



# Principles of Corporate Finance

Brealey and Myers

Sixth Edition

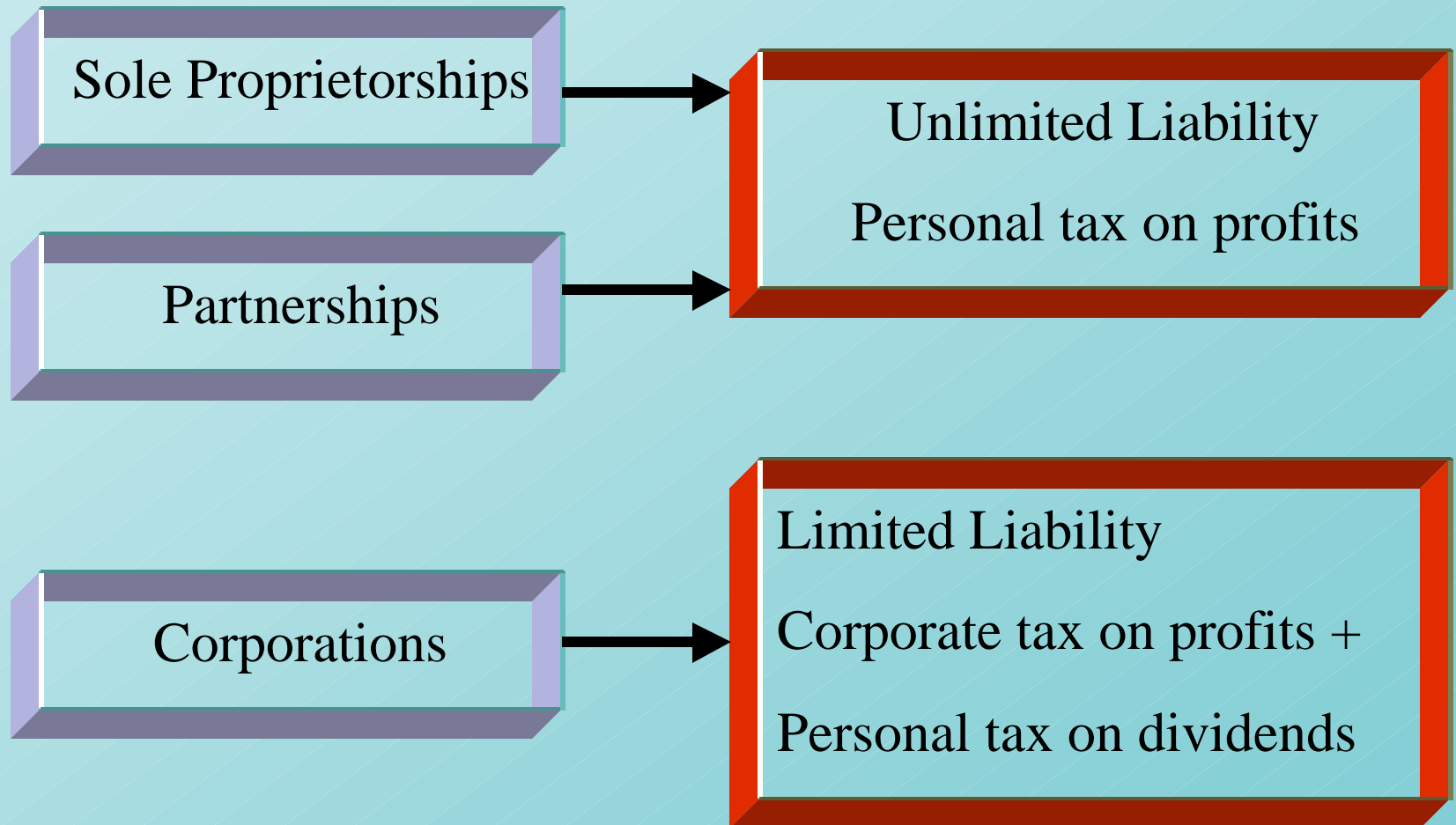
## ◆ Finance and the Financial Manager

### Chapter 1

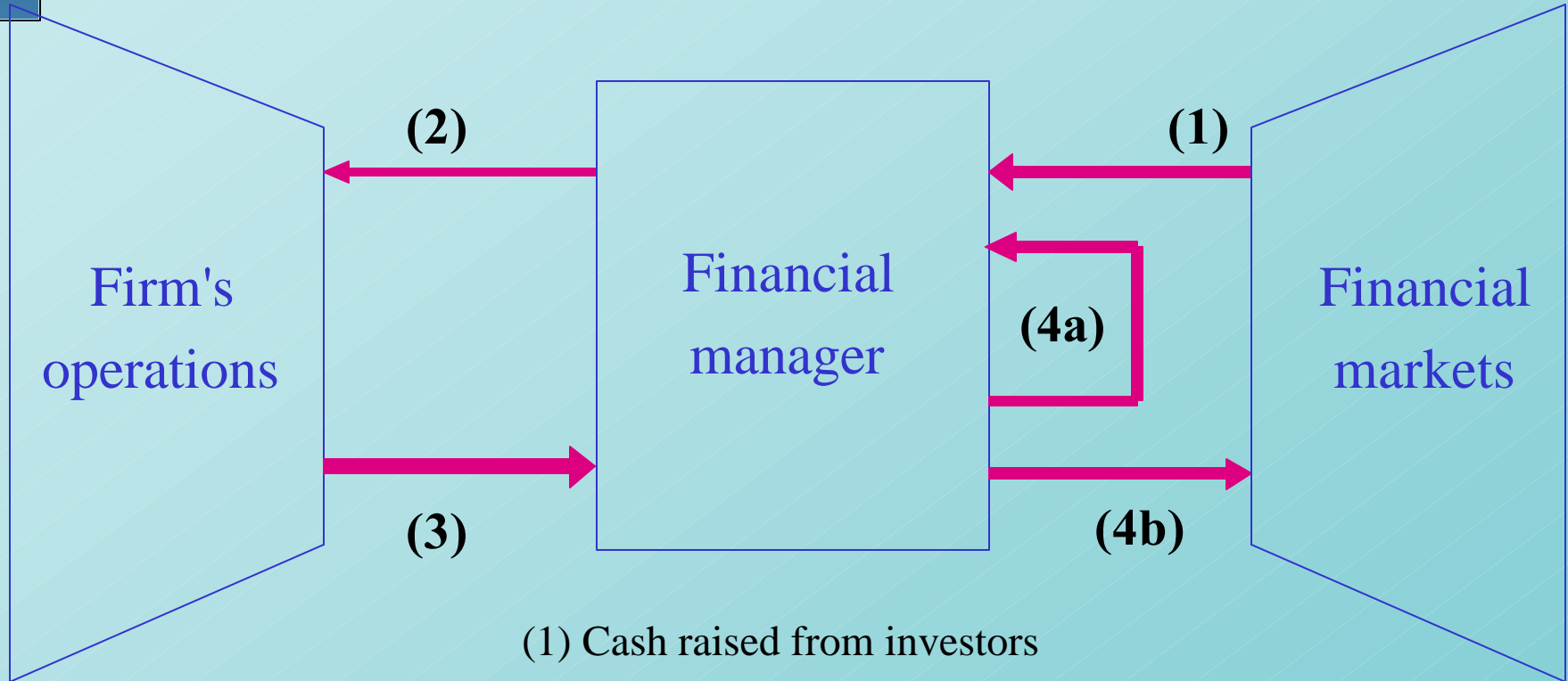
# Topics Covered

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

# Corporate Structure



# Role of The Financial Manager



(1) Cash raised from investors

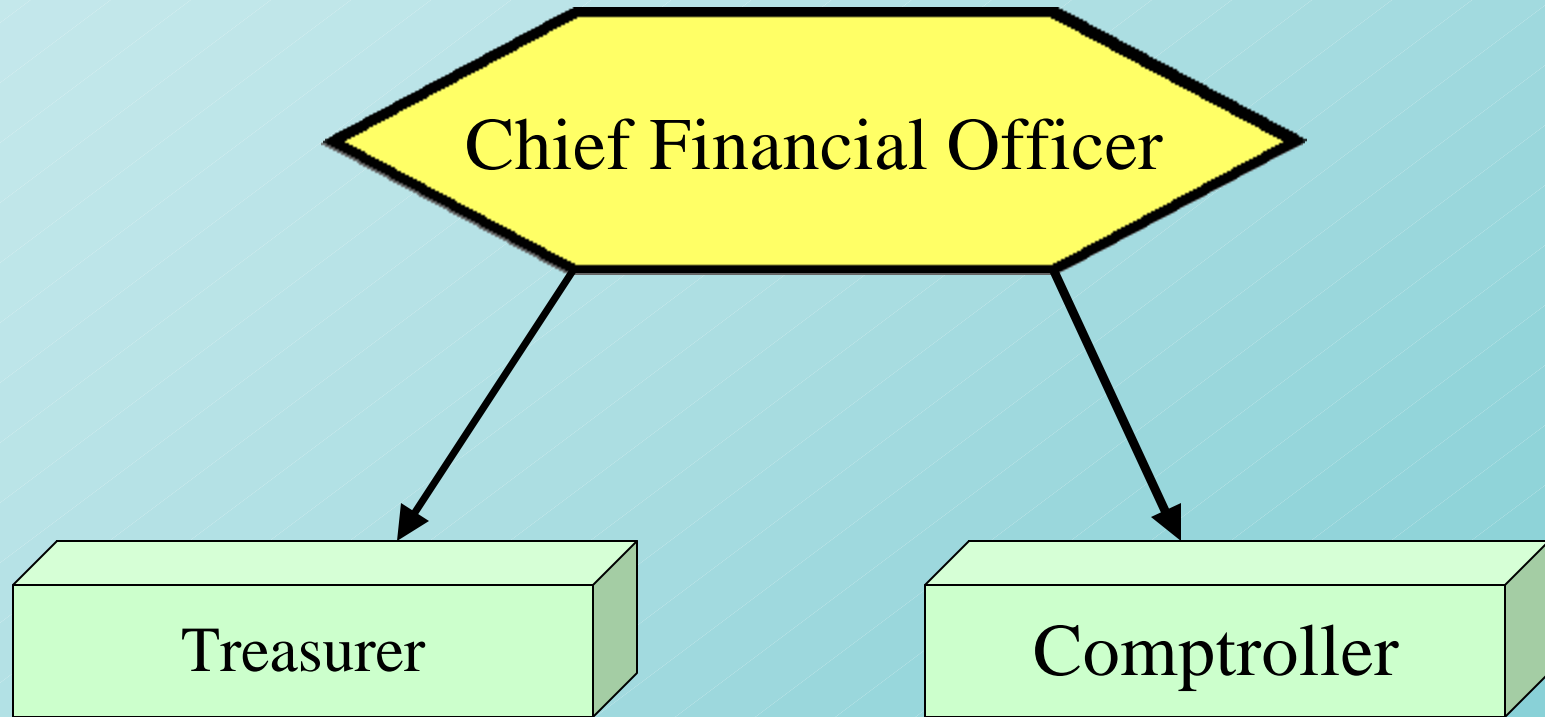
(2) Cash invested in firm

