Example - AEP Corp currently has 11 million shares outstanding. The market price is $24/sh. AEP decides to raise additional funds via a 1 for 11 rights offer at $22 per share. If we assume 100% subscription, what is the value of each right?

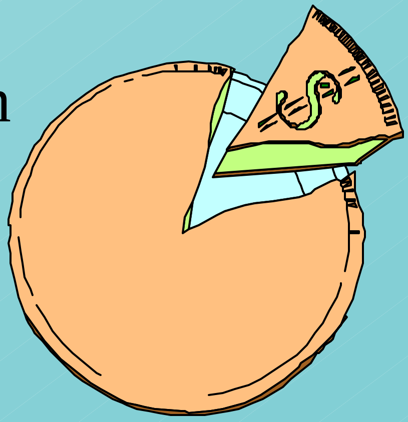
$\Rightarrow$ Current Market Value = 2mil x $24 = $264 mil

$\Rightarrow$ Total Shares = 11 mil + 1 mil = 12 mil

$\Rightarrow$ Amount of new funds = 1 mil x $22 = $22 mil

$\Rightarrow$ New Share Price = (264 + 22) / 12 = $23.83/sh

$\Rightarrow$ Value of a Right = 24 - 23.83 = $0.17



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

◆ The Dividend Controversy

Chapter 16

Topics Covered

- How Dividends Are Paid
- How Do Companies Decide on Dividend Payments?
- Information in Dividends and Stock Repurchases
- Dividend Policy is Irrelevant
- The Rightists
- Taxes and the Radical Left
- The Middle of the Roaders

Types of Dividends

- Cash Div
- Regular Cash Div
- Special Cash Div
- Stock Div
- Stock Repurchase (3 methods)
  1. Buy shares on the market
  2. Tender Offer to Shareholders
  3. Private Negotiation (Green Mail)

Dividend Payments

Cash Dividend - Payment of cash by the firm to its shareholders.

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Ex-Dividend Date - Date that determines whether a stockholder is entitled to a dividend payment; anyone holding stock before this date is entitled to a dividend.

Dividend Payments

Cash Dividend - Payment of cash by the firm to its shareholders.

Ex-Dividend Date - Date that determines whether a stockholder is entitled to a dividend payment; anyone holding stock before this date is entitled to a dividend.

Record Date - Person who owns stock on this date received the dividend.

Dividend Payments

Stock Dividend - Distribution of additional shares to a firm's stockholders.

Dividend Payments

Stock Dividend - Distribution of additional shares to a firm's stockholders.

Stock Splits - Issue of additional shares to firm's stockholders.

Dividend Payments

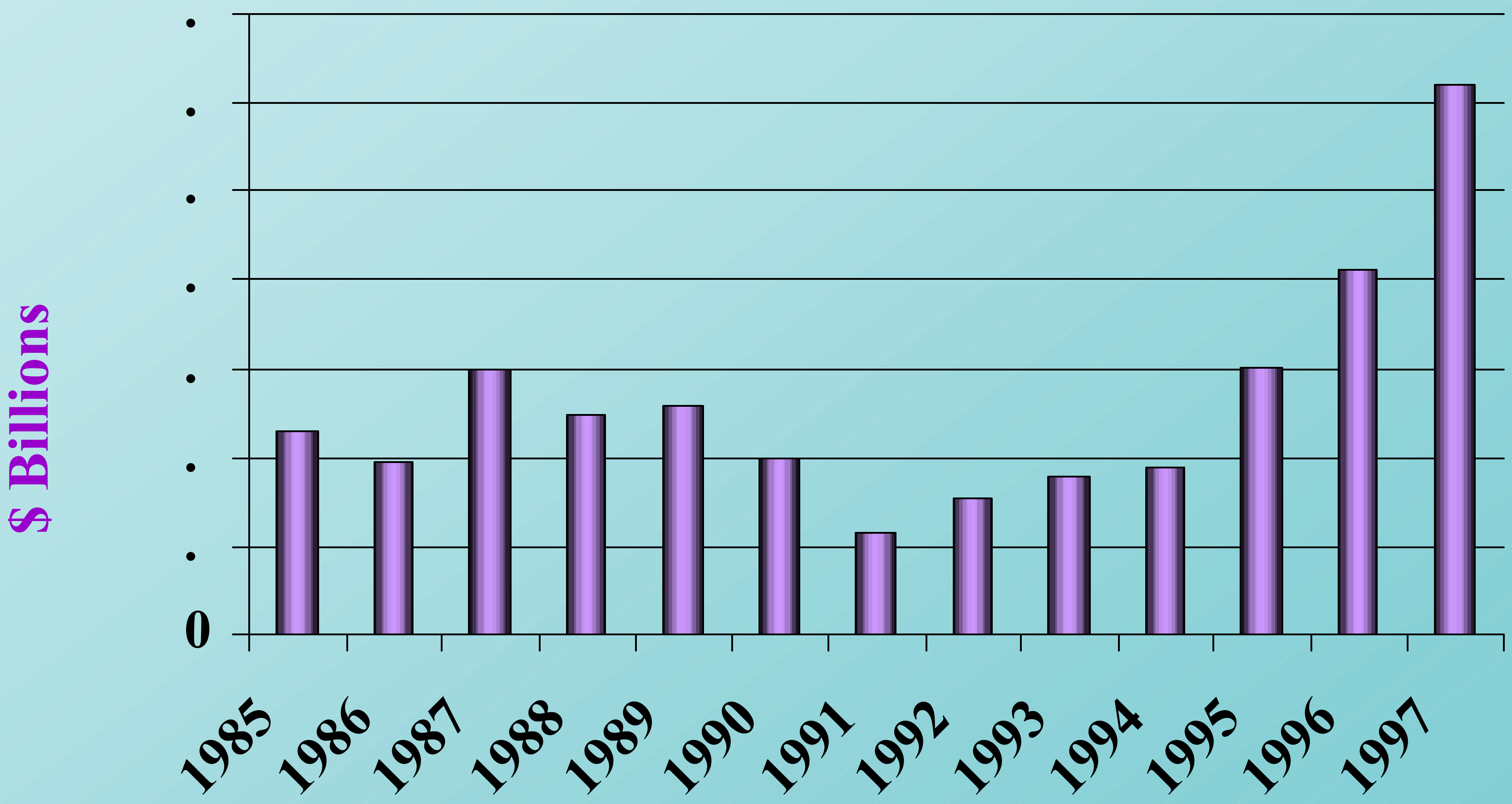
Stock Dividend - Distribution of additional shares to a firm's stockholders.

Stock Splits - Issue of additional shares to firm's stockholders.

Stock Repurchase - Firm buys back stock from its shareholders.

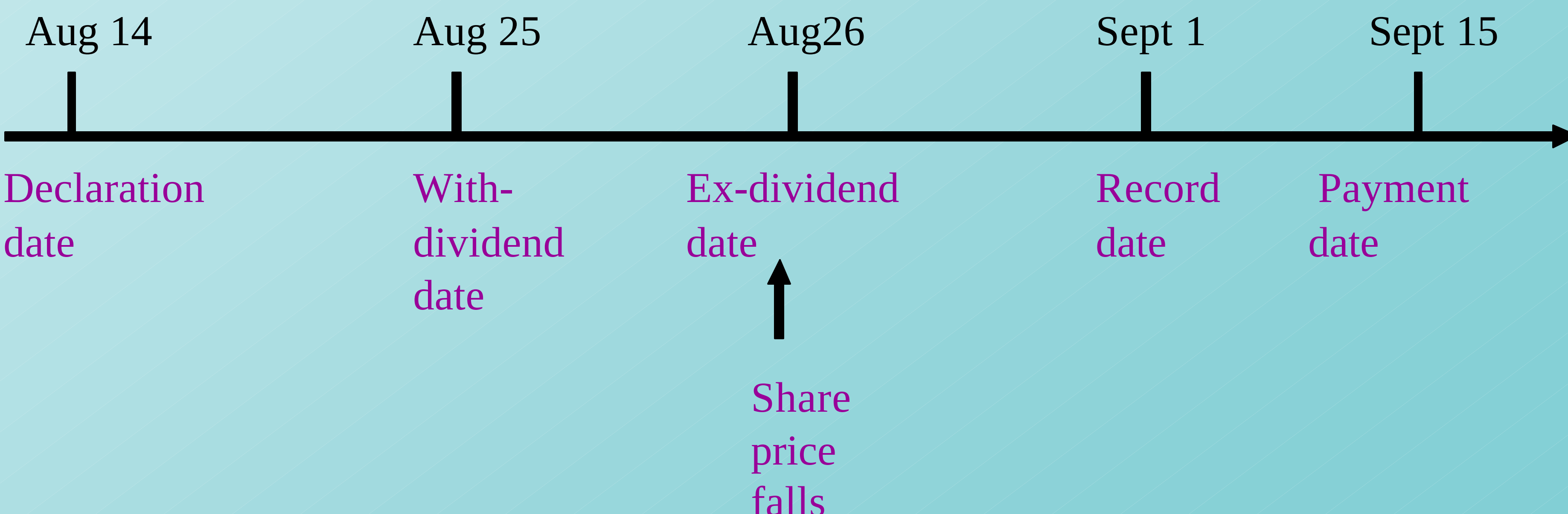
Stock Repurchases

U.S. Stock Repurchases 1985-1997



Dividend Payments

Maytag's Quarterly Dividend



The Dividend Decision

Lintner's "Stylized Facts"

(<u>How Dividends are Determined)</u>

1. Firms have longer term target dividend payout ratios.
2. Managers focus more on dividend changes than on absolute levels.
3. Dividends changes follow shifts in long-run, sustainable levels of earnings rather than short-run changes in earnings.
4. Managers are reluctant to make dividend changes that might have to be reversed.

The Dividend Decision

- Attitudes concerning dividend targets vary

$$\begin{aligned} DIV_1 &= \text{target dividend} \\ &= \text{target ratio} \times EPS_1 \end{aligned}$$

- Dividend Change

$$\begin{aligned} DIV_1 - DIV_0 &= \text{target change} \\ &= \text{target ratio} \times EPS_1 - DIV_0 \end{aligned}$$

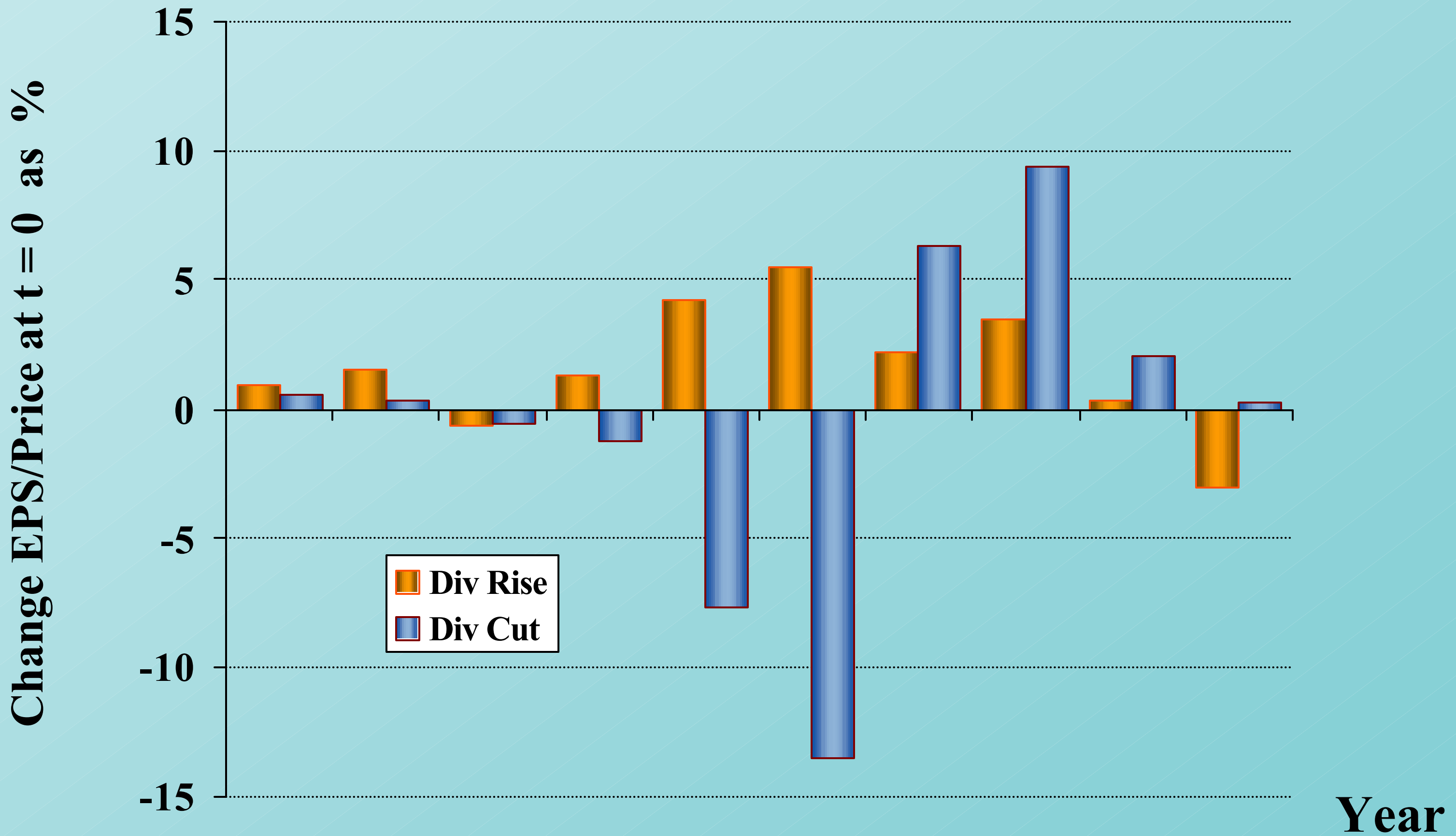
The Dividend Decision

- Dividend changes confirm the following:

$$\begin{aligned} \text{DIV}_1 - \text{DIV}_0 &= \text{adjustment rate} \times \text{target change} \\ &= \text{adjustment rate} \times \left(\text{target ratio} \times \text{EPS}_1 - \text{DIV}_0\right) \end{aligned}$$

Dividend Policy

Impact of Dividend Changes on EPS



Source: Healy & Palepu (1988)

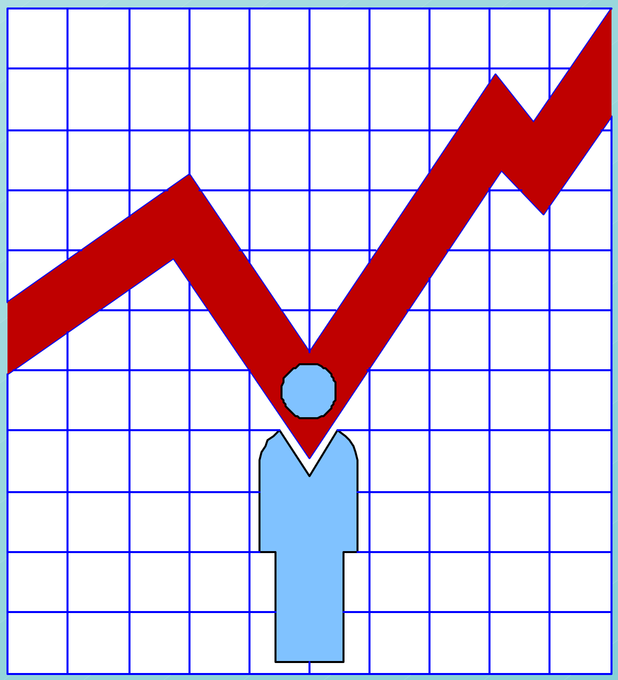
Dividend Policy is Irrelevant

- Since investors do not need dividends to convert shares to cash they will not pay higher prices for firms with higher dividend payouts. In other words, dividend policy will have no impact on the value of the firm.

Dividend Policy is Irrelevant

Example - Assume Rational Demiconductor has no extra cash, but declares a $1,000 dividend. They also require $1,000 for current investment needs. Using M&M Theory, and given the following balance sheet information, show how the value of the firm is not altered when new shares are issued to pay for the dividend.

Record Date	
Cash	**1,000**
Asset Value	**9,000**
Total Value	**10,000 +**
New Proj NPV	**2,000**
# of Shares	**1,000**
price/share	**$12**



Dividend Policy is Irrelevant

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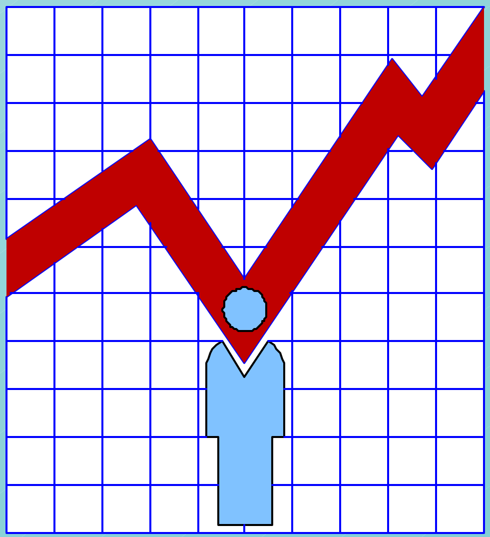
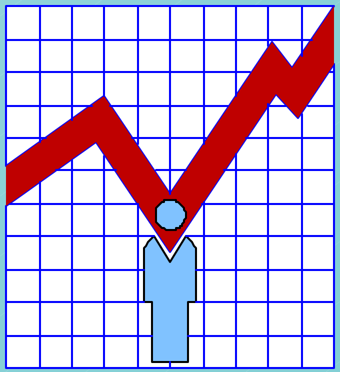
Record Date		**Pmt Date**
Cash	1,000	**0**
Asset Value	9,000	**9,000**
Total Value	10,000 +	**9,000**
New Proj NPV	2,000	**2,000**
# of Shares	1,000	**1,000**
price/share	$12	**$11**



Dividend Policy is Irrelevant

Example - Assume Rational Demiconductor has no extra cash, but declares a $1,000 dividend. They also require $1,000 for current investment needs. Using M&M Theory, and given the following balance sheet information, show how the value of the firm is not altered when new shares are issued to pay for the dividend.

Record Date		Pmt Date	**Post Pmt**
Cash	1,000	0	**1,000 (910sh @ $11)**
Asset Value	9,000	9,000	**9,000**
Total Value	10,000 +	9,000	**10,000**
New Proj NPV	2,000	2,000	**2,000**
# of Shares	1,000	1,000	**1,091**
price/share	$12	$11	**$11**



NEW SHARES ARE ISSUED

Dividend Policy is Irrelevant

Example - continued - Shareholder Value

	Record
Stock	12,000
Cash	0
Total Value	12,000

Stock = 1,000 sh @ $12 = 12,000

Dividend Policy is Irrelevant

Example - continued - Shareholder Value

	Record	Pmt
Stock	12,000	11,000
Cash	0	1,000
Total Value	12,000	12,000

Stock = 1,000sh @ $11 = 11,000

Dividend Policy is Irrelevant

Example - continued - Shareholder Value

	Record	Pmt	**Post**
Stock	12,000	11,000	**12,000**
Cash	0	1,000	**0**
Total Value	12,000	12,000	**12,000**

Stock = 1,091sh @ $115 = 12,000

- Assume stockholders purchase the new issue with the cash dividend proceeds.

Dividends Increase Value

<u>Market Imperfections and Clientele Effect</u>

There are natural clients for high-payout stocks, but it does not follow that any particular firm can benefit by increasing its dividends. The high dividend clientele already have plenty of high dividend stock to choose from.

These clients increase the price of the stock through their demand for a dividend paying stock.

Dividends Increase Value

<u>Dividends as Signals</u>

Dividend increases send good news about cash flows and earnings. Dividend cuts send bad news.

Because a high dividend payout policy will be costly to firms that do not have the cash flow to support it, dividend increases signal a company's good fortune and its manager's confidence in future cash flows.

Dividends Decrease Value

Tax Consequences

Companies can convert dividends into capital gains by shifting their dividend policies. If dividends are taxed more heavily than capital gains, taxpaying investors should welcome such a move and value the firm more favorably.

In such a tax environment, the total cash flow retained by the firm and/or held by shareholders will be higher than if dividends are paid.

Taxes and Dividend Policy

- Since capital gains are taxed at a lower rate than dividend income, companies should pay the lowest dividend possible.
- Dividend policy should adjust to changes in the tax code.

Taxes and Dividend Policy

	Firm A (no dividend)	Firm B (high dividend)
Next year's price	112.50	102.50
Dividend	0	10
Total pretax payoff	112.50	112.50
Today's stock price	100	96.67
Capital gain	12.50	5.83
Pretax rate of return (%)	$\frac{12.5}{100} \times 100 = 12.5$	$\frac{15.83}{96.67} \times 100 = 16.4$
Tax on div @ 50%	0	$.50 \times 10 = 5.00$
Tax on Cap Gain @ 20%	$.20 \times 12.50 = 2.50$	$.20 \times 5.83 = 1.17$
Total After Tax income (div + cap gain - taxes)	$(0 + 12.50) - 2.50 = 10$	$(10 - 5.83) - (5 + 1.17) = 9.66$
After tax rate of return (%)	$\frac{10}{100} \times 100 = 10.0$	$\frac{9.66}{96.67} \times 100 = 10.0$

Taxes and Dividend Policy

1998 Marginal Income Tax Brackets

	Income Bracket	
Marginal Tax Rate	**Single**	**Married (joint return)**
15%	\$0 - \$25,350	\$0 - \$42,350
28	25,351 - 61,400	42,351 - 102,300
31	61,401 - 128,100	102,301 - 155,950
36	128,101 - 278,450	155,951 - 278,450
39.6	over 278,450	over 278,450

Taxes and Dividend Policy

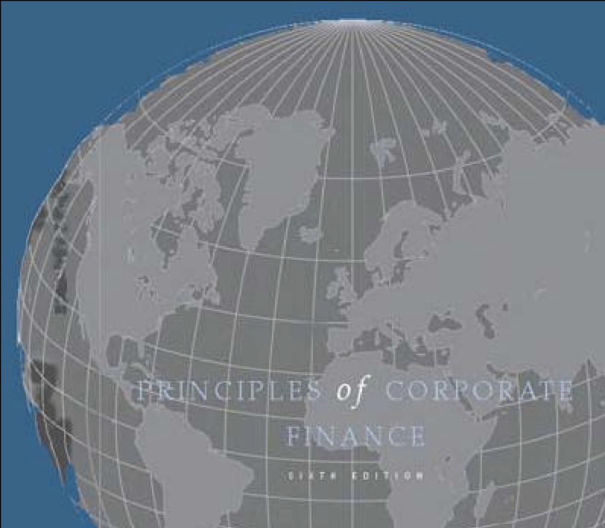
In U.S., shareholders are taxed twice (figures in dollars)

	Rate of Income tax	
	0%	**39.60%**
Operating Income	100	100
Corporate tax (Tc=.35)	35	35
After Tax income (paid as div)	65	65
Income tax	0	25.7
Cash to Shareholder	65	39.3

Taxes and Dividend Policy

Under imputed tax systems, such as that in Australia, shareholders receive a tax credit for the corporate tax the firm pays (figures in Australian dollars)

	Rate of Income tax		
	15%	**33%**	**47%**
Operating Income	100	100	100
Corporate tax (Tc=.33)	35	33	33
After Tax income	67	67	67
Grossed up Dividend	100	100	100
Income tax	15	33	47
Tax credit for Corp Pmt	-33	-33	-33
Tax due from shareholder	-18	0	14
Cash to Shareholder	85	67	53



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

◆ Does Debt Policy Matter?

Chapter 17

Topics Covered

- Leverage in a Tax Free Environment
- How Leverage Effects Returns
- The Traditional Position

M&M (Debt Policy Doesn't Matter)

- Modigliani & Miller
  - When there are no taxes and capital markets function well, it makes no difference whether the firm borrows or individual shareholders borrow. Therefore, the market value of a company does not depend on its capital structure.

M&M (Debt Policy Doesn't Matter)

Assumptions

- By issuing 1 security rather than 2, company diminishes investor choice. This does not reduce value if:
  - ➔ Investors do not need choice, OR
  - ➔ There are sufficient alternative securities
- Capital structure does not affect cash flows e.g...
  - ➔ No taxes
  - ➔ No bankruptcy costs
  - ➔ No effect on management incentives

M&M (Debt Policy Doesn't Matter)

<u>Example</u> - Macbeth Spot Removers - All Equity Financed

Data

Number of shares	1,000
Price per share	$10
Market Value of Shares	$10,000

Outcomes

	A	B	C	D
Operating Income	$500	1,000	1,500	2,000
Earnings per share	$.50	1.00	1.50	2.00
Return on shares (%)	5 %	10	15	20

Expected outcome

M&M (Debt Policy Doesn't Matter)

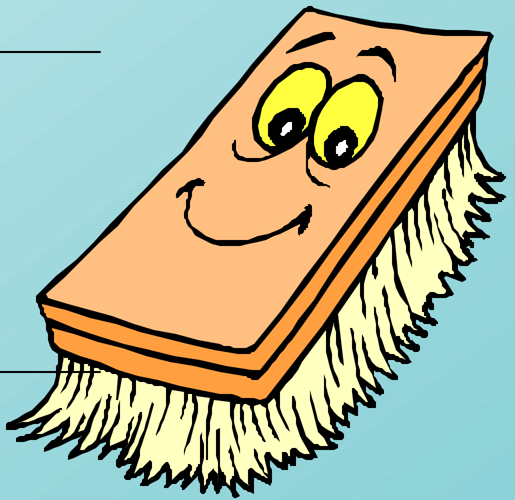
Example

cont.

50% debt

Data

Number of shares	500
Price per share	$10
Market Value of Shares	$ 5,000
Market value of debt	$ 5,000



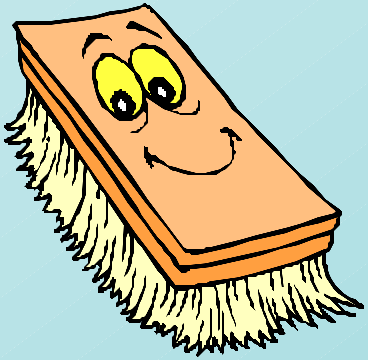
Outcomes

	A	B	C	*D*
Operating Income	$500	1,000	1,500	2,000
Interest	$500	500	500	500
Equity earnings	$0	500	1,000	1,500
Earnings per share	$0	1	2	3
Return on shares (%)	***0%***	***15***	***25***	***30***

M&M (Debt Policy Doesn't Matter)

<u>Example</u> - Macbeth's - All Equity Financed

- Debt replicated by investors



Outcomes

	A	B	C	D
Earnings on two shares	$1.00	2.00	3.00	4.00
LESS : Interest @ 10%	$1.00	1.00	1.00	1.00
Net earnings on investment	$ 0	1.00	2.00	3.00
Return on $10 investment (%)	***0%***	***10***	***20***	***30***

No Magic in Financial Leverage

MM'S PROPOSITION I

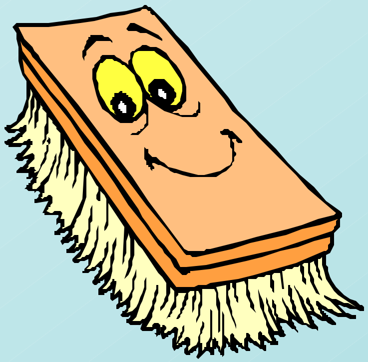
If capital markets are doing their job, firms cannot increase value by tinkering with capital structure.

V is independent of the debt ratio.

AN EVERYDAY ANALOGY

It should cost no more to assemble a chicken than to buy one whole.

Proposition I and Macbeth



Macbeth continued

	Cuttent Structure : All Equity	Proposed Structure : Equal Debt and Equity
Expected earnings per share ($)	1.50	2.00
Price per share ($)	10	10
Expected return per share (%)	15	20

Leverage and Returns

$$\text{Expected return on assets} = r_a = \frac{\text{expected operating income}}{\text{market value of all securities}}$$

$$r_A = \left(\frac{D}{D+A} \times r_D\right) + \left(\frac{E}{D+E} \times r_E\right)$$

M&M Proposition II

Macbeth continued

$$r_E = r_A + \frac{D}{V}\left(r_A - r_D\right)$$

$$r_E = r_A = \frac{\text{expected operating income}}{\text{market value of all securities}}$$

$$= \frac{1500}{10{,}000} = .15$$

M&M Proposition II

$$r_E = r_A + \frac{D}{V}\left(r_A - r_D\right)$$

$$r_E = r_A = \frac{\text{expected operating income}}{\text{market value of all securities}}$$

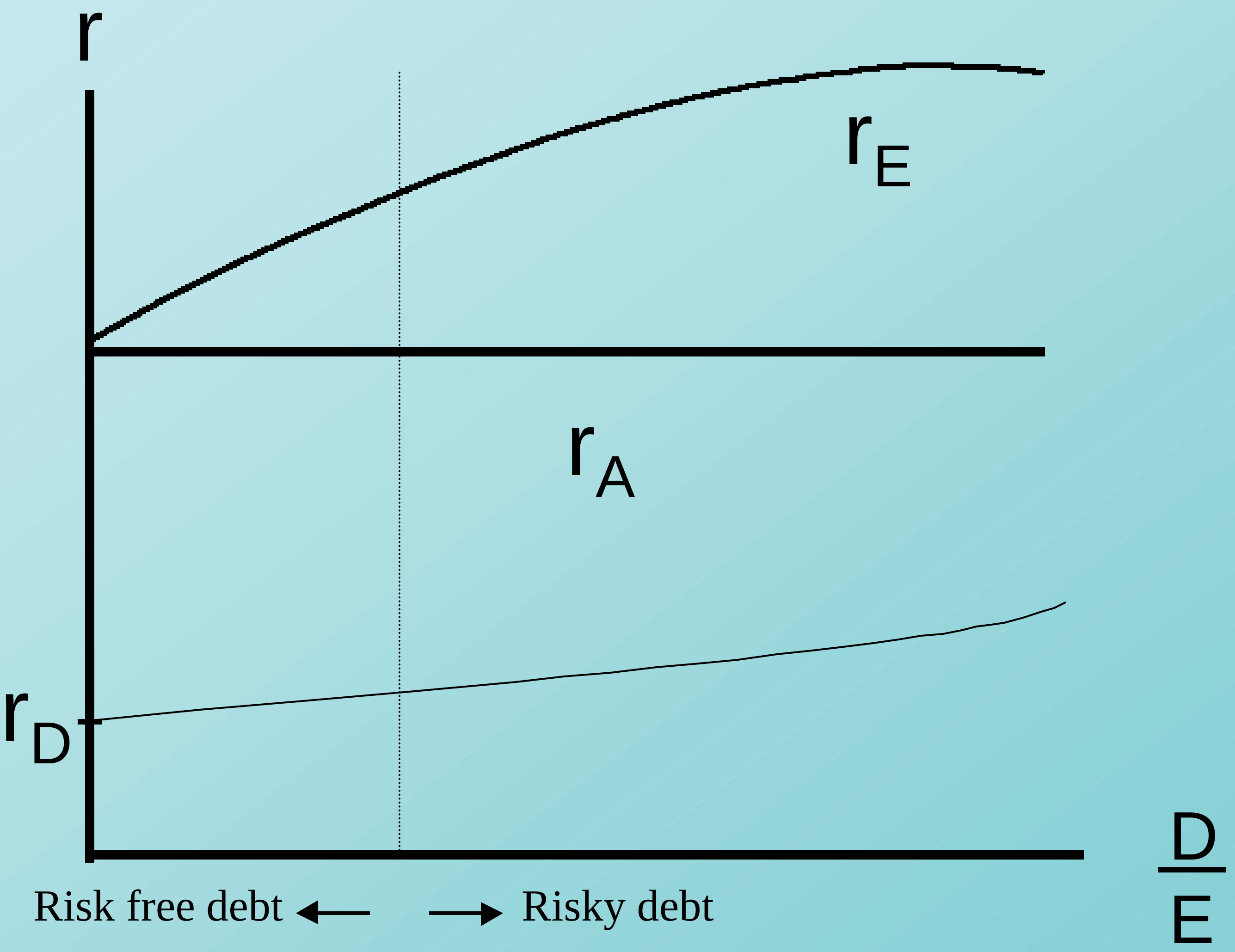
$$= \frac{1500}{10{,}000} = .15$$

Macbeth continued

$$r_E = .15 + \frac{5000}{5000}\left(.15 - .10\right)$$

$$= .20 \text{ or } 20\%$$

M&M Proposition II

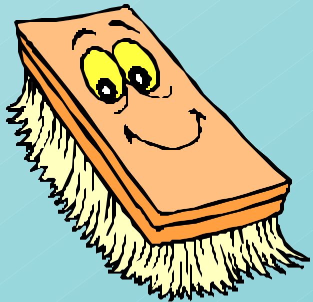


Leverage and Risk

Macbeth continued

Leverage increases the risk of Macbeth shares

		Operating	Income
		$500	$1,500
All equity	Earnings per share ($)	.50	1.50
	Return on shares	5	15
50 % debt :	Earnings per share ($)	0	2
	Return on shares	0	20



Leverage and Returns

$$B_A = \left(\frac{D}{D+A} \times B_D \right) + \left(\frac{E}{D+E} \times B_E \right)$$

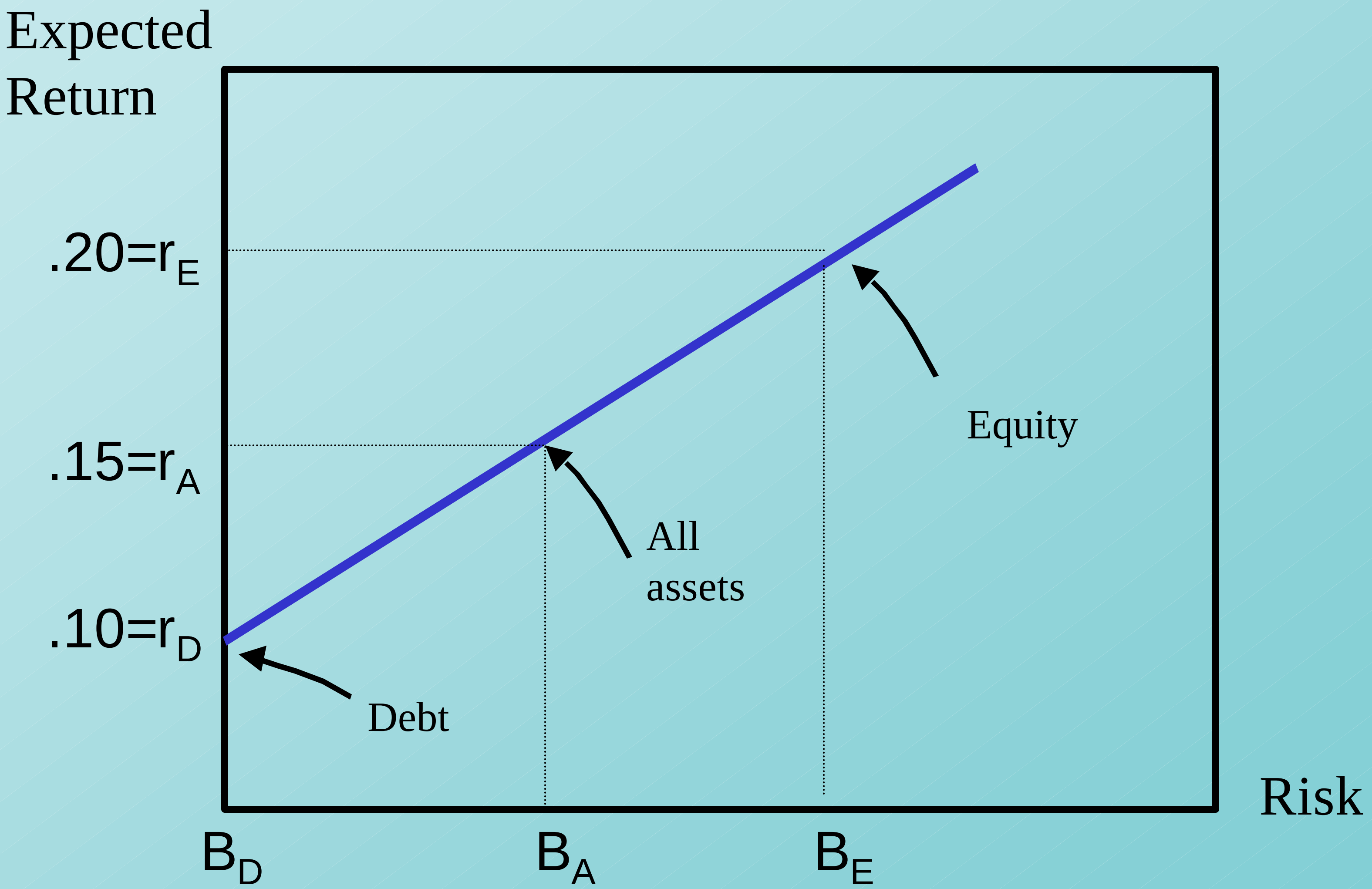
$$B_E = B_A + \frac{D}{V}\left(B_A - B_D\right)$$

WACC

- WACC is the traditional view of capital structure, risk and return.

$$WACC = r_A = \left(\frac{D}{V} \times r_D\right) + \left(\frac{E}{V} \times r_E\right)$$

WACC


Expected Return
.20=r E
.15=r A
.10=r D
Equity
All assets
Debt
Risk
B D
B A
B E

WACC

Example - A firm has \$2 mil of debt and 100,000 of outstanding shares at \$30 each. If they can borrow at 8% and the stockholders require 15% return what is the firm's WACC?

D = \$2 million

E = 100,000 shares X \$30 per share = \$3 million

V = D + E = 2 + 3 = \$5 million

WACC

Example - A firm has $2 mil of debt and 100,000 of outstanding shares at $30 each. If they can borrow at 8% and the stockholders require 15% return what is the firm's WACC?

D = $2 million

E = 100,000 shares X $30 per share = $3 million

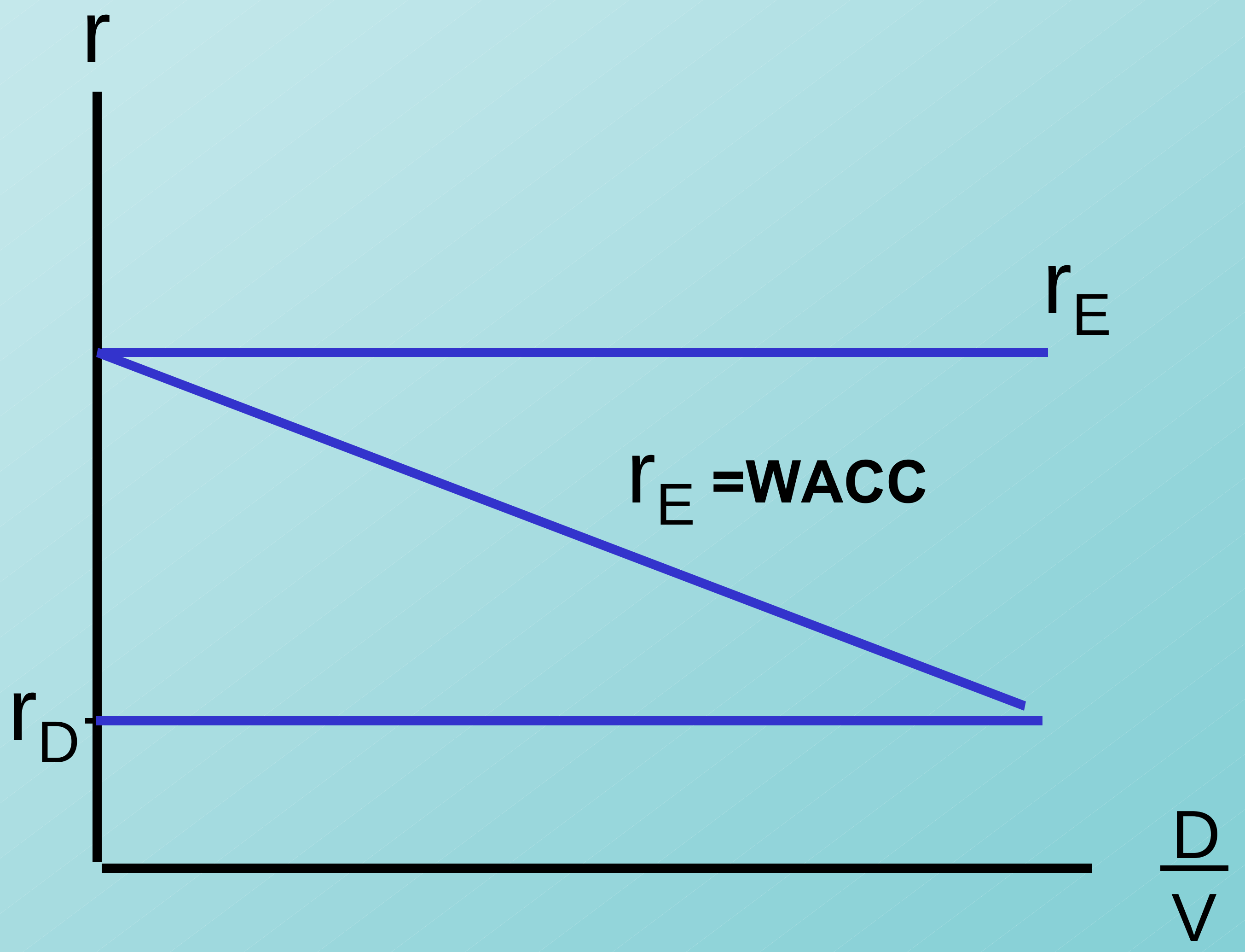
V = D + E = 2 + 3 = $5 million

$$WACC = \left(\frac{D}{V} \times r_D\right) + \left(\frac{E}{V} \times r_E\right)$$

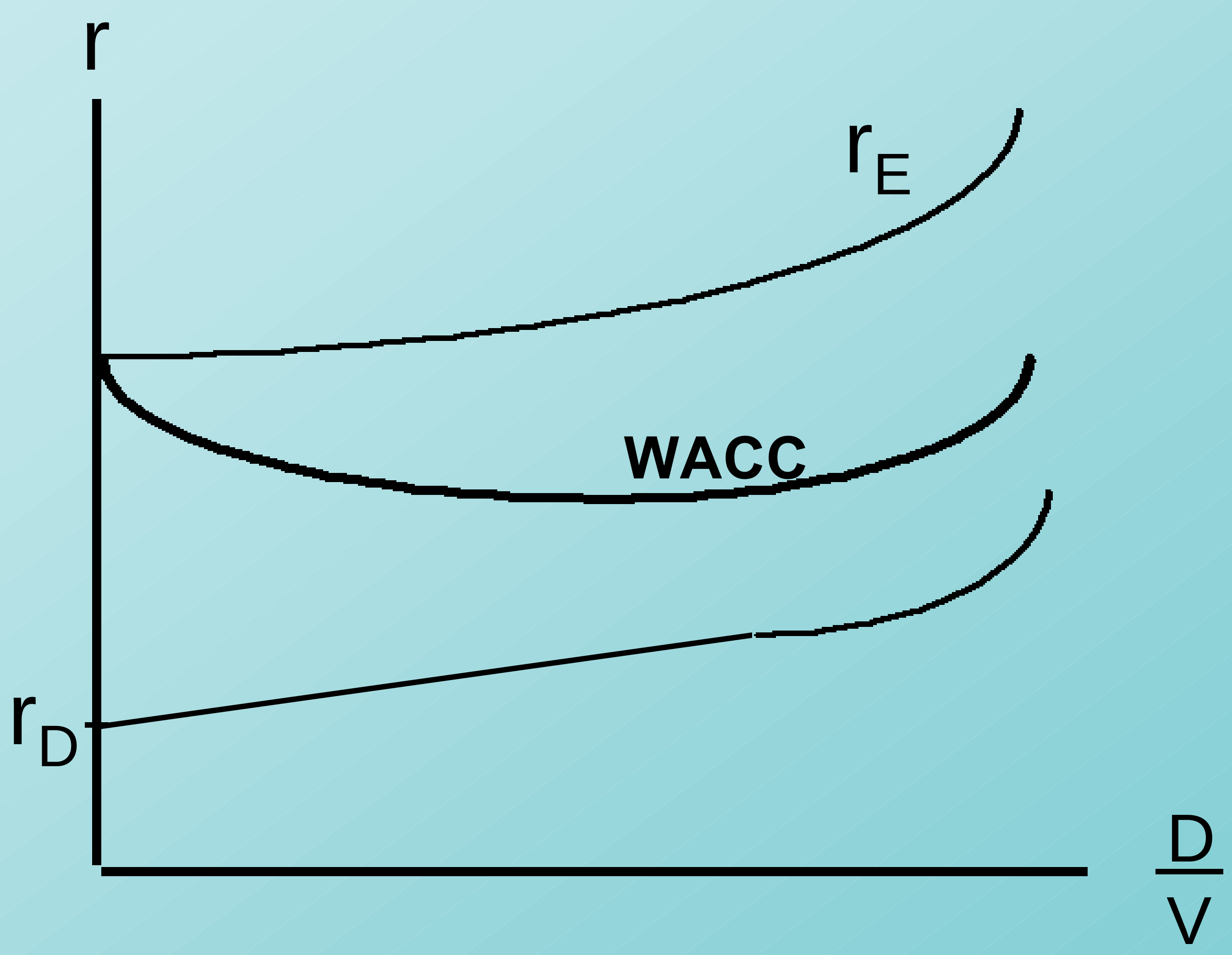
$$= \left(\frac{2}{5} \times .08\right) + \left(\frac{3}{5} \times .15\right)$$

$$= .122 \text{ or } 12.2\%$$

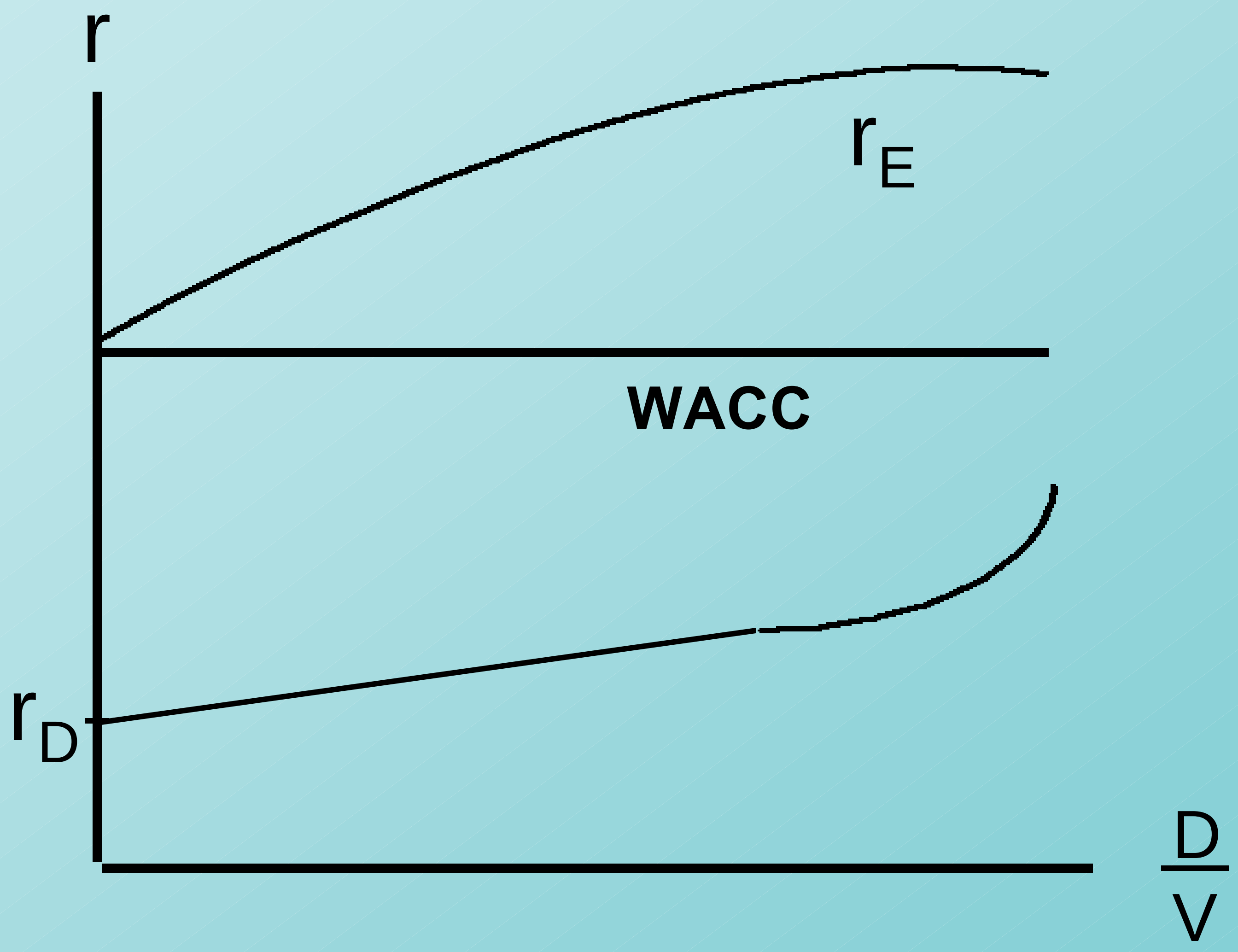
WACC

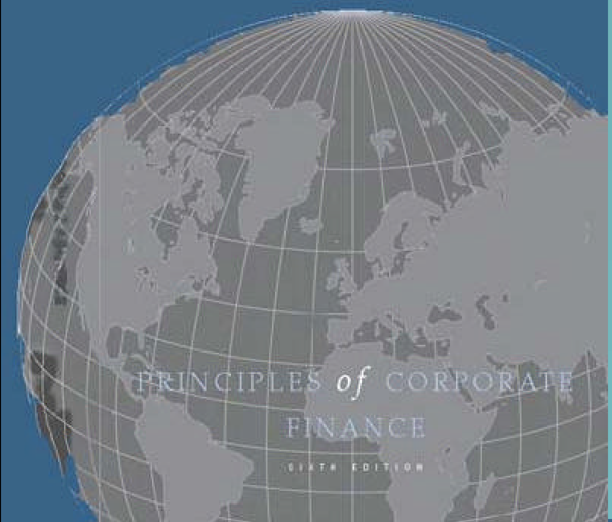


WACC (traditional view)



WACC (M&M view)





Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

How Much Should a Firm Borrow?