(3) Cash generated by operations

(4a) Cash reinvested

(4b) Cash returned to investors

# Who is The Financial Manager?



# Ownership vs. Management

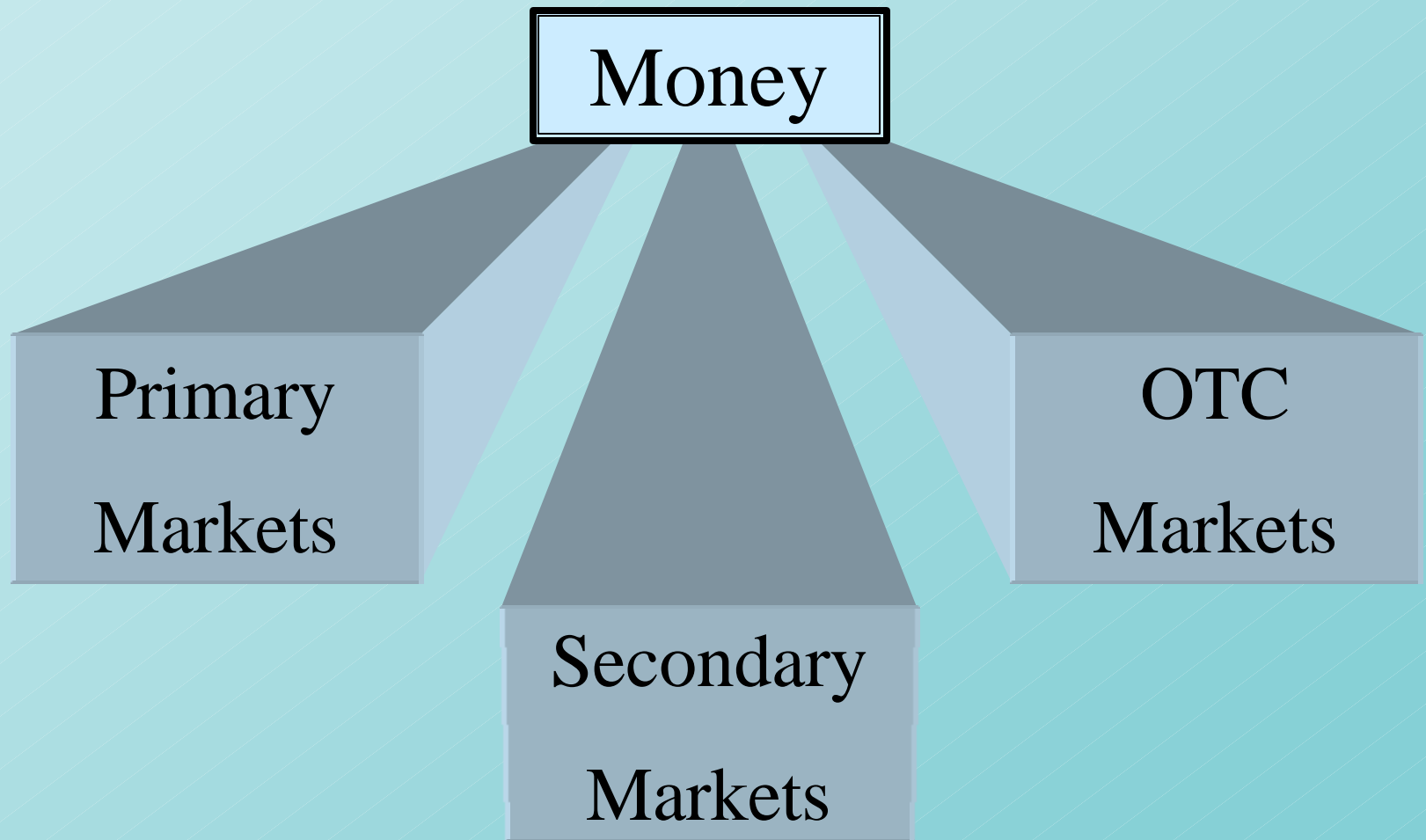
## Difference in Information

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

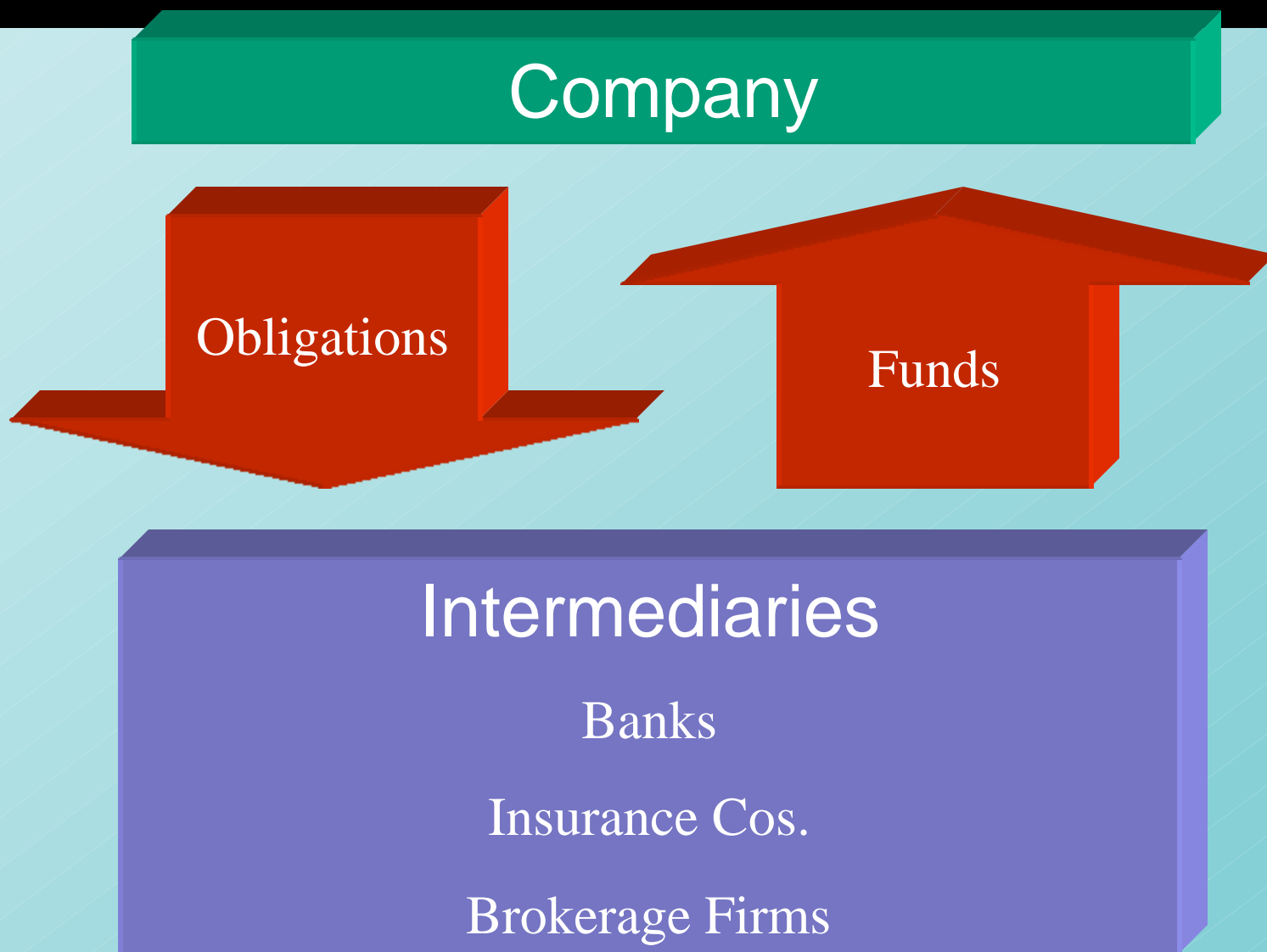
## Different Objectives

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

# Financial Markets



# Financial Institutions





# Financial Institutions



The diagram illustrates the structure of financial institutions. At the top is a purple rectangular box labeled 'Intermediaries'. Below this box are two red 3D shapes: a downward-pointing arrow labeled 'Obligations' on the left and an upward-pointing arrow labeled 'Funds' on the right. At the bottom is a large purple rectangular box labeled 'Investors', which contains a list of roles: 'Depositors', 'Policyholders', and 'Investors'.