Chapter 18

Topics Covered

- Corporate Taxes and Value
- Corporate and Personal Taxes
- Cost of Financial Distress
- Pecking Order of Financial Choices

C.S. & Corporate Taxes

Financial Risk - Risk to shareholders resulting from the use of debt.

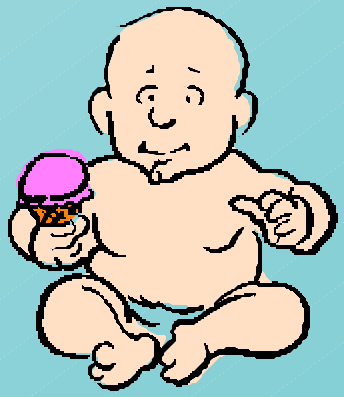
Financial Leverage - Increase in the variability of shareholder returns that comes from the use of debt.

Interest Tax Shield- Tax savings resulting from deductibility of interest payments.

C.S. & Corporate Taxes

Example - You own all the equity of Space Babies Diaper Co.. The company has no debt. The company's annual cash flow is $1,000, before interest and taxes. The corporate tax rate is 40%. You have the option to exchange 1/2 of your equity position for 10% bonds with a face value of $1,000.

Should you do this and why?



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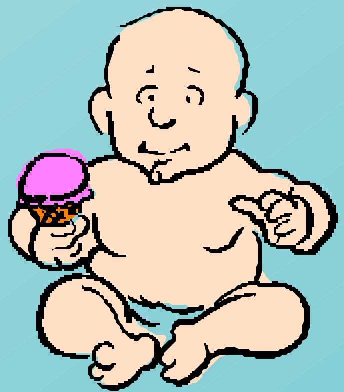
Should you do this and why?

	All Equity	1/2 Debt
EBIT	1,000	
Interest Pmt	0	
Pretax Income	1,000	
Taxes @ 40%	400	
Net Cash Flow	*$600*	



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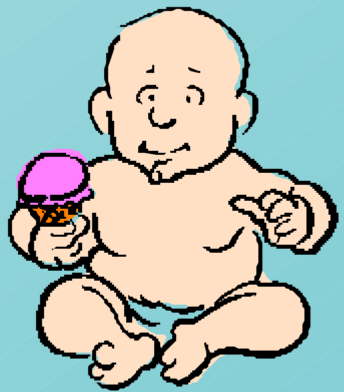
Should you do this and why?

	All Equity	1/2 Debt
EBIT	1,000	1,000
Interest Pmt	0	100
Pretax Income	1,000	900
Taxes @ 40%	400	360
Net Cash Flow	*$600*	*$540*



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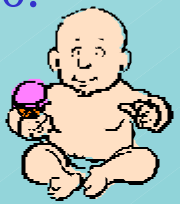

	All Equity	1/2 Debt
EBIT	1,000	1,000
Interest Pmt	0	100
Pretax Income	1,000	900
Taxes @ 40%	400	360
Net Cash Flow	*$600*	*$540*

Total Cash Flow

All Equity = 600

***1/2 Debt = 640**

(540 + 100)

Capital Structure

$$\text{PV of Tax Shield} = \frac{D \times r_D \times Tc}{r_D} = D \times Tc$$

(assume perpetuity)

Capital Structure

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(assume perpetuity)

<u>Example:</u>

Tax benefit = 1000 x (.10) x (.40) = $40

Capital Structure

$$\text{PV of Tax Shield} = \frac{D \times r_D \times Tc}{r_D} = D \times Tc$$

(assume perpetuity)

<u>Example:</u>

Tax benefit = 1000 x (.10) x (.40) = $40

PV of 40 perpetuity = 40 / .10 = $400

Capital Structure

$$\text{PV of Tax Shield} = \frac{D \times r_D \times Tc}{r_D} = D \times Tc$$

(assume perpetuity)

<u>Example:</u>

Tax benefit = 1000 x (.10) x (.40) = $40

PV of 40 perpetuity = 40 / .10 = $400

PV Tax Shield = D x Tc = 1000 x .4 = <u>$400</u>

Capital Structure

Firm Value =

Value of All Equity Firm + PV Tax Shield

Capital Structure

Firm Value =

Value of All Equity Firm + PV Tax Shield

Example

All Equity Value = 600 / .10 = 6,000

Capital Structure

Firm Value =

Value of All Equity Firm + PV Tax Shield

Example

All Equity Value = 600 / .10 = 6,000

PV Tax Shield = 400

Capital Structure

Firm Value =

Value of All Equity Firm + PV Tax Shield

<u>Example</u>

All Equity Value = 600 / .10 = 6,000

PV Tax Shield = 400

<u>Firm Value with 1/2 Debt = $6,400</u>

C.S. & Taxes (Personal & Corp)

Relative Advantage Formula

(Debt vs Equity)

$$\frac{1-T_{P}}{(1-T_{PE})\;(1-T_{C})}$$

C.S. & Taxes (Personal & Corp)

Relative Advantage Formula

(Debt vs Equity)

$$\frac{1-T_P}{(1-T_{PE})\ (1-T_C)}$$

	<u>Advantage</u>
RAF > 1	Debt
RAF < 1	Equity

C.S. & Taxes (Personal & Corp)

Example 1

	All Debt	All Equity
Income BT_{CP}	1.00	
less TC=.46	0.00	
Income BT_{P}	1.00	
Taxes T_P =.5 T_{PE}=0	0.50	
After Tax Income	0.50	

C.S. & Taxes (Personal & Corp)

Example 1

	All Debt	All Equity
Income BT_{CP}	1.00	1.00
less TC=.46	0.00	0.46
Income BT_P	1.00	0.54
Taxes T_P =.5 T_{PE}=0	0.50	0.00
After Tax Income	0.50	0.54

C.S. & Taxes (Personal & Corp)

Example 1

	All Debt	All Equity
Income BT_{CP}	1.00	1.00
less TC=.46	0.00	0.46
Income BT_P	1.00	0.54
Taxes T_P =.5 T_{PE}=0	0.50	0.00
After Tax Income	0.50	0.54

RAF = .926 Advantage Equity

C.S. & Taxes (Personal & Corp)

Example 2

	All Debt	All Equity
Income BT_{CP}	1.00	
less TC=.34	0.00	
Income BT_{P}	1.00	
Taxes T_P =.28 T_{PE}=.21	0.28	
After Tax Income	0.72	

C.S. & Taxes (Personal & Corp)

Example 2

	All Debt	All Equity
Income BT_{CP}	1.00	1.00
less T_C=.34	0.00	0.34
Income BT_P	1.00	0.66
Taxes T_P =.28 T_{PE}=.21	0.28	0.139
After Tax Income	0.72	0.521

C.S. & Taxes (Personal & Corp)

Example 2

	All Debt	All Equity
Income BT_{CP}	1.00	1.00
less TC=.34	0.00	0.34
Income BT_P	1.00	0.66
Taxes T_P =.28 T_{PE}=.21	0.28	0.139
After Tax Income	0.72	0.521

RAF = 1.381 Advantage Debt

C.S. & Taxes (Personal & Corp)

- Today's RAF & Debt vs Equity preference.

$$\text{RAF} = \frac{1-.28}{(1-.28)\ (1-.34)} = 1.52$$

- Old Tax Code

C.S. & Taxes (Personal & Corp)

- Today's RAF & Debt vs Equity preference.

$$\text{RAF} = \frac{1-.28}{(1-.20)\ (1-.34)} = 1.36$$

- New Tax Code

C.S. & Taxes (Personal & Corp)

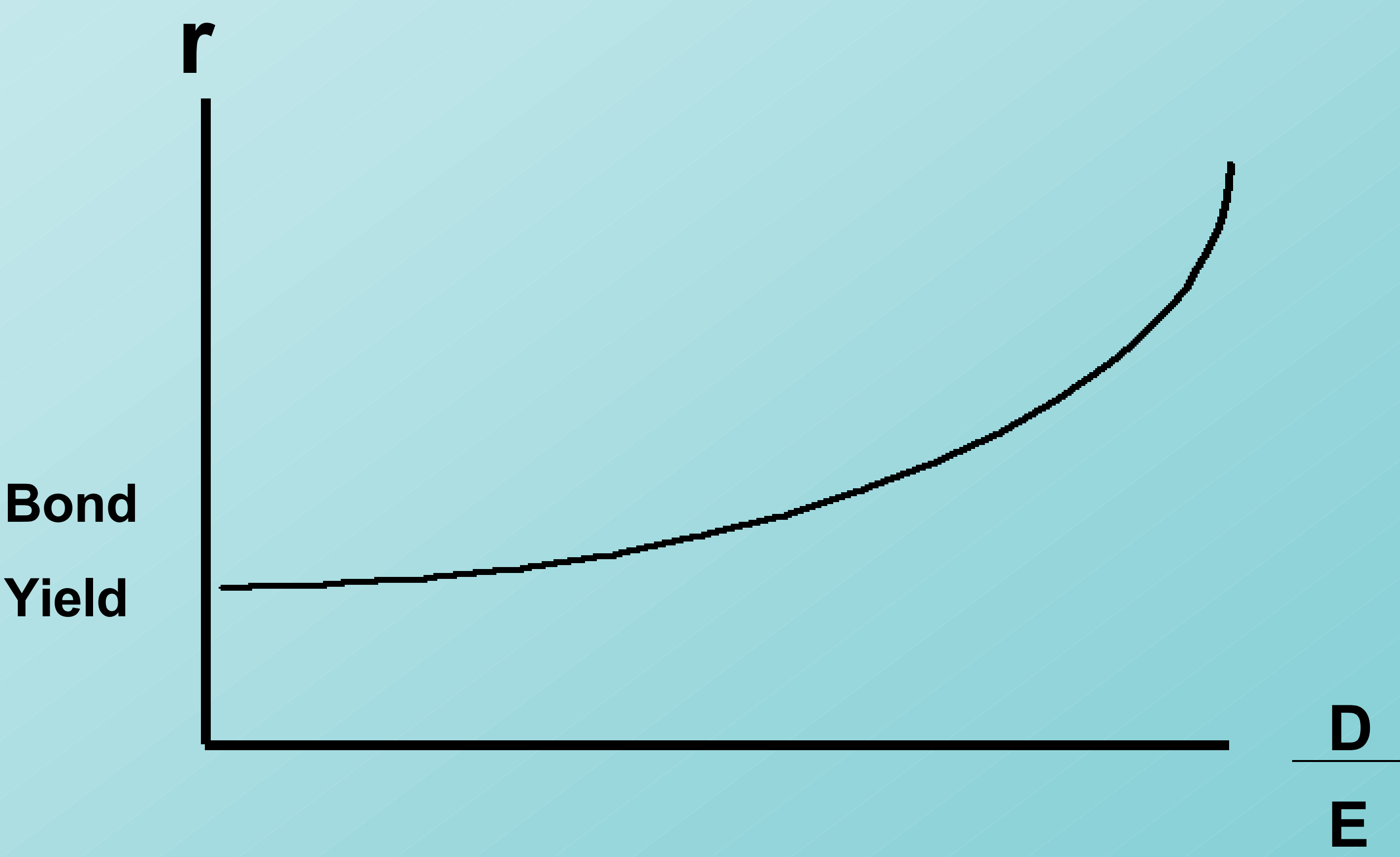
- Today's RAF & Debt vs Equity preference.

$$\text{RAF} = \frac{1-.28}{(1-.20)\ (1-.34)} = 1.36$$

Why are companies not all debt?

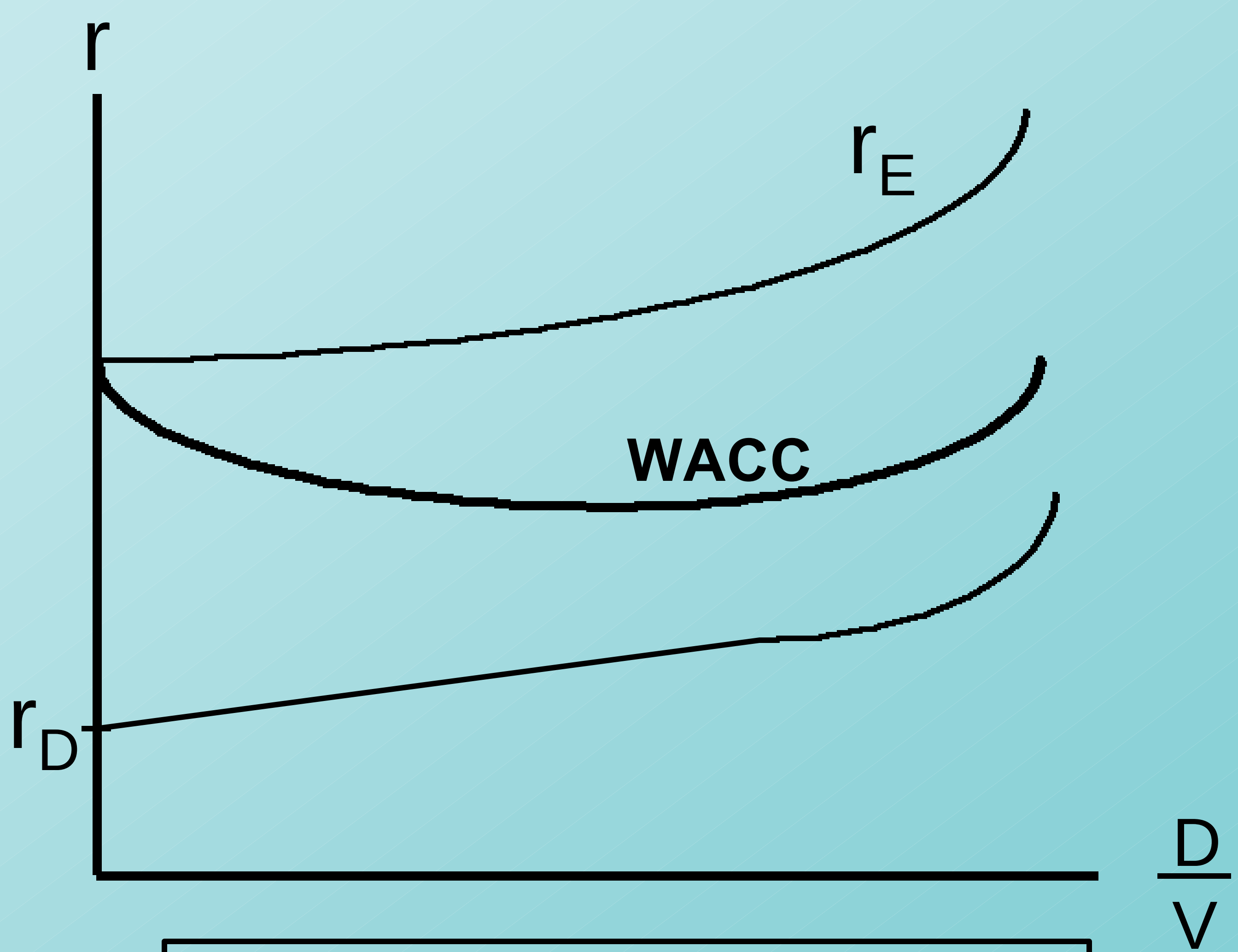
Capital Structure

Structure of Bond Yield Rates



Weighted Average Cost of Capital

without taxes (traditional view)



Includes Bankruptcy Risk

Financial Distress

Costs of Financial Distress - Costs arising from bankruptcy or distorted business decisions before bankruptcy.

Financial Distress

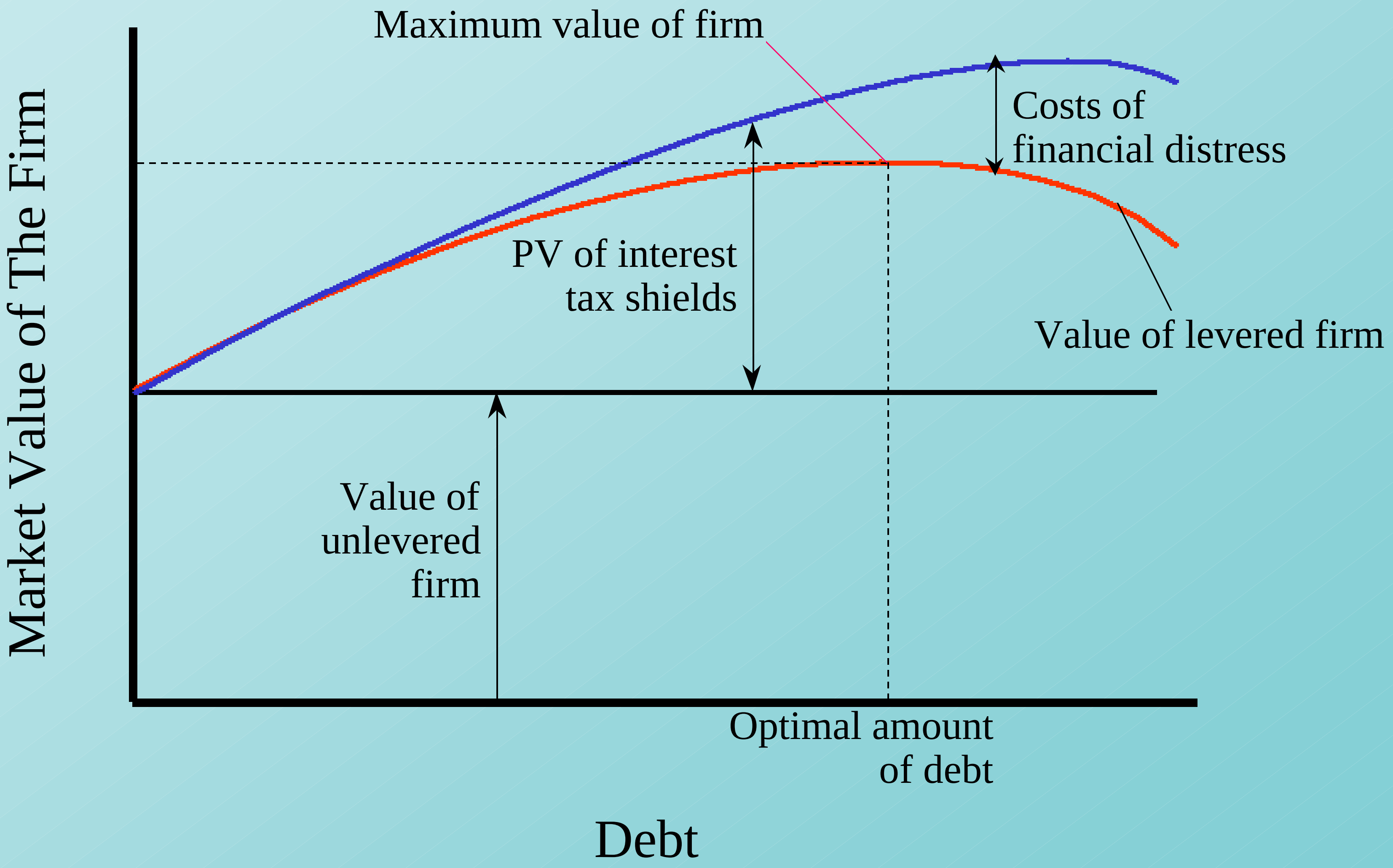
Costs of Financial Distress - Costs arising from bankruptcy or distorted business decisions before bankruptcy.

Market Value = ***Value if all Equity Financed***

+ PV Tax Shield

- PV Costs of Financial Distress

Financial Distress



Conflicts of Interest

Circular File Company has $50 of 1-year debt.

Circular File Company (Book Values)			
Net W.C.	20	50	Bonds outstanding
Fixed assets	80	50	Common stock
Total assets	100	100	Total liabilities

Conflicts of Interest

Circular File Company has $50 of 1-year debt.

Circular File Company (Market Values)

Net W.C.	20	25	Bonds outstanding
Fixed assets	10	5	Common stock
Total assets	30	30	Total liabilities

- Why does the equity have any value ?
- Shareholders have an option -- they can obtain the rights to the assets by paying off the $50 debt.

Conflicts of Interest

Circular File Company has may invest $10 as follows.

Now	Possible Payoffs Next Year
Invest $10	$120 (10% probability)
	$0 (90% probability)

- Assume the NPV of the project is (-$2).
  What is the effect on the market values?

Conflicts of Interest

Circular File Company value (post project)

Circular File Company (Market Values)

Net W.C.	10	20	Bonds outstanding
Fixed assets	18	8	Common stock
Total assets	28	28	Total liabilities

- Firm value falls by $2, but equity holder gains $3

Conflicts of Interest

Circular File Company value (assumes a safe project with NPV = $5)

Circular File Company (Market Values)

Net W.C.	20	33	Bonds outstanding
Fixed assets	25	12	Common stock
Total assets	45	45	Total liabilities

- While firm value rises, the lack of a high potential payoff for shareholders causes a decrease in equity value.

Financial Distress Games

- Cash In and Run
- Playing for Time
- Bait and Switch

Financial Choices

Trade-off Theory - Theory that capital structure is based on a trade-off between tax savings and distress costs of debt.

Pecking Order Theory - Theory stating that firms prefer to issue debt rather than equity if internal finance is insufficient.

Trade Off Theory & Prices

1. Stock-for-debt exchange offers → Stock price falls

   Debt-for-stock exchange offers → Stock price rises

2. Issuing common stock drives down stock prices; repurchase increases stock prices.

3. Issuing straight debt has a small negative impact.

Issues and Stock Prices

- **Why do security issues affect stock price? The demand for a firm's securities ought to be flat.**

- **Any firm is a drop in the bucket.**
- **Plenty of close substitutes.**
- **Large debt issues don't significantly depress the stock price.**

Pecking Order Theory

Consider the following story:

The announcement of a stock issue drives down the stock price because investors believe managers are more likely to issue when shares are overpriced.

Therefore firms prefer internal finance since funds can be raised without sending adverse signals.

If external finance is required, firms issue debt first and equity as a last resort.

The most profitable firms borrow less not because they have lower target debt ratios but because they don't need external finance.

Pecking Order Theory

Some Implications:

- Internal equity may be better than external equity.
- Financial slack is valuable.
- If external capital is required, debt is better. (There is less room for difference in opinions about what debt is worth).

Principles of Corporate Finance

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◆ Interactions of Investment and Financing Decisions

Chapter 19

Topics Covered

- After Tax WACC
- Tricks of the Trade
- Capital Structure and WACC
- Adjusted Present Value

After Tax WACC

- The tax benefit from interest expense deductibility must be included in the cost of funds.
- This tax benefit reduces the effective cost of debt by a factor of the marginal tax rate.

$$\boxed{WACC = \left(\frac{D}{V} \times r_D\right) + \left(\frac{E}{V} \times r_E\right)}$$

Old Formula

After Tax WACC

Tax Adjusted Formula

$$WACC = (1 - Tc)\left(\frac{D}{V} \times r_D\right) + \left(\frac{E}{V} \times r_E\right)$$

After Tax WACC

Example - Sangria Corporation

The firm has a marginal tax rate of 35%. The cost of equity is 14.6% and the pretax cost of debt is 8%. Given the book and market value balance sheets, what is the tax adjusted WACC?

After Tax WACC

Example - Sangria Corporation - continued

Balance Sheet (Book Value, millions)

Assets	100	50	Debt
		50	Equity
Total assets	100	100	Total liabilities

After Tax WACC

Example - Sangria Corporation - continued

Balance Sheet (Market Value, millions)

Assets	125	50	Debt
		<u>75</u>	Equity
Total assets	125	125	Total liabilities

After Tax WACC

Example - Sangria Corporation - continued

Debt ratio = (D/V) = 50/125 = .4 or 40%

Equity ratio = (E/V) = 75/125 = .6 or 60%

$$\boxed{WACC = (1 - Tc)\left(\frac{D}{V} \times r_D\right) + \left(\frac{E}{V} \times r_E\right)}$$

After Tax WACC

Example - Sangria Corporation - continued

$$WACC = (1 - Tc)\left(\frac{D}{V} \times r_D\right) + \left(\frac{E}{V} \times r_E\right)$$

$$\begin{aligned} WACC &= (1 - .35)\left(\frac{50}{125} \times .08\right) + \left(\frac{75}{125} \times .146\right) \\ &= .1084 \\ &= 10.84\% \end{aligned}$$

After Tax WACC

Example - Sangria Corporation - continued

The company would like to invest in a perpetual crushing machine with cash flows of $2.085 million per year pre-tax.

Given an initial investment of $12.5 million, what is the value of the machine?

After Tax WACC

Example - Sangria Corporation - continued

The company would like to invest in a perpetual crushing machine with cash flows of $2.085 million per year pre-tax. Given an initial investment of $12.5 million, what is the value of the machine?

Cash Flows		
Pretax cash flow	2.085	
Tax @ 35%	0.73	
After-tax cash flow	$1.355	million

After Tax WACC

Example - Sangria Corporation - continued

The company would like to invest in a perpetual crushing machine with cash flows of \$2.085 million per year pre-tax. Given an initial investment of \$12.5 million, what is the value of the machine?

$$NPV = C_0 + \frac{C_1}{r-g}$$

$$= -12.5 + \frac{1.355}{.1084}$$

$$= 0$$

After Tax WACC

- Preferred stock and other forms of financing must be included in the formula.

$$WACC = (1 - Tc)\left(\frac{D}{V} \times r_D\right) + \left(\frac{P}{V} \times r_P\right) + \left(\frac{E}{V} \times r_E\right)$$

After Tax WACC

Example - Sangria Corporation - continued

Calculate WACC given preferred stock is $25 mil of total equity and yields 10%.

Balance Sheet (Market Value, millions)			
Assets	125	50	Debt
		25	Preferred Equity
		50	Common Equity
Total assets	125	125	Total liabilities

$$WACC = (1-.35)\left(\frac{50}{125}\times .08\right)+\left(\frac{25}{125}\times .10\right)+\left(\frac{50}{125}\times .146\right)$$

$$= .1104$$

$$= 11.04\%$$

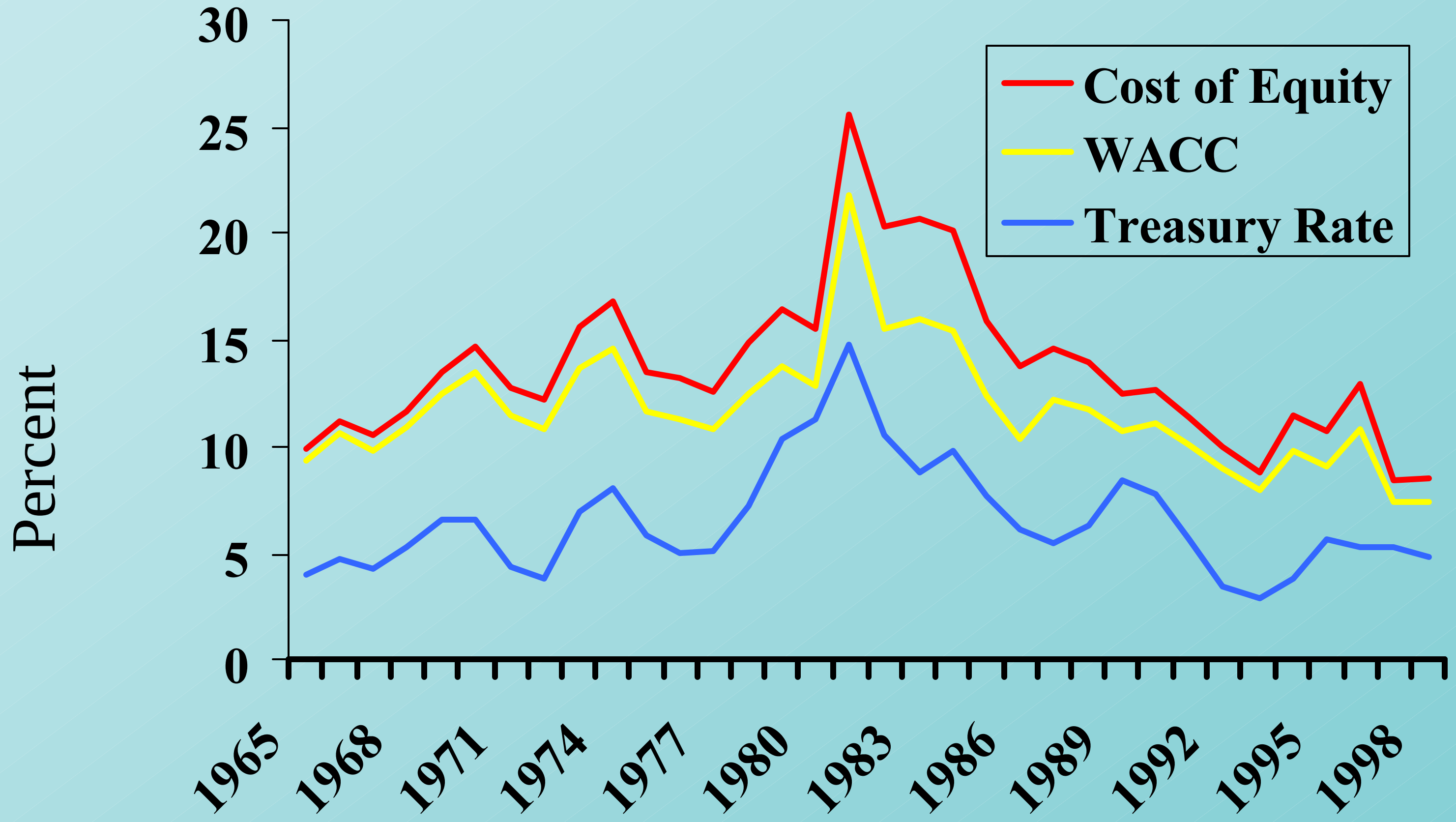
Tricks of the Trade

- What should be included with debt?
  - ➔ Long-term debt?
  - ➔ Short-term debt?
  - ➔ Cash (netted off?)
  - ➔ Receivables?
  - ➔ Deferred tax?

Tricks of the Trade

- How are costs of financing determined?
  - **Return on equity can be derived from market data.**
  - **Cost of debt is set by the market given the specific rating of a firm's debt.**
  - **Preferred stock often has a preset dividend rate.**

Historical WACC



WACC vs. Flow to Equity

- If you discount at WACC, cash flows have to be projected just as you would for a capital investment project. Do not deduct interest. Calculate taxes as if the company were 41-equity financed. The value of interest tax shields is picked up in the WACC formula.

WACC vs. Flow to Equity

- The company's cash flows will probably not be forecasted to infinity. Financial managers usually forecast to a medium-term horizon -- ten years, say -- and add a terminal value to the cash flows in the horizon year. The terminal value is the present value at the horizon of post-horizon flows. Estimating the terminal value requires careful attention, because it often accounts for the majority of the value of the company.

WACC vs. Flow to Equity

- Discounting at WACC values the assets and operations of the company. If the object is to value the company's equity, that is, its common stock, don't forget to subtract the value of the company's outstanding debt.

Adjusted Present Value

APV = Base Case NPV

+ PV Impact

- Base Case = All equity finance firm NPV.
- PV Impact = all costs/benefits directly resulting from project.

Adjusted Present Value

example:

Project A has an NPV of $150,000. In order to finance the project we must issue stock, with a brokerage cost of $200,000.

Adjusted Present Value

example:

Project A has an NPV of $150,000. In order to finance the project we must issue stock, with a brokerage cost of $200,000.

Project NPV =	150,000
Stock issue cost =	-200,000
Adjusted NPV	- 50,000

don't do the project

Adjusted Present Value

example:

Project B has a NPV of -$20,000. We can issue debt at 8% to finance the project. The new debt has a PV Tax Shield of $60,000. Assume that Project B is your only option.

Adjusted Present Value

example:

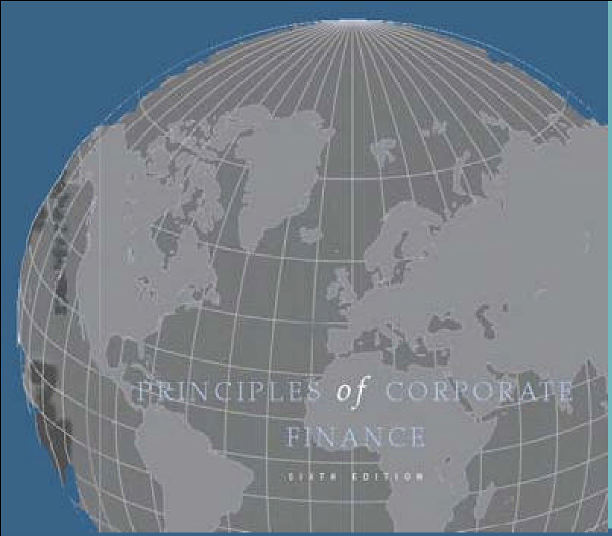
Project B has a NPV of -$20,000. We can issue debt at 8% to finance the project. The new debt has a PV Tax Shield of $60,000. Assume that Project B is your only option.

Project NPV =	- 20,000
Stock issue cost =	60,000
Adjusted NPV	40,000

do the project

Miles and Ezzell

$$WACC = r - L r_D T_c \left(\frac{1+r}{1+r_D} \right)$$



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Spotting and Valuing Options

Chapter 20

Topics Covered

- Calls, Puts and Shares
- Financial Alchemy with Options
- What Determines Option Value
- Option Valuation

Option Terminology

<u>Call Option</u>

Right to buy an asset at a specified exercise price on or before the exercise date.

Option Terminology

Call Option

Right to buy an asset at a specified exercise price on or before the exercise date.

Put Option

Right to sell an asset at a specified exercise price on or before the exercise date.

Option Obligations

	Buyer	Seller
Call option	Right to buy asset	Obligation to sell asset
Put option	Right to sell asset	Obligation to buy asset

Option Value

- The value of an option at expiration is a function of the stock price and the exercise price.

Option Value

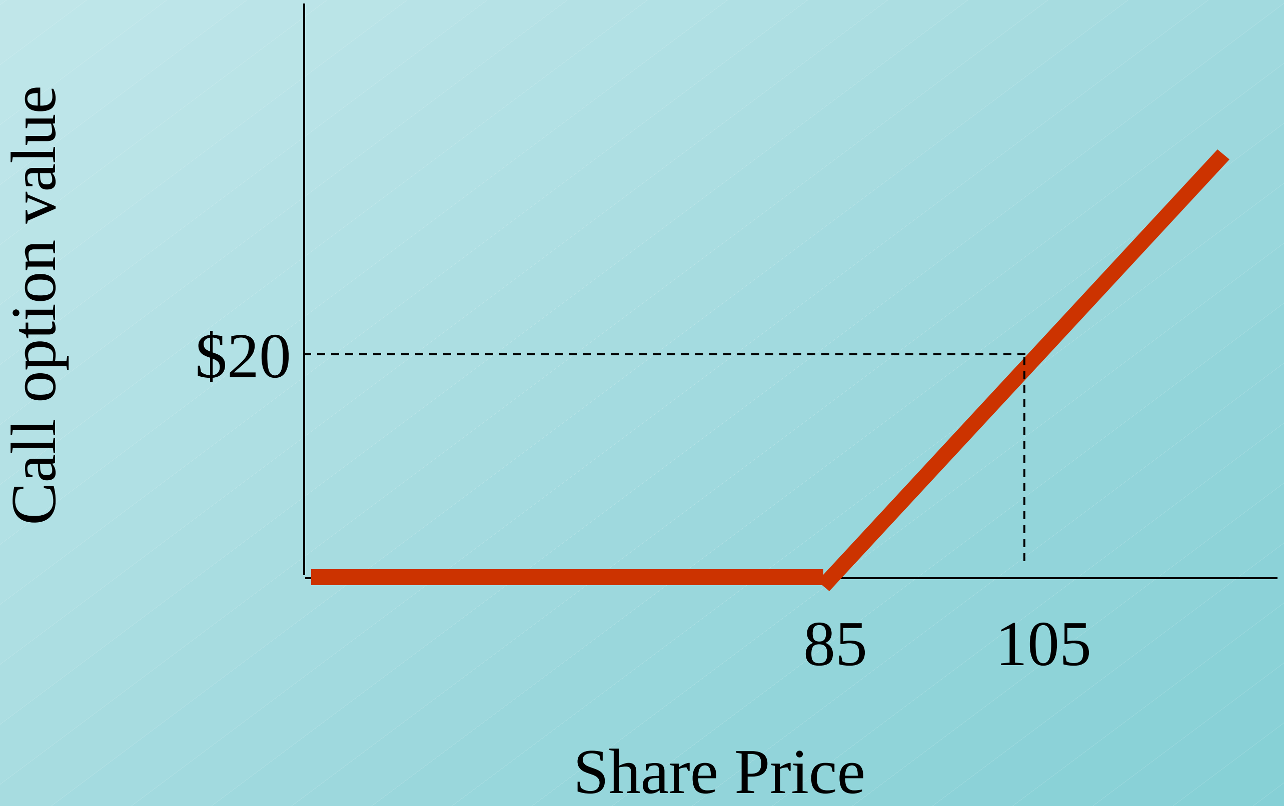
- The value of an option at expiration is a function of the stock price and the exercise price.