Intermediaries

Obligations

Funds

Investors

Depositors

Policyholders

Investors



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## ◆ 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

Present Value = PV

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

# Present Value

Discount Factor = DF = PV of \$1

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

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 =  $r = 7\%$



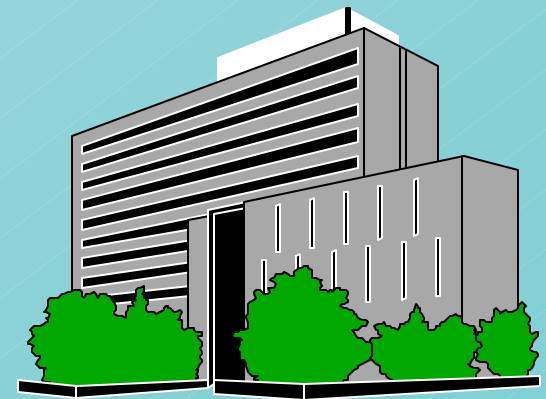
# Valuing an Office Building

*Step 3: Discount future cash flows*

$$PV = \frac{C_1}{(1+r)} = \frac{400}{(1+0.07)} = 374$$

*Step 4: Go ahead if PV of payoff exceeds investment*

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





# Net Present Value

$$\text{NPV} = \text{PV} - \text{required investment}$$

$$\text{NPV} = C_0 + \frac{C_1}{1 + r}$$

# Risk and Present Value

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

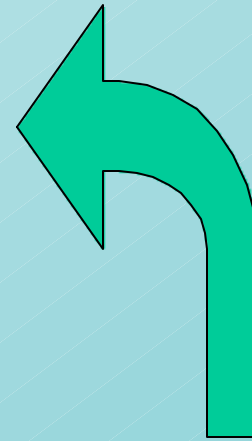
PV of  $C_1 = \$400$  at 7%

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

# Risk and Present Value

PV of  $C_1 = \$400$  at 12%

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



PV of  $C_1 = \$400$  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.

## Example

*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.

## Example

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

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

# 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.*

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

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



# Opportunity Cost of Capital

## Example - continued

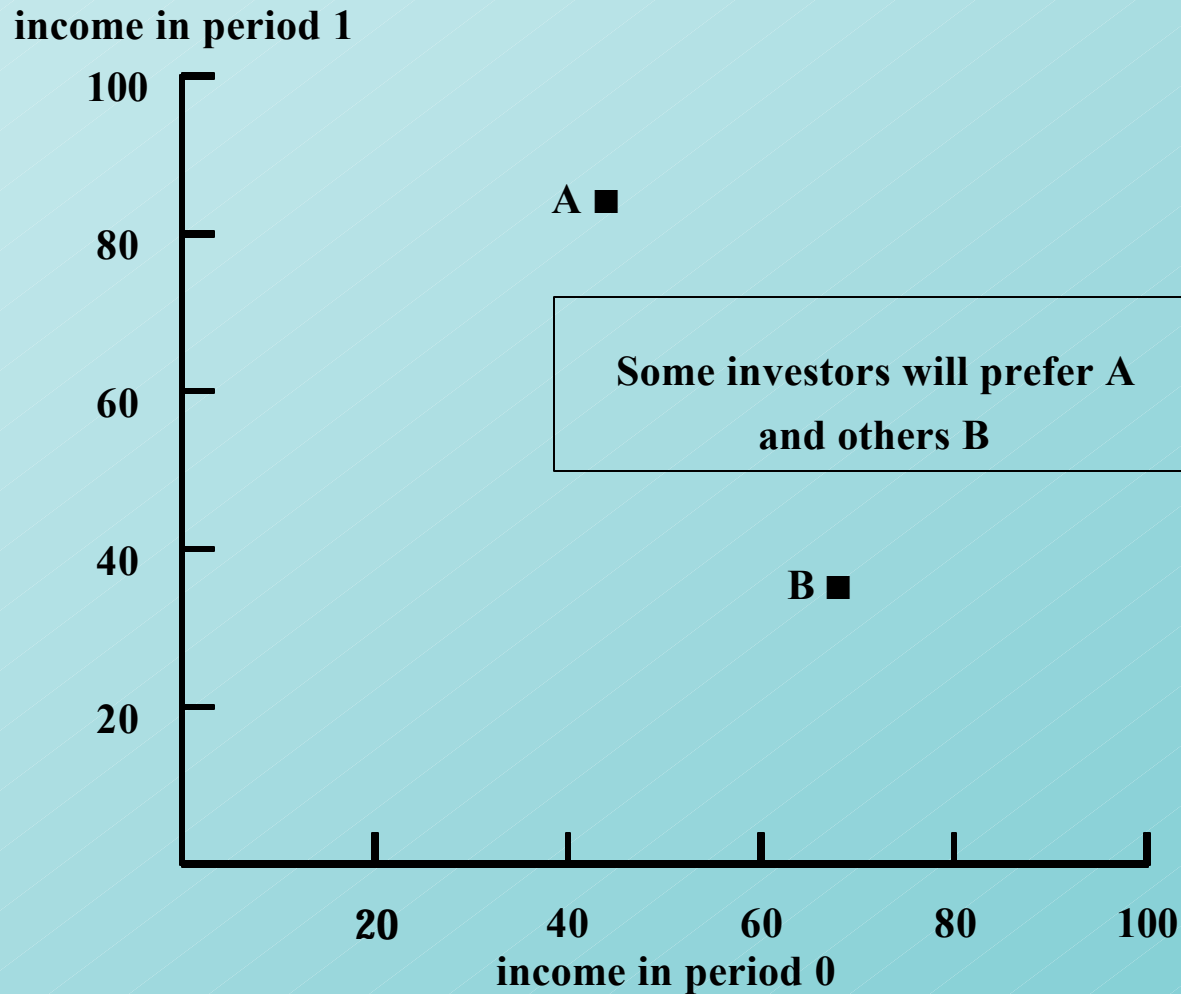
*Discounting the expected payoff at the expected return leads to the PV of the project.*

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

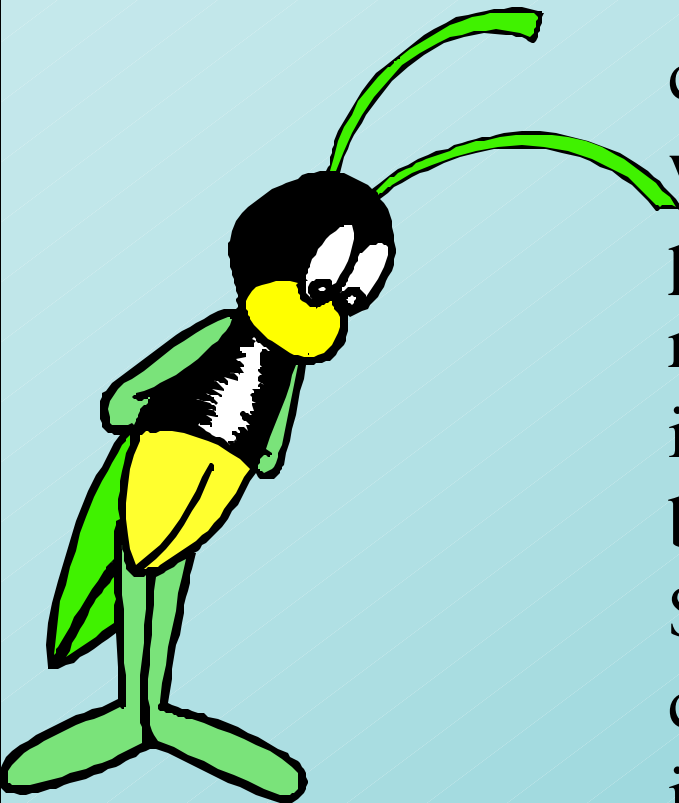
# Investment vs. Consumption

- ◆ 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

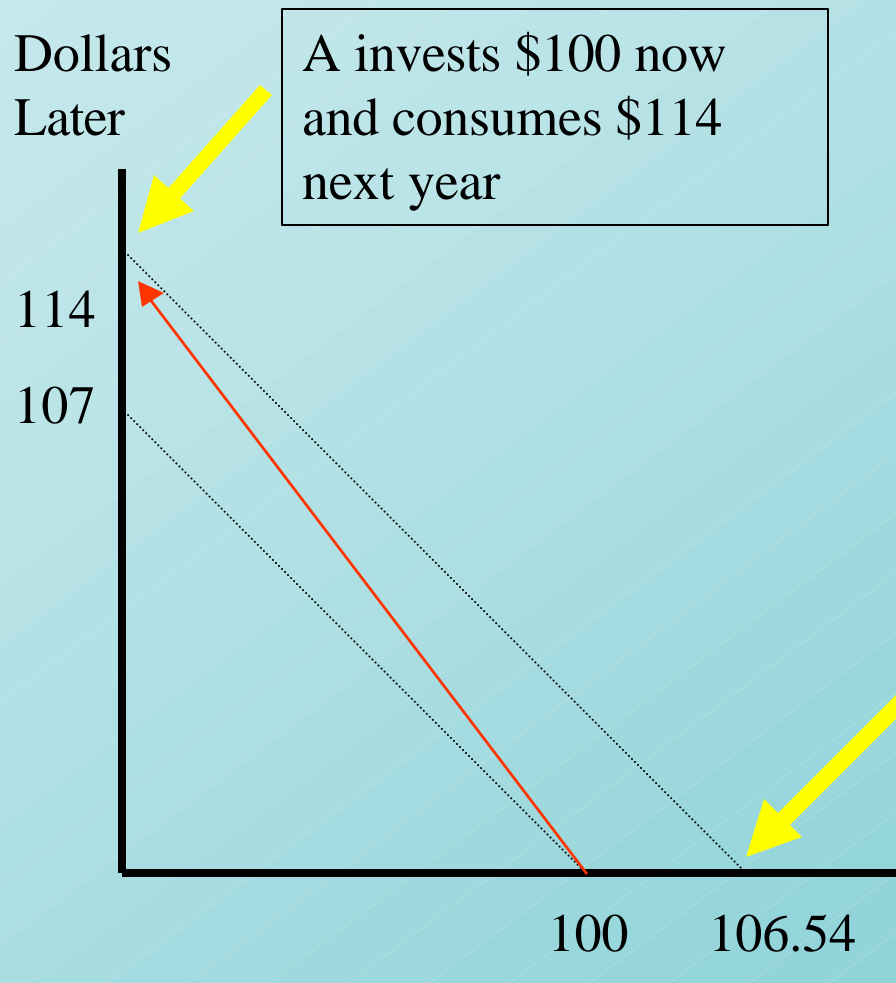


# Investment vs. Consumption

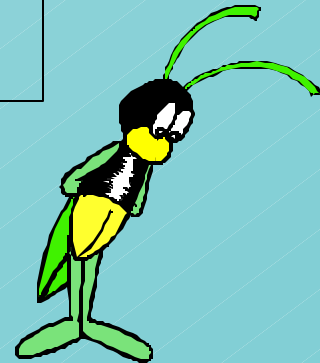


The grasshopper (G) wants to consume now. The ant (A) wants to wait. But each is happy to invest. A prefers to invest 14%, moving up the red arrow, rather than at the 7% interest rate. G invests and then borrows at 7%, thereby transforming \$100 into \$106.54 of immediate consumption. Because of the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

# Investment vs. Consumption



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# 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

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## ◆ 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

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

- ◆ 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

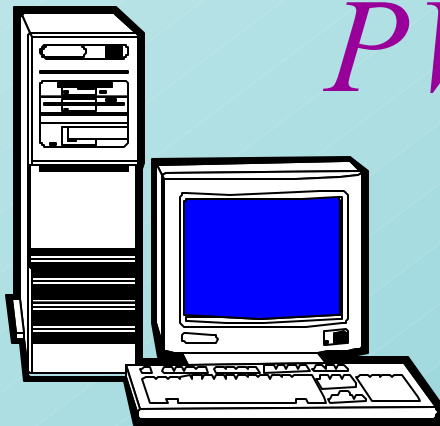
$$PV = DF \times C_t = \frac{C_t}{1 + r_t}$$

- ◆ 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.