Example - Option values given a exercise price of $85

Stock Price	$60	70	80	90	100	110
Call Value	0	0	0	5	15	25
Put Value	25	15	5	0	0	0

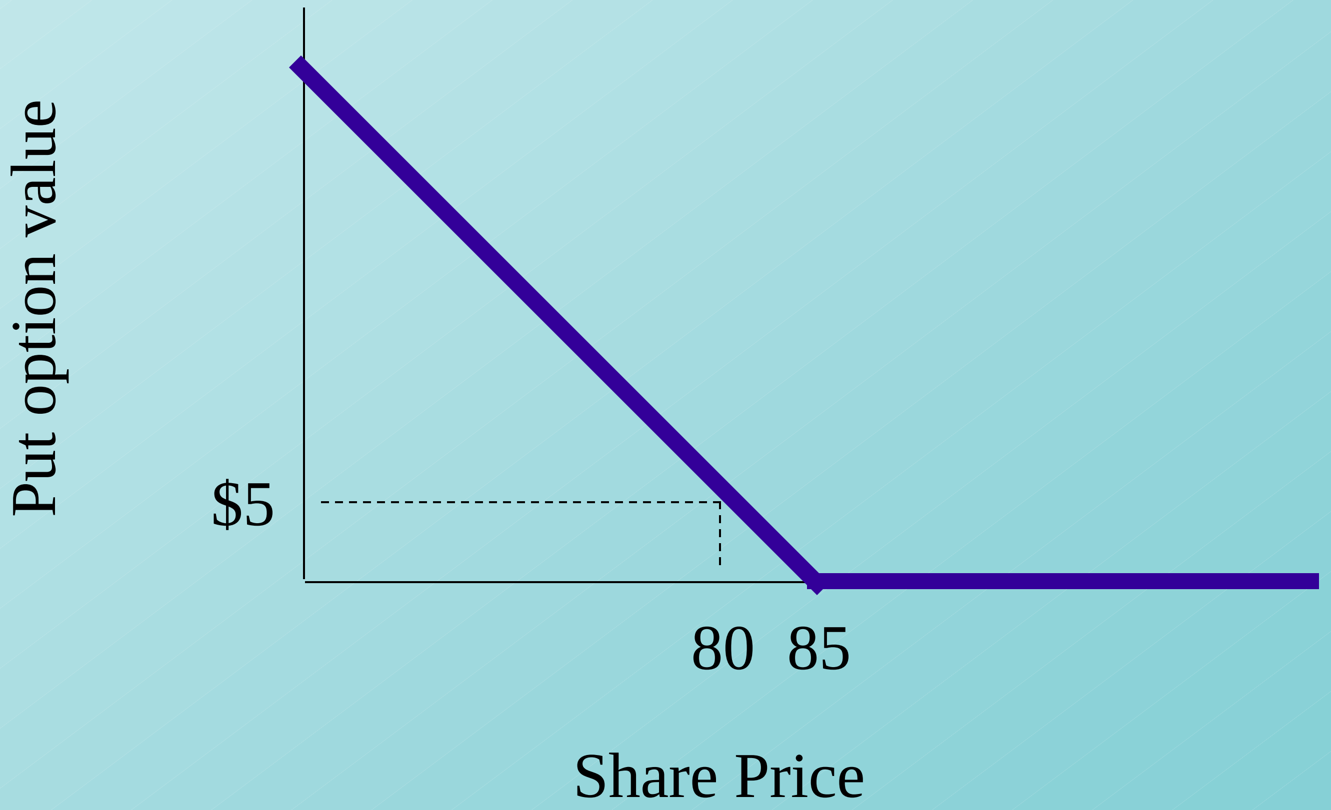
Option Value

Call option value (graphic) given a $85 exercise price.



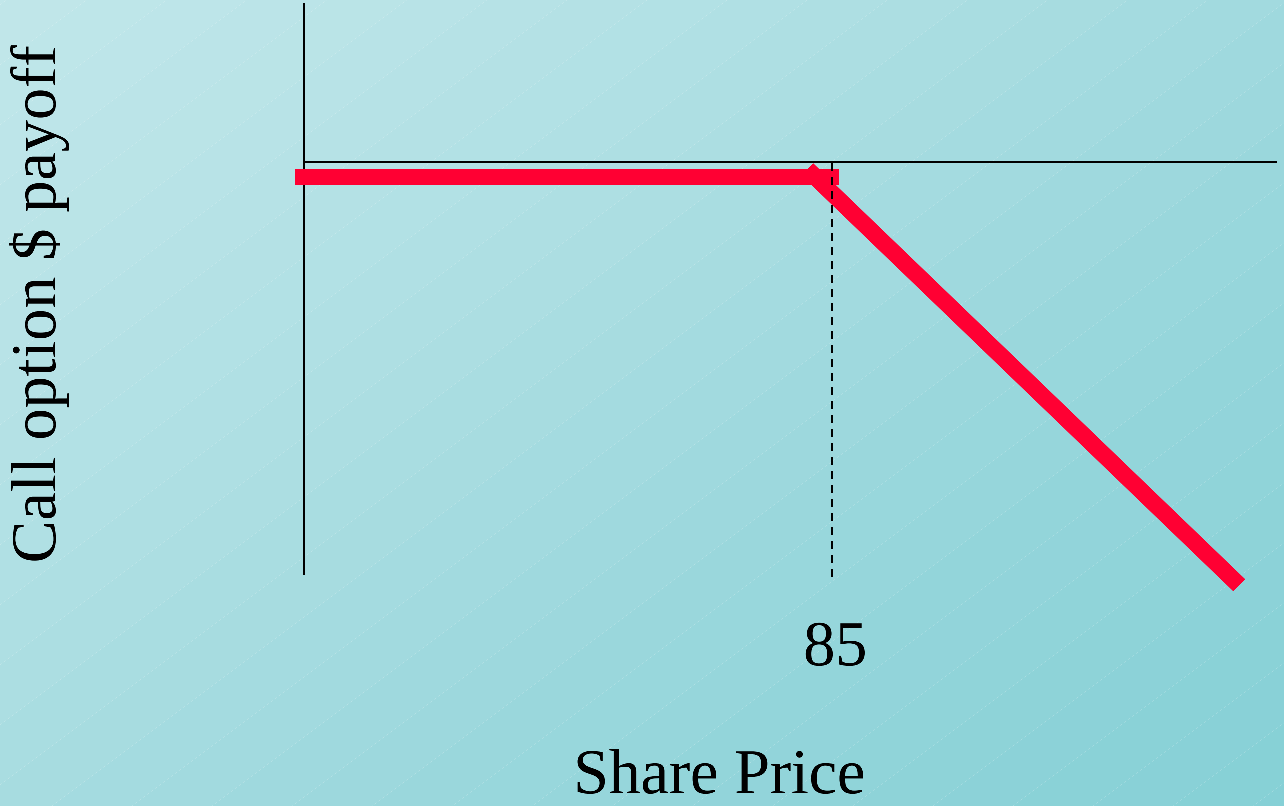
Option Value

Put option value (graphic) given a $85 exercise price.



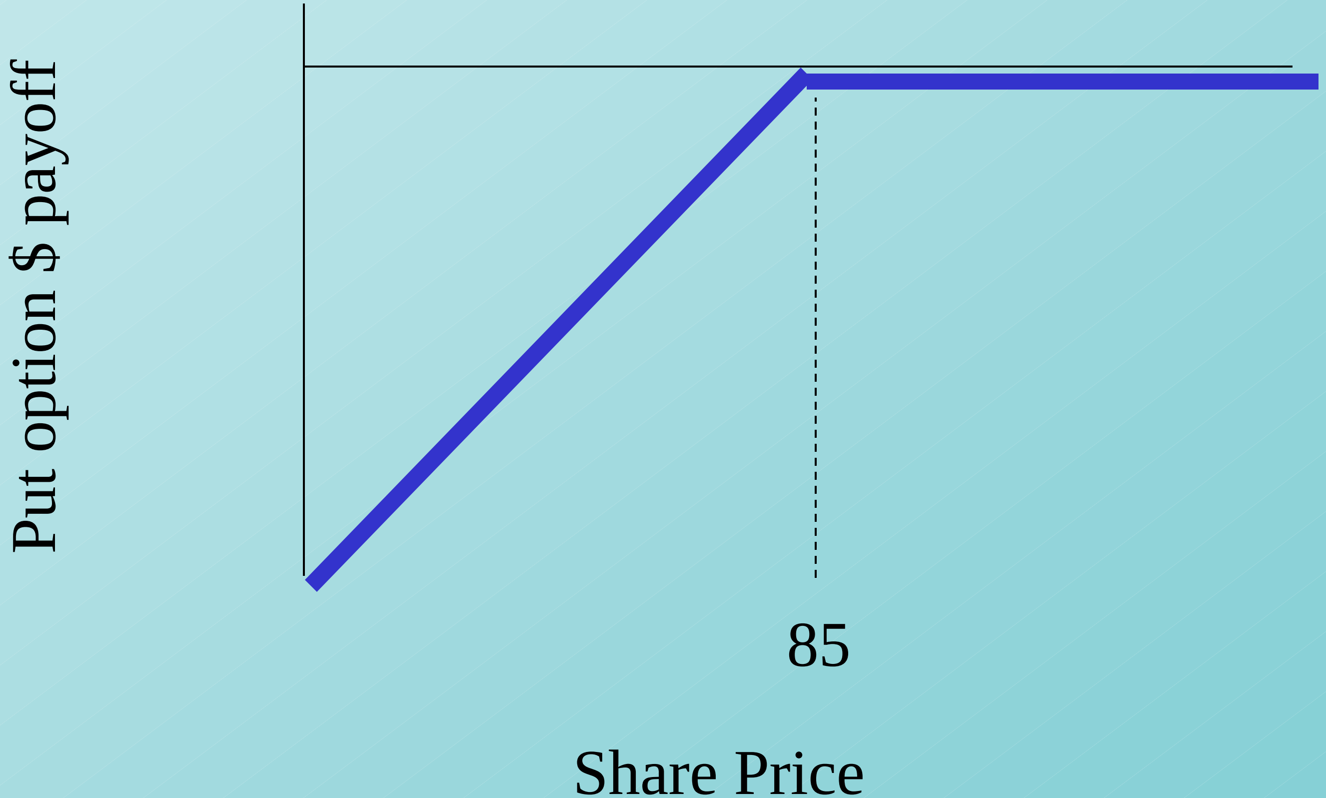
Option Value

Call option payoff (to seller) given a $85 exercise price.



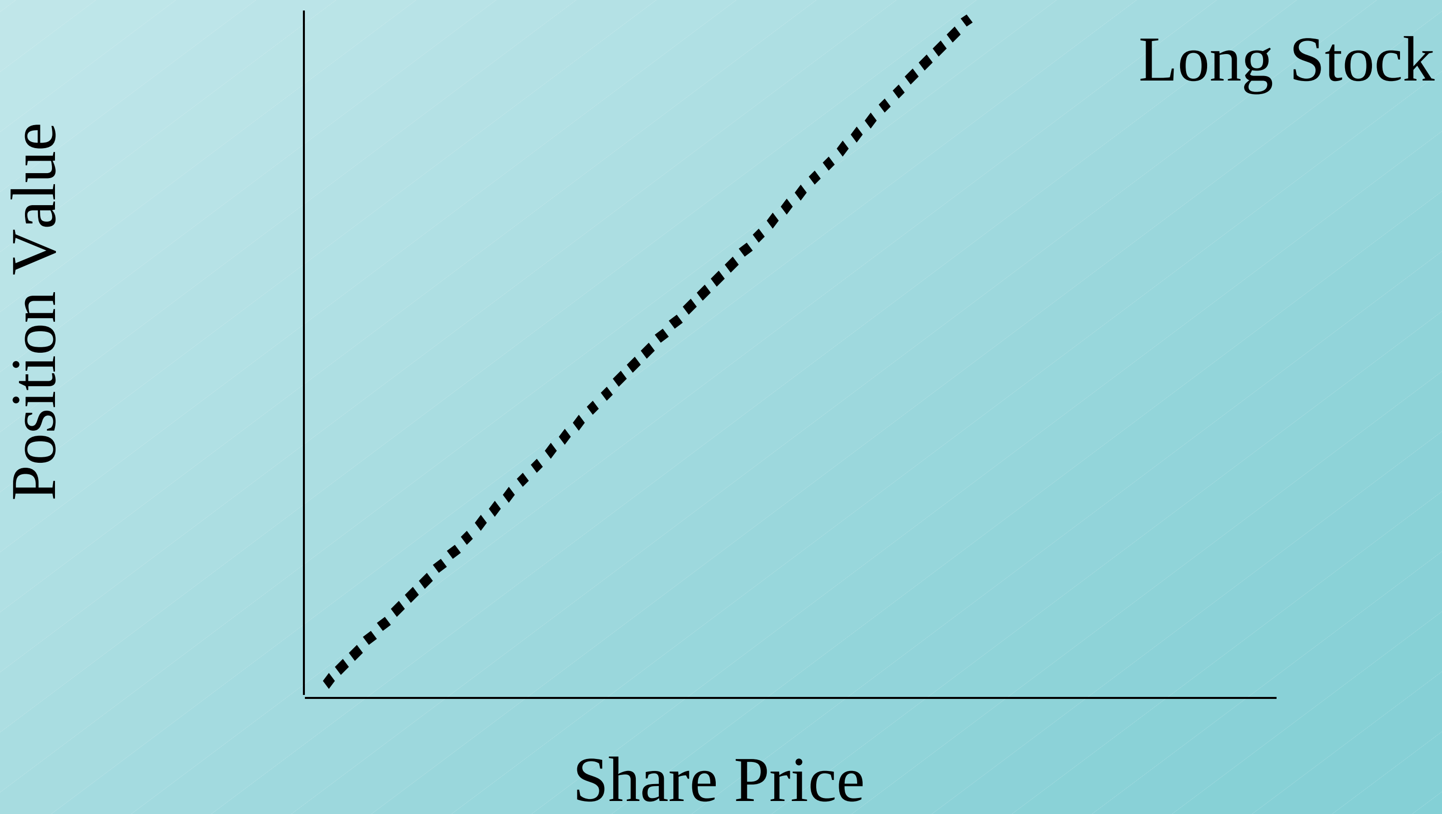
Option Value

Put option payoff (to seller) given a $85 exercise price.



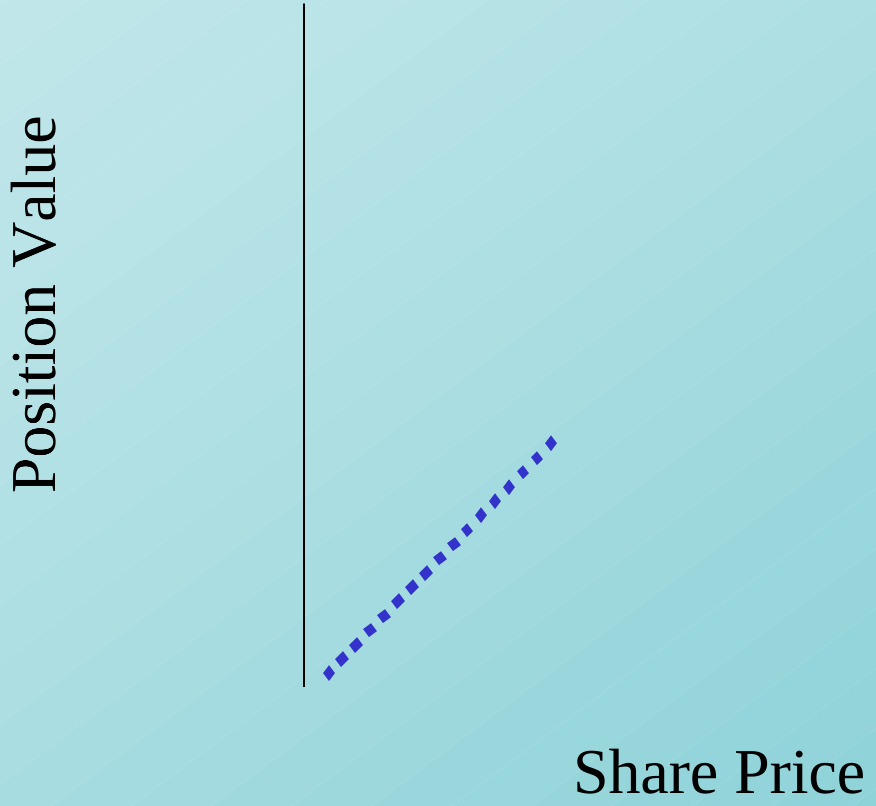
Option Value

Protective Put - Long stock and long put



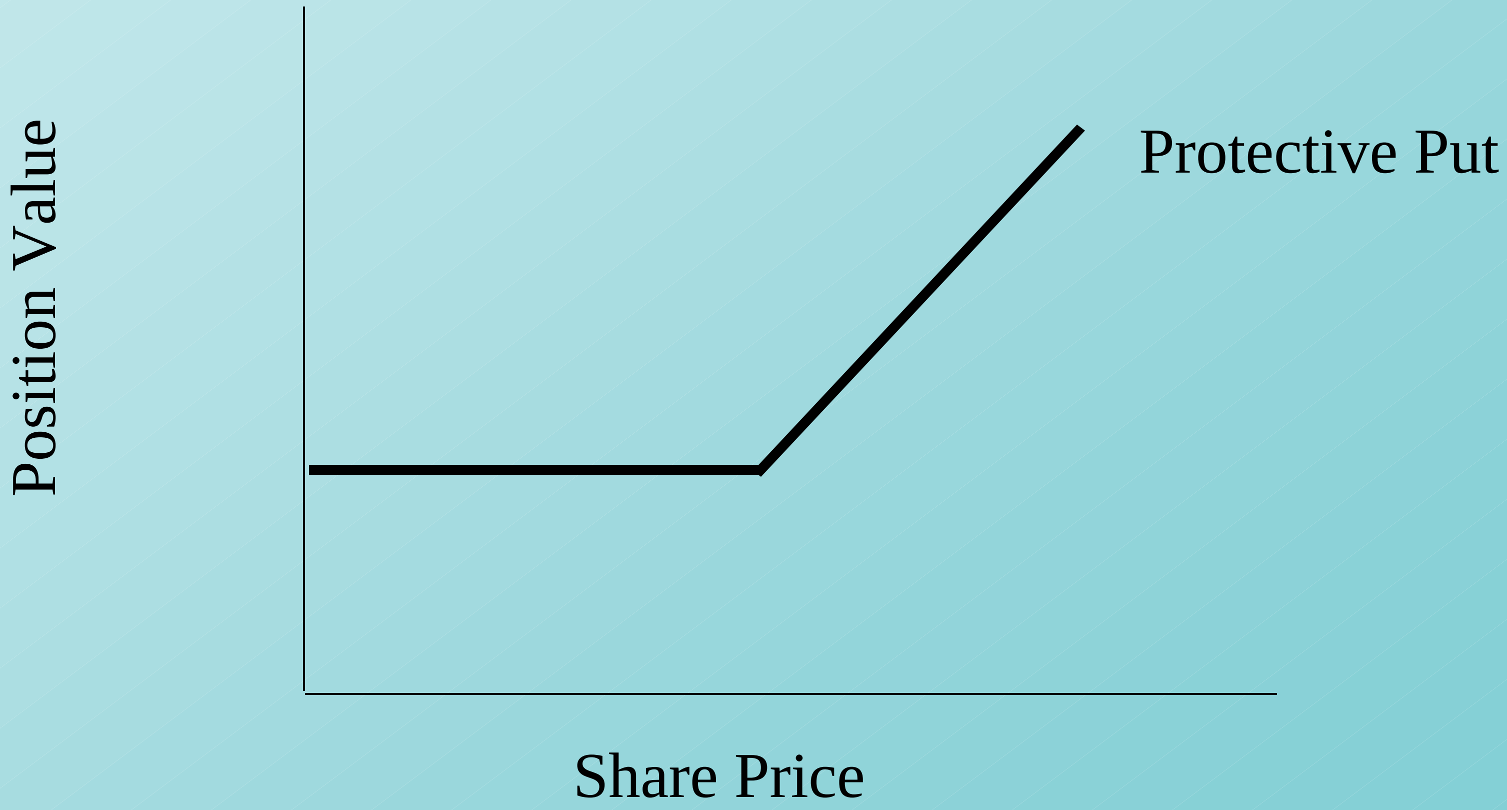
Option Value

Protective Put - Long stock and long put



Option Value

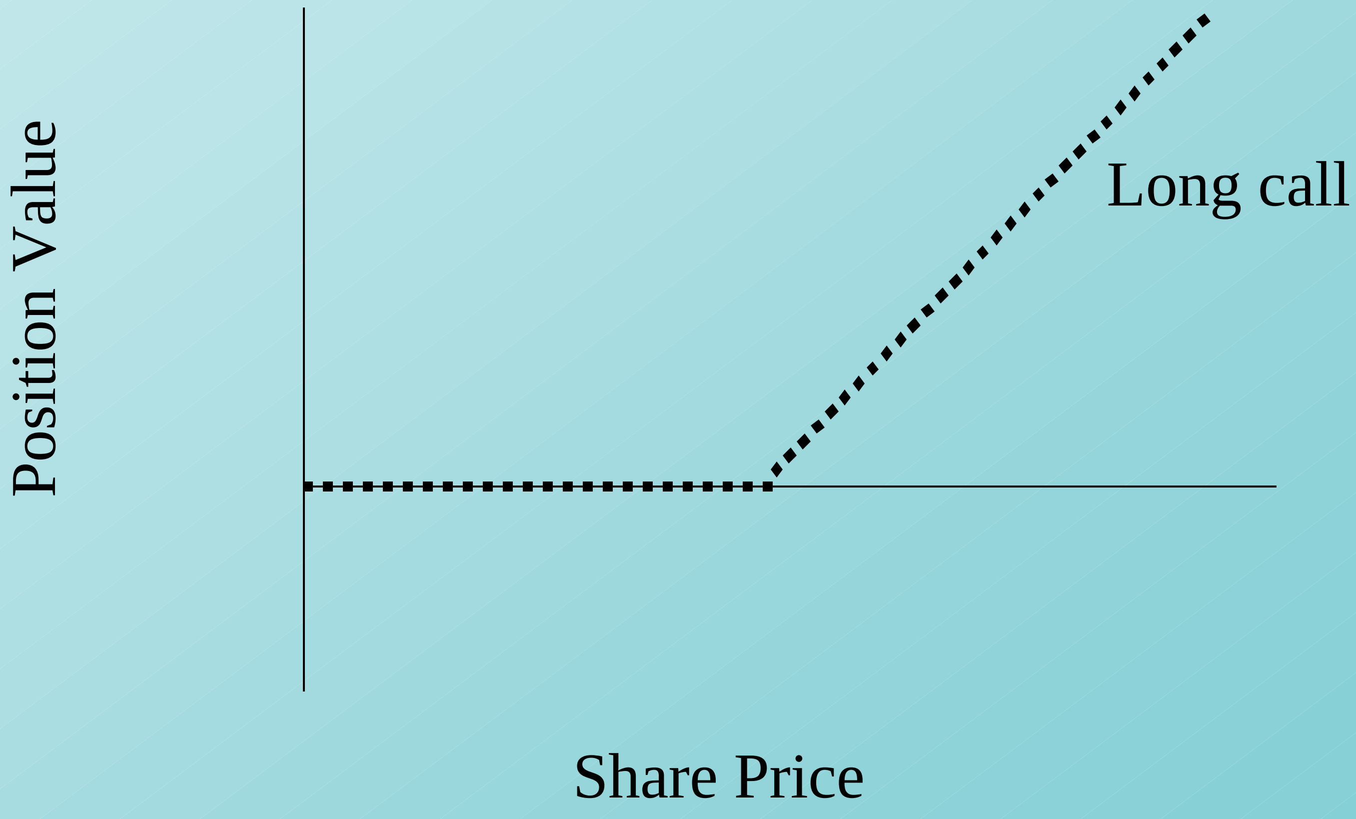
Protective Put - Long stock and long put



Option Value

Straddle - Long call and long put

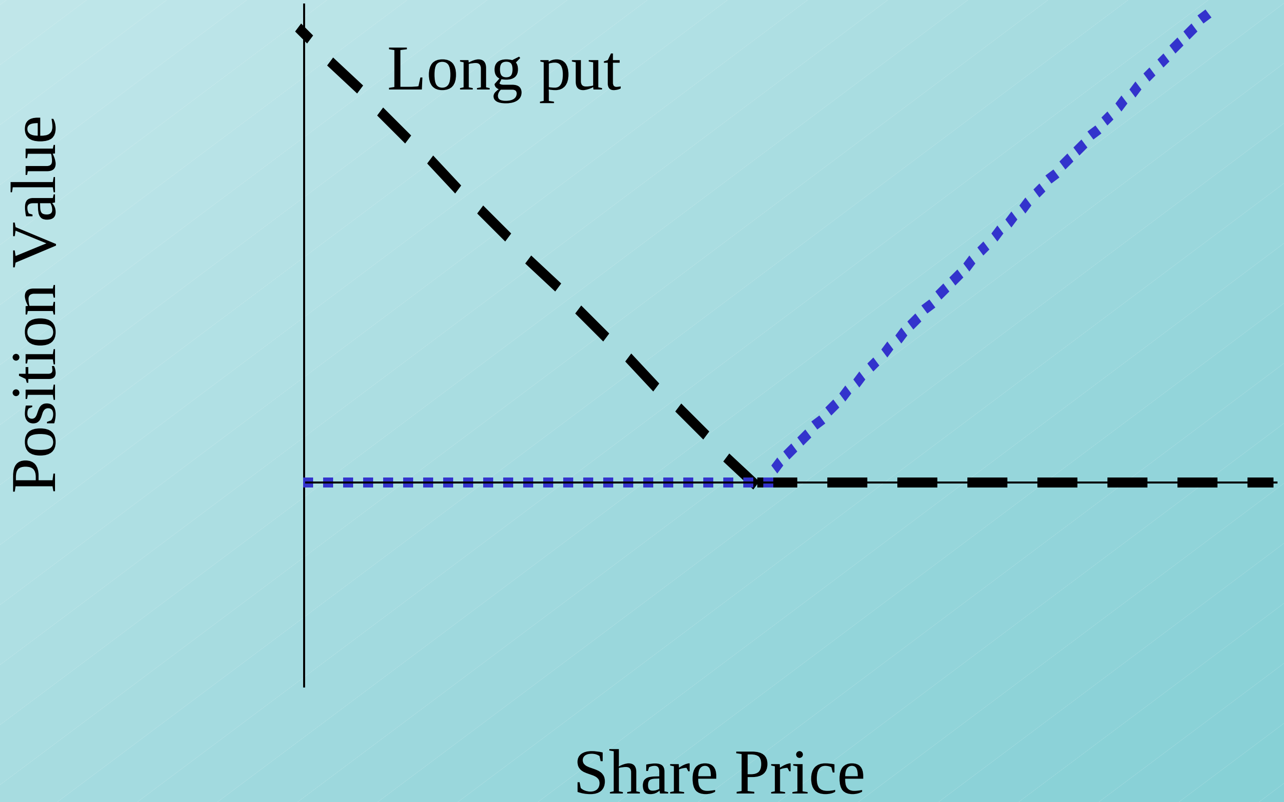
- Strategy for profiting from high volatility



Option Value

Straddle - Long call and long put

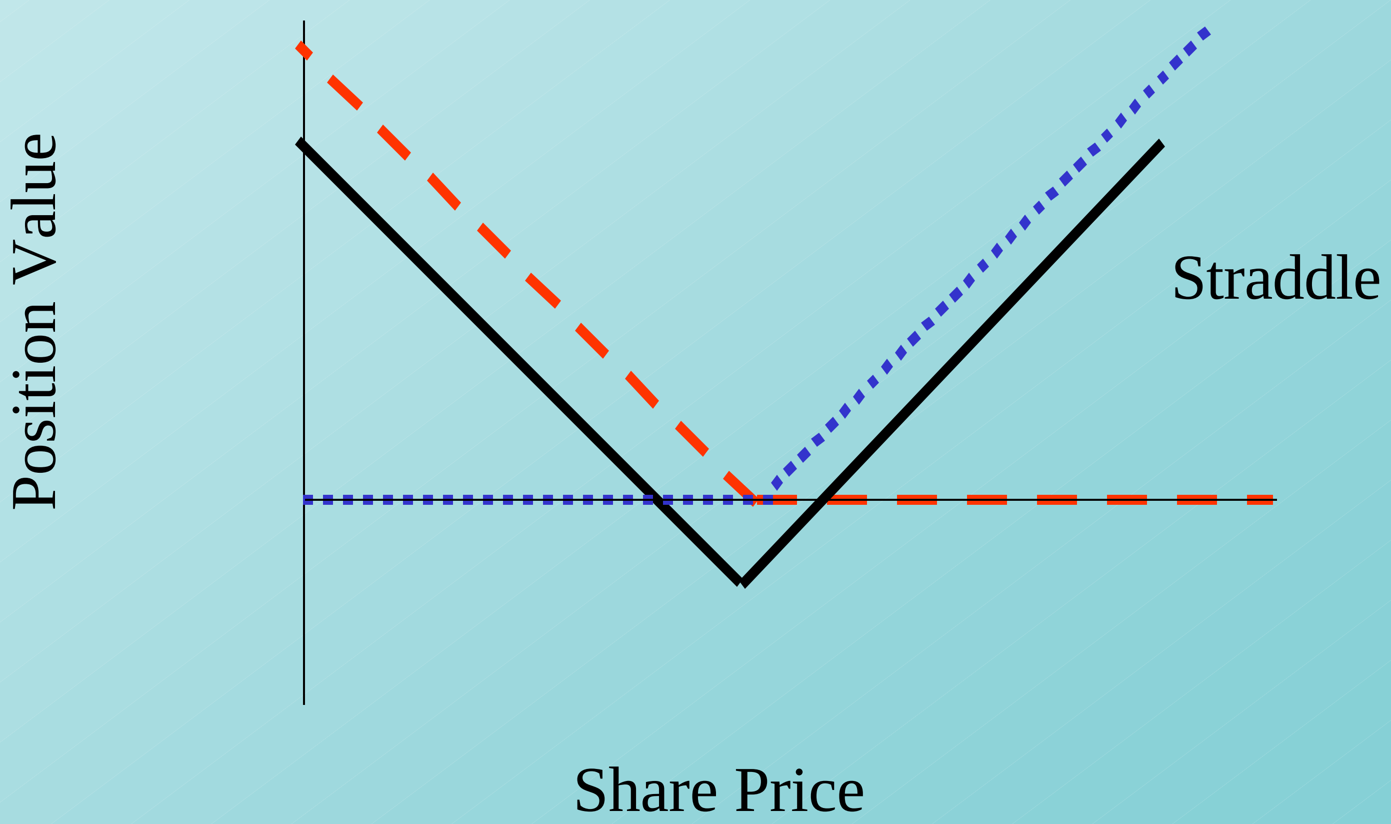
- Strategy for profiting from high volatility



Option Value

Straddle - Long call and long put

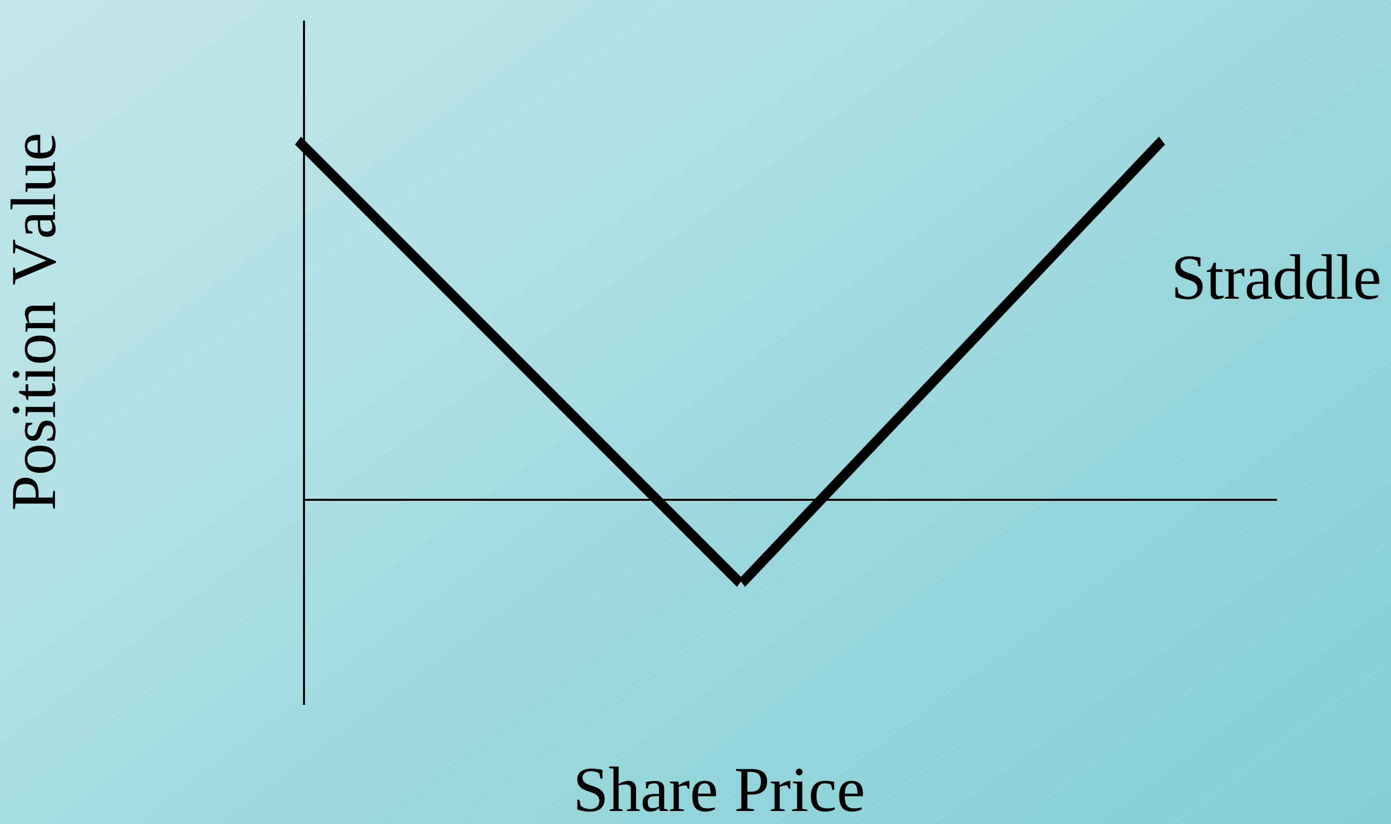
- Strategy for profiting from high volatility



Option Value

Straddle - Long call and long put

- Strategy for profiting from high volatility



Option Value

Stock Price

Upper Limit

Option Value

Stock Price

Upper Limit

↓

Lower Limit

(Stock price - exercise price) or 0
whichever is higher

Option Value

Components of the Option Price

1 - Underlying stock price

2 - Striking or Exercise price

3 - Volatility of the stock returns (standard deviation of annual returns)

4 - Time to option expiration

5 - Time value of money (discount rate)

Option Value

Black-Scholes Option Pricing Model

$$O_C = P_s[N(d_1)] - S[N(d_2)]e^{-rt}$$

Black-Scholes Option Pricing Model

$$O_C = P_s[N(d_1)] - S[N(d_2)]e^{-rt}$$

O_C- Call Option Price

P_s - Stock Price

$N(d_1)$ - Cumulative normal density function of (d_1)

S - Strike or Exercise price

$N(d_2)$ - Cumulative normal density function of (d_2)

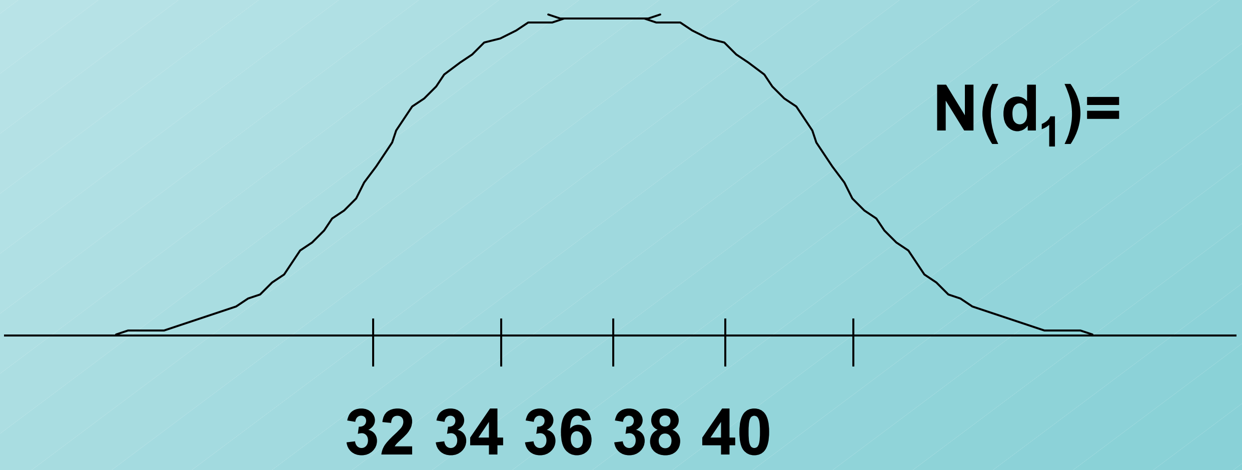
r - discount rate (90 day comm paper rate or risk free rate)

t - time to maturity of option (as % of year)

v - volatility - annualized standard deviation of daily returns

Black-Scholes Option Pricing Model

$$(d_1) = \frac{\ln \frac{P_s}{S} + \left(r + \frac{v^2}{2} \right) t}{v \sqrt{t}}$$



$N(d_1) =$

Cumulative Normal Density Function

$$(d_1) = \frac{\ln \frac{P_s}{S} + \left(r + \frac{v^2}{2}\right) t}{v\sqrt{t}}$$

$$(d_2) = d_1 - v\sqrt{t}$$

Call Option

Example

What is the price of a call option given the following?

P = 36	r = 10%	v = .40
S = 40	t = 90 days / 365	

Call Option

Example

What is the price of a call option given the following?

P = 36 r = 10% v = .40

S = 40 t = 90 days / 365

$$(d_1) = \frac{\ln \frac{P_s}{S} + \left(r + \frac{v^2}{2}\right)t}{v\sqrt{t}}$$

$(d_1) = -.3070$

$N(d_1) = 1 - .6206 = \underline{.3794}$

Call Option

Example

What is the price of a call option given the following?

P = 36   r = 10%   v = .40

S = 40   t = 90 days / 365

$$(d_2) = d_1 - v\sqrt{t}$$

$$(d_2) = -.5056$$

$$N(d_2) = 1 - .6935 = \underline{.3065}$$

Call Option

Example

What is the price of a call option given the following?

P = 36   r = 10%   v = .40

S = 40   t = 90 days / 365

$$O_C = P_s[N(d_1)] - S[N(d_2)]e^{-rt}$$

$$O_C = 36[.3794] - 40[.3065]e^{-(.10)(.2466)}$$

$$O_C = \$\ 1.70$$

Put - Call Parity

$$\boxed{\text{Put Price} = \text{Oc} + S - P - \text{Carrying Cost} + \text{Div.}}$$

Carrying cost = r x S x t

Put - Call Parity

Example

ABC is selling at $41 a share. A six month May 40 Call is selling for $4.00. If a May $ .50 dividend is expected and r=10%, what is the put price?

Put - Call Parity

Example

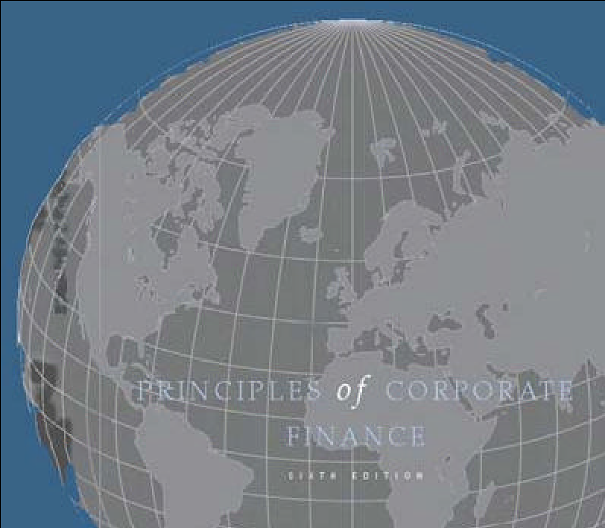
ABC is selling at $41 a share. A six month May 40 Call is selling for $4.00. If a May $ .50 dividend is expected and r=10%, what is the put price?

Op = Oc + S - P - Carrying Cost + Div.

Op = 4 + 40 - 41 - (.10x 40 x .50) + .50

Op = 3 - 2 + .5

Op = $1.50



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

Real Options

Chapter 21

Topics Covered

- Real Options
  - Follow Up Investments
  - Abandon
  - Wait
  - Vary Output or Production
- Binomial Model

Corporate Options

<u>4 types of "Real Options"</u>

1 - The opportunity to make follow-up investments.

2 - The opportunity to abandon a project

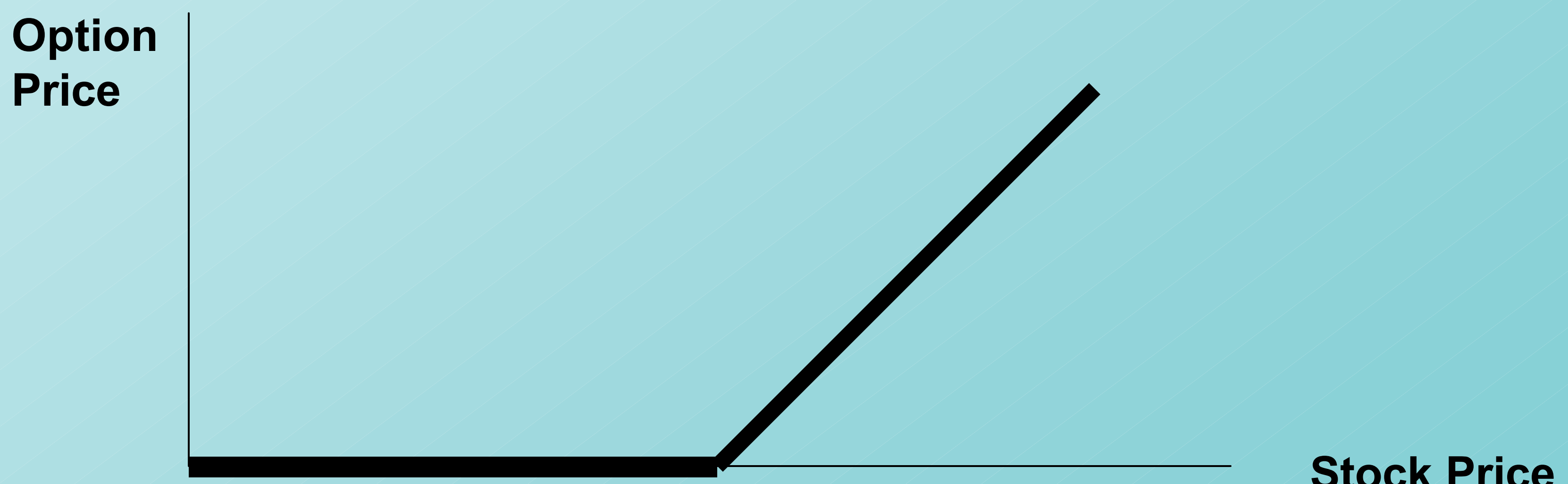
3 - The opportunity to "wait" and invest later.

4 - The opportunity to vary the firm's output or production methods.