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

# 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  $r_2 = 7\%$ .

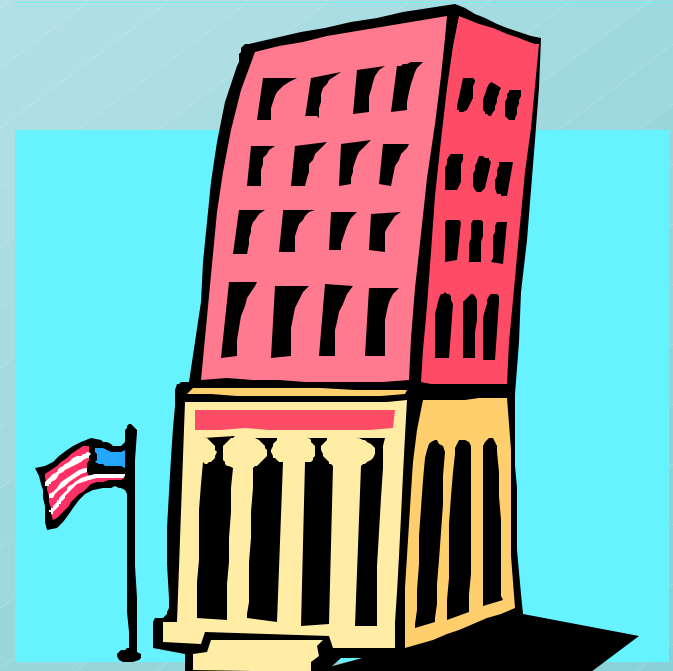
$$DF_1 = \frac{1.00}{(1+.20)^1} = .83$$

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

# 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.*



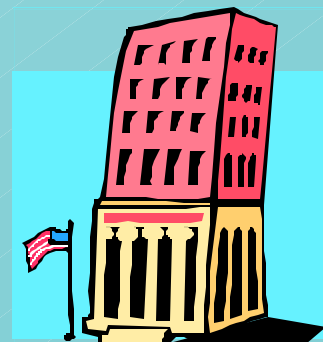
Year 0	Year 1	Year 2
-----	-----	-----
-150,000	-100,000	+ 300,000

# 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.*

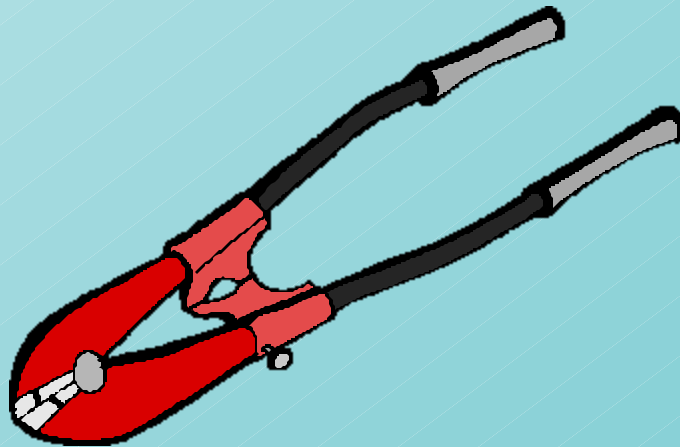
Period	Discount Factor	Cash Flow	Present Value
0	1.0	−150,000	−150,000
1	$\frac{1}{1.07} = .935$	−100,000	−93,500
2	$\frac{1}{(1.07)^2} = .873$	+300,000	+261,900
<i>NPV = Total =</i>			<i>\$18,400</i>





# 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 tools allow us to cut through the calculations quickly.



# Short Cuts

**Perpetuity** - 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?*



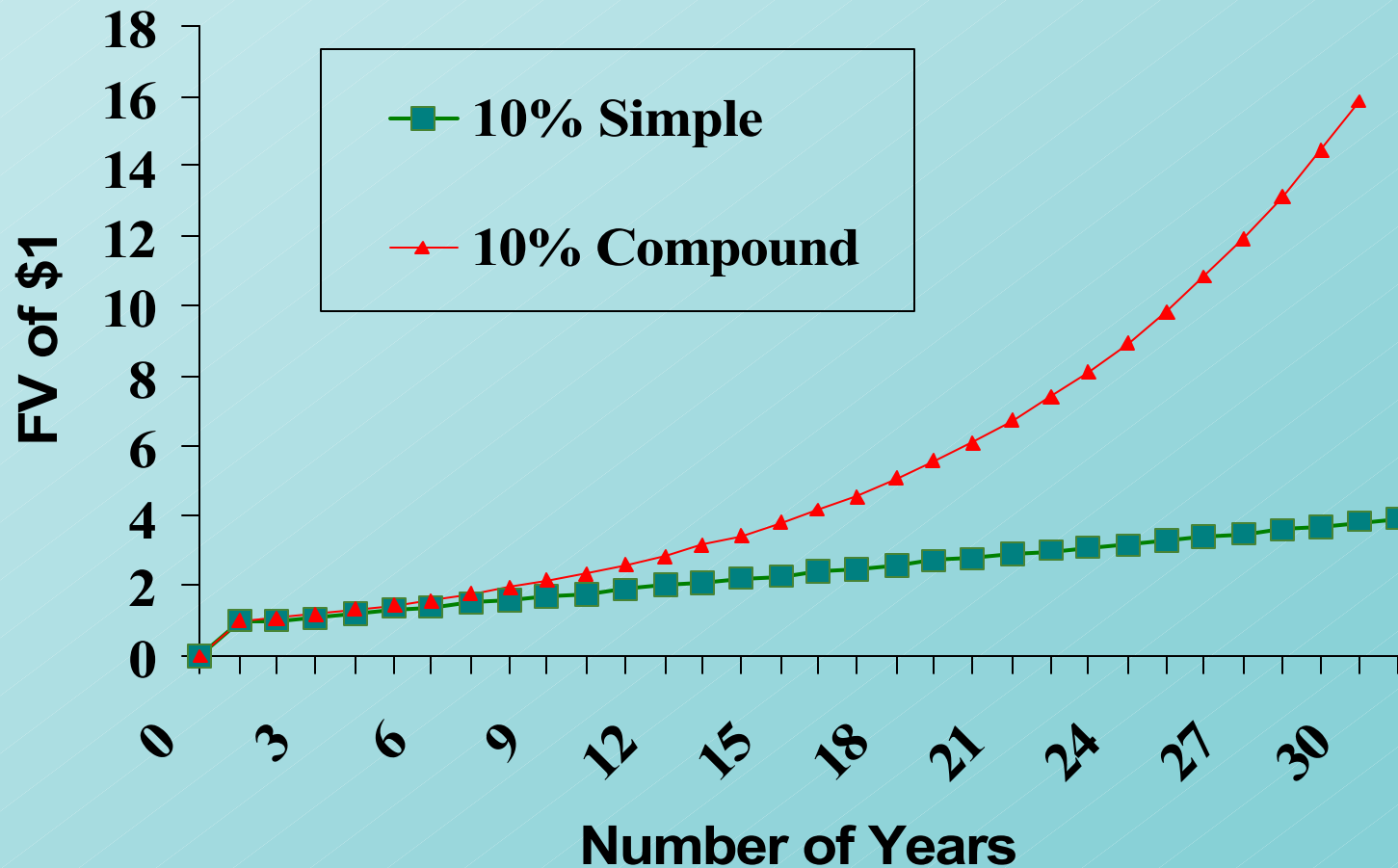
$$\text{Lease Cost} = 300 \times \left[ \frac{1}{.005} - \frac{1}{.005(1 + .005)^{48}} \right]$$

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

# Compound Interest

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

# 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

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

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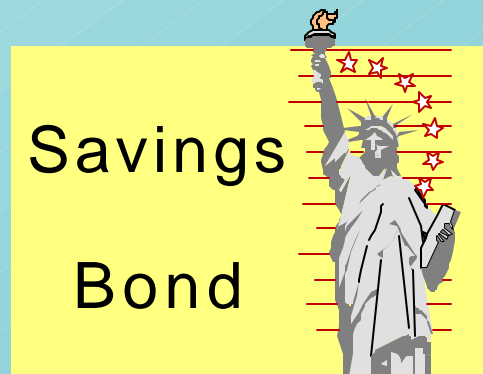
approximation formula

Real int. rate  $\approx$  nominal int. rate - 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

## 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?*

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

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

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

Savings

Bond



# Inflation

## Example

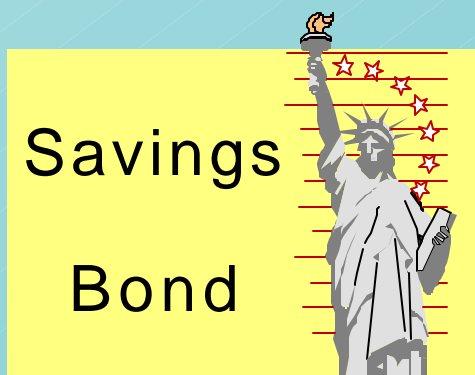
*If the interest rate on one year govt. bonds is 5.9% and the inflation rate is 3.3%, what is the real interest rate?*

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

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

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

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



# 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

<u>Sept 01</u>	<u>02</u>	<u>03</u>	<u>04</u>	<u>05</u>
115	115	115	115	1115

# Valuing a Bond

## Example continued

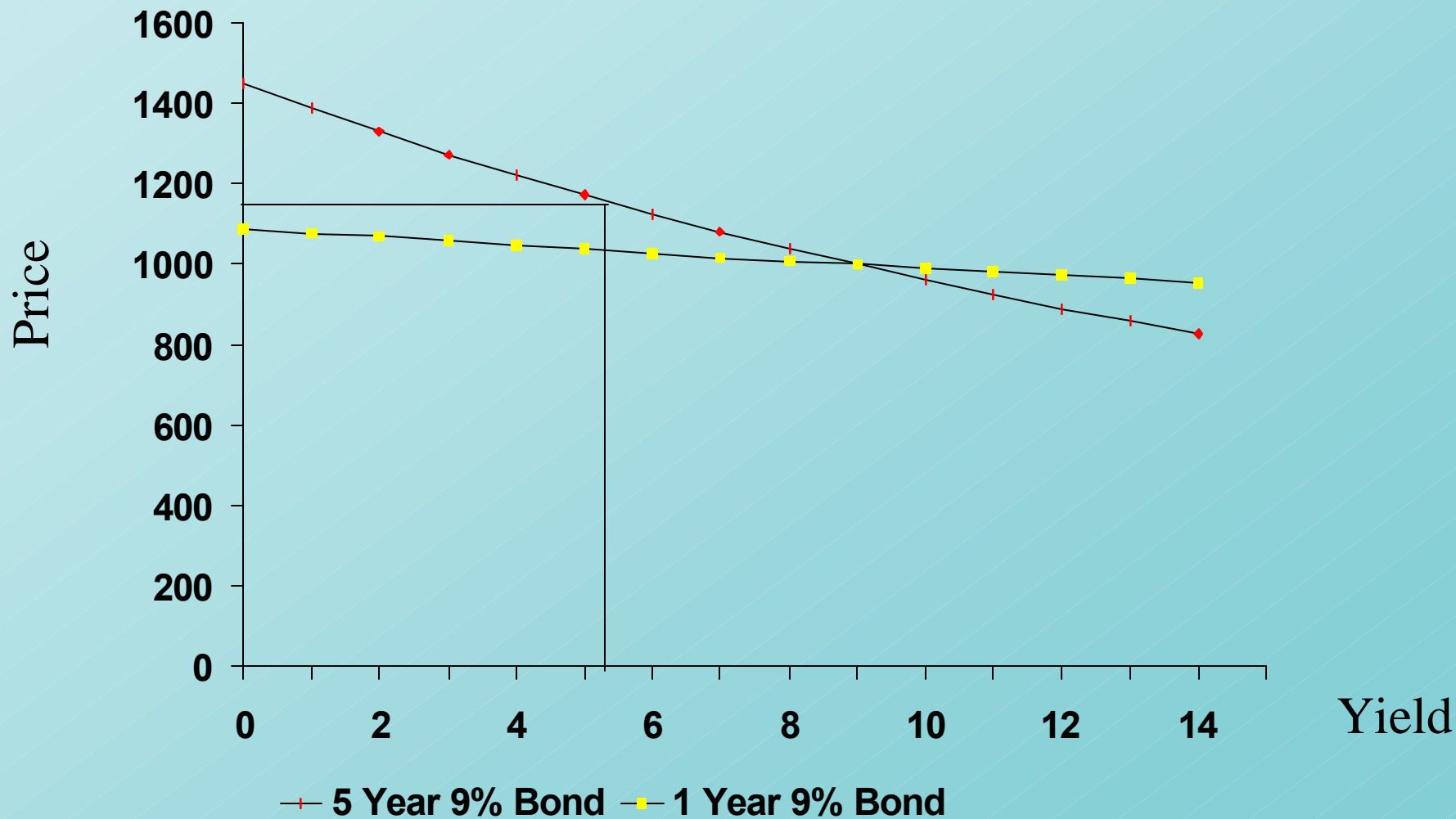
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$$PV = \frac{115}{1.075} + \frac{115}{(1.075)^2} + \frac{115}{(1.075)^3} + \frac{115}{(1.075)^4} + \frac{1,115}{(1.075)^5}$$
$$= \$1,161.84$$



# Bond Prices and Yields





# Principles of Corporate Finance

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## ◆ 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.