Value "Real Option" = NPV with option - NPV w/o option

Option to Wait

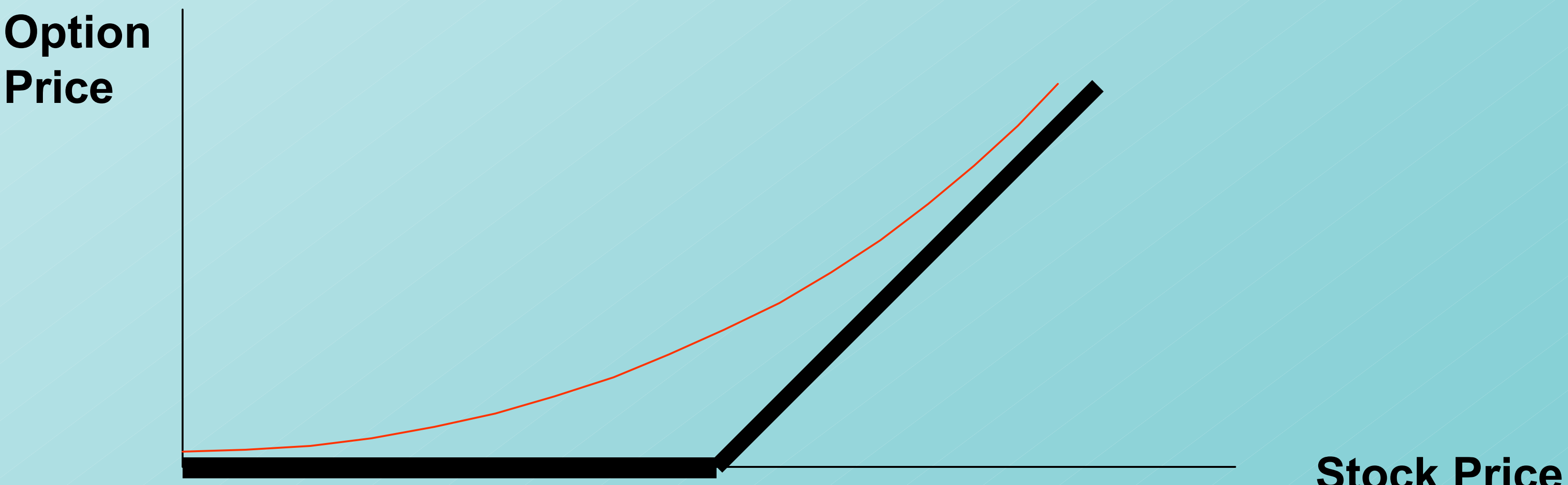
Intrinsic Value



Option to Wait

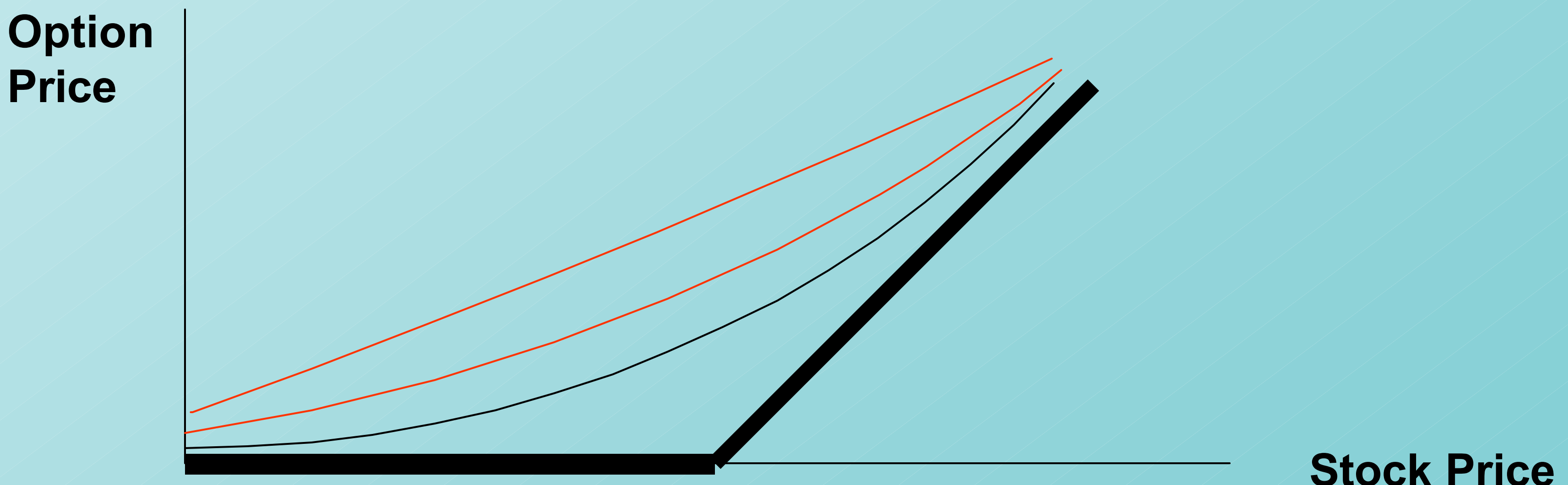
Intrinsic Value + Time Premium = Option Value

Time Premium = Vale of being able to wait



Option to Wait

More time = More value



Option to Abandon

Example - Abandon

Mrs. Mulla gives you a non-retractable offer to buy your company for $150 mil at anytime within the next year. Given the following decision tree of possible outcomes, what is the value of the offer (i.e. the put option) and what is the most Mrs. Mulla could charge for the option?

Use a discount rate of 10%

Option to Abandon

Example - Abandon

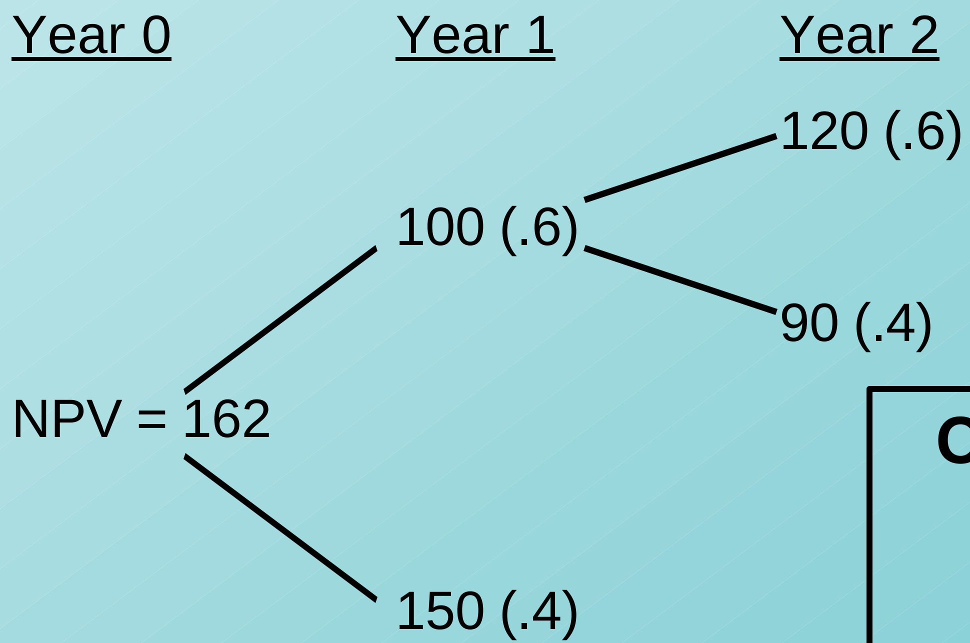
Mrs. Mulla gives you a non-retractable offer to buy your company for $150 mil at anytime within the next year. Given the following decision tree of possible outcomes, what is the value of the offer (i.e. the put option) and what is the most Mrs. Mulla could charge for the option?

Year 0	Year 1	Year 2
		120 (.6)
	100 (.6)	
		90 (.4)
NPV = 145		
		70 (.6)
	50 (.4)	
		40 (.4)

Option to Abandon

Example - Abandon

Mrs. Mulla gives you a non-retractable offer to buy your company for $150 mil at anytime within the next year. Given the following decision tree of possible outcomes, what is the value of the offer (i.e. the put option) and what is the most Mrs. Mulla could charge for the option?



Option Value =

162 - 145 =

$17 mil

Corporate Options

<u>Reality</u>

- Decision trees for valuing “real options” in a corporate setting can not be practically done by hand.
- We must introduce binomial theory & B-S models

Binomial Pricing

Probability Up = p = $\dfrac{(a - d)}{(u - d)}$ **Prob Down = 1 - p**

$a = e^{rD\ t}$ $d = e^{-s\ [D\ t]^{.5}}$ $u = e^{s\ [D\ t]^{.5}}$

Dt = time intervals as % of year

Binomial Pricing

Example

Price = 36 σ = .40 t = 90/365 Δ t = 30/365

Strike = 40 r = 10%

a = 1.0083

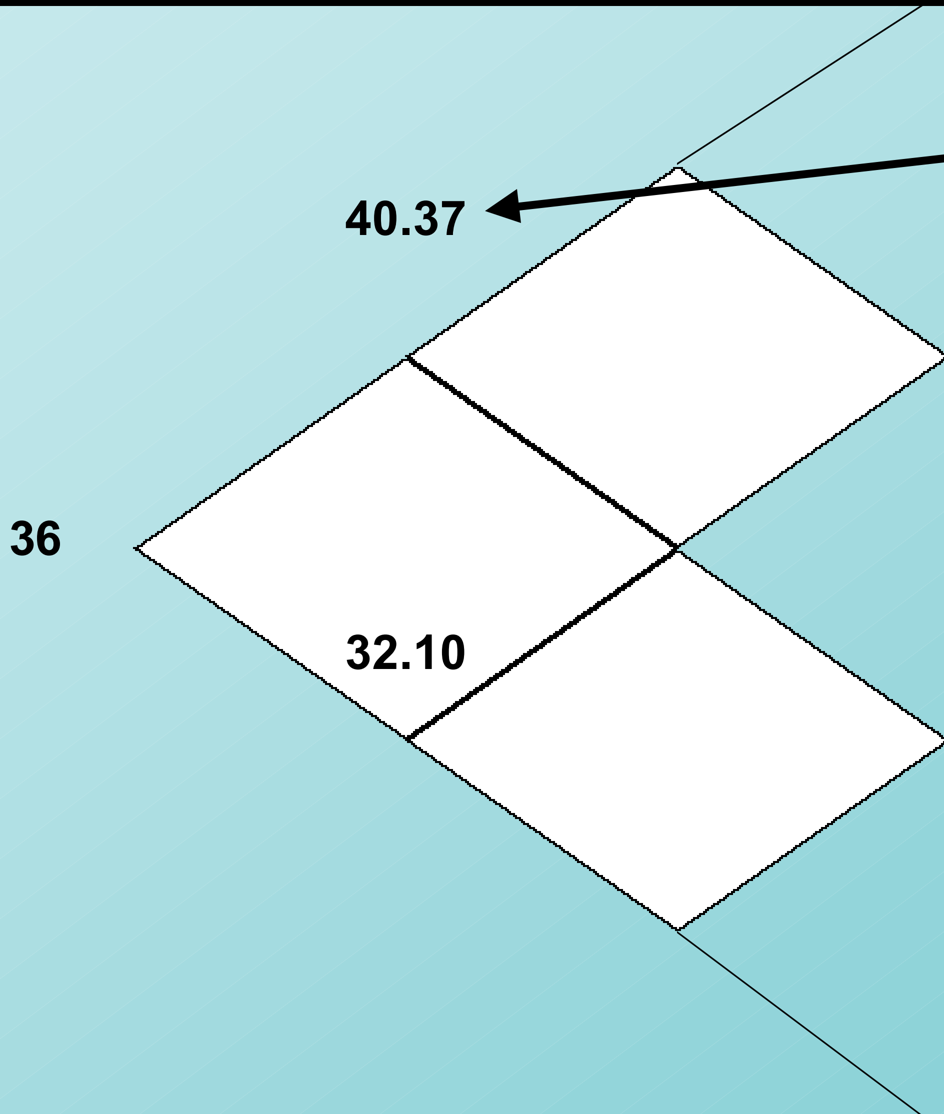
u = 1.1215

d = .8917

Pu = .5075

Pd = .4925

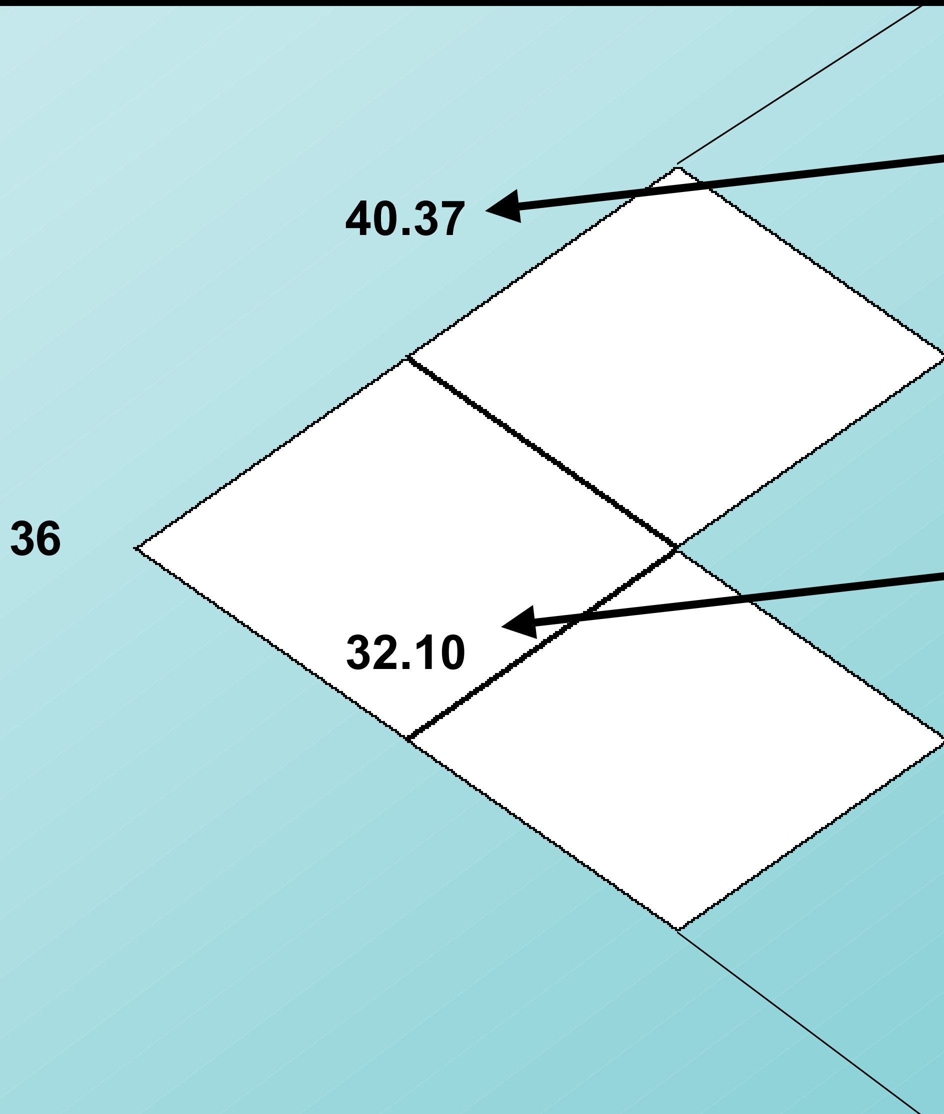
Binomial Pricing



$$P_0 \times U = P_{U1}$$

$$36 \times 1.1215 = 40.37$$

Binomial Pricing



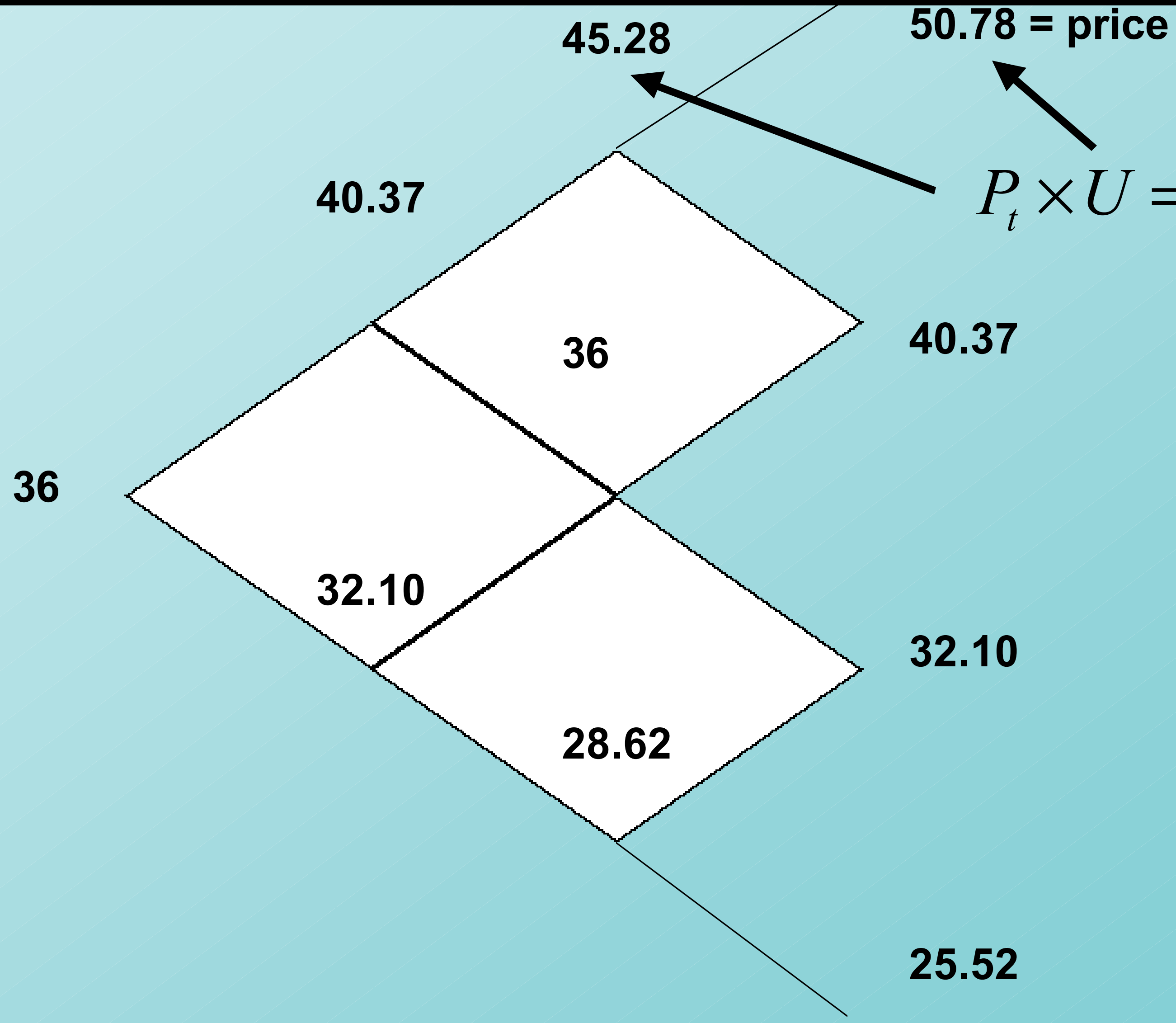
$$P_0 \times U = P_{U1}$$

$$36 \times 1.1215 = 40.37$$

$$P_0 \times D = P_{D1}$$

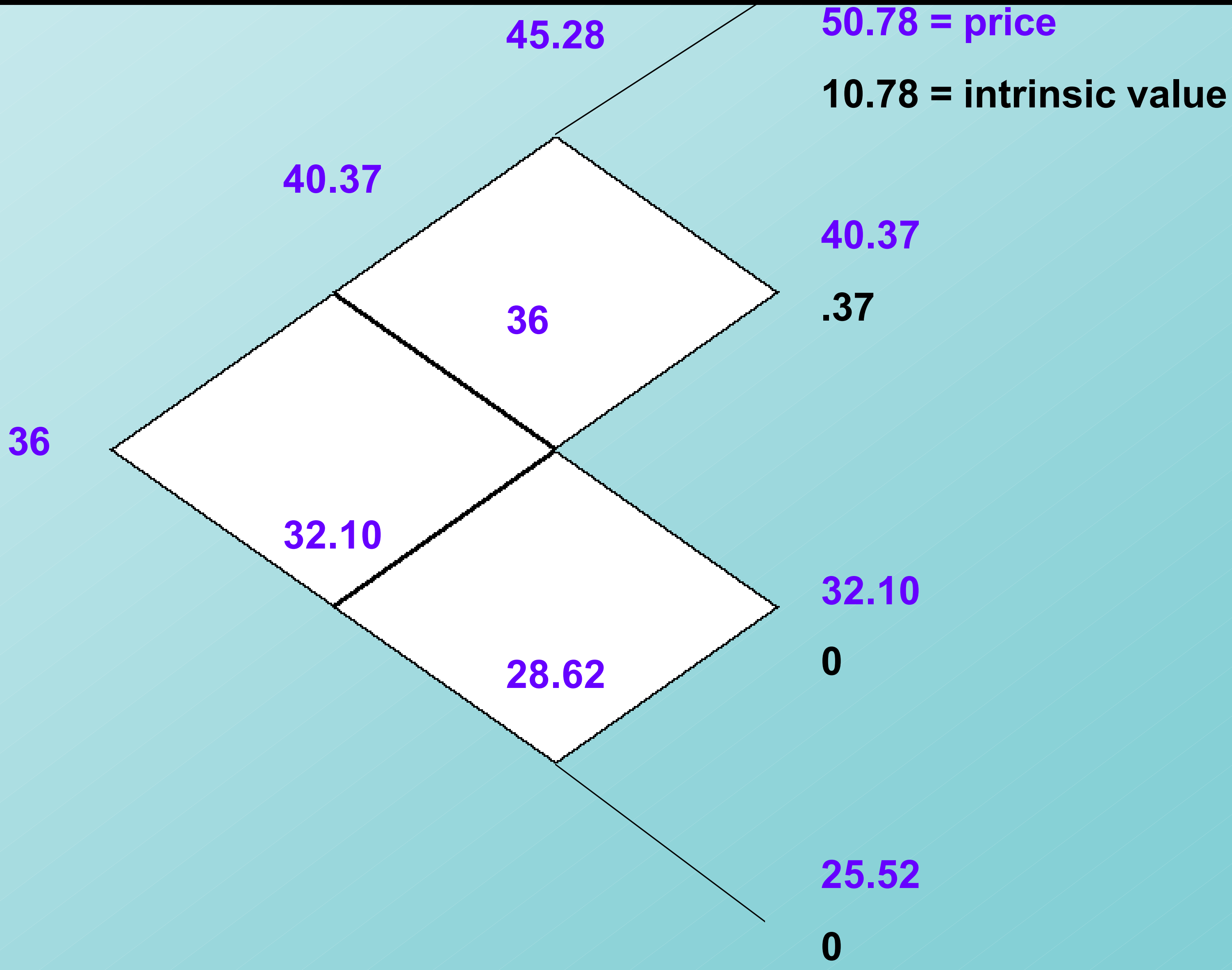
$$36 \times .8917 = 32.10$$

Binomial Pricing



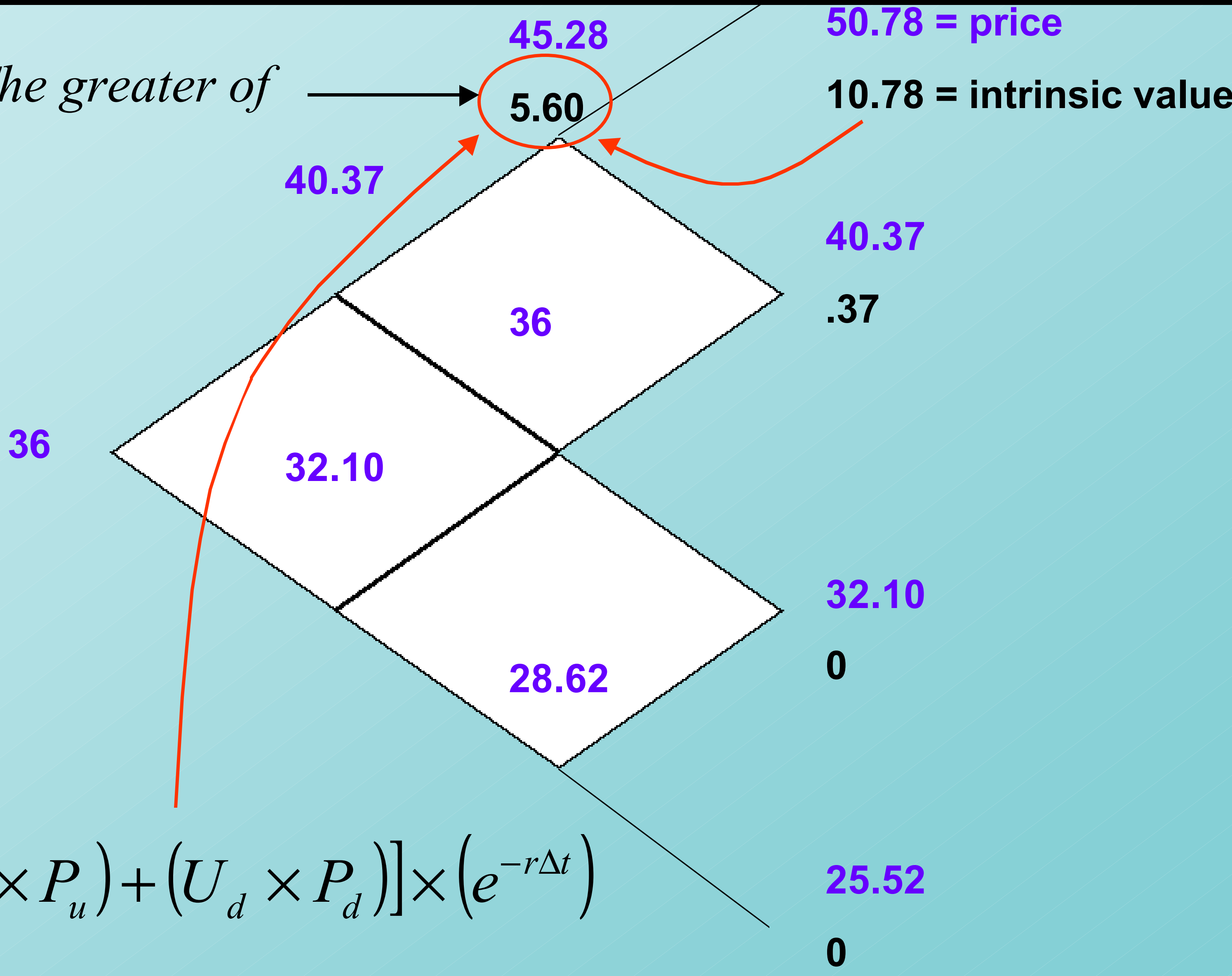
$$P_t \times U = P_{t+1}$$

Binomial Pricing



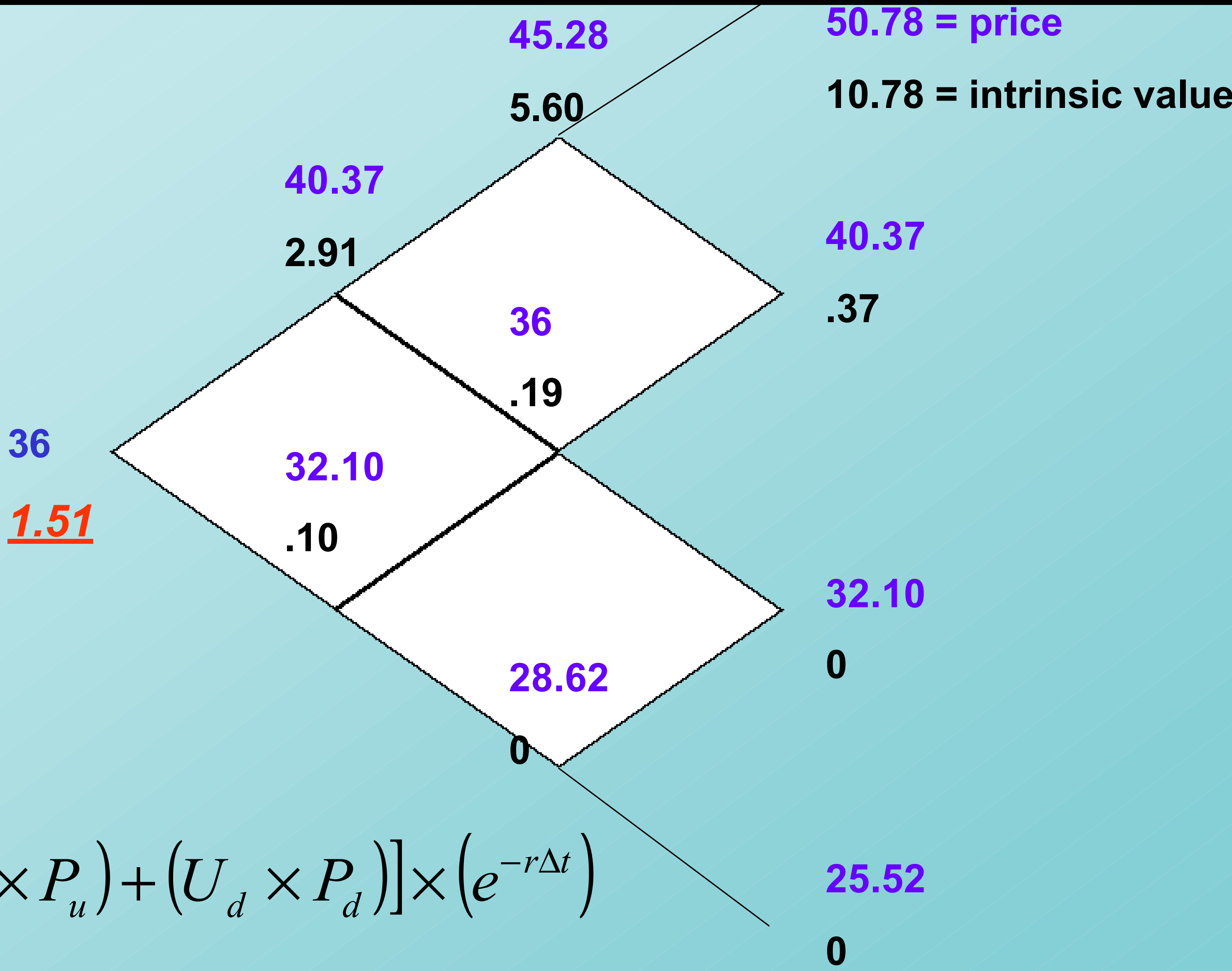
Binomial Pricing

The greater of



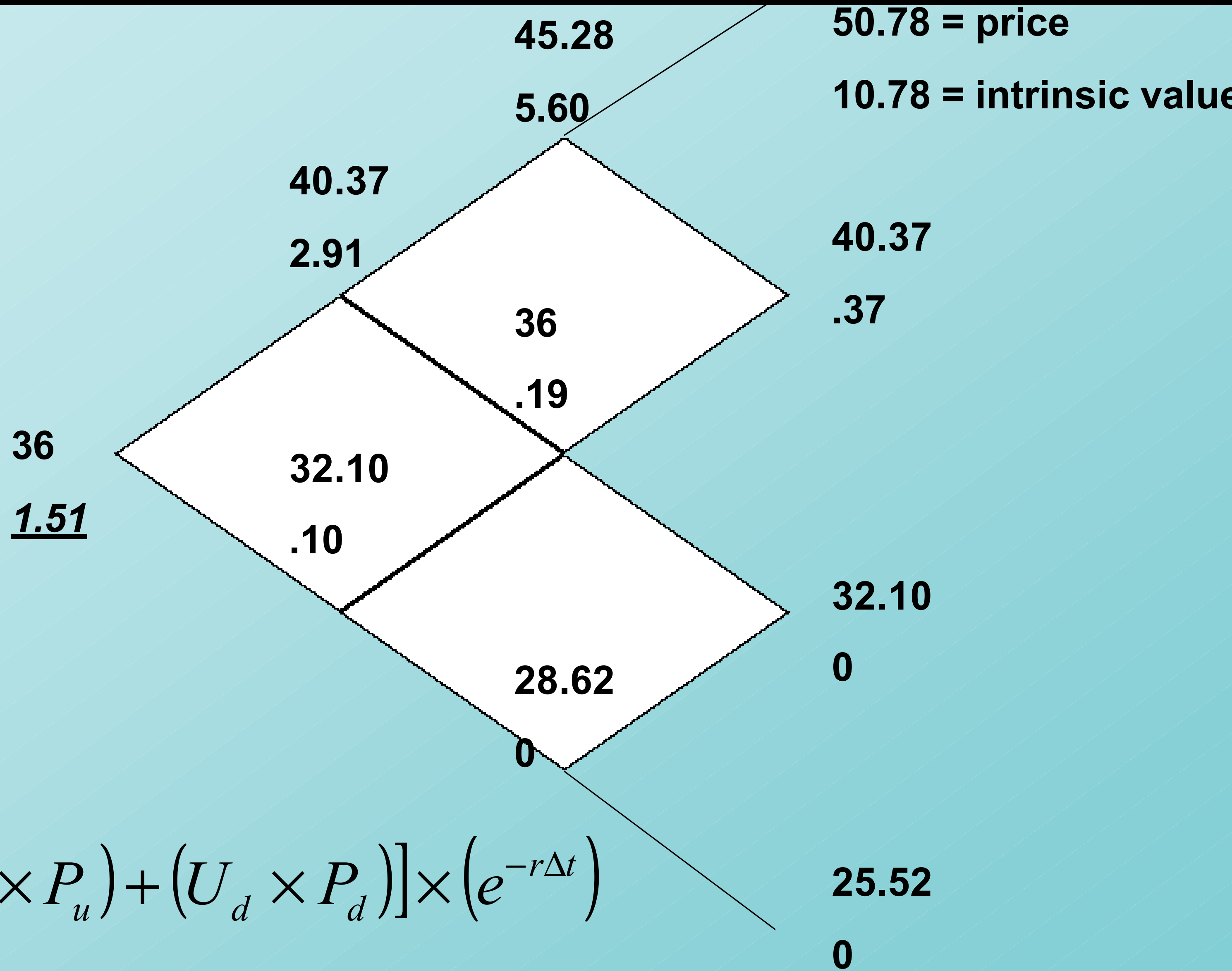
$$\left[\left(O_u \times P_u\right) + \left(U_d \times P_d\right)\right] \times \left(e^{-r\Delta t}\right)$$

Binomial Pricing



$$\left[\left(O_u \times P_u\right) + \left(U_d \times P_d\right)\right] \times \left(e^{-r\Delta t}\right)$$

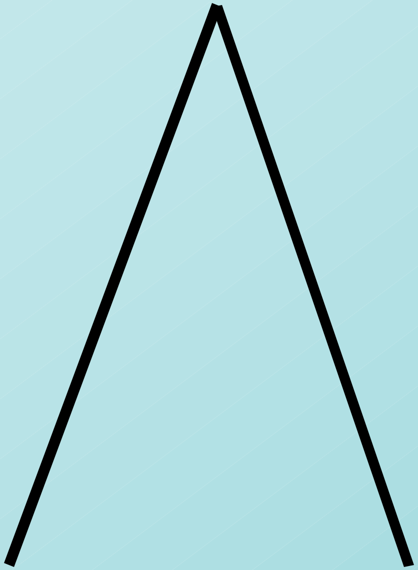
Binomial Pricing



$$\left[\left(O_u \times P_u\right) + \left(U_d \times P_d\right)\right] \times \left(e^{-r\Delta t}\right)$$

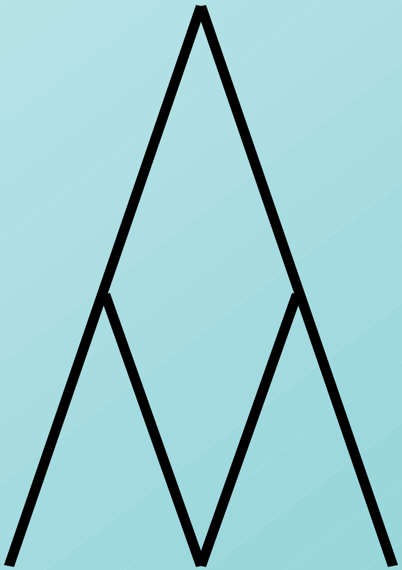
Binomial vs. Black Scholes

Expanding the binomial model to allow more possible price changes



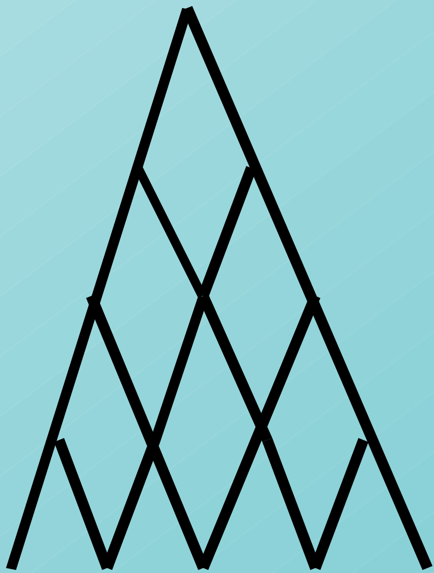
1 step

(2 outcomes)



2 steps

(3 outcomes)



4 steps

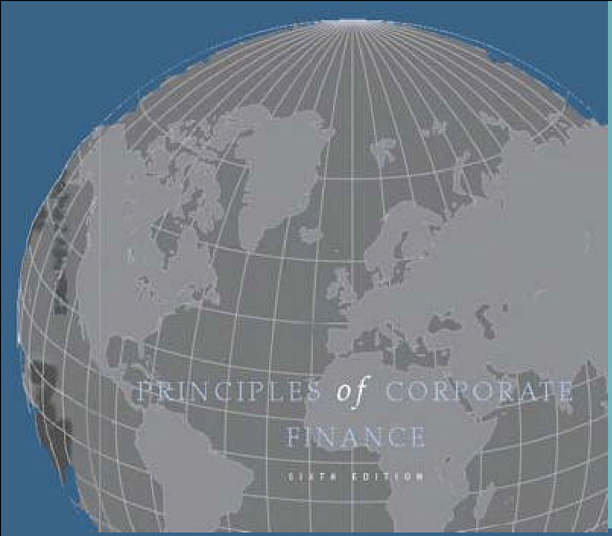
(5 outcomes)

etc. etc.

Binomial vs. Black Scholes

How estimated call price changes as number of binomial steps increases

No. of steps	Estimated value
1	48.1
2	41.0
3	42.1
5	41.8
10	41.4
50	40.3
100	40.6
Black-Scholes	40.5



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

Warrants and Convertibles

Chapter 22

Topics Covered

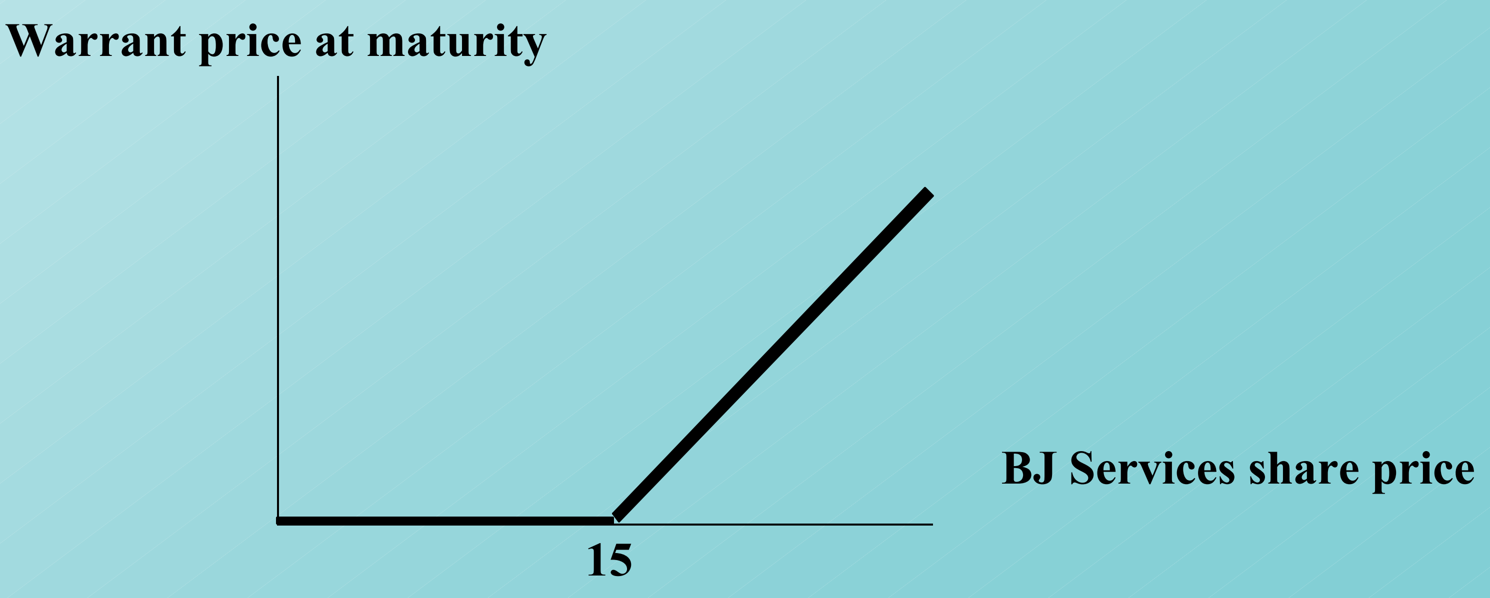
- What is a Warrant?
- What is a Convertible Bond?
- The Difference Between Warrants and Convertibles
- Why do Companies Issue Warrants and Convertibles?

Warrant Value

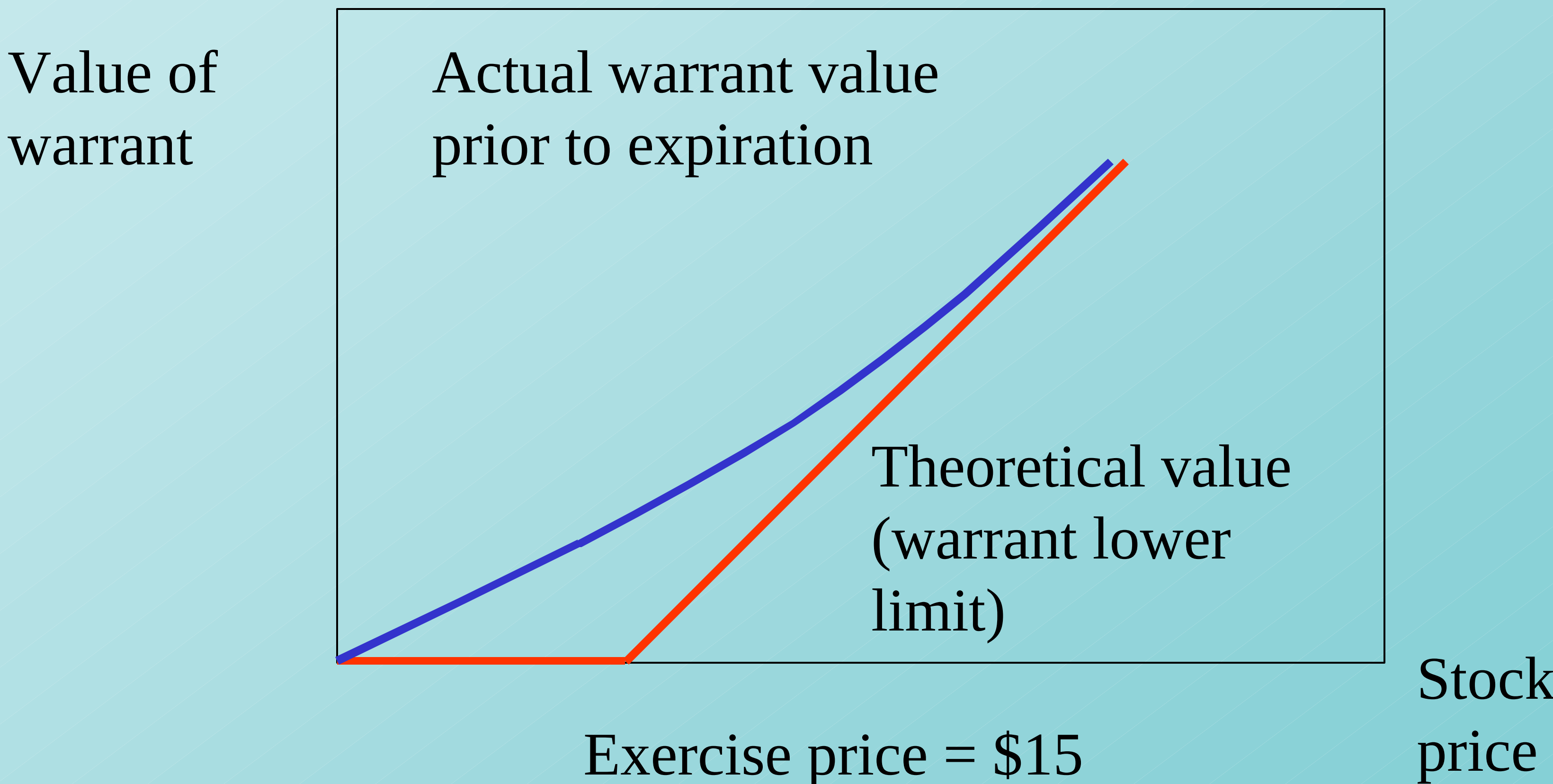
Example:

BJ Services warrants, January 1999

Exercise price	$ 15
Warrant price	$ 9
Share price	$ 16



Warrant Value vs. Stock Price



United Glue Warrants

- United glue has just issued $2 million package of debt and warrants. Using the following data, calculate the warrant value.

  - # shares outstanding = 1 mil
  - Current stock price = $12
  - Number of shares issued per share outstanding = .10
  - Total number of warrants issued = 100,000
  - Exercise price of warrants = $10
  - Time to expiration of warrants = 4 years
  - Annualized standard deviation of stock daily returns = .40
  - Rate of return = 10 percent

United Glue Warrants

- United glue has just issued \$2 million package of debt and warrants. Using the following data, calculate the warrant value.

$$\text{Cost of warrants} = \text{total financing} - \text{value of loans w/o warrants}$$

$$500{,}000 = 2{,}000{,}000 - 1{,}500{,}000$$

$$\$5 = \frac{500{,}000}{100{,}000} \text{ Cost of each warrant}$$

United Glue Warrants

- United glue has just issued \$2 million package of debt and warrants. Using the following data, calculate the warrant value.

$(d_1) = 1.104$

$(d_2) = .304$

$N(d_1) = .865$

$N(d_2) = .620$

United Glue Warrants

- United glue has just issued $2 million package of debt and warrants. Using the following data, calculate the warrant value.

$$\text{Warrant} = 12[.865] - [.620]\{10/1.1^4]$$

$$= \mathbf{\$6.15}$$

United Glue Warrants

- United glue has just issued \$2 million package of debt and warrants. Using the following data, calculate the warrant value.
- Value of warrant with dilution

$$\text{Current equity value of alternative firm} = V = \text{Value of United's total assets} - \text{value of loans}$$

$$V = 18 - 5.5 = \$12.5 million$$

United Glue Warrants

- United glue has just issued \$2 million package of debt and warrants. Using the following data, calculate the warrant value.
- Value of warrant with dilution

$$\text{Current share price of alternative firm} = \frac{V}{N} = \frac{12.5\text{ million}}{1 \textit{million}} = \$12.50$$

Black Scholes formula gives value = \$6.64

United Glue Warrants

- United glue has just issued $2 million package of debt and warrants. Using the following data, calculate the warrant value.
- Value of warrant with dilution

$$\frac{1}{1+q} \times \text{value of call on alternative firm}$$

$$\frac{1}{1.10} \times 6.64 = \$6.03$$

What is a Convertible Bond?

- ALZA
  - 5% Convertible 2006
  - Convertible into 26.2 shares
  - Conversion ratio 26.2
  - Conversion price = 1000/26.2 = $38.17
  - Market price of shares = $28

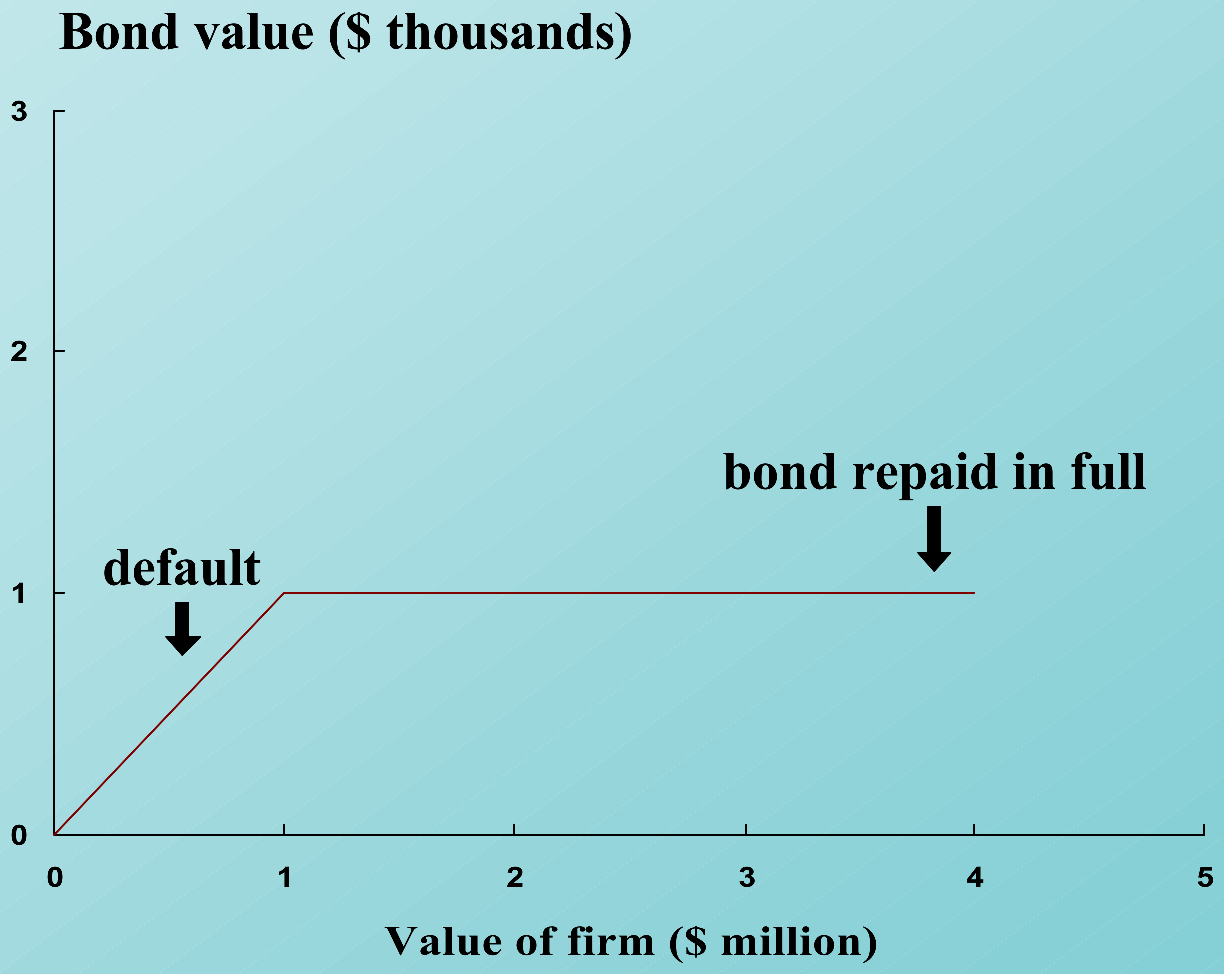
What is a Convertible Bond?

- ALZA
  - 5% Convertible 2006
  - Convertible into 26.2 shares
  - Conversion ratio 26.2
  - Conversion price = 1000/26.2 = $38.17
  - Market price of shares = $28

- Lower bound of value
  - Bond value
  - Conversion value = 26.2 x 28 = 733.60

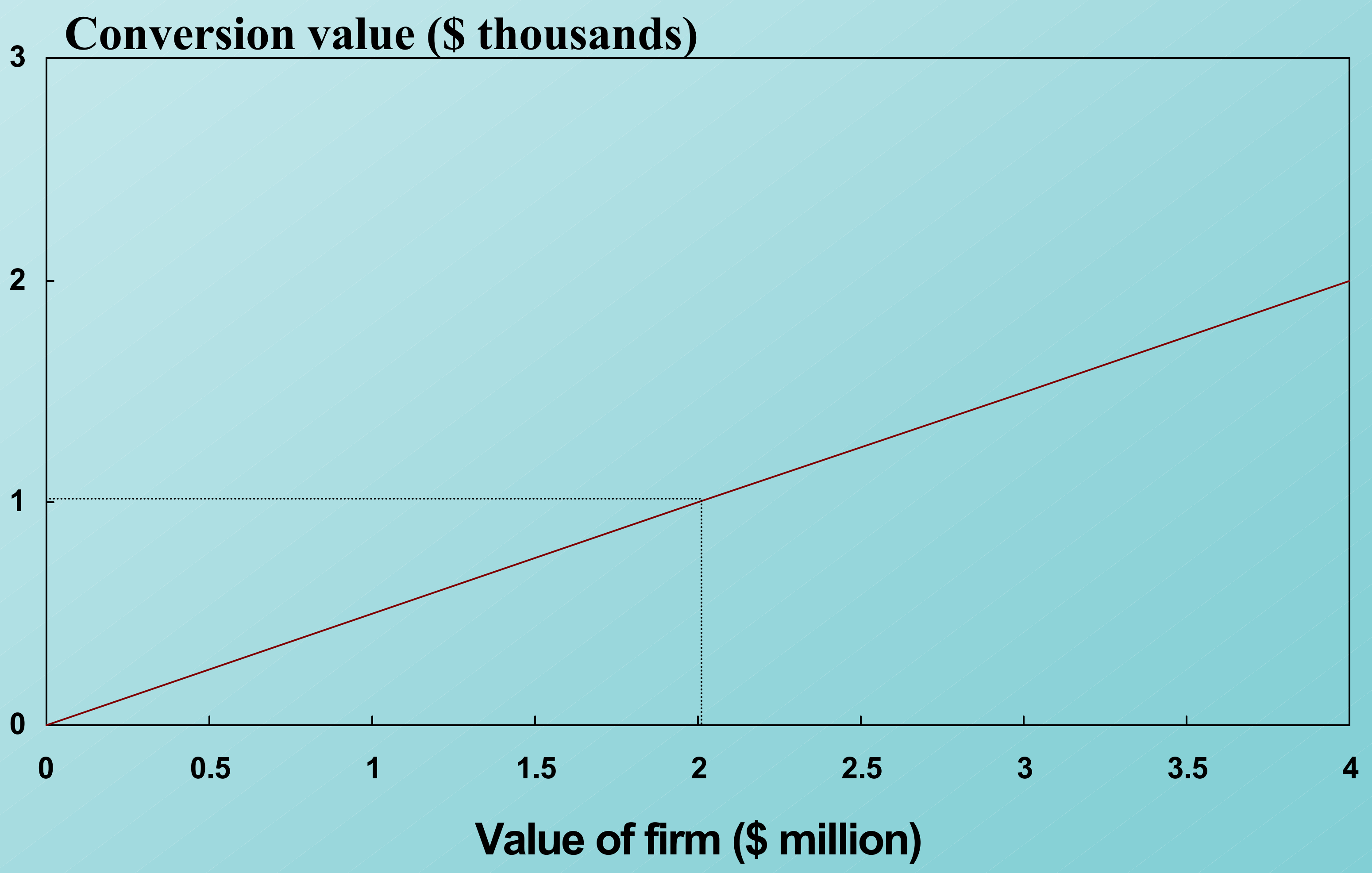
What is a Convertible Bond?

- How bond value varies with firm value at maturity.



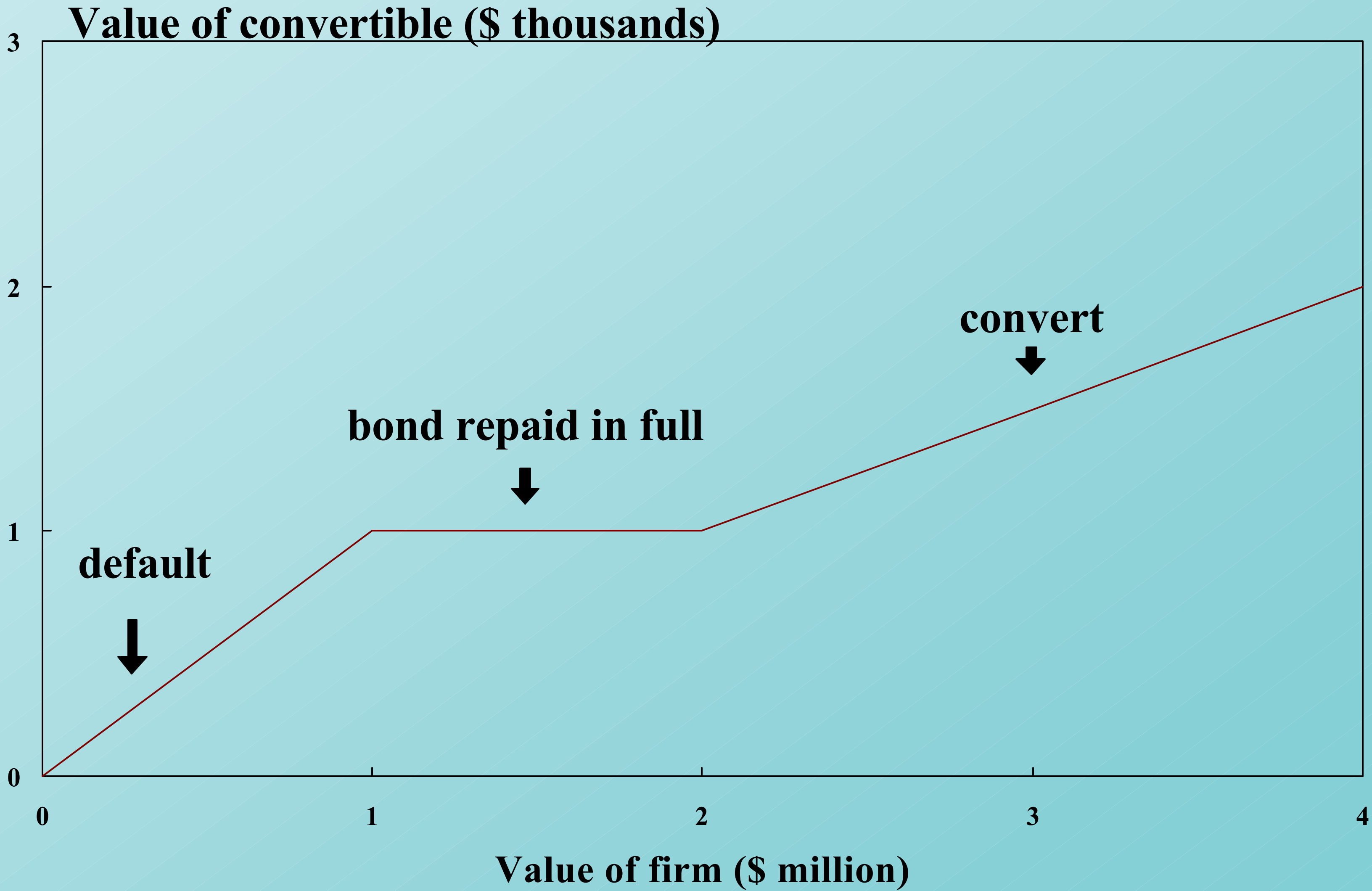
What is a Convertible Bond?

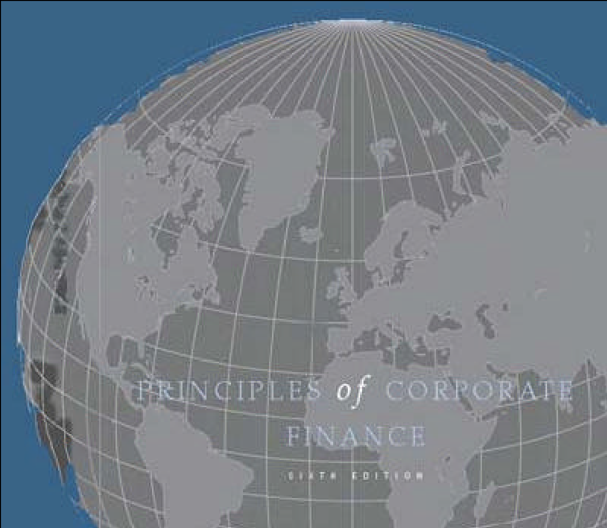
- **How conversion value at maturity varies with firm value.**



What is a Convertible Bond?

- How value of convertible at maturity varies with firm value.





Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

Valuing Debt

Chapter 23

Topics Covered

- The Classical Theory of Interest
- The Term Structure and YTM
- Duration and Volatility
- Explaining the Term Structure
- Allowing for the Risk of Default

Debt & Interest Rates

Classical Theory of Interest Rates (Economics)

- developed by Irving Fisher

Debt & Interest Rates

Classical Theory of Interest Rates (Economics)

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Nominal Interest Rate = The rate you actually pay when you borrow money.

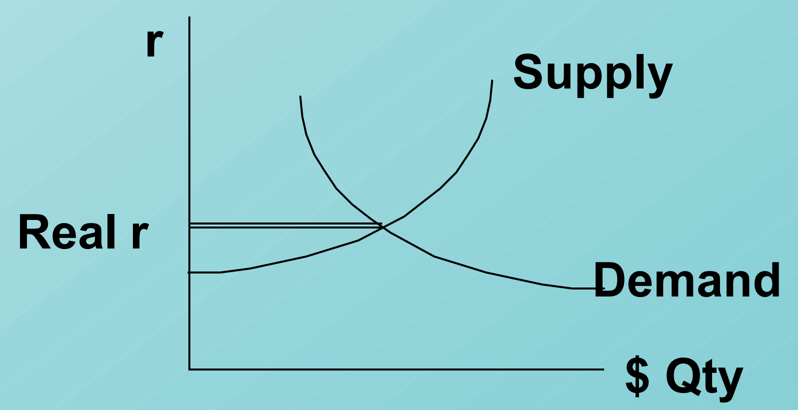
Debt & Interest Rates

Classical Theory of Interest Rates (Economics)

- developed by Irving Fisher

Nominal Interest Rate = The rate you actually pay when you borrow money.

Real Interest Rate = The theoretical rate you pay when you borrow money, as determined by supply and demand.



Debt & Interest Rates

Nominal r = Real r + expected inflation

Real r is theoretically somewhat stable

Inflation is a large variable

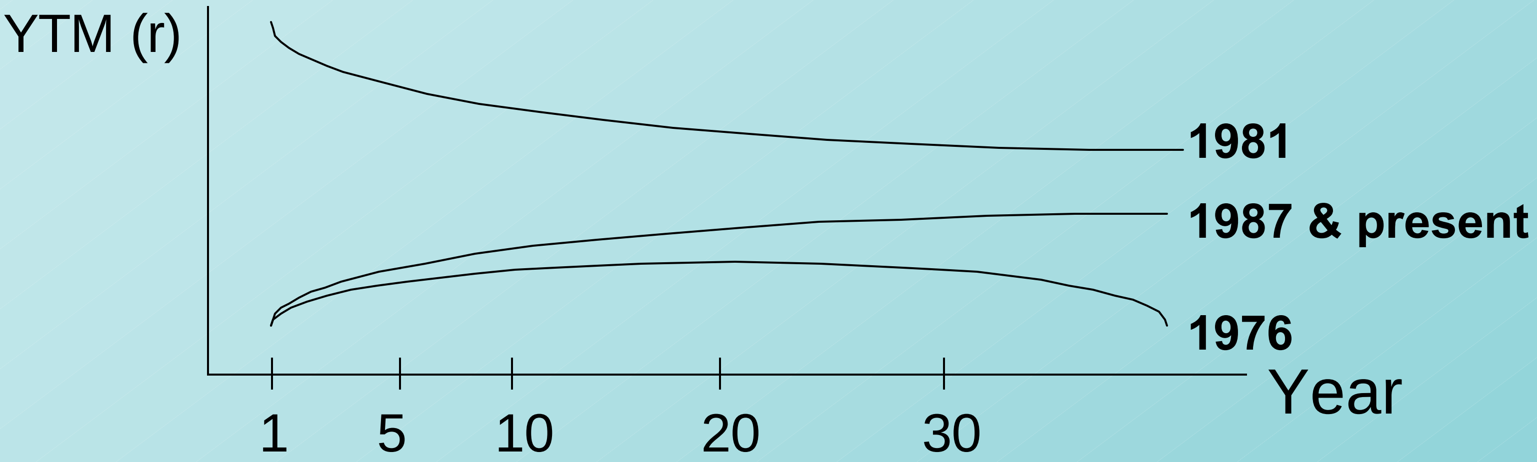
Q: Why do we care?

A: This theory allows us to understand the Term Structure of Interest Rates.

Q: So What?

A: The Term Structure tells us the cost of debt.

Term Structure



Spot Rate - The actual interest rate today (t=0)

Forward Rate - The interest rate, fixed today, on a loan made in the future at a fixed time.

Future Rate - The spot rate that is expected in the future.

Yield To Maturity (YTM) - The IRR on an interest bearing instrument.

Debt & Risk

Example (Bond 1)

Calculate the duration of our 10.5% bond @ 8.5% YTM

Year	CF	PV@YTM	% of Total PV	% x Year

Debt & Risk

Example (Bond 1)

Calculate the duration of our 10.5% bond @ 8.5% YTM

Year	CF	PV@YTM	% of Total PV	% x Year
1	105			
2	105			
3	105			
4	105			
5	1105			

Debt & Risk

Example (Bond 1)

Calculate the duration of our 10.5% bond @ 8.5% YTM

Year	CF	PV@YTM	% of Total PV	% x Year
1	105	96.77		
2	105	89.19		
3	105	82.21		
4	105	75.77		
5	1105	734.88		
		1078.82		

Debt & Risk

Example (Bond 1)

Calculate the duration of our 10.5% bond @ 8.5% YTM

Year	CF	PV@YTM	% of Total PV	% x Year
1	105	96.77	.090	
2	105	89.19	.083	
3	105	82.21	.076	
4	105	75.77	.070	
5	1105	734.88	.681	
		1078.82	1.00	

Debt & Risk

Example (Bond 1)

Calculate the duration of our 10.5% bond @ 8.5% YTM

Year	CF	PV@YTM	% of Total PV	% x Year
1	105	96.77	.090	0.090
2	105	89.19	.083	0.164
3	105	82.21	.076	0.227
4	105	75.77	.070	0.279
5	1105	734.88	.681	3.406
		1078.82	1.00	**4.166 Duration**

Debt & Risk

Example (Bond 2)

Given a 5 year, 9.0%, $1000 bond, with a 8.5% YTM, what is this bond's duration?

Year	CF	PV@YTM	% of Total PV	% x Year

Debt & Risk

Example (Bond 2)

Given a 5 year, 9.0%, $1000 bond, with a 8.5% YTM, what is this bond's duration?

Year	CF	PV@YTM	% of Total PV	% x Year
1	90			
2	90			
3	90			
4	90			
5	1090			

Debt & Risk

Example (Bond 2)

Given a 5 year, 9.0%, $1000 bond, with a 8.5% YTM, what is this bond's duration?

Year	CF	PV@YTM	% of Total PV	% x Year
1	90	82.95		
2	90	76.45		
3	90	70.46		
4	90	64.94		
5	1090	724.90		
		1019.70		

Debt & Risk

Example (Bond 2)

Given a 5 year, 9.0%, $1000 bond, with a 8.5% YTM, what is this bond's duration?

Year	CF	PV@YTM	% of Total PV	% x Year
1	90	82.95	.081	
2	90	76.45	.075	
3	90	70.46	.069	
4	90	64.94	.064	
5	1090	724.90	.711	
		1019.70	1.00	

Debt & Risk

Example (Bond 2)

Given a 5 year, 9.0%, $1000 bond, with a 8.5% YTM, what is this bond's duration?

Year	CF	PV@YTM	% of Total PV	% x Year
1	90	82.95	.081	0.081
2	90	76.45	.075	0.150
3	90	70.46	.069	0.207
4	90	64.94	.064	0.256
5	1090	724.90	.711	3.555
		1019.70	1.00	**4.249 Duration**

Term Structure

<u>What Determines the Shape of the TS?</u>

1 - Unbiased Expectations Theory

2 - Liquidity Premium Theory

3 - Market Segmentation Hypothesis

<u>Term Structure & Capital Budgeting</u>

- CF should be discounted using Term Structure info.
- Since the spot rate incorporates all forward rates, then you should use the spot rate that equals the term of your project.
- If you believe inother theories take advantage of the arbitrage.

Yield To Maturity

- All interest bearing instruments are priced to fit the term structure.
- This is accomplished by modifying the asset price.
- The modified price creates a New Yield, which fits the Term Structure.
- The new yield is called the Yield To Maturity (YTM).

Yield to Maturity

Example

- A $1000 treasury bond expires in 5 years. It pays a coupon rate of 10.5%. If the market price of this bond is 107-88, what is the YTM?

Yield to Maturity

Example

- A $1000 treasury bond expires in 5 years. It pays a coupon rate of 10.5%. If the market price of this bond is 107-88, what is the YTM?

C0	C1	C2	C3	C4	C5
-1078.80	105	105	105	105	1105

Calculate IRR = 8.5%

Default, Premiums & Ratings

The risk of default changes the price of a bond and the YTM.

<u>Book Example</u>

We have a 9% 1 year bond. The built in price is $1000. But, there is a 20% chance the company will go into bankruptcy and not be able to pay. What is the bond's value?

A:

Default, Premiums & Ratings

Book Example

We have a 9% 1 year bond. The built in price is $1000. But, there is a 20% chance the company will go into bankruptcy and not be able to pay. What is the bond's value?

A: Bond Value	Prob		
1090	.80	=	872.00
0	.20	=	0 .

872.00=expected CF

$$Value = \frac{872}{1.09} = \$800$$

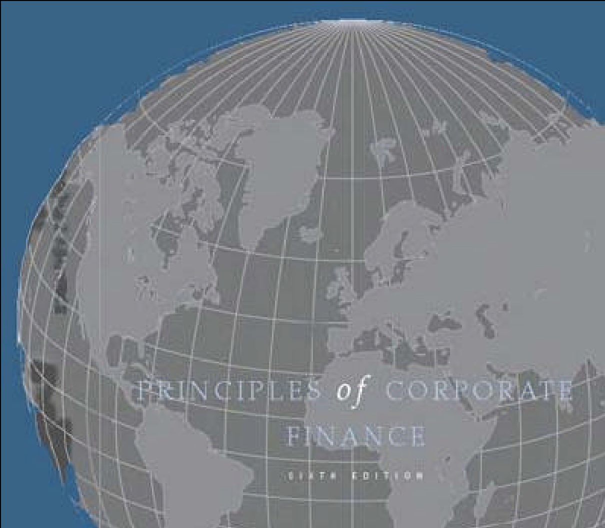
$$YTM = \frac{1090}{800} = 36.3\%$$

Default, Premiums & Ratings

Conversely - If on top of default risk, investors require an additional 2 percent market risk premium, the price and YTM is as follows:

$$Value = \frac{872}{1.11} = \$785.59$$

$$YTM = \frac{1090}{785.59} = 38.8\%$$



Principles of Corporate Finance

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◆ The Many Different Kinds of Debt

Chapter 24

Topics Covered

- Domestic Bonds and International Bonds
- The Bond Contract
- Security and Seniority Asset-Backed Securities
- Repayment Provisions
- Restrictive Covenants
- Private Placements and Project Finance
- Innovation in the Bond Market

Bond Terminology

- Foreign bonds - Bonds that are sold to local investors in another country's bond market.
- Yankee bond- a bond sold publicly by a foreign company in the United States.
- Sumari - a bond sold by a foreign firm in Japan.
- Eurobond market - wind European and American multinationals were forced to tap into international markets for capital.

Bond Terminology

- Indenture or trust deed - the bond agreement between the borrower and a trust company.
- Registered bond - a bond in which the Company's records show ownership and interest and principle are paid directly to each owner.
- Bearer bonds - the bond holder must send in coupons to claim interest and must send a certificate to claim the final payment of principle.

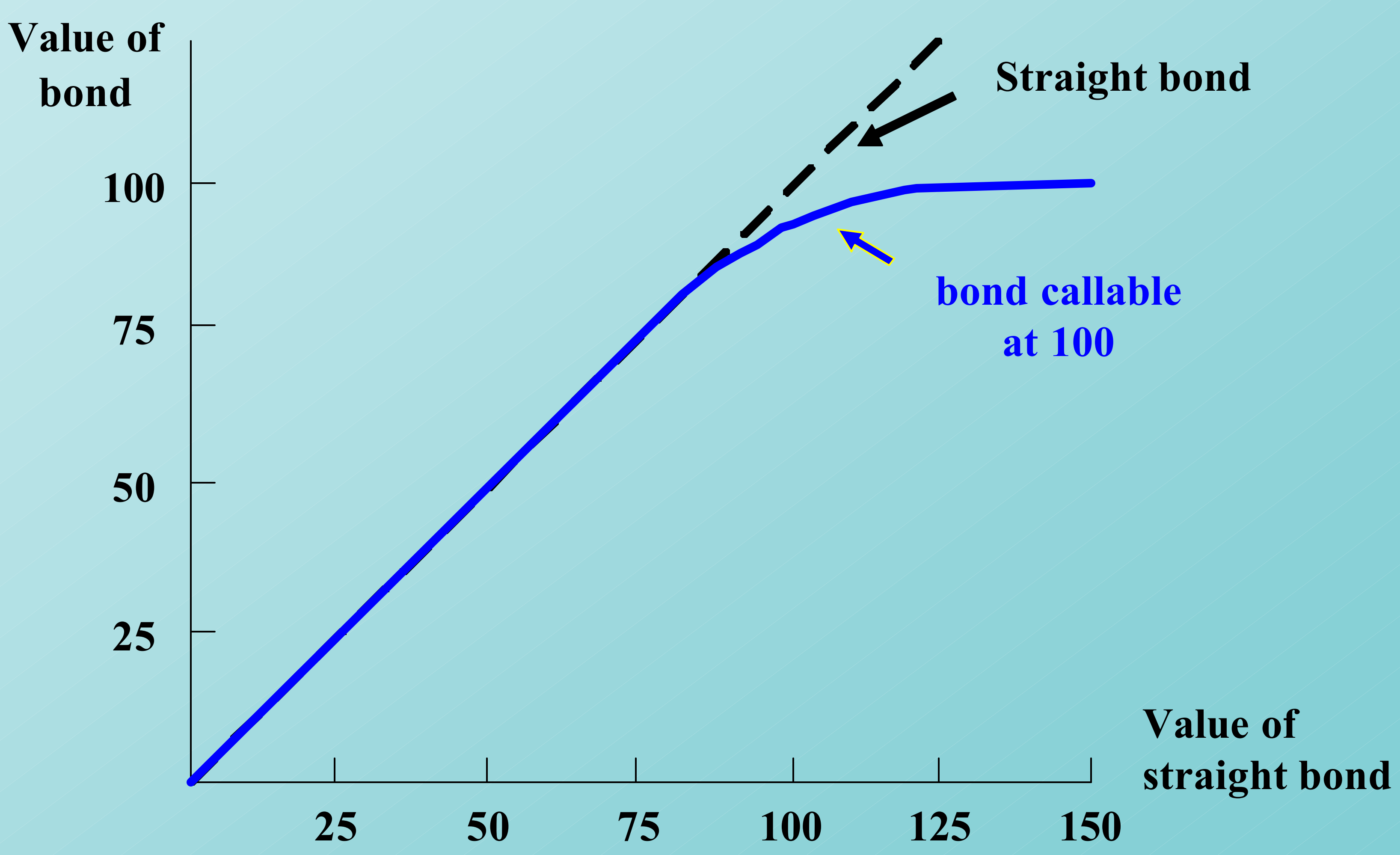
Bond Terminology

- Accrued interest - the amount of accumulated interest since the last coupon payment
- Debentures - long-term unsecured issues on debt
- Mortgage bonds - long-term secured debt often containing a claim against a specific building or property
- Asset-backed securities - the sale of cash flows derived directly from a specific set of bundled assets

Bond Terminology

- Sinking fund - a fund established to retired debt before maturity.
- Callable bond - a bond that may be repurchased by a the firm before maturity at a specified call price.
- Defeasance - a method of retiring corporate debt involving the creation of a trust funded with treasury bonds.

Straight Bond vs. Callable Bond



Bond Terminology

- Restrictive covenants - Limitations set by bondholders on the actions of the Corporation.
- Negative Pledge Clause - the processing of giving unsecured debentures equal protection and when assets are mortgaged.
- Poison Put - a clause that obliges the borrower to repay the bond if a large quantity of stock is bought by single investor, which causes the firms bonds to beat down rated.

Bond Terminology

- Pay in kind (PIK) - a bond that makes regular interest payments, but in the early years of the bonds life the issuer can choose to pay interest in the form of either cash or more bonds with an equivalent face value.

Covenants

- Debt ratios:
  - Senior debt limits senior borrowing
  - Junior debt limits senior & junior borrowing
- Security:
  - Negative pledge
- Dividends
- Event risk
- Positive covenants:
  - Working capital
  - Net worth

Event Risk: An Example

October 1993 Marriott spun off its hotel management business worth 80% of its value.

Before the spin-off, Marriott's long-term book debt ratio was 2891/3644 = 79%. Almost all the debt remained with the parent (renamed Host Marriott), whose debt ratio therefore rose to 93%.

Marriott's stock price rose 13.8% and its bond prices declined by up to 30%.

Bondholders sued and Marriott modified its spinoff plan.

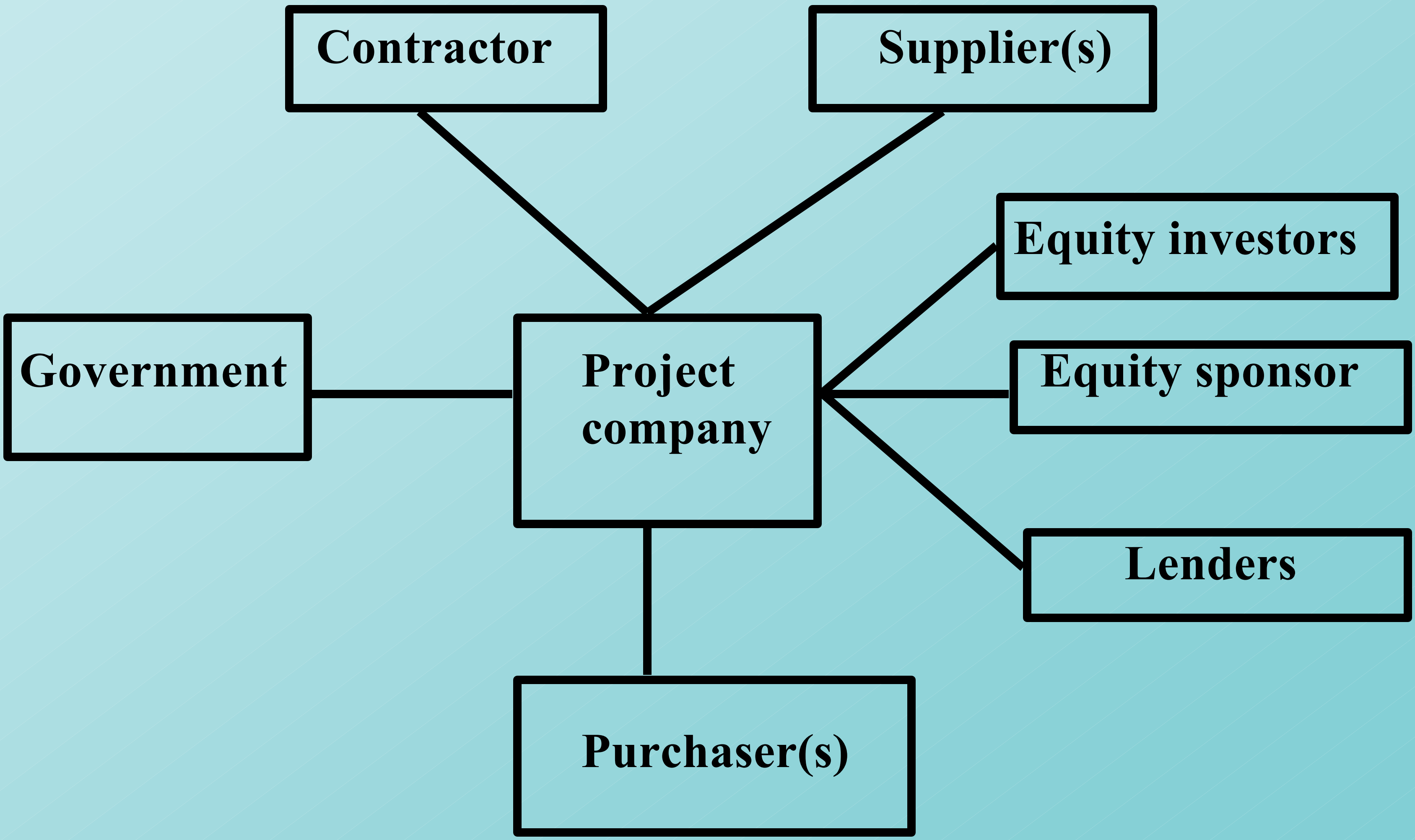
Project Finance

1. Project is set up as a separate company.

2. A major proportion of equity is held by project manager or contractor, so provision of finance and management are linked.

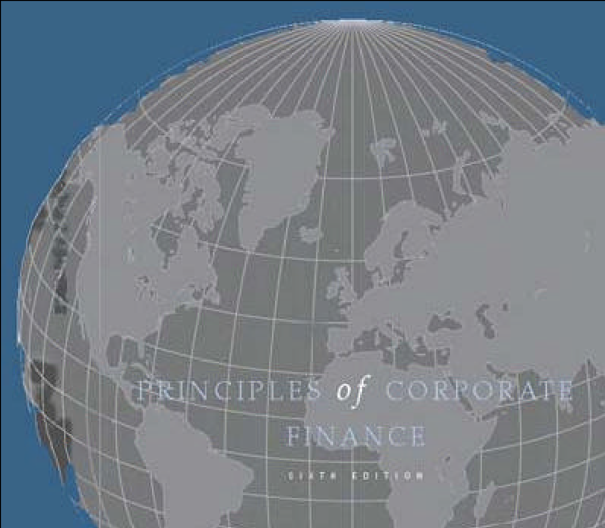
3. The company is highly levered.

Parties In Project Finance



Risk Allocation

Risk	Shifted to:	Contract
Completion/ continuing management	Sponsor	Management contract/ completion gtees / working capital maintenance
Construction cost	Contractor	Turnkey contract/ fixed price/ delay penalties
Raw materials	Supplier(s)	Long-term contract/ indexed prices/ supply or pay
Revenues	Purchaser(s)	Long-term contract/ indexed to costs/ take or pay/ throughput agreements/ tolling contract
Concession/regulation	Government	Concession agreement/ provision of supporting infrastructure
Currency convertibility	Government	Gtees or comfort letters/ hard currency paid to offshore escrow account



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

◆ Leasing

Chapter 25

Topics Covered

- What is a Lease?
- Why Lease?
- Operating Leases
- Valuing Financial Leases
- When Do Financial Leases Pay?

Lease Terms

- Operating Leases
- Financial Leases
  - Rental Lease
  - Net lease
  - Direct lease
  - Leveraged lease

Why Lease?

- Sensible Reasons for Leasing
  - ➔ Short-term leases are convenient
  - ➔ Cancellation options are valuable
  - ➔ Maintenance is provided
  - ➔ Standardization leads to low costs
  - ➔ Tax shields can be used
  - ➔ Avoiding the alternative minimum tax

Why Lease?

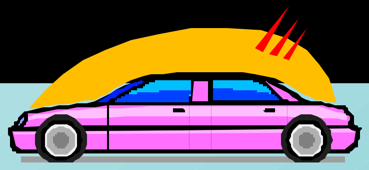
- Dubious Reasons for Leasing
  - ➔ Leasing avoids capital expenditure controls
  - ➔ Leasing preserves capital
  - ➔ Leases may be off balance sheet financing
  - ➔ Leasing effects book income

Operating Lease

Example

Acme Limo has a client who will sign a lease for 7 years, with lease payments due at the start of each year. The following table shows the NPV of the limo if Acme purchases the new limo for $75,000 and leases it our for 7 years.

Operating Lease



Example - cont

Acme Limo has a client who will sign a lease for 7 years, with lease payments due at the start of each year. The following table shows the NPV of the limo if Acme purchases the new limo for $75,000 and leases it our for 7 years.

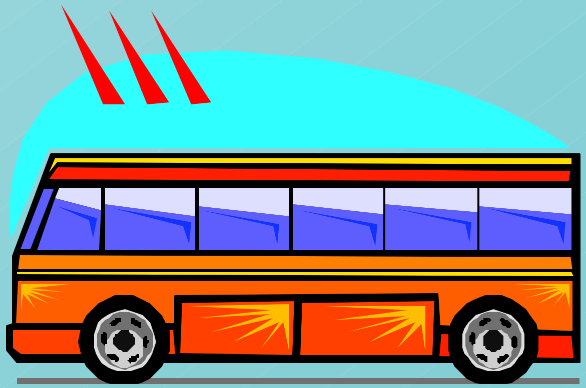
	Year						
	0	1	2	3	4	5	6
Initial cost	-75						
Maintenance, insurance, selling, and administrative costs	-12	-12	-12	-12	-12	-12	-12
Tax shield on costs	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Depreciation tax shield	0	5.25	8.4	5.04	3.02	3.02	1.51
Total	-82.8	-2.55	0.6	-2.76	-4.78	-4.78	-6.29
NPV @ 7% = - $98.15							
Break even rent(level)	26.18	26.18	26.18	26.18	26.18	26.18	26.18
Tax	-9.16	-9.16	-9.16	-9.16	-9.16	-9.16	-9.16
Break even rent after-tax	17.02	17.02	17.02	17.02	17.02	17.02	17.02
NPV @ 7% = - $98.15							

Financial Leases

Example

Greymore Bus Lines is considering a lease. Your operating manager wants to buy a new bus for \$100,000. The bus has an 8 year life. The bus saleswoman says she will lease Greymore the bus for 8 years at \$16,900 per year, but Greymore assumes all operating and maintenance costs.

Should Greymore buy or lease the bus?



Financial Leases

Example - cont

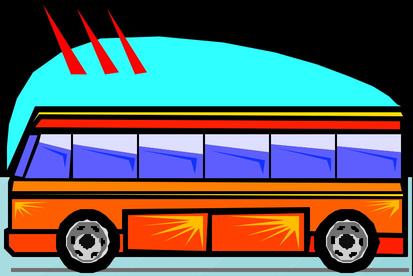
Greymore Bus Lines is considering a lease. Your operating manager wants to buy a new bus for $100,000. The bus has an 8 year life. The bus saleswoman says she will lease Greymore the bus for 8 years at $16,900 per year, but Greymore assumes all operating and maintenance costs.

Should Greymore buy or lease the bus?

Cash flow consequences of the lease contract to Greymore

	Year							
	0	1	2	3	4	5	6	7
Cost of new bus	100.00							
Lost Depr tax shield		(7.00)	(11.20)	(6.72)	(4.03)	(4.03)	(2.02)	-
Lease payment	(16.90)	(16.90)	(16.90)	(16.90)	(16.90)	(16.90)	(16.90)	(16.90)
Tax shield of lease	5.92	5.92	5.92	5.92	5.92	5.92	5.92	5.92
Cash flow of lease	89.02	(17.98)	(22.18)	(17.70)	(15.01)	(15.01)	(13.00)	(10.98)

Financial Leases



Example - cont

Greymore Bus Lines is considering a lease. Your operating manager wants to buy a new bus for $100,000. The bus has an 8 year life. The bus saleswoman says she will lease Greymore the bus for 8 years at $16,900 per year, but Greymore assumes all operating and maintenance costs.

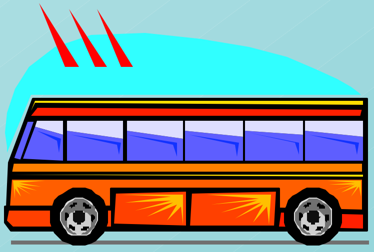
Should Greymore buy or lease the bus?

Cash flow consequences of the lease contract to Greymore:

- Greymore saves the $100,000 cost of the bus.
- Loss of depreciation benefit of owning the bus.
- $16,900 lease payment is due at the start of each year.
- Lease payments are tax deductible.

Financial Leases

Example - cont



Greymore Bus Lines Balance Sheet without lease

Greymore Bus Lines (figures in $1,000s)			
Bus	10	100	Loan secured by bus
All other assets	1000	450	Other loans
		550	Equity
Toital Assets	1100	1100	Total liabilities

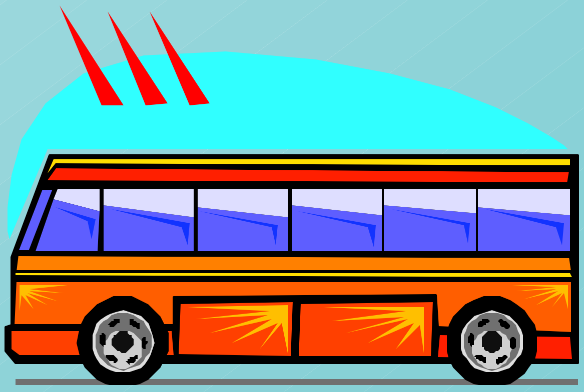
Equivalent lease balance sheet

Greymore Bus Lines (figures in $1,000s)			
Bus	10	100	Financial lease
All other assets	1000	450	Other loans
		550	Equity
Toital Assets	1100	1100	Total liabilities

Financial Leases

Example - cont

Greymore Bus Lines can borrow at 10%, thus the value of the lease should be discounted at 6.5% or .10 x (1-.35). The result will tell us if Greymore should lease or buy the bus.

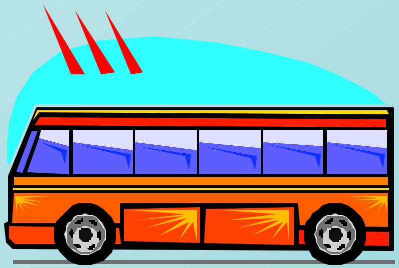


Financial Leases

Example - cont

Greymore Bus Lines can borrow at 10%, thus the value of the lease should be discounted at 6.5% or .10 x (1-.35). The result will tell us if Greymore should lease or buy the bus.

$$\text{NPV lease} = 89.02 - \frac{17.99}{1.065} - \frac{22.19}{(1.065)^2} - \frac{17.71}{(1.065)^3} - \frac{15.02}{(1.065)^4}$$



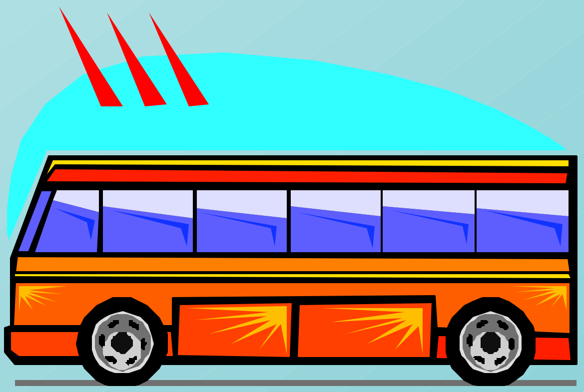
$$- \frac{15.02}{(1.065)^5} - \frac{13.00}{(1.065)^6} - \frac{10.98}{(1.065)^7}$$

$$= -.70 \text{ or } -\$700$$

Financial Leases

Example - cont

Greymore Bus Lines lease cash flows can also be thought of as loan equivalent cash flows.

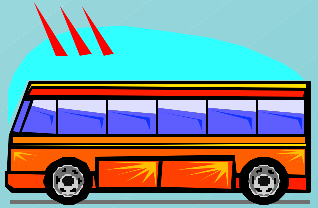


Financial Leases

Example - cont

Greymore Bus Lines lease cash flows can also be thought of as loan equivalent cash flows.

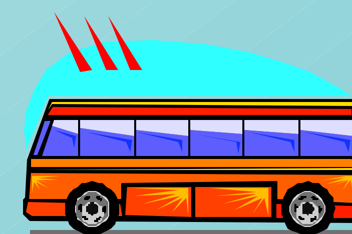
	Year							
	0	1	2	3	4	5	6	7
Amount borrowed at year end	89.72	77.56	60.42	46.64	34.66	21.89	10.31	0.00
Interest paid @ 10%		-8.97	-7.76	-6.04	-4.66	-3.47	-2.19	-1.03
Tax shield @ 35%		3.14	2.71	2.11	1.63	1.21	0.77	0.36
Interest paid after tax		-5.83	-5.04	-3.93	-3.03	-2.25	-1.42	-0.67
Principal repaid		-12.15	-17.14	-13.78	-11.99	-12.76	-11.58	-10.31
Net cash flow of equivalent loan	89.72	-17.99	-22.19	-17.71	-15.02	-15.02	-13.00	-10.98



Financial Leases

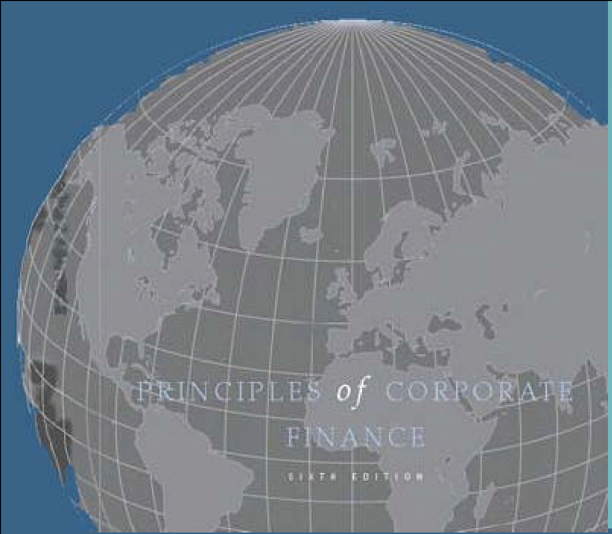
Example - cont

The Greymore Bus Lines lease cash flows can also be treated as a favorable financing alternative and valued using APV.



$$\text{APV} = \text{NPV of project} \quad \text{NPV of lease}$$

$$\text{APV} = -5{,}000 + 8{,}000 = \$3{,}000$$



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

Managing Risk

Chapter 26

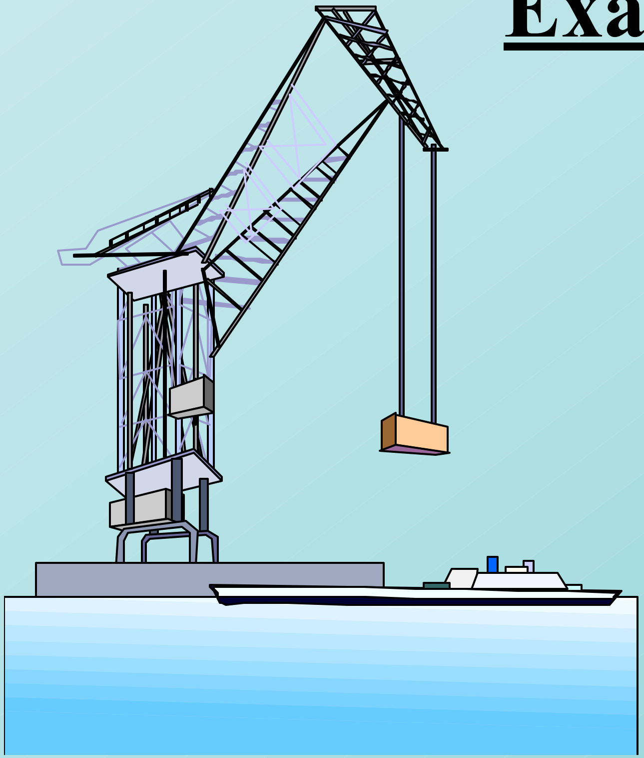
Topics Covered

- Insurance
- Hedging With Futures
- Speculating and Margin
- SWAPS

Insurance

- Most businesses face the possibility of a hazard that can bankrupt the company in an instant.
- These risks are neither financial or business and can not be diversified.
- The cost and risk of a loss due to a hazard, however, can be shared by others who share the same risk.

Insurance



Example

An offshore oil platform is valued at $1 billion. Expert meteorologist reports indicate that a 1 in 10,000 chance exists that the platform may be destroyed by a storm over the course of the next year.

How can the cost of this hazard be shared?

Insurance

<u>Example - cont.</u>

An offshore oil platform is valued at $1 billion. Expert meteorologist reports indicate that a 1 in 10,000 chance exists that the platform may be destroyed by a storm over the course of the next year.

How can the cost of this hazard be shared?

Answer:

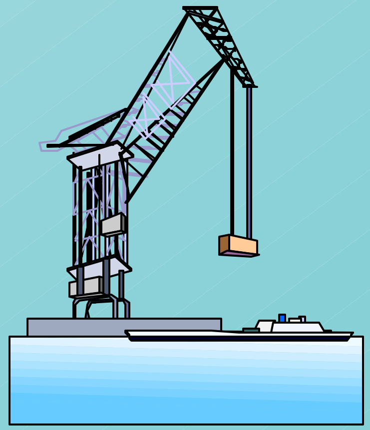
A large number of companies with similar risks can each contribute pay into a fund that is set aside to pay the cost should a member of this risk sharing group experience the 1 in 10,000 loss. The other 9,999 firms may not experience a loss, but also avoided the risk of not being compensated should a loss have occurred.

Insurance

<u>Example - cont.</u>

An offshore oil platform is valued at $1 billion. Expert meteorologist reports indicate that a 1 in 10,000 chance exists that the platform may be destroyed by a storm over the course of the next year.

What would the cost to each group member be for this protection?

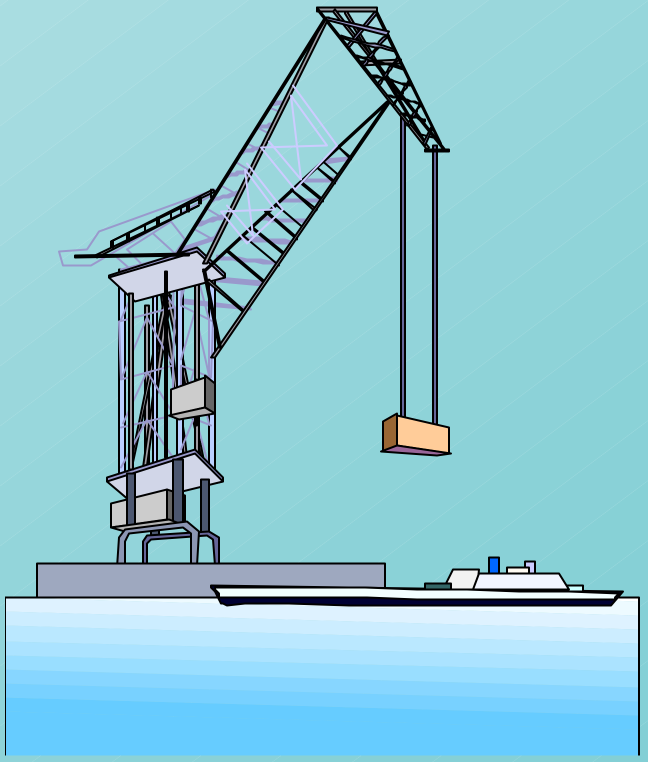


Answer:

$$\frac{1{,}000{,}000{,}000}{10{,}000} = \$100{,}000$$

Insurance

- Why would an insurance company not offer a policy on this oil platform for $100,000?
  - ➔ Administrative costs
  - ➔ Adverse selection
  - ➔ Moral hazard



Insurance

- The loss of an oil platform by a storm may be 1 in 10,000. The risk, however, is larger for an insurance company since all the platforms in the same area may be insured, thus if a storm damages one in may damage all in the same area. The result is a much larger risk to the insurer.

- Catastrophe Bonds - (CAT Bonds) Allow insurers to transfer their risk to bond holders by selling bonds whose cash flow payments depend on the level of insurable losses NOT occurring.

Hedging

Business has risk

Business Risk - variable costs

Financial Risk - Interest rate changes

Goal - Eliminate risk

HOW?

Hedging & Futures Contracts

Hedging

Ex - Kellogg produces cereal. A major component and cost factor is sugar.

- Forecasted income & sales volume is set by using a fixed selling price.
- Changes in cost can impact these forecasts.
- To fix your sugar costs, you would ideally like to purchase all your sugar today, since you like today's price, and made your forecasts based on it. But, you can not.
- You can, however, sign a contract to purchase sugar at various points in the future for a price negotiated today.
- This contract is called a "Futures Contract."
- This technique of managing your sugar costs is called "Hedging."

Hedging

1- Spot Contract - A contract for immediate sale & delivery of an asset.

2- Forward Contract - A contract between two people for the delivery of an asset at a negotiated price on a set date in the future.

3- Futures Contract - A contract similar to a forward contract, except there is an intermediary that creates a standardized contract. Thus, the two parties do not have to negotiate the terms of the contract.

The intermediary is the Commodity Clearing Corp (CCC). The CCC guarantees all trades & “provides” a secondary market for the speculation of Futures.

Types of Futures

<u>Commodity Futures</u>

-Sugar -Corn -OJ

-Wheat-Soy beans -Pork bellies

<u>Financial Futures</u>

-Tbills -Yen -GNMA

-Stocks -Eurodollars

<u>Index Futures</u>

-S&P 500 -Value Line Index

-Vanguard Index

Futures Contract Concepts

Not an actual sale

Always a winner & a loser (unlike stocks)

K are “settled” every day. (Marked to Market)

Hedge - K used to eliminate risk by locking in prices

Speculation - K used to gamble

Margin - not a sale - post partial amount

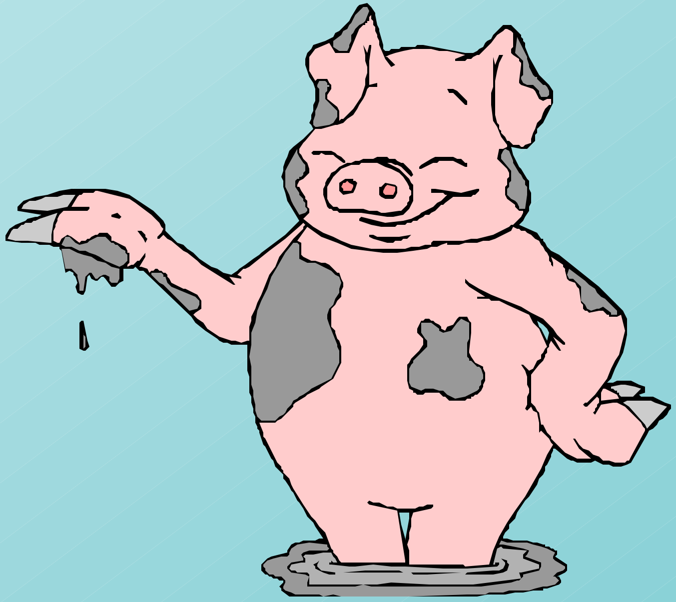
Hog K = 30,000 lbs

Tbill K = $1.0 mil

Value line Index K = $index x 500

Ex - Settlement & Speculate

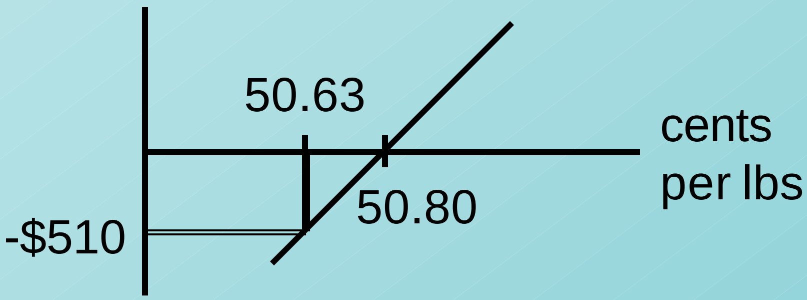
Example - You are speculating in Hog Futures. You think that the Spot Price of hogs will rise in the future. Thus, you go Long on 10 Hog Futures. If the price drops .17 cents per pound ($.0017) what is total change in your position?

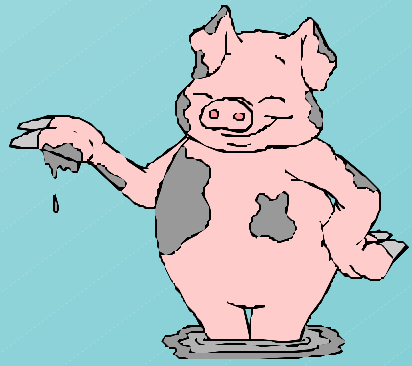


Ex - Settlement & Speculate

<u>Example -</u> You are speculating in Hog Futures. You think that the Spot Price of hogs will rise in the future. Thus, you go Long on 10 Hog Futures. If the price drops .17 cents per pound ($.0017) what is total change in your position?

30,000 lbs x $.0017 loss x 10 Ks = $510.00 loss





Since you must settle your account every day, you must give your broker $510.00

Commodity Hedge

In June, farmer John Smith expects to harvest 10,000 bushels of corn during the month of August. In June, the September corn futures are selling for $2.94 per bushel (1K = 5,000 bushels). Farmer Smith wishes to lock in this price.

Show the transactions if the Sept spot price drops to $2.80.

Commodity Hedge

In June, farmer John Smith expects to harvest 10,000 bushels of corn during the month of August. In June, the September corn futures are selling for $2.94 per bushel (1K = 5,000 bushels). Farmer Smith wishes to lock in this price.

Show the transactions if the Sept spot price drops to $2.80.

Revenue from Crop: 10,000 x 2.80	28,000
June: Short 2K @ 2.94 = 29,400	
Sept: Long 2K @ 2.80 = 28,000	
Gain on Position-------------------------------	1,400
Total Revenue	**$ 29,400**

Commodity Hedge

In June, farmer John Smith expects to harvest 10,000 bushels of corn during the month of August. In June, the September corn futures are selling for $2.94 per bushel (1K = 5,000 bushels). Farmer Smith wishes to lock in this price.

Show the transactions if the Sept spot price rises to $3.05.

Commodity Hedge

In June, farmer John Smith expects to harvest 10,000 bushels of corn during the month of August. In June, the September corn futures are selling for $2.94 per bushel (1K = 5,000 bushels). Farmer Smith wishes to lock in this price.

Show the transactions if the Sept spot price rises to $3.05.

Revenue from Crop: 10,000 x 3.05 30,500

June: Short 2K @ 2.94 = 29,400

Sept: Long 2K @ 3.05 = 30,500 .

Loss on Position------------------------------- (1,100)

Total Revenue $ 29,400

Commodity Speculation

You have lived in NYC your whole life and are independently wealthy. You think you know everything there is to know about pork bellies (uncurred bacon) because your butler fixes it for you every morning. Because you have decided to go on a diet, you think the price will drop over the next few months. On the CME, each PB K is 38,000 lbs. Today, you decide to short three May Ks @ 44.00 cents per lbs. In Feb, the price rises to 48.5 cents and you decide to close your position. What is your gain/loss?

Commodity Speculation

You have lived in NYC your whole life and are independently wealthy. You think you know everything there is to know about pork bellies (uncurred bacon) because your butler fixes it for you every morning. Because you have decided to go on a diet, you think the price will drop over the next few months. On the CME, each PB K is 38,000 lbs. Today, you decide to short three May Ks @ 44.00 cents per lbs. In Feb, the price rises to 48.5 cents and you decide to close your position. What is your gain/loss?

Nov: Short 3 May K (.4400 x 38,000 x 3) = + 50,160

Feb: Long 3 May K (.4850 x 38,000 x 3) = - 55,290

Loss of 10.23 % = - 5,130

Margin

- The amount (percentage) of a Futures Contract Value that must be on deposit with a broker.
- Since a Futures Contract is not an actual sale, you need only pay a fraction of the asset value to <u>open</u> a position = margin.
- CME margin requirements are 15%
- Thus, you can control $100,000 of assets with only $15,000.

Commodity Speculation with margin

You have lived in NYC your whole life and are independently wealthy. You think you know everything there is to know about pork bellies (uncurred bacon) because your butler fixes it for you every morning. Because you have decided to go on a diet, you think the price will drop over the next few months. On the CME, each PB K is 38,000 lbs. Today, you decide to short three May Ks @ 44.00 cents per lbs. In Feb, the price rises to 48.5 cents and you decide to close your position. What is your gain/loss?

Commodity Speculation with margin

You have lived in NYC your whole life and are independently wealthy. You think you know everything there is to know about pork bellies (uncurred bacon) because your butler fixes it for you every morning. Because you have decided to go on a diet, you think the price will drop over the next few months. On the CME, each PB K is 38,000 lbs. Today, you decide to short three May Ks @ 44.00 cents per lbs. In Feb, the price rises to 48.5 cents and you decide to close your position. What is your gain/loss?

Nov: Short 3 May K (.4400 x 38,000 x 3) = + 50,160

Feb: Long 3 May K (.4850 x 38,000 x 3) = - 55,290

Loss = - 5,130

$$\frac{\text{Loss}}{\text{Margin}} = \frac{5130}{50160 \times .15} = \frac{5130}{7524} = 68\%\ \text{loss}$$

SWAPS

Birth 1981

Definition - An agreement between two firms, in which each firm agrees to exchange the "interest rate characteristics" of two different financial instruments of identical principal

<u>Key points</u>

Spread inefficiencies

Same notation principle

Only interest exchanged

SWAPS

- “Plain Vanilla Swap” - (generic swap)
- fixed rate payer
- floating rate payer
- counterparties
- settlement date
- trade date
- effective date
- terms

- Swap Gain = fixed spread - floating spread

SWAPS

example (vanilla/annually settled)

	XYZ	ABC
fixed rate	10%	11.5%
floating rate	libor + .25	libor + .50

Q: if libor = 7%, what swap can be made 7 what is the profit (assume $1mil face value loans)

A:

XYZ borrows $1mil @ 10% fixed

ABC borrows $1mil @ 7.5% floating

XYZ pays floating @ 7.25%

ABC pays fixed @ 10.50%

SWAPS

<u>example - cont.</u>

Benefit to XYZ	Net position
floating +7.25 -7.25	0
<u>fixed +10.50 -10.00</u>	<u>+.50</u>
Net gain	+.50%

Benefit ABC	Net Position
floating +7.25 - 7.50	-.25
<u>fixed -10.50 + 11.50</u>	<u>+1.00</u>
net gain	+.75%

SWAPS

example - cont.

Settlement date

ABC pmt 10.50 x 1mil	= 105,000
XYZ pmt 7.25 x 1mil	= 72,500
net cash pmt by ABC	= 32,500

if libor rises to 9%

settlement date

ABC pmt 10.50 x 1mil	= 105,000
XYZ pmt 9.25 x 1mil	= 92,500
net cash pmt by ABC	= 12,500

SWAPS

- transactions
- rarely done direct
- banks = middleman
- bank profit = part of "swap gain"

<u>example - same continued</u>

XYZ & ABC go to bank separately

XYZ term = SWAP floating @ libor + .25 for fixed @ 10.50

ABC terms = swap floating libor + .25 for fixed 10.75

SWAPS

example - cont.

settlement date - XYZ

Bank pmt 10.50 x 1mil = 105,000

XYZ pmt 7.25 x 1mil = 72,500

net Bank pmt to XYZ = 32,500

settlement date - ABC

Bank pmt 7.25 x 1mil = 72,500

ABC pmt 10.75 x 1mil = 107,500

net ABC pmt to bank = 35,000

bank "swap gain" = +35,000 - 32,500 = +2,500

SWAPS

<u>example - cont.</u>

<u>benefit to XYZ</u>

floating 7.25 - 7.25 = 0

fixed 10.50 - 10.00 = +.50 net gain .50

<u>benefit to ABC</u>

floating 7.25 - 7.50 = - .25

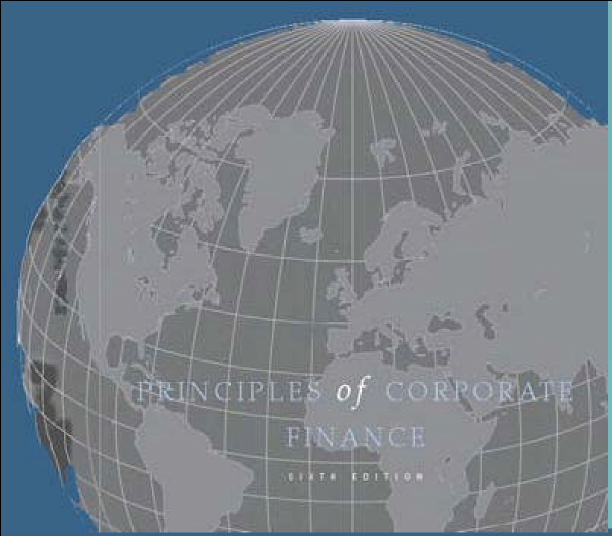
fixed -10.75 + 11.50 = + .75 net gain .50

<u>benefit to bank</u>

floating +7.25 - 7.25 = 0

fixed 10.75 - 10.50 = +.25 net gain +.25

total benefit = 12,500 (same as w/o bank)



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

Managing International Risk

Chapter 27

Topics Covered

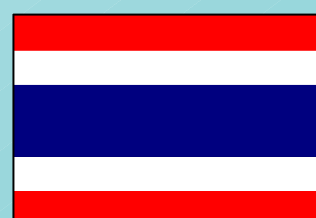
- Foreign Exchange Markets
- Some Basic Relationships
- Hedging Currency Risk
- Exchange Risk and International Investment Decisions

Foreign Exchange Markets

<u>Exchange Rate</u> - Amount of one currency needed to purchase one unit of another.

<u>Spot Rate of Exchange</u> - Exchange rate for an immediate transaction.

<u>Forward Exchange Rate</u> - Exchange rate for a forward transaction.



Foreign Exchange Markets

Forward Premiums and Forward Discounts

Example - The yen spot price is 112.645 yen per dollar and the 6 month forward rate is 111.300 yen per dollar, what is the premium and discount relationship?

¥

Foreign Exchange Markets

Forward Premiums and Forward Discounts

Example - The yen spot price is 112.645 yen per dollar and the 6 month forward rate is 111.300 yen per dollar, what is the premium and discount relationship?

$$\frac{\text{Forward Price} - \text{Spot Price}}{\text{Spot Price}} = \text{Premium or (-Discount)}$$

$$4 \times \frac{112.645 - 111.300}{111.300} \text{ x } 100 = 4.8\%$$

¥

Foreign Exchange Markets

Forward Premiums and Forward Discounts

Example - The yen spot price is 112.645 yen per dollar and the 6 month forward rate is 111.300 yen per dollar, what is the premium and discount relationship?

Answer - The dollar is selling at a 4.8% premium, relative to the yen. The yen is selling at a 4.8% discount, relative to the dollar.

Exchange Rate Relationships

- Basic Relationships

$$\boxed{\frac{1 + r_{foreign}}{1 + r_{\$}}} \quad \text{equals} \quad \boxed{\frac{1 + i_{foreign}}{1 + i_{\$}}}$$

equals equals

$$\boxed{\frac{f_{foreign/\$}}{S_{foreign/\$}}} \quad \text{equals} \quad \boxed{\frac{E(s_{foreign/\$})}{S_{foreign/\$}}}$$

Exchange Rate Relationships

1) Interest Rate Parity Theory

$$\frac{1 + r_{foreign}}{1 + r_{\$}} = \frac{f_{foreign/\$}}{S_{foreign/\$}}$$

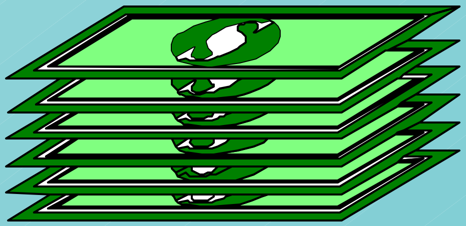
- The ratio between the risk free interest rates in two different countries is equal to the ratio between the forward and spot exchange rates.

Exchange Rate Relationships

Example - You have the opportunity to invest $1,000,000 for one year. All other things being equal, you have the opportunity to obtain a 1 year Japanese bond (in yen) @ 0.25 % or a 1 year US bond (in dollars) @ 5%. The spot rate is 112.645 yen:$1 The 1 year forward rate is 107.495 yen:$1

Which bond will you prefer and why?

Ignore transaction costs.



Exchange Rate Relationships

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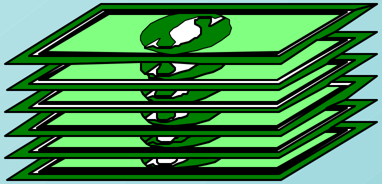
Which bond will you prefer and why? Ignore transaction costs.

Value of US bond = $100,000 x 1.05 = $105,000



Exchange Rate Relationships

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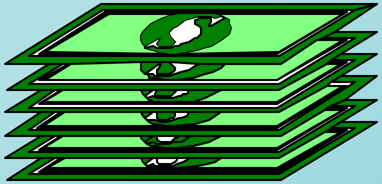
Which bond will you prefer and why? Ignore transaction costs

Value of US bond = $100,000 x 1.05 = $105,000

Value of Japan bond = $100,000 x 112.645 = 112,645,000 yen exchange



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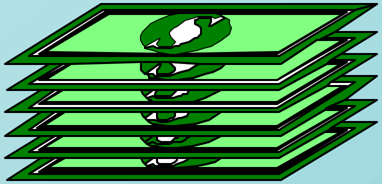
Which bond will you prefer and why? Ignore transaction costs

Value of US bond = $100,000 x 1.05 = $105,000

Value of Japan bond = $100,000 x 112.645 = 112,645,000 yen exchange

112,645,000 yen x 1.08 = 112,927,000 yen bond pmt



Exchange Rate Relationships

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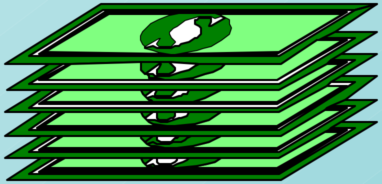
Which bond will you prefer and why? Ignore transaction costs

Value of US bond = $100,000 x 1.05 = $105,000

Value of Japan bond = $100,000 x 112.645 = 112,645,000 yen exchange

112,645,000 yen x 1.08 = 112,927,000 yen bond pmt



112,927,000 yen / 107.495 = $1,050,500 exchange

Exchange Rate Relationships

2) Expectations Theory of Exchange Rates

$$\frac{f_{\text{foreign}/\$}}{S_{\text{foreign}/\$}} = \frac{E(s_{\text{foreign}/\$})}{S_{\text{foreign}/\$}}$$

Theory that the expected spot exchange rate equals the forward rate.

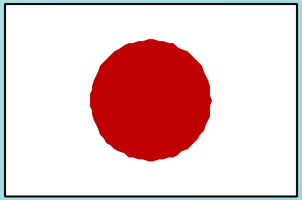
Exchange Rate Relationships

3) Purchasing Power Parity

$$\frac{1 + i_{\text{foreign}}}{1 + i_{\$}} = \frac{E(s_{\text{foreign}/\$})}{S_{\text{foreign}/\$}}$$

The expected change in the spot rate equals the expected difference in inflation between the two countries.

Exchange Rate Relationships



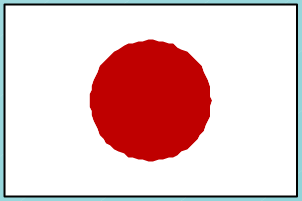
Example

If inflation in the US is forecasted at 2.0% this year and Japan is forecasted to fall 2.5%, what do we know about the expected spot rate?

Given a spot rate of 112.645yen:$1

Exchange Rate Relationships

Example - If inflation in the US is forecasted at 2.0% this year and Japan is forecasted to fall 2.5%, what do we know about the expected spot rate?

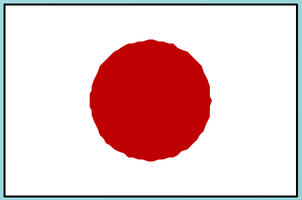


Given a spot rate of 112.645yen:$1

$$\frac{1+\mathrm{i}_{\text{foreign}}}{1+\mathrm{i}_{\$}} = \frac{E(s_{\text{foreign/\$}})}{S_{\text{foreign/\$}}}$$

Exchange Rate Relationships

Example - If inflation in the US is forecasted at 2.0% this year and Japan is forecasted to fall 2.5%, what do we know about the expected spot rate?



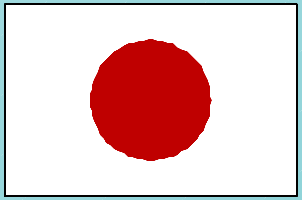
Given a spot rate of 112.645yen:$1

$$\frac{1+i_{\text{foreign}}}{1+i_{\$}} = \frac{E(s_{\text{foreign/\$}})}{S_{\text{foreign/\$}}}$$

$$\frac{1-.025}{1+.02} = \frac{E(s_{\text{foreign/\$}})}{112.645}$$

Exchange Rate Relationships

Example - If inflation in the US is forecasted at 2.0% this year and Japan is forecasted to fall 2.5%, what do we know about the expected spot rate?



Given a spot rate of 112.645yen:$1

$$\frac{1+i_{foreign}}{1+i_{\$}} = \frac{E(s_{foreign/\$})}{S_{foreign/\$}}$$

$$\frac{1-.025}{1+.02} = \frac{E(s_{foreign/\$})}{112.645}$$

solve for *Es*

***Es* = 107.68**

Exchange Rate Relationships

4) International Fisher effect

$$\frac{1 + r_{foreign}}{1 + r_{\$}} = \frac{1 + i_{foreign}}{1 + i_{\$}}$$

The expected difference in inflation rates equals the difference in current interest rates.

Also called common real interest rates.

Exchange Rate Relationships

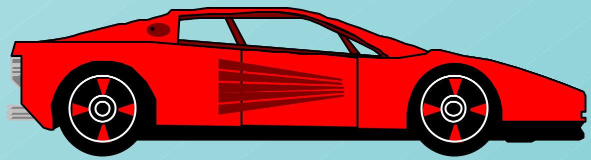
Example - The real interest rate in each country is about the same.

$$r(real) = \frac{1 + r_{foreign}}{1 + i_{foreign}} = \frac{1.0025}{.975} = .028$$

$$r(real) = \frac{1 + r_{\$}}{1 + i_{\$}} = \frac{1.05}{1.02} = .029$$

Exchange Rate Risk

Example - Honda builds a new car in Japan for a cost + profit of 1,715,000 yen. At an exchange rate of 101.18:$1 the car sells for $16,950 in Baltimore. If the dollar rises in value, against the yen, to an exchange rate of 105:$1, what will be the price of the car?



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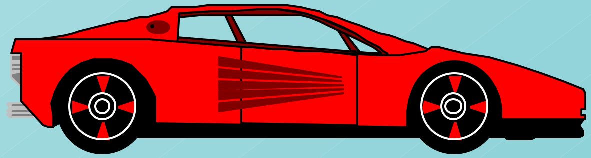
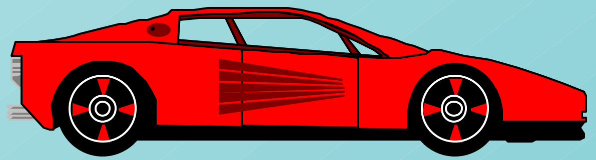


$$\frac{\mathbf{1{,}715{,}000}}{\mathbf{105}} = \mathbf{\$16{,}333}$$

Exchange Rate Risk

Example - Honda builds a new car in Japan for a cost + profit of 1,715,000 yen. At an exchange rate of 101.18:$1 the car sells for $16,950 in Baltimore. If the dollar rises in value, against the yen, to an exchange rate of 105:$1, what will be the price of the car?



$$\frac{\mathbf{1{,}715{,}000}}{\mathbf{105}} = \mathbf{\$16{,}333}$$

Conversely, if the yen is trading at a forward discount, Japan will experience a decrease in purchasing power.

Exchange Rate Risk

Example - Harley Davidson builds a motorcycle for a cost plus profit of $12,000. At an exchange rate of 101.18:$1, the motorcycle sells for 1,214,160 yen in Japan. If the dollar rises in value and the exchange rate is 105:$1, what will the motorcycle cost in Japan?

Exchange Rate Risk

Example - Harley Davidson builds a motorcycle for a cost plus profit of $12,000. At an exchange rate of 101.18:$1, the motorcycle sells for 1,214,160 yen in Japan. If the dollar rises in value and the exchange rate is 105:$1, what will the motorcycle cost in Japan?

$12,000 x 105 = 1,260,000 yen (3.78% rise)

Exchange Rate Risk

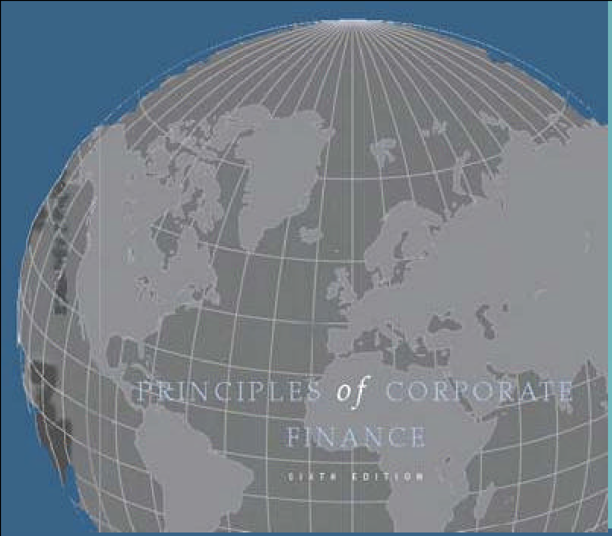
- Currency Risk can be reduced by using various financial instruments.

- Currency forward contracts, futures contracts, and even options on these contracts are available to control the risk.

Capital Budgeting

Techniques

1) Exchange to $ and analyze.
2) Discount using foreign cash flows and interest rates, then exchange to $.
3) Choose a currency standard ($) and hedge all non dollar CF.



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

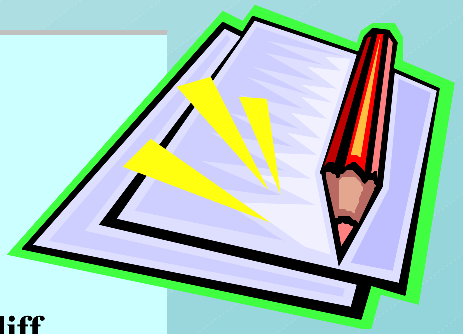
◆ Financial Analysis and Planning

Chapter 28

Topics Covered

- Executive Paper Corporation
- Financial Ratios
- The DuPont System
- Financial Planning
- Growth and External Financing

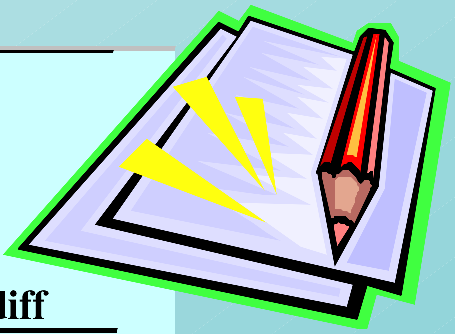
Executive Paper



Executive Paper Balance Sheet

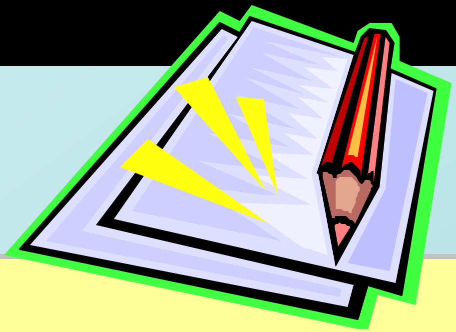
	Dec 1998	Dec 1999	diff
Assets			
Current Assets			
Cash & Securities	100.0	110.0	10.0
Receivables	433.1	440.0	6.9
Inventory	339.9	350.0	10.1
Total	873.0	900.0	27.0
Fixed Assets			
P, P, E	929.8	100.0	-829.8
accum Depr	396.7	450.0	53.3
Net Fixed Assets	533.1	550.0	16.9
Total Assets	1,406.1	1,450.0	43.9

Executive Paper



	Dec 1998	Dec 1999	diff
Liabilities and Equity			
Current Liabilities			
Debt due in 1 year	96.6	100.0	3.4
Payable	349.9	360.0	10.1
Total current liabilities	446.5	460.0	13.5
Long term debt	400.0	400.0	0.0
Shareholders equity	559.6	590.0	30.4
Total liabilities and equity	1,406.1	1,450.0	43.9

Executive Paper



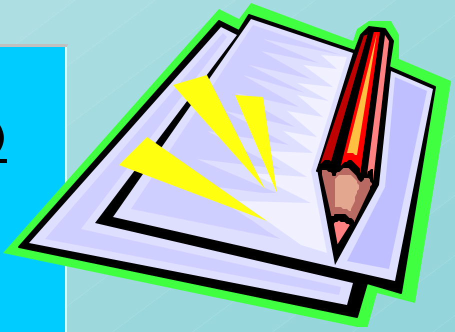
Executive Paper - Other Data	***1998***	***1999***
Estimated repalcement cost of assets	1110	1231
Market value of equity	598	708
Average number of shares, millions	14.16	14.16
Share price, dollars	42.25	50

Executive Paper

Executive Paper Income Statement (1999)

	$ millions
Revenues	2,200.00
Costs	1,980.00
Depreciation	53.30
EBIT	166.70
Interest	40.00
Tax	50.70
Net income	***76.00***
Dividend	45.60
Retained earnings	30.40
Earnings per share, dollars	5.37
Dividend per share, dollars	3.22

Executive Paper



Executive Paper Sources and Uses of Funds (1999)

Sources:	**$ millions**
Net Income	76.00
Depreciation	53.30
Operating cash flow	129.30
Borrowing	-
Stock issues	-
Total sources	**129.30**

Uses:	
Increase in net working capital	13.50
Investment	70.20
Dividends	45.60
Total uses	**129.30**

Leverage Ratios

$$\text{Long term debt ratio} = \frac{\text{long term debt}}{\text{long term debt} + \text{equity}}$$

$$\text{Debt equity ratio} = \frac{\text{long term debt} + \text{value of leases}}{\text{equity}}$$

Leverage Ratios

$$\text{Total debt ratio} = \frac{\text{total liabilities}}{\text{total assets}}$$

$$\text{Times interest earned} = \frac{\text{EBIT}}{\text{interest payments}}$$

$$\text{Cash cover age ratio} = \frac{\text{EBIT} + \text{depreciation}}{\text{interest payments}}$$

Liquidity Ratios

$$\text{Net working capital to total assets ratio} = \frac{\text{Net working capital}}{\text{Total assets}}$$

$$\text{Current ratio} = \frac{\text{current assets}}{\text{current liabilities}}$$

Liquidity Ratios

$$\text{Quick ratio} = \frac{\text{cash} + \text{marketable securities} + \text{receivables}}{\text{current liabilities}}$$

$$\text{Cash ratio} = \frac{\text{cash} + \text{marketable securities}}{\text{current liabilities}}$$

$$\text{Interval measure} = \frac{\text{cash} + \text{marketable securities} + \text{receivables}}{\text{average daily expenditures from operations}}$$

Efficiency Ratios

$$\text{Asset turnover ratio} = \frac{\text{Sales}}{\text{Average total assets}}$$

$$\text{NWCturnover} = \frac{\text{sales}}{\text{average net working capital}}$$

Efficiency Ratios

$$\text{Inventory turnover ratio} = \frac{\text{cost of goods sold}}{\text{average inventory}}$$

$$\text{Days' sales in inventory} = \frac{\text{average inventory}}{\text{cost of goods sold} \;/\; 365}$$

$$\text{Average collection period} = \frac{\text{average receivables}}{\text{average daily sales}}$$

Profitability Ratios

$$\text{Net profit margin} = \frac{\text{EBIT} - \text{tax}}{\text{sales}}$$

$$\text{Return on assets} = \frac{\text{EBIT} - \text{tax}}{\text{average total assets}}$$

$$\text{Return on equity} = \frac{\text{earnings available for common stock}}{\text{average equity}}$$

Profitability Ratios

$$\text{Payout ratio} = \frac{\text{dividends}}{\text{earnings}}$$

$$\text{Plowback ratio} = \frac{\text{earnings} - \text{dividends}}{\text{earnings}}$$

$$= 1 - \text{payout ratio}$$

$$\text{Growth in equity from plowback} = \frac{\text{earnings} - \text{dividends}}{\text{earnings}}$$

Market Value Ratios

$$\text{PE Ratio} = \frac{\text{stock price}}{\text{earnings per share}}$$

$$\text{Forecasted PE ratio} = \frac{P_0}{\text{aveEPS}_1} = \frac{\text{Div}_1}{\text{EPS}_1} \times \frac{1}{r - g}$$

$$\text{Dividend yield} = \frac{\text{dividend per share}}{\text{stock price}}$$

Market Value Ratios

$$\text{Price per share} = P_0 = \frac{Div_1}{r - g}$$

$$\text{Market to book ratio} = \frac{\text{stock price}}{\text{book value per share}}$$

$$\text{Tobins Q} = \frac{\text{market value of assets}}{\text{estimated replcement cost}}$$

The DuPont System

- A breakdown of ROE and ROA into component ratios:

$$\text{ROA} = \frac{\text{EBIT} - \text{taxes}}{\text{assets}}$$

$$\text{ROE} = \frac{\text{earnings available for common stock}}{\text{equity}}$$

The DuPont System

$$ROA = \frac{\text{sales}}{\text{assets}} \times \frac{\text{EBIT} - \text{taxes}}{\text{sales}}$$

The DuPont System

$$\text{ROA} = \frac{\text{sales}}{\text{assets}} \times \frac{\text{EBIT} - \text{taxes}}{\text{sales}}$$

asset
turnover

profit
margin

The DuPont System

$$\text{ROE} = \frac{\text{assets}}{\text{equity}} \times \frac{\text{sales}}{\text{assets}} \times \frac{\text{EBIT} - \text{taxes}}{\text{sales}} \times \frac{\text{EBIT} - \text{taxes} - \text{interest}}{\text{EBIT} - \text{taxes}}$$

The DuPont System

$$\text{ROE} = \frac{\text{assets}}{\text{equity}} \times \frac{\text{sales}}{\text{assets}} \times \frac{\text{EBIT} - \text{taxes}}{\text{sales}} \times \frac{\text{EBIT} - \text{taxes} - \text{interest}}{\text{EBIT} - \text{taxes}}$$

leverage ratio

asset turnover

profit margin

debt burden

Principles of Corporate Finance

Brealey and Myers

Sixth Edition

◆ Short Term Financial Planning

Chapter 29

Topics Covered

- Working Capital
- Links Between Long-Term and Short-Term Financing
- Tracing Changes in Cash and Working Capital
- Cash Budgeting
- A Short-Term Financing Plan

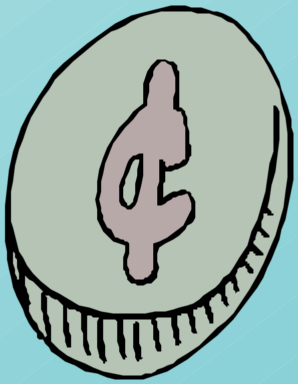
Working Capital

Net Working Capital - Current assets minus current liabilities. Often called working capital.

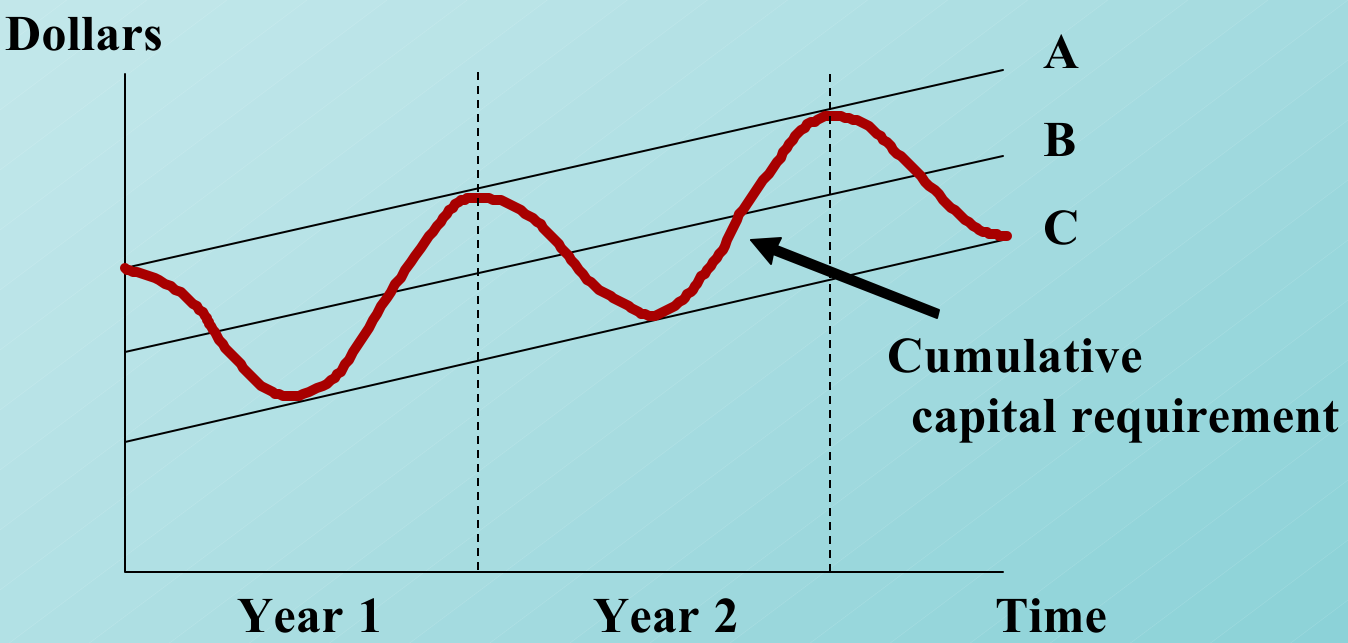
Cash Conversion Cycle - Period between firm's payment for materials and collection on its sales.

Carrying Costs - Costs of maintaining current assets, including opportunity cost of capital.

Shortage Costs - Costs incurred from shortages in current assets.



Firm’s Cumulative Capital Requirement



Lines A, B, and C show alternative amounts of long-term finance.

Strategy A: A permanent cash surplus
Strategy B: Short-term lender for part of year and borrower for remainder
Strategy C: A permanent short-term borrower

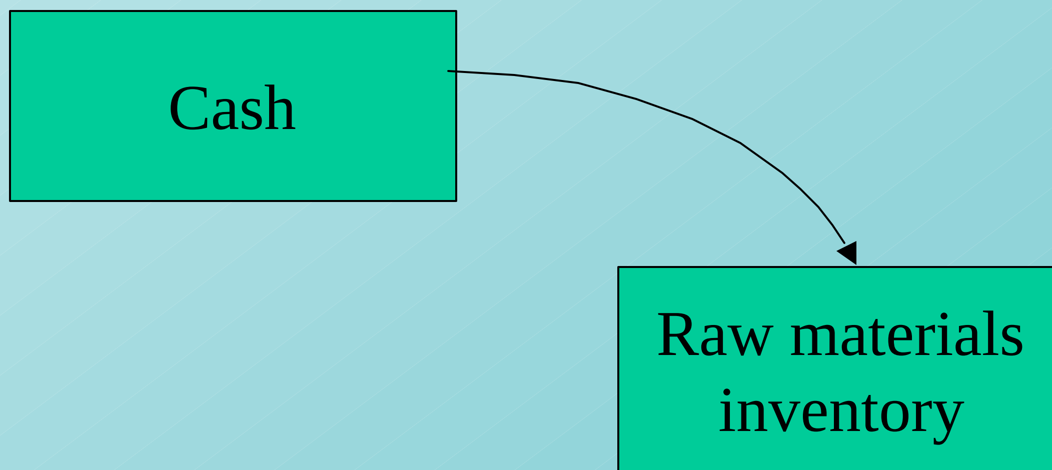
Working Capital

Simple Cycle of operations

Cash

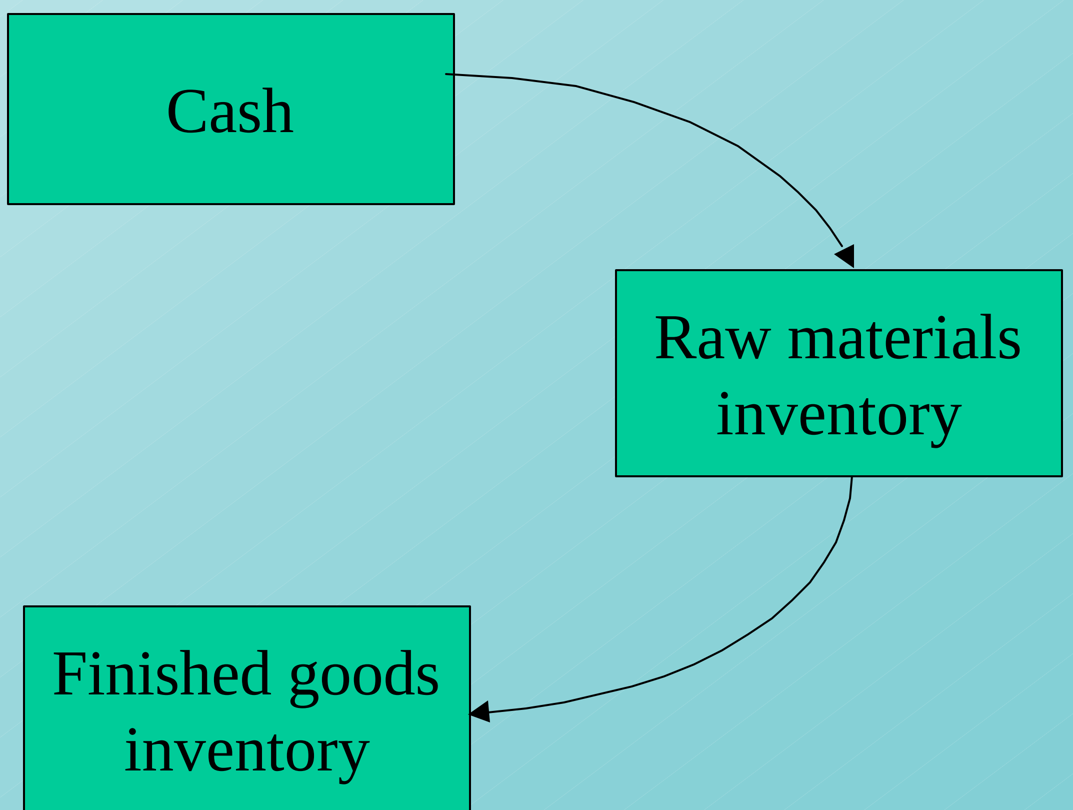
Working Capital

Simple Cycle of operations



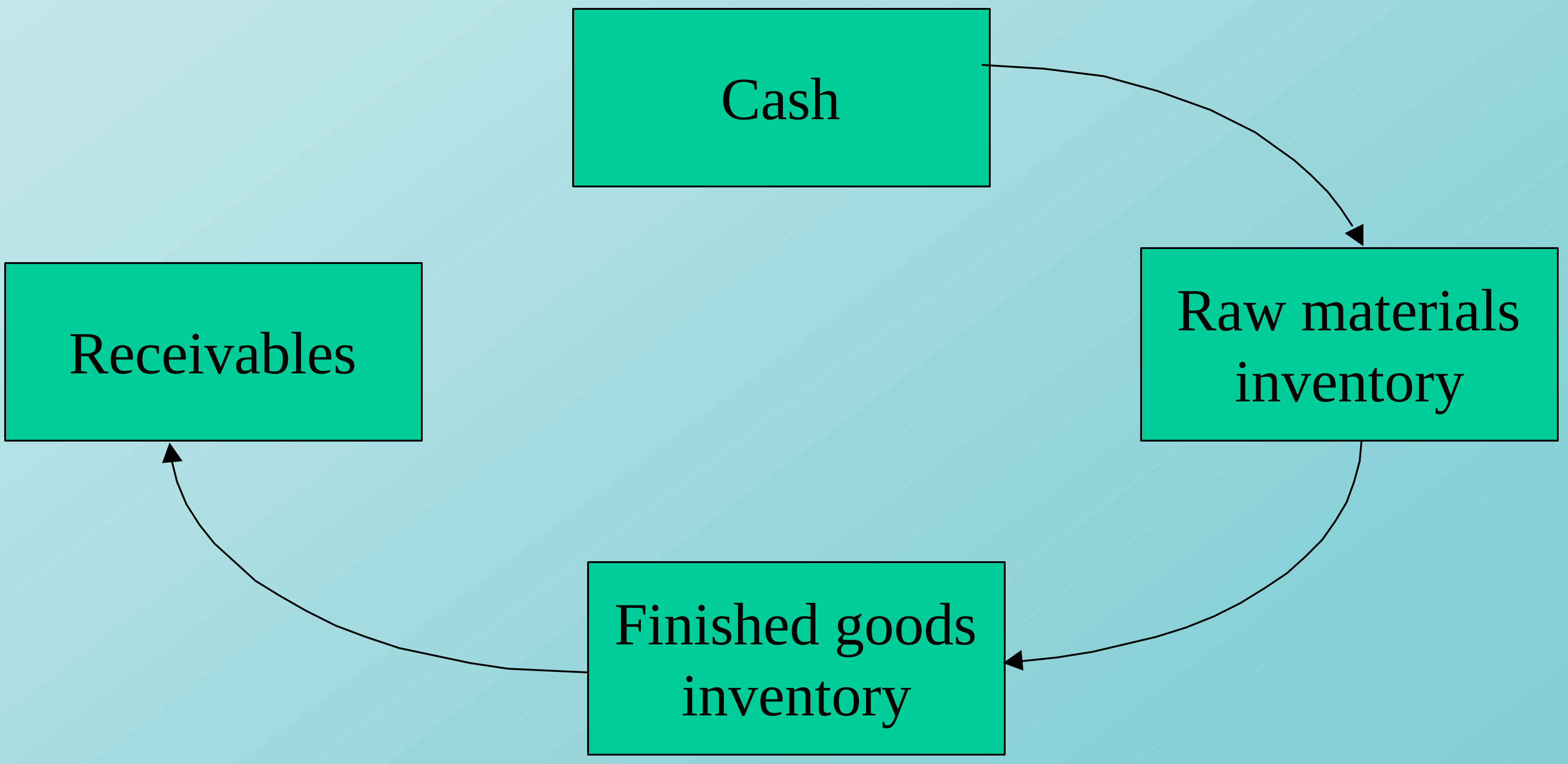
Working Capital

Simple Cycle of operations



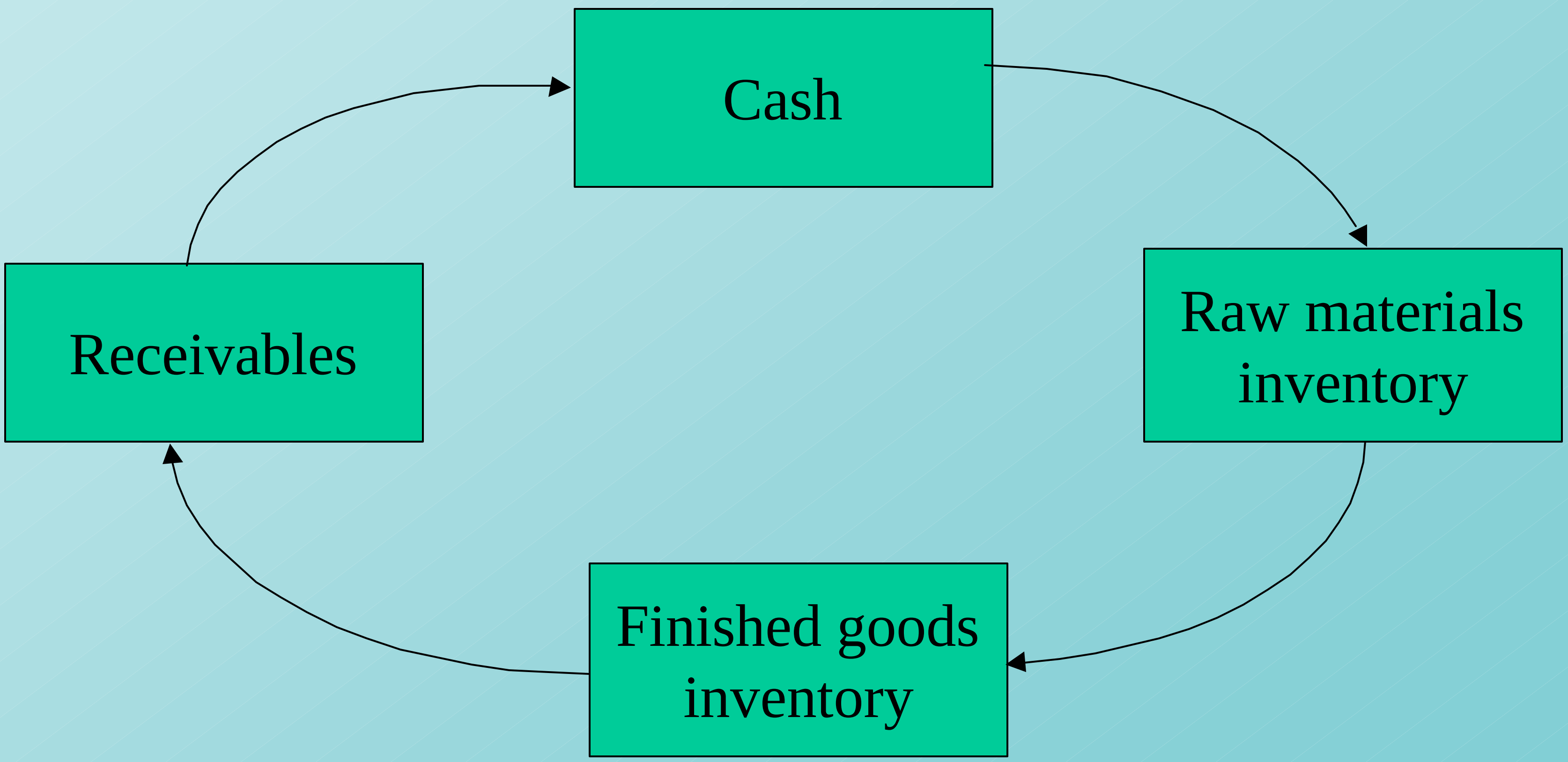
Working Capital

Simple Cycle of operations



Working Capital

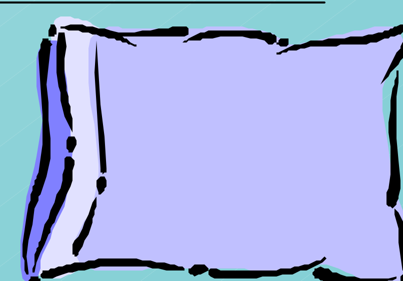
Simple Cycle of operations



Changes in Cash & W.C.

Example - Dynamic Mattress Company

Assets	1998	1999	Liabilities & Equity	1998	1999
Current Assets	4	5	Current Liabilities		
Cash	4	5	Bank Loans	5	0
Mark Securities	0	5	Accts Payable	20	27
Inventory	26	25	Total Curr Liab	25	27
Accts Recv	25	30	Long Term Debt	5	12
Total Curr Assets	55	65	Net Worth	65	76
Fixed Assets					
Gross investment	56	70			
less Depr	16	20			
Net Fixed Assets	40	50	Total Liab and		
Total Assets	95	115	owner's equity	95	115



Changes in Cash & W.C.

Example - Dynamic Mattress Company

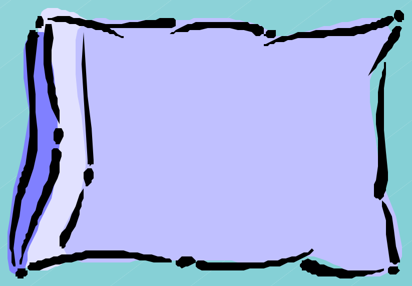
Income Statement

Sales	$350
Operating Costs	321
Depreciation	4
EBIT	25
Interest	1
Pretax income	24
. Tax at 50%	12
Net Income	$12

Assume

dividend = $1 mil

R.E.=$11 mil



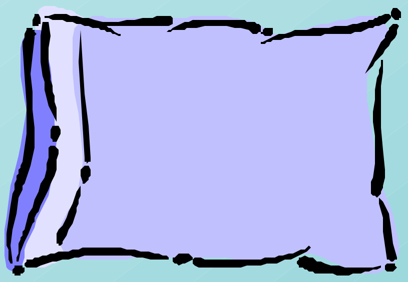
Changes in Cash & W.C.

Example -

Dynamic

Mattress

Company



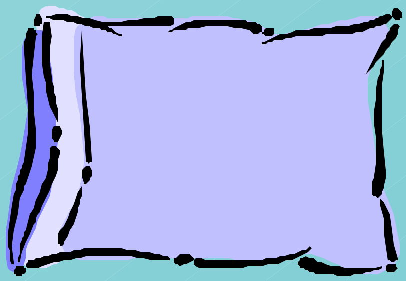
Sources	
Issued long term debt	7
Reduced inventories	1
Increased accounts payable	7
Cash from operations	
Net income	12
Depreciation	4
Total Sources	$31
Uses	
Repaid short term bank loan	5
Invested in fixed assets	14
Purchased marketable securities	5
Increased accounts receivable	5
Dividend	1
Total Uses	$30
Increase in cash balance	$ 1

Changes in Cash & W.C.

Example - Dynamic Mattress Company

Dynamic used cash as follows:

- Paid $1 mil dividend.
- Repaid $5 mil short term bank loan.
- Invested $14 mil.
- Purchased $5 mil of marketable securities.
- Accounts receivable expanded by $5 mil.



Cash Budgeting

Steps to preparing a cash budget

Step 1 - Forecast the sources of cash.

Step 2 - Forecast uses of cash.

Step 3 - Calculate whether the firm is facing a cash shortage or surplus.

Cash Budgeting

Example - Dynamic Mattress Company

Dynamic forecasted sources of cash

	Quarter	1st	2nd	3rd	4th
Sales, $mil		87.50	78.50	116.00	131.00

AR ending balance = AR beginning balance + sales - collections

Cash Budgeting

Example - Dynamic Mattress Company

Dynamic collections on AR

		Qtr		
	1st	2nd	3rd	4th
1. Beginning receivables	30.0	32.5	30.7	38.2
2. Sales	87.5	78.5	116.0	131.0
3. Collections				
. Sales in current Qtr (80%)	70	62.8	92.8	104.8
. Sales in previous Qtr (20%)	15.0	17.5	15.7	23.2
Total collections	85.0	80.3	108.5	128.0
4. Receivables at end of period				
. (4 = 1 + 2 - 3)	$32.5	$30.7	$38.2	$41.2

Cash Budgeting

Example - Dynamic Mattress Company

Dynamic forecasted uses of cash

- Payment of accounts payable
- Labor, administration, and other expenses
- Capital expenditures
- Taxes, interest, and dividend payments

Cash Budgeting

Example - Dynamic Mattress Company

Dynamic
cash budget

	Qtr			
	1st	2nd	3rd	4th
Sources of cash				
collections on AR	85.0	80.3	108.5	128.0
other	0.0	0.0	12.5	0.0
Total Sources	85.0	80.3	121.0	128.0
Uses of cash				
payment of AP	65.0	60.0	55.0	50.0
labor and admin expenses	30.0	30.0	30.0	30.0
capital expenditur es	32.5	1.3	5.5	8.0
taxes, interest, & dividends	4.0	4.0	4.5	5.0
Total uses of cash	131.5	95.3	95.0	93.0
Net cash inflow (sources minus uses)	$46.5	$15.0	$26.0	$35.0

Cash Budgeting

Example - Dynamic Mattress Company

Dynamic short term financing requirements

Cash at start of period	5	- 41.5	- 56.5	- 30.5
+ Net cash flow	- 46.5	- 15	+ 26	+ 35
= Cash at end of period	- 41.5	- 56.5	- 30.5	+ 4.5
Min operating cash balance	5	5	5	5
Cumulative short term financing required (minimum cash balance minus caash at end of period)	$46.5	$61.5	$35.5	- $.5

A Short Term Financing Plan

Example - Dynamic Mattress Company

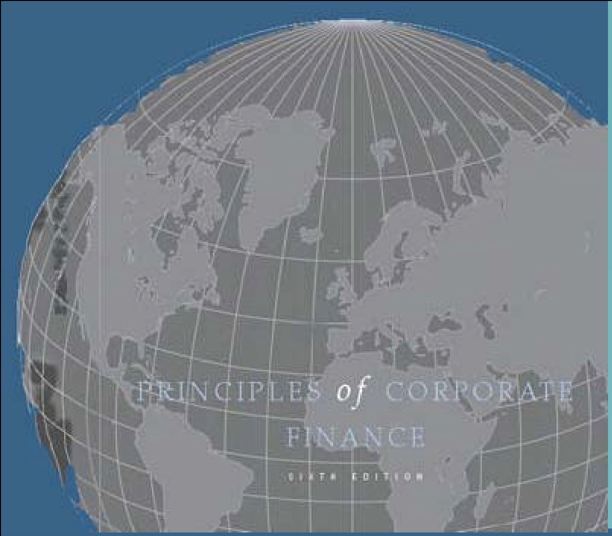
Dynamic forecasted deferrable expenses

	Quarter	1st	2nd	3rd	4th
Amount Deferrable, $mil		52	48	44	40

A Short Term Financing Plan

Example - Dynamic Mattress Company- *Financing Plan*

	1st	2nd	3rd	4th
New borrowing				
1. Line of credit	41.0	0.0	0.0	0.0
2. Stretching payables	3.6	20.0	0.0	0.0
3. Total	44.6	20.0	0.0	0.0
Repayments				
4. Line of credit	0.0	0.0	4.8	36.2
5. Stetched payables	0.0	3.6	20.0	0.0
6. Total	0.0	3.6	24.8	36.2
7. Net new borrowing	44.6	16.4	-24.8	-36.2
8. Plus securities sold	5.0	0.0	0.0	0.0
9. Less securities bought	0.0	0.0	0.0	0.0
10. Total cash raised	49.6	16.4	-24.8	-36.2
Interest payments:				
11. Line of credit	0.0	1.2	1.2	1.0
12. Stretching payables	0.0	0.2	1.0	0.0
13. Less interest on securities	-0.1	0.0	0.0	0.0
14. Net interest paid	-0.1	1.4	2.2	1.0
15. Funds for Compensating balances	3.2	0.0	-1.0	-2.2
16. Cash required for operations	46.5	15.0	0.3	-35.0
17. Total cash required	49.6	16.4	-24.8	-36.2



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

Credit Management

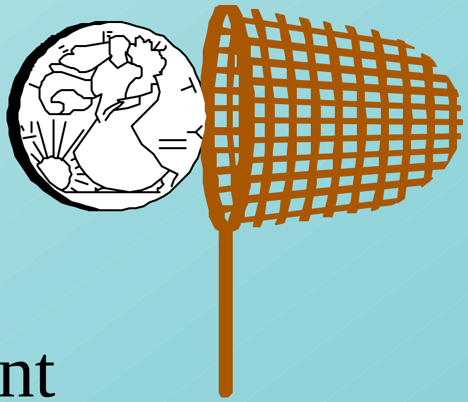
Chapter 30

Topics Covered

- Terms of Sale
- Commercial Credit Instruments
- Credit Analysis
- The Credit Decision
- Collection Policy
- Bankruptcy

Terms of Sale

<u>Terms of Sale</u> - Credit, discount, and payment terms offered on a sale.



Example - *5/10 net 30*

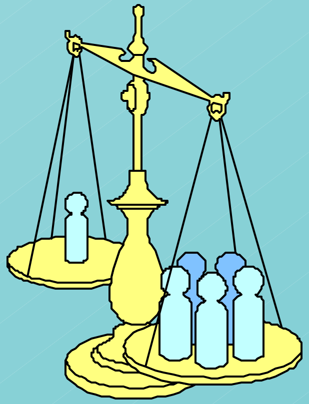
5 - percent discount for early payment

10 - number of days that the discount is available

net 30 - number of days before payment is due

Terms of Sale

- A firm that buys on credit is in effect borrowing from its supplier. It saves cash today but will have to pay later. This, of course, is an implicit loan from the supplier.
- We can calculate the implicit cost of this loan.



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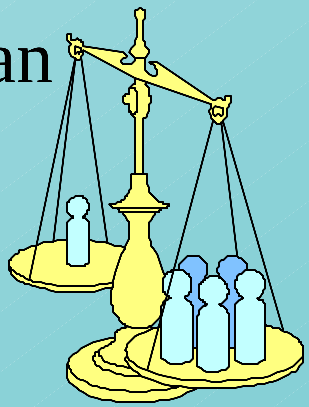
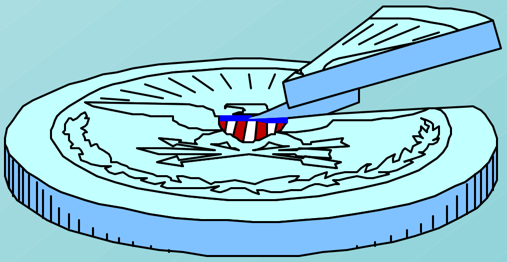


Effective annual rate

$$= \left(1 + \frac{\text{discount}}{\text{discounted price}}\right)^{365/\text{extra days credit}} - 1$$

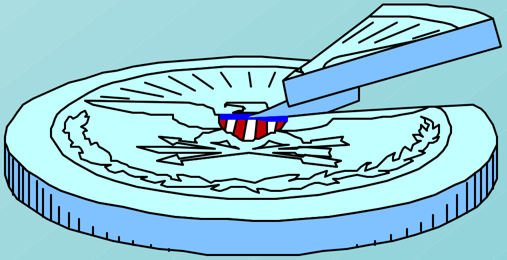
Terms of Sale

Example - On a $100 sale, with terms 5/10 net 60, what is the implied interest rate on the credit given?



Terms of Sale

Example - On a $100 sale, with terms 5/10 net 60, what is the implied interest rate on the credit given?



Effective annual rate

$$= \left(1 + \frac{\text{discount}}{\text{discounted price}}\right)^{365/\text{extra days credit}} - 1$$

$$= \left(1 + \frac{5}{95}\right)^{365/50} - 1 = .454, \text{ or } 45.4\%$$

Credit Instruments

- Terminology
  - open account
  - promissory note
  - commercial draft
  - sight draft
  - time draft
  - trade acceptance
  - banker's acceptance

Credit Analysis

<u>Credit Analysis</u> - Procedure to determine the likelihood a customer will pay its bills.

- Credit agencies, such as Dun & Bradstreet provide reports on the credit worthiness of a potential customer.
- Financial ratios can be calculated to help determine a customer's ability to pay its bills.

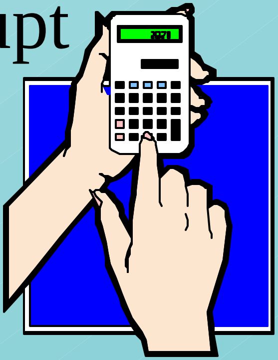
Credit Analysis

Numerical Credit Scoring categories

- The customer's *character*
- The customer's *capacity* to pay
- The customer's *capital*
- The *collateral* provided by the customer
- The *condition* of the customer's business

Credit Analysis

Multiple Discriminant Analysis - A technique used to develop a measurement of solvency, sometimes called a *Z Score*. Edward Altman developed a Z Score formula that was able to identify bankrupt firms approximately 95% of the time.



Credit Analysis

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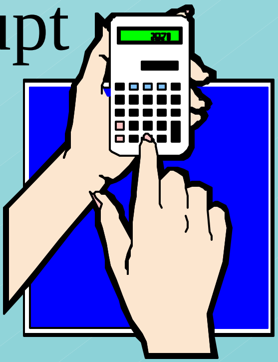


Altman Z Score formula

$$Z = 3.3\,\frac{\text{EBIT}}{\text{total assets}} + 1.0\,\frac{\text{sales}}{\text{total assets}} + .6\,\frac{\text{market value of equity}}{\text{total book debt}}$$

$$+ 1.4\,\frac{\text{retained earnings}}{\text{total assets}} + 1.2\,\frac{\text{working capital}}{\text{total assets}}$$

Credit Analysis

Example - If the Altman Z score cut off for a credit worthy business is 2.7 or higher, would we accept the following client?

Credit Analysis

Example - If the Altman Z score cut off for a credit worthy business is 2.7 or higher, would we accept the following client?

$$\frac{\text{EBIT}}{\text{total assets}} = 1.2$$

$$\frac{\text{retained earnings}}{\text{total assets}} = .4$$

$$\frac{\text{sales}}{\text{total assets}} = 1.4$$

$$\frac{\text{working capital}}{\text{total assets}} = .12$$

$$\frac{\text{market equity}}{\text{book debt}} = .9$$

Credit Analysis

Example - If the Altman Z score cut off for a credit worthy business is 2.7 or higher, would we accept the following client?

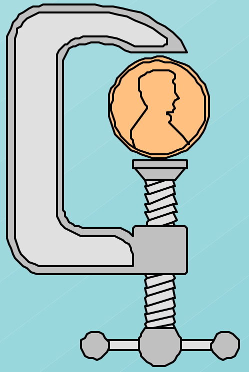
Firm's Z Score

$$(3.3 x .12) + (1.0 x 1.4) + (.6 x .9) + (1.4 x .4) + (1.2 x .12) = 3.04$$

A score above 2.7 indicates good credit.

Credit Analysis

- Credit analysis is only worth while if the expected savings exceed the cost.
  - ➔ Don’t undertake a full credit analysis unless the order is big enough to justify it.
  - ➔ Undertake a full credit analysis for the doubtful orders only.



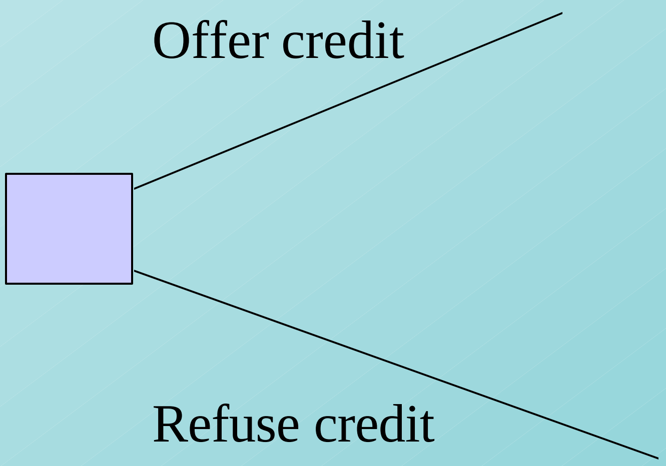
The Credit Decision

Credit Policy - Standards set to determine the amount and nature of credit to extend to customers.

- Extending credit gives you the probability of making a profit, not the guarantee. There is still a chance of default.
- Denying credit guarantees neither profit or loss.

The Credit Decision

The credit decision and its probable payoffs



The Credit Decision

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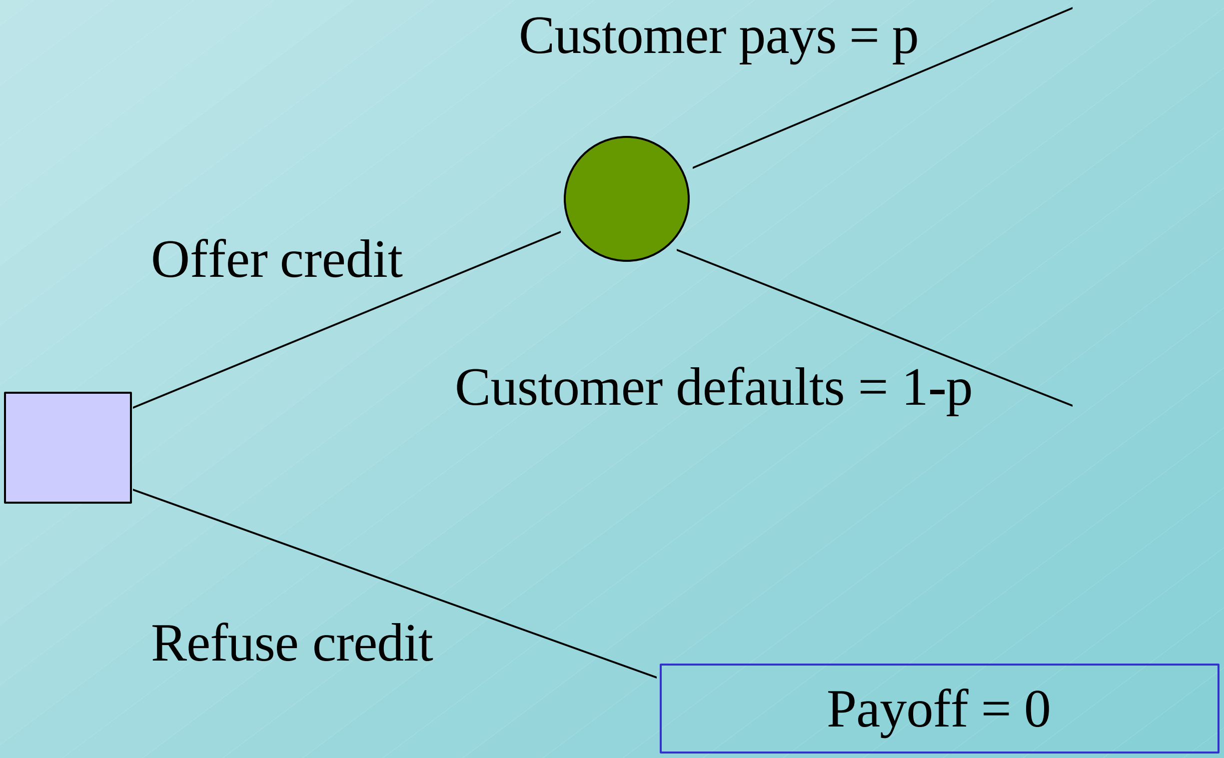
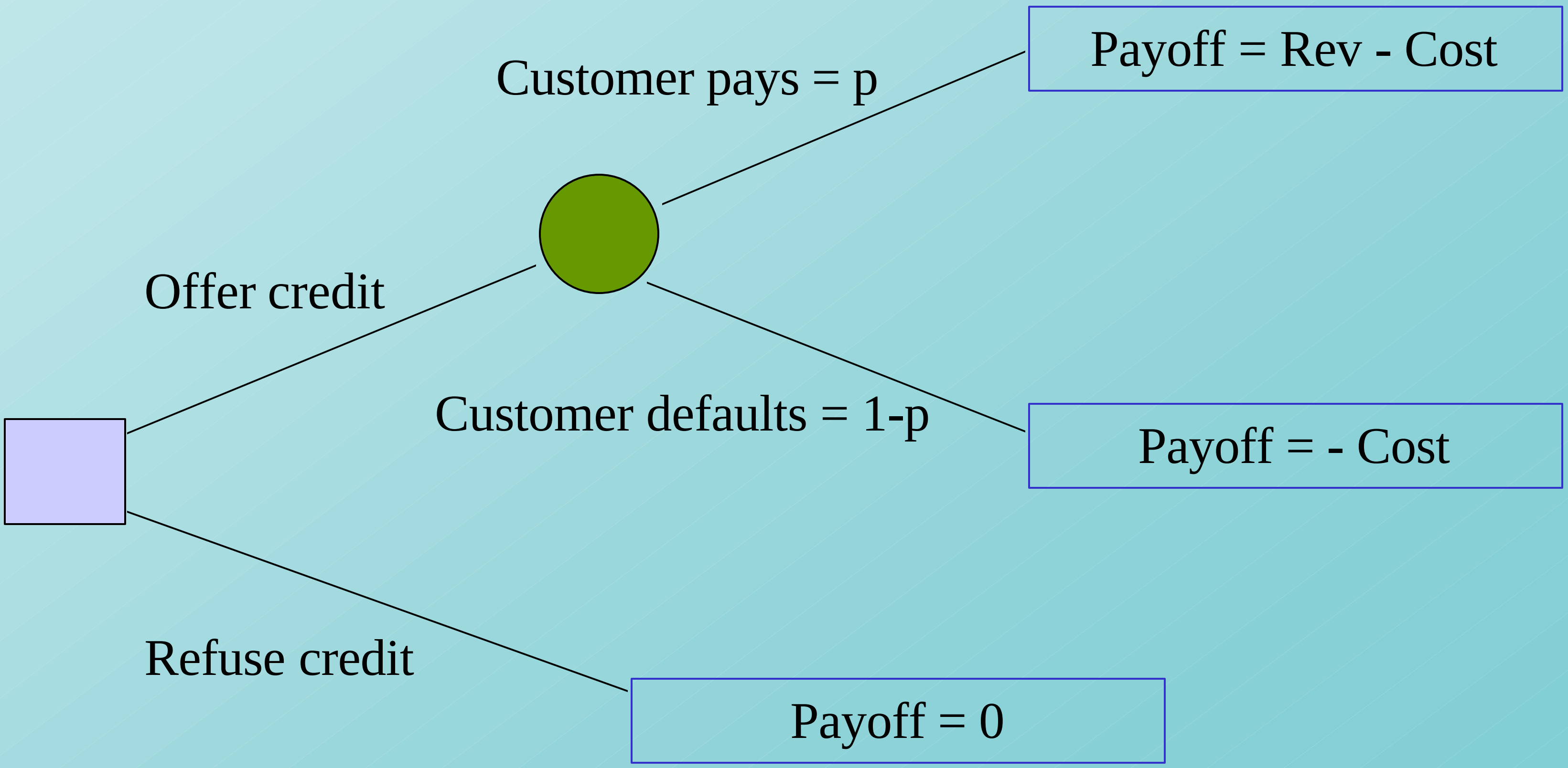


The Credit Decision

The credit decision and its probable payoffs



The Credit Decision

- Based on the probability of payoffs, the expected profit can be expressed as:

The Credit Decision

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$$p \times PV(Rev - Cost) - (1 - p) \times (PV(cost)$$

The Credit Decision

- Based on the probability of payoffs, the expected profit can be expressed as:

$$p \times PV(Rev - Cost) - (1 - p) \times (PV(cost)$$

- The break even probability of collection is:

$$p = \frac{PV(Cost)}{PV(Rev)}$$

Collection Policy

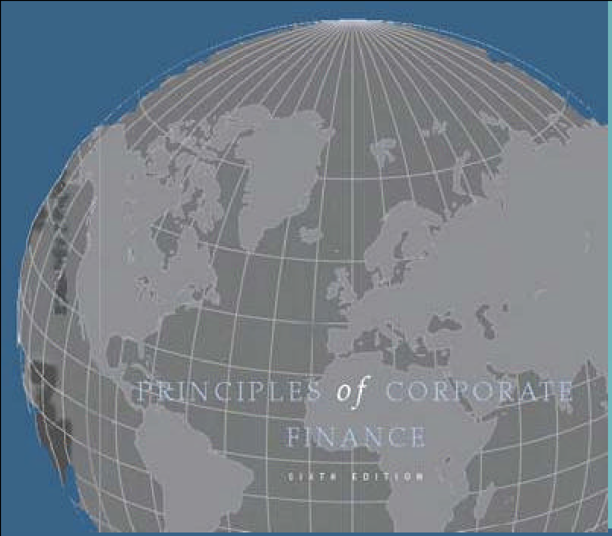
Collection Policy - Procedures to collect and monitor receivables.

Aging Schedule - Classification of accounts receivable by time outstanding.

Collection Policy

Sample aging schedule for accounts receivable

Customer's Name	Amount Not Yet Due	1 Month Overdue	More than 1 Month Overdue	Total Owed
Alpha	10,000	0	0	10,000
Beta	0	0	5,000	5,000
*	*	*	*	*
*	*	*	*	*
*	*	*	*	*
Omega	5,000	4,000	21,000	30,000
Total	$200,000	$40,000	$58,000	$298,000



Principles of Corporate Finance

Brealey and Myers **Sixth Edition**

Cash Management

Chapter 31

Topics Covered

- Inventories and Cash Balances
- Cash Collection and Disbursement Systems
  - Float
- Bank Relations

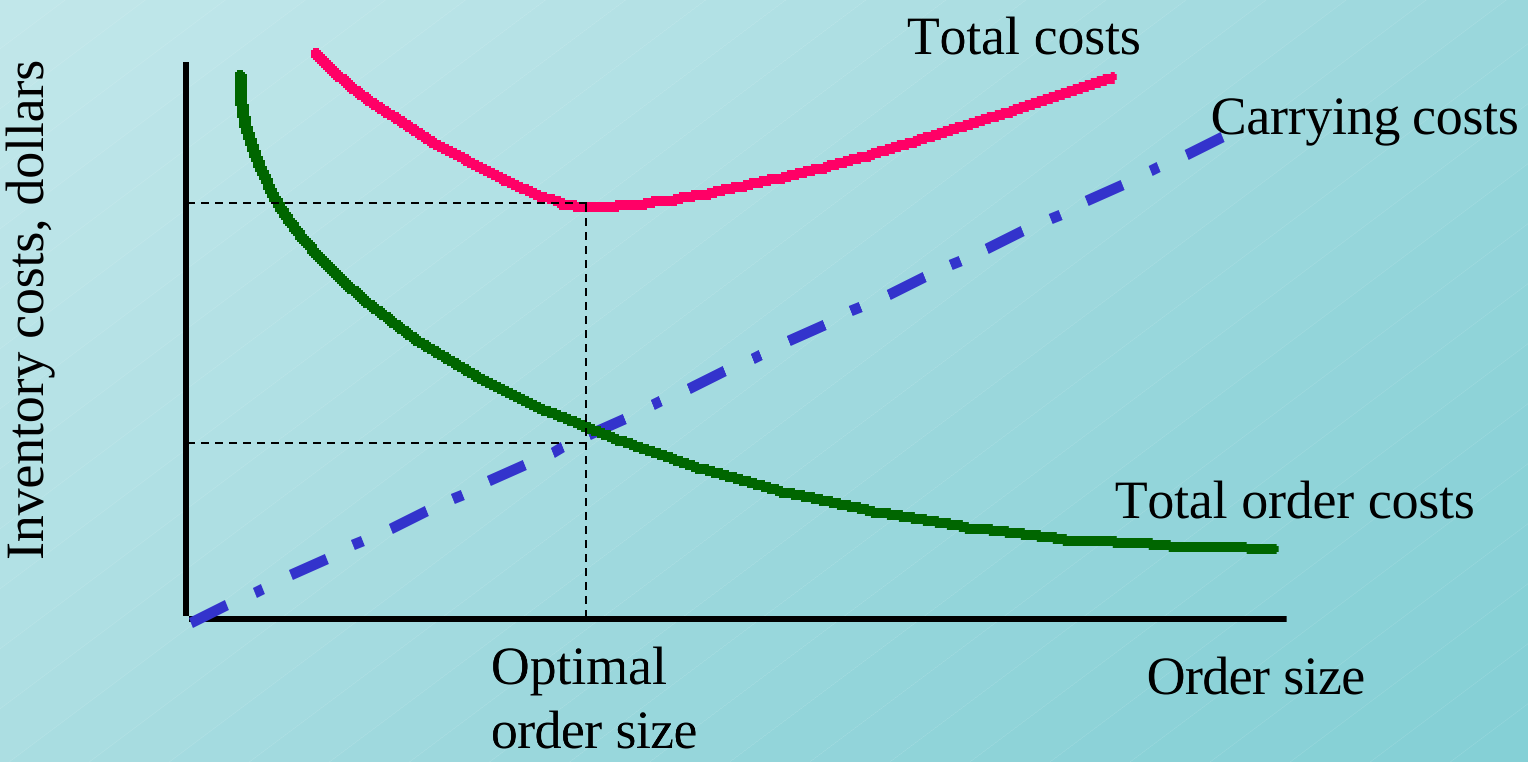
Inventories & Cash Balances

Economic Order Quantity - Order size that minimizes total inventory costs.

$$\text{Economic Order Quantity} = \sqrt{\frac{2 \text{ x annual sales x cost per order}}{\text{carrying cost}}}$$

Inventories & Cash Balances

Determination of optimal order size



Inventories & Cash Balances

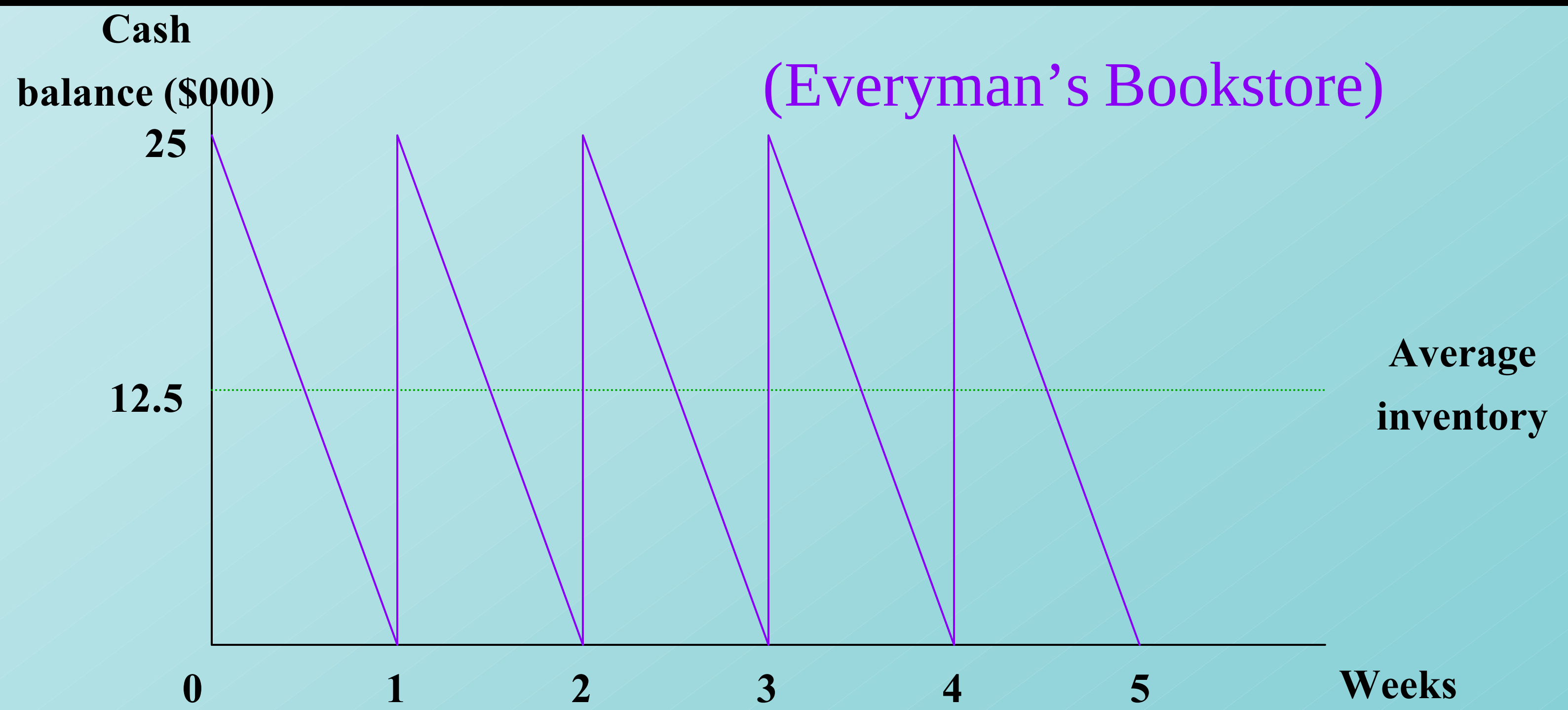
- The optimal amount of short term securities sold to raise cash will be higher when annual cash outflows are higher and when the cost per sale of securities is higher. Conversely, the initial cash balance falls when the interest is higher.

$$\text{Initial cash balance} = \sqrt{\frac{2 \text{ x annual cash outflows x cost per sale of securities}}{\text{interest rate}}}$$

Inventories & Cash Balances

- Money Market - market for short term financial assets.
  - commercial paper
  - certificates of deposit
  - repurchase agreements

Inventories & Cash Balances



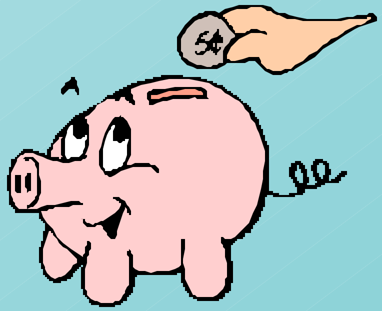
Value of bills sold = Q =

$$\sqrt{\frac{2 \text{ x annual cash disbursement x cost per sale}}{\text{interest rate}}} =$$

$$\sqrt{\frac{2 \text{ x } 1260 \text{ x } 20}{.08}} = 25$$

Float

- Time exists between the moment a check is written and the moment the funds are deposited in the recipient's account.
- This time spread is called *Float*.

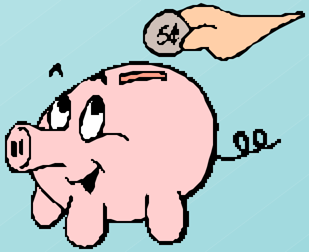


Payment Float - Checks written by a company that have not yet cleared.

Availability Float - Checks already deposited that have not yet cleared.

Float

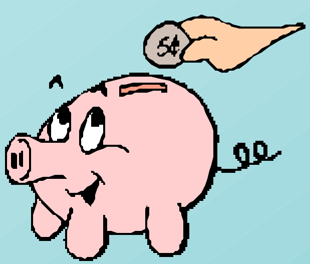
<u>Payment Float illustration</u> - The company issues a $200,000 check that has not yet cleared.



Float

<u>Payment Float illustration</u> - The company issues a $200,000 check that has not yet cleared.

Company's ledger balance	+	Payment float
$800,000		$200,000



Float

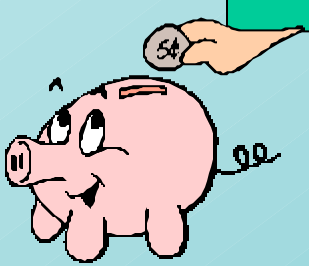
<u>Payment Float illustration</u> - The company issues a $200,000 check that has not yet cleared.

Company's ledger balance	+	Payment float
$800,000		$200,000

equals

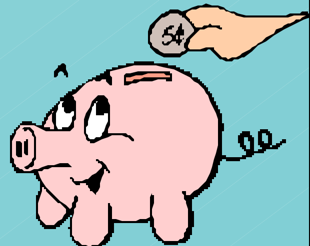
Bank's ledger balance

$1,000,000



Float

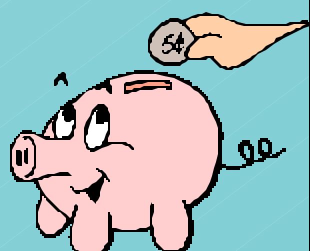
<u>Availability Float illustration</u> - The company deposits a $100,000 check that has not yet cleared.



Float

<u>Availability Float illustration</u> - The company deposits a $100,000 check that has not yet cleared.

Company's ledger balance	+	Payment float
$900,000		$200,000



Float

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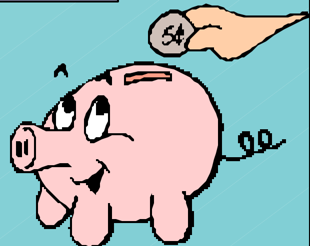
$900,000		$200,000

equals

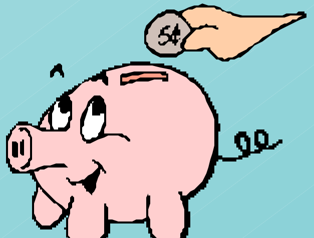
Bank's ledger balance
$1,100,000



Float

Net Float illustration

Net float = payment float - availability float

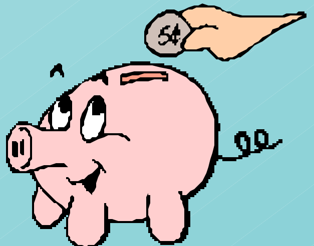


Float

Net Float illustration

Net float = payment float - availability float

Bank's ledger balance
$1,100,000



Float

Net Float illustration

Net float = payment float - availability float

Bank's ledger balance

$1,100,000

equals

Available balance + Availability float

$1,000,000 + $100,000

Managing Float

- Payers attempt to create delays in the check clearing process.
- Recipients attempt to remove delays in the check clearing process.
- Sources of delay
  - Time it takes to mail check
  - Time for recipient to process check
  - Time for bank to clear check

Managing Float

Check mailed

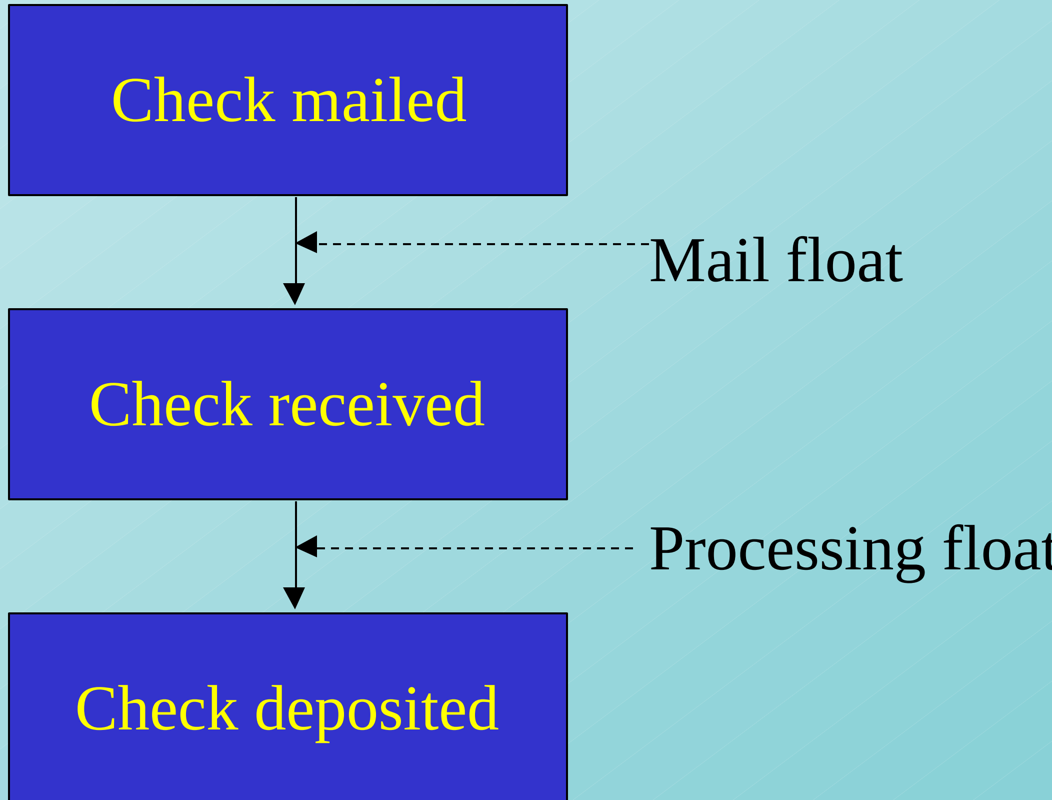
Managing Float

Check mailed

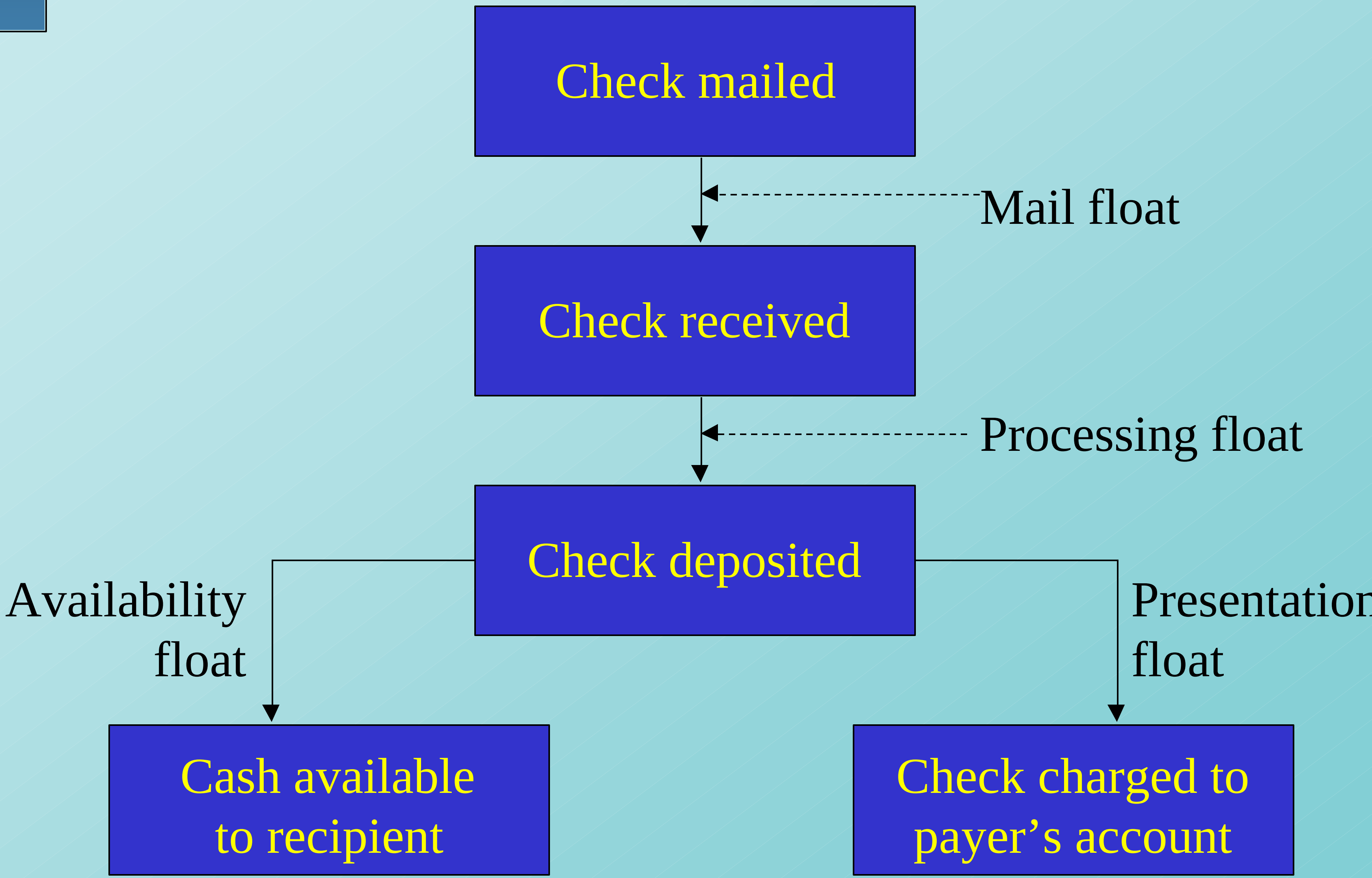
Mail float

Check received

Managing Float



Managing Float



Managing Float

Concentration Banking - system whereby customers make payments to a regional collection center which transfers the funds to a principal bank.

Lock-Box System - System whereby customers send payments to a post office box and a local bank collects and processes checks.

Zero-Balance Accounts - Regional bank accounts to which just enough funds are transferred daily to pay each day’s bills.

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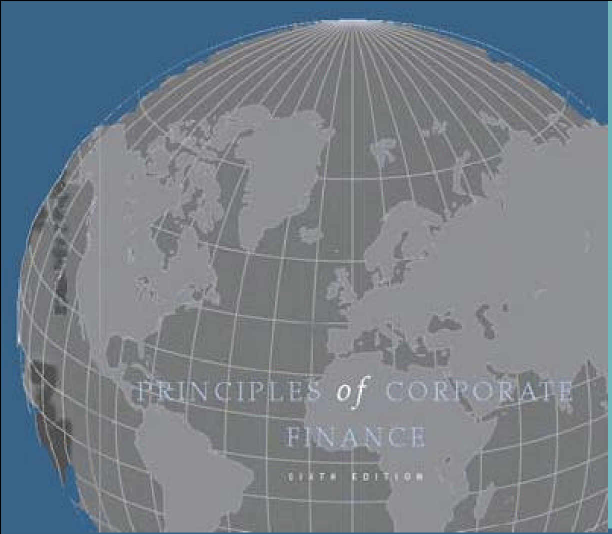


◆ Short Term Lending and Borrowing

Chapter 32

Topics Covered

- Short-Term Lending
- Money Market Instruments
- Floating Rate Preferred Stock
- Short Term Borrowing

Sources of Short Term Financing

- Money Markets
- Commercial paper
- Secured loans
- Eurodollars

Cost of Short-Term Loans

Simple Interest

$$\text{Amount of loan X } \frac{\text{annual interest rate}}{\text{number of periods in the year}}$$

Cost of Short-Term Loans

Simple Interest

$$\text{Amount of loan X } \frac{\text{annual interest rate}}{\text{number of periods in the year}}$$

Effective annual rate

$$\left(1 + \frac{\text{quoted annual interest rate}}{n}\right)^n - 1$$

Cost of Short-Term Loans

Discount Interest

$$\text{Face value of loan X}\left(1 - \frac{\text{quoted annual interest rate}}{\text{number of periods in the year}}\right)$$

Calculating Yields

Example

In January of 1999, 91-day T-bills were issued at a discount of 4.36%.

1. Price of bill = 100 - 91/360 x 4.36 = 98.898
2. 91-day return = (100 - 98.898) / 98.898 = 1.11%
3. Annual return = 1.11 x 365/91 = 4.47% simple interest

   or

   $(1.0111)^{365/91} - 1 = 4.55\%$ compound interest

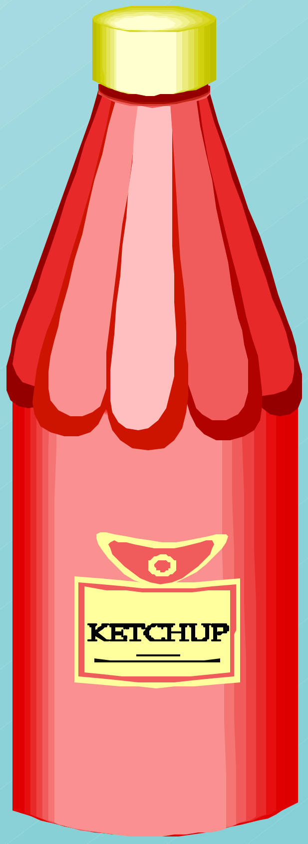
Money Market Investments

- US Treasury Bills
- Federal Agency Securities
- Short-Term Tax-Exempts
- Bank Time Deposits and CDs
- Commercial Paper
- Medium Term Notes
- Bankers' Acceptances
- Repos

Credit Rationing

Example - Henrietta Ketchup

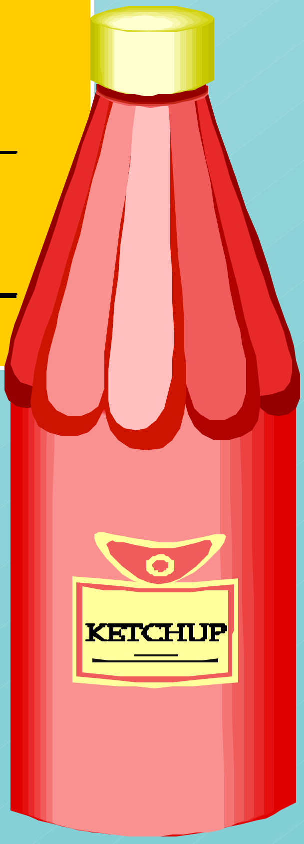
	Investments	Payoff	Prob. of Payoff
Project 1	-12	15	1
Project 2	-12	24 or 0	.5 or .5



Credit Rationing

Example - Henrietta Ketchup

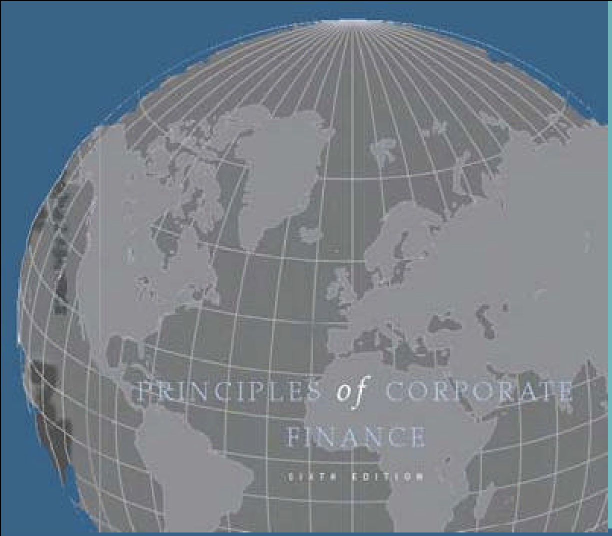
	Expected Payoff to Bank	Expected Payoff to Ms. Ketchup
Project 1	110	15
Project 2	(.5x10) + (.5x0) = +5	.5 x (24-10) = +7



Credit Rationing

Example - Henrietta Ketchup

	Expected Payoff to Bank	**Expected Payoff to Ms. Ketchup**
Project 1	5	10
Project 2	(.5x5) + (.5x0) = +2.5	.5 x (24-5) = +9.5



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Mergers

Chapter 33

Topics Covered

- Sensible Motives for Mergers
- Some Dubious Reasons for Mergers
- Estimating Merger Gains and Costs
- The Mechanics of a Merger
- Takeover Battles
- Mergers and the Economy

1997 and 1998 Mergers

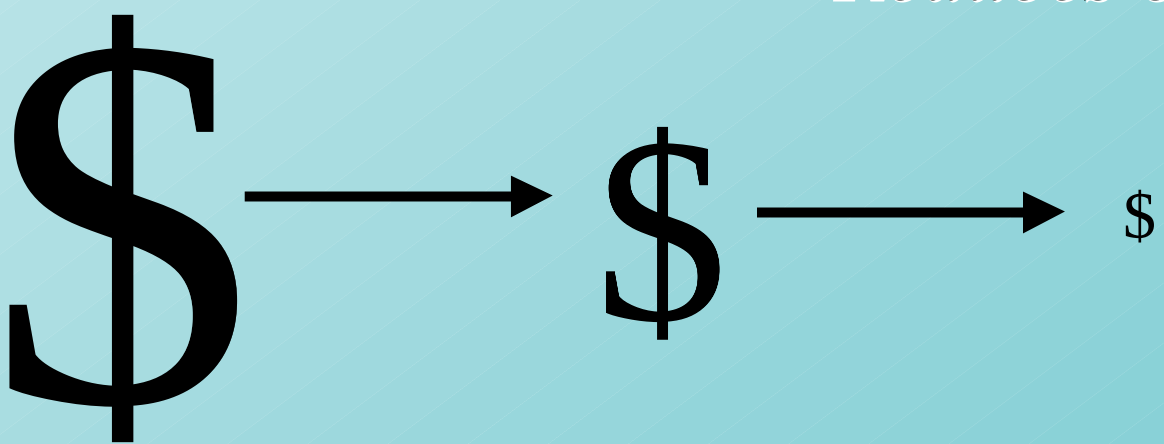
Selling Company	Acquiring Company	Payment, billions of dollars
NYNEX	Bell Atlantic	21.0
McDonnell Douglas	Boeing	13.4
Digital Equipment	Compaq Computer	9.1
Schweizerischer	Union Bank of Swiz.	23.0
Energy Group PCC	Texas Utilities	11.0
Amoco Corp.	British Petroleum	48.2
Sun America	American Intl.	18.0
BankAmerica Corp.	Nationsbank Corp.	61.6
Chrysler	Daimler-Benz	38.3
Bankers Trust Corp.	Deutsche Bank AG	9.7
Netscape	America Online	4.2
Citicorp	Travelers Group Inc.	83.0

Sensible Reasons for Mergers

Economies of Scale

A larger firm may be able to reduce its per unit cost by using excess capacity or spreading fixed costs across more units.

Reduces costs



Sensible Reasons for Mergers

Economies of Vertical Integration

- Control over suppliers “may” reduce costs.
- Over integration can cause the opposite effect.

Sensible Reasons for Mergers

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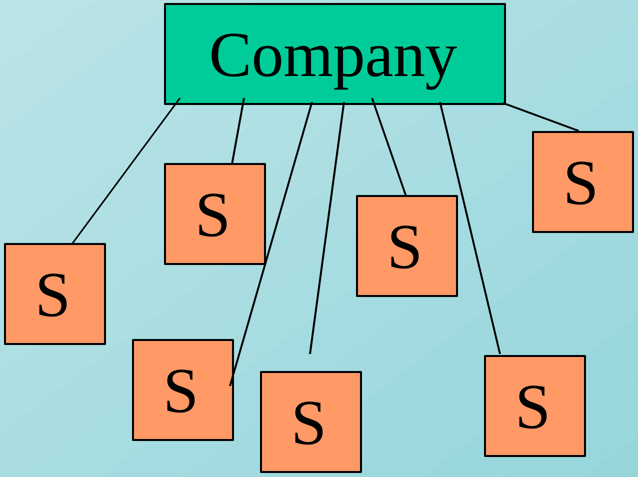
<u>Pre-integration (less efficient)</u>



Sensible Reasons for Mergers

Economies of Vertical Integration

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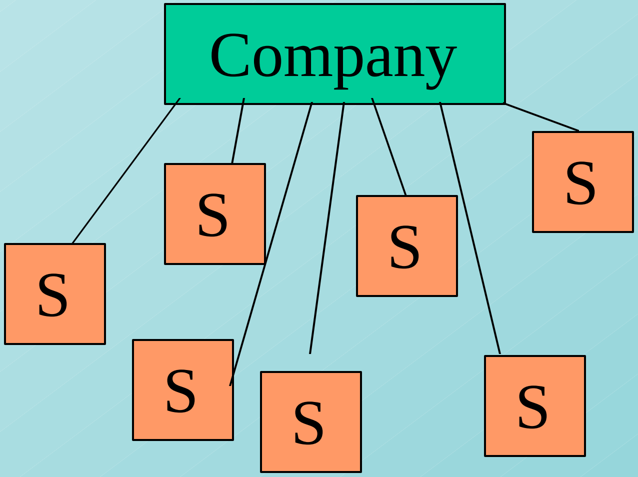
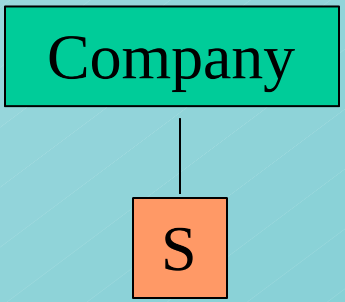
<u>Pre-integration (less efficient)</u>



<u>Post-integration (more efficient)</u>



Sensible Reasons for Mergers

Combining Complementary Resources

Merging may result in each firm filling in the "missing pieces" of their firm with pieces from the other firm.

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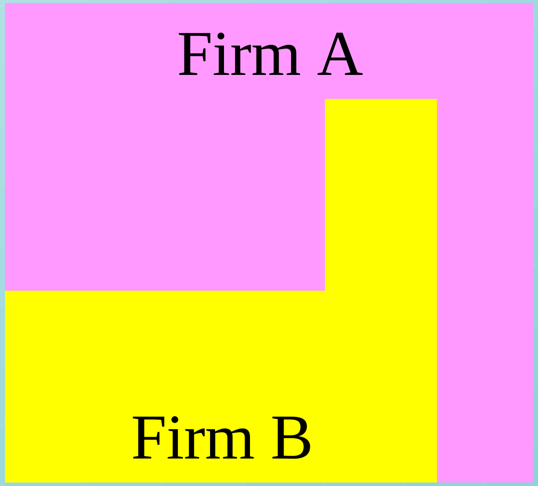


Sensible Reasons for Mergers

Mergers as a Use for Surplus Funds

If your firm is in a mature industry with few, if any, positive NPV projects available, acquisition may be the best use of your funds.

Dubious Reasons for Mergers

- Diversification
  - Investors should not pay a premium for diversification since they can do it themselves.

Dubious Reasons for Mergers

The Bootstrap Game

Acquiring Firm has high P/E ratio

Dubious Reasons for Mergers

The Bootstrap Game

Acquiring Firm has high P/E ratio

Selling firm has low P/E ratio (due to low number of shares)

Dubious Reasons for Mergers

The Bootstrap Game

Acquiring Firm has high P/E ratio

Selling firm has low P/E ratio (due to low number of shares)

After merger, acquiring firm has short term EPS rise

Dubious Reasons for Mergers

The Bootstrap Game

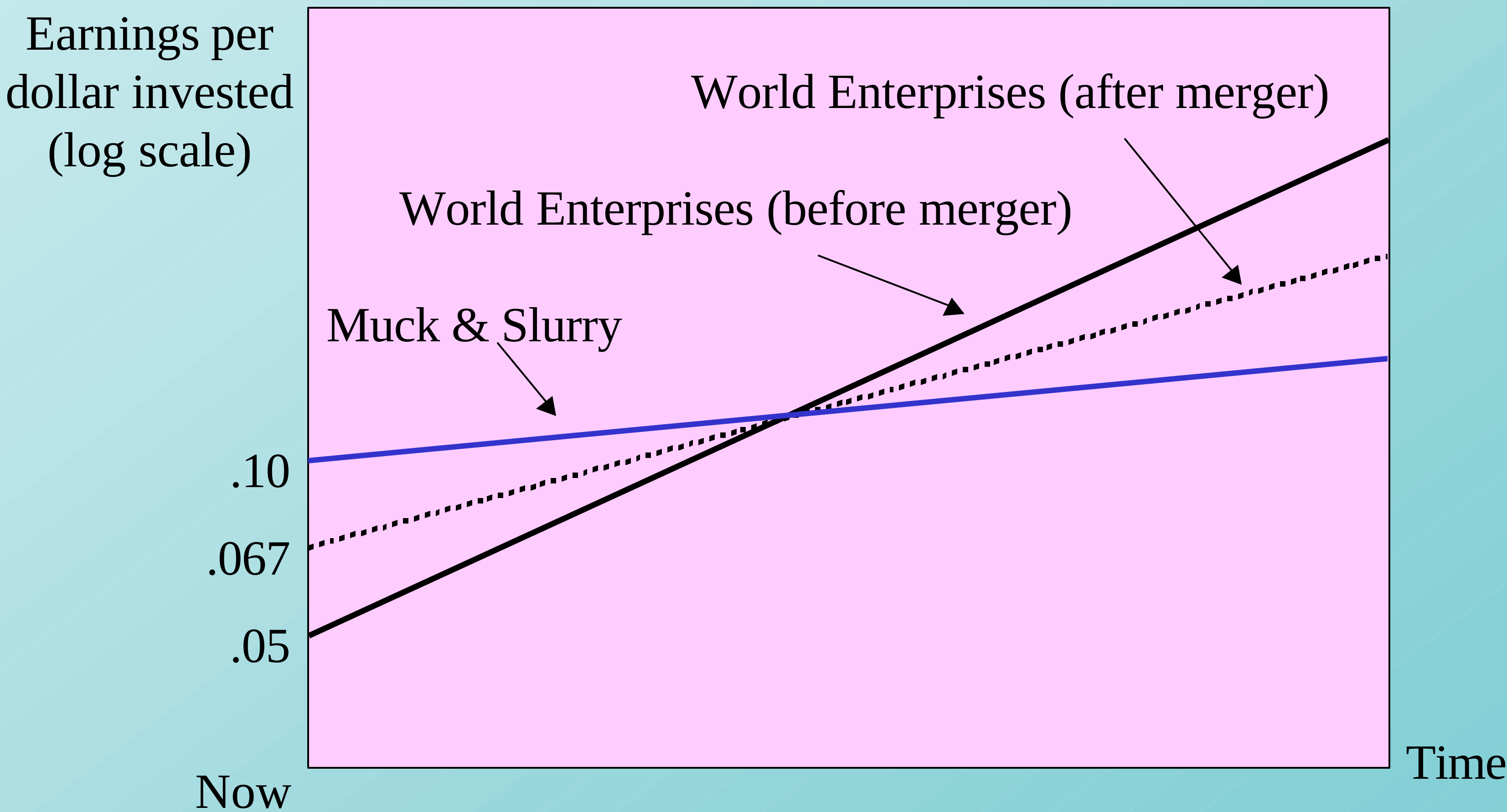
Acquiring Firm has high P/E ratio

Selling firm has low P/E ratio (due to low number of shares)

After merger, acquiring firm has short term EPS rise

Long term, acquirer will have slower than normal EPS growth due to share dilution.

Dubious Reasons for Mergers



Estimating Merger Gains

- Questions
  - Is there an overall economic gain to the merger?
  - Do the terms of the merger make the company and its shareholders better off?

????

$$PV(AB) > PV(A) + PV(B)$$

Estimating Merger Gains

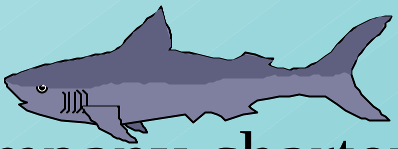
- Economic Gain

$$\text{Economic Gain} = \text{PV(increased earnings)}$$

$$= \frac{\text{New cash flows from synergies}}{\text{discount rate}}$$

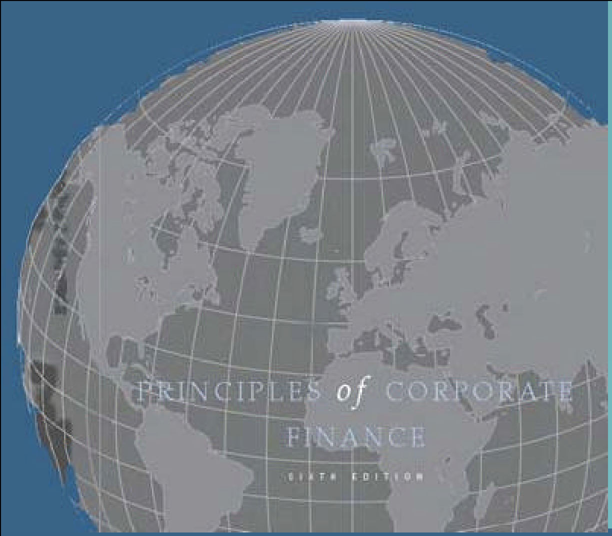
Takeover Defenses

White Knight - Friendly potential acquirer sought by a target company threatened by an unwelcome suitor.



Shark Repellent - Amendments to a company charter made to forestall takeover attempts.

Poison Pill - Measure taken by a target firm to avoid acquisition; for example, the right for existing shareholders to buy additional shares at an attractive price if a bidder acquires a large holding.



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- Control, Governance, and Financial Architecture

Chapter 34

Topics Covered

- Leveraged Buyouts
- Spin-offs and Restructuring
- Conglomerates
- Private Equity Partnership
- Control and Governance

Definitions

- ***Corporate control*** -- the power to make investment and financing decisions.
- ***Corporate governance*** -- the role of the Board of Directors, shareholder voting, proxy fights, etc. and the actions taken by shareholders to influence corporate decisions.
- ***Financial architecture*** -- the financial organization of the business.

Leveraged Buyouts

- The difference between leveraged buyouts and ordinary acquisitions:

1. A large fraction of the purchase price is debt financed.
2. The LBO goes private, and its share is no longer trade on the open market.

Leveraged Buyouts

- The three main characteristics of LBOs:

1. High debt
2. Incentives
3. Private ownership

Leveraged Buyouts

10 Largest LBOs in 1980s and 1997/98 examples

Acquirer	*Target*	*Year*	*Price ($bil)*
KKR	RJR Nabisco	1989	$ 24.72
KKR	Beatrice	1986	$ 6.25
KKR	Safeway	1986	$ 4.24
Thompson Co.	Southland	1987	$ 4.00
AV Holdings	Borg-Warner	1987	$ 3.76
Wing Holdings	NWA, Inc.	1989	$ 3.69
KKR	Owens-Illinois	1987	$ 3.69
TF Investments	Hospital Corp of America	1989	$ 3.69
FH Acquisitions	For Howard Corp.	1988	$ 3.59
Macy Acquisition Corp.	RH Macy & Co	1986	$ 3.50
Bain Capital	Sealy Corp.	1997	$ 811.20
Citicorp Venture Capital	Neenah Corp.	1997	$ 250.00
Cyprus Group (w/mgmt)	WESCO Distribution Inc.	1998	$ 1,100.00
Clayton, Dublier & Rice	North Maerican Van Lines	1998	$ 200.00
Clayton, Dublier & Rice (w/mgmt)	Dynatech Corp.	1998	$ 762.90
Kohlberg & Co. (w.mgmt)	Helley Performance Products	1998	$ 100.00

Spin-offs, etc.

- ***Spin off*** -- debut independent company created by detaching part of a parent company's assets and operations.
- ***Carve-outs***-- similar to spin offs, except that shares in the new company are not given to existing shareholders but sold in a public offering.
- ***Privatization*** -- the sale of a government-owned company to private investors.

Privatization

- Motives for *Privatization:*

1. Increased efficiency
2. Share ownership
3. Revenue for the government

Privatization

Examples of Privatization

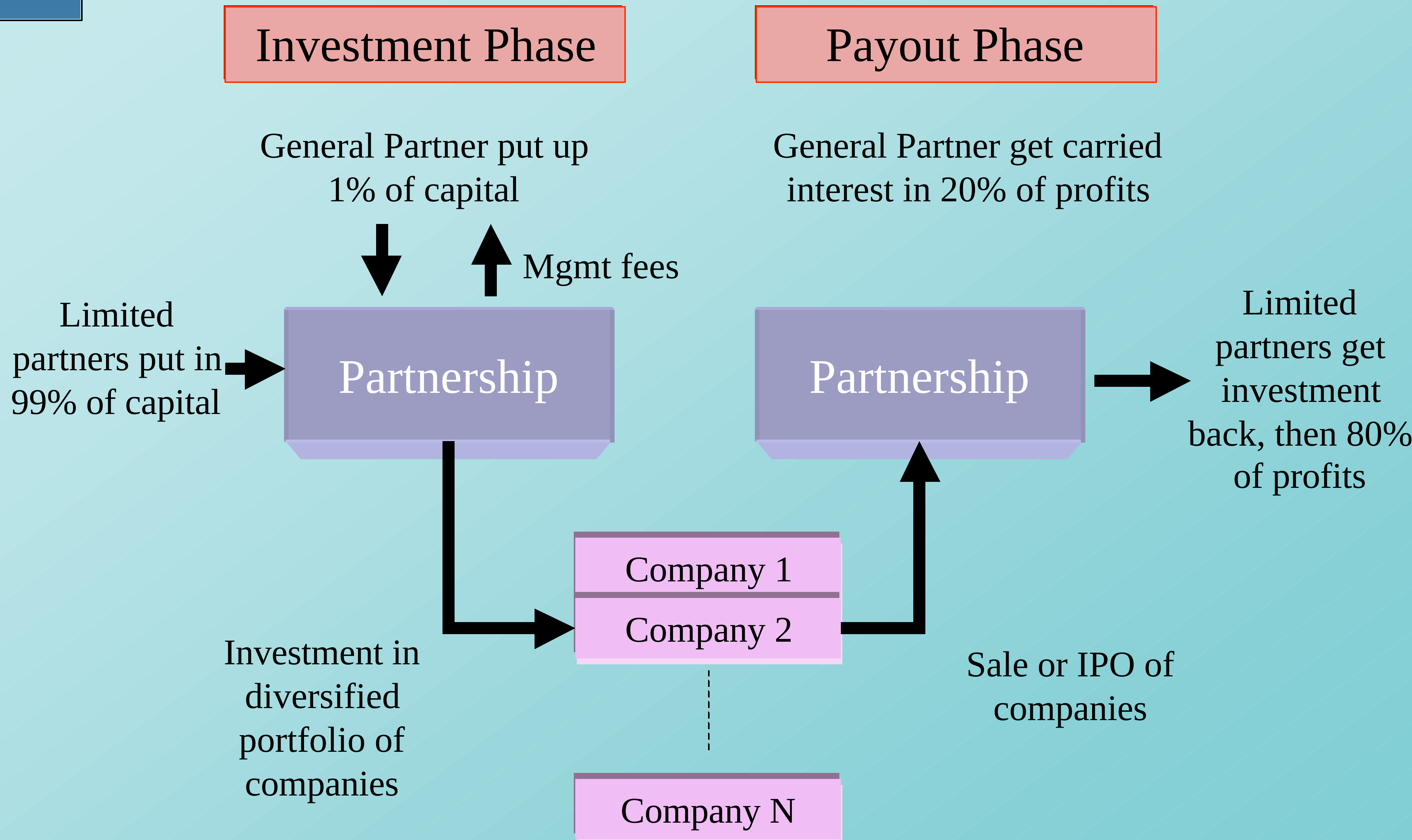
Country	Company and Date	Amount Issued, $ millions
France	St. Gobain (1986)	$ 2,091.40
France	Paribas (1987)	$ 2,742.00
Germany	Volkswagon (1961)	$ 315.00
Jamaica	Caribbean Cement (1987)	$ 45.60
Jpan	Japan Airlines (1987)	$ 2,600.00
Mexico	Telefonos de Mexico (1990)	$ 3,760.00
New Zealand	Air New Zealand (1989)	$ 99.10
Singapore	Neptune Orient Lines (1981-1988)	$ 308.50
United Kingdom	British Gas (1986)	$ 8,012.00
United Kingdom	BAA (Airports)(1987)	$ 2,028.00
United Kingdom	British Steel (1988)	$ 4,524.00
United States	Conrail (1987)	$ 1,650.00

Conglomerates

The largest US conglomerates in 1979

Sales Rank	Company	Numebr of Industries
8	ITT	38
15	Tenneco	28
42	Gulf & Western Industries	41
51	Litton Industries	19
66	LTV	18
73	Illinois Central Industries	26
103	Textron	16
104	Greyhound	19
128	Marin Marietta	14
131	Dart Industries	18
132	U.S. Industries	24
143	Northwest Industries	18
173	Walter Kidde	22
180	Ogden Industries	13
188	Colt Industries	9

Private Equity Partnership



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◆ Conclusion: What We Do and Do Not Know about Finance

Chapter 35

Topics Covered

- What We Do Know
- What We Do Not Know

7 Most Important Ideas in Finance

- Net Present Value
- Capital Asset Pricing Model (CAPM)
- Efficient Capital Markets
- Value Additivity & Law Conservation of Value
- Capital Structure Theory
- Option Theory
- Agency Theory

10 Unsolved Problems In Finance

- How major decisions are made?
- What determines project risk and PV ?
- Risk and return - What have we missed?
- How important are the exceptions to the Efficient Market Theory?
- Is management an off-balance-sheet liability?

10 Unsolved Problems In Finance

- How can we explain the success of new markets and new securities?
- How can we resolve the dividend controversy?
- What risks should a firm take?
- What is the value of liquidity?