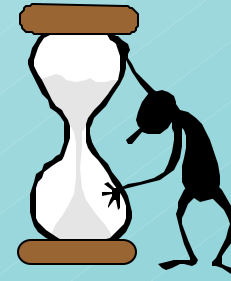
# Valuing Common Stocks

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*.



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

# 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.

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

$$\begin{aligned}\text{Capitalization Rate} = P_0 &= \frac{Div_1}{r - g} \\ &= r = \frac{Div_1}{P_0} + g\end{aligned}$$

# Valuing Common Stocks

## Return Measurements

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

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.

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

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*

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

$$PV = \$75.00$$



# Valuing Common Stocks

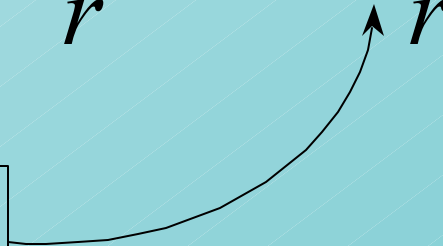
If we forecast no growth, and plan to hold out stock indefinitely, we will then value the stock as a **PERPETUITY**.

# Valuing Common Stocks

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

$$\textit{Perpetuity} = P_0 = \frac{\textit{Div}_1}{r} \textit{ or } \frac{\textit{EPS}_1}{r}$$

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.

$$g = \text{return on equity} \times \text{plowback ratio}$$

# 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

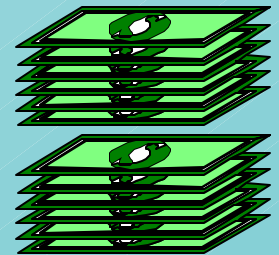
## Example

*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 blow 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?*

### No Growth

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

### With Growth





# Valuing Common Stocks

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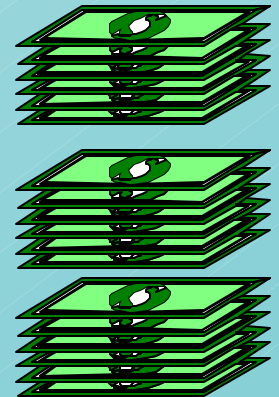
### No Growth

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

### With Growth

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

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



# 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  $\times$  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**.

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

# FCF and PV

## Valuing a Business

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

# 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
Asset Value	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
Free Cash Flow	-.80	-.96	-1.15	-1.39	-.20	-.23	1.59	1.68	1.79	1.89
.EPS growth (%)	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  $g=6\%$*

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

$$\begin{aligned} \text{PV(FCF)} &= -\frac{.80}{1.1} - \frac{.96}{(1.1)^2} - \frac{1.15}{(1.1)^3} - \frac{1.39}{(1.1)^4} - \frac{.20}{(1.1)^5} - \frac{.23}{(1.1)^6} \\ &= -3.6 \end{aligned}$$



# 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  $g=6\%$*

.

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



# Principles of Corporate Finance

Brealey and Myers

Sixth Edition

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

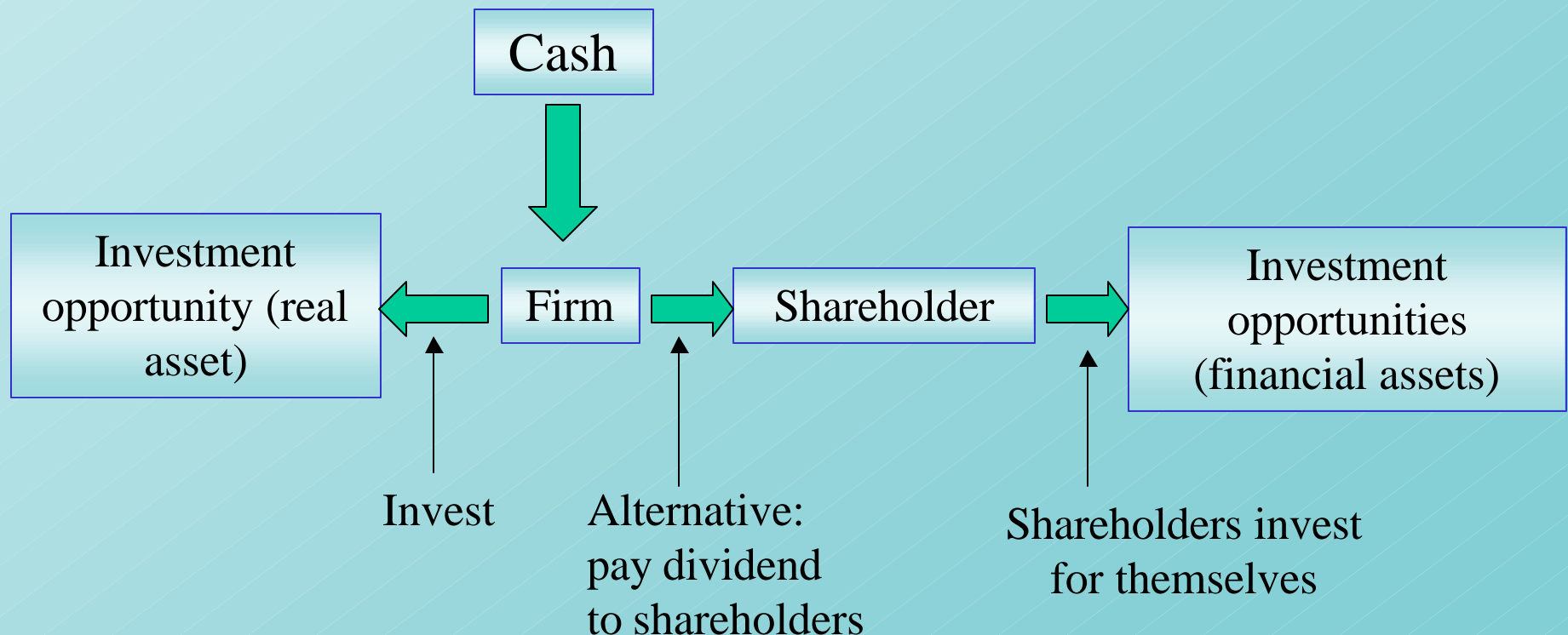
## Chapter 5

# 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

## 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?*

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

# Internal Rate of Return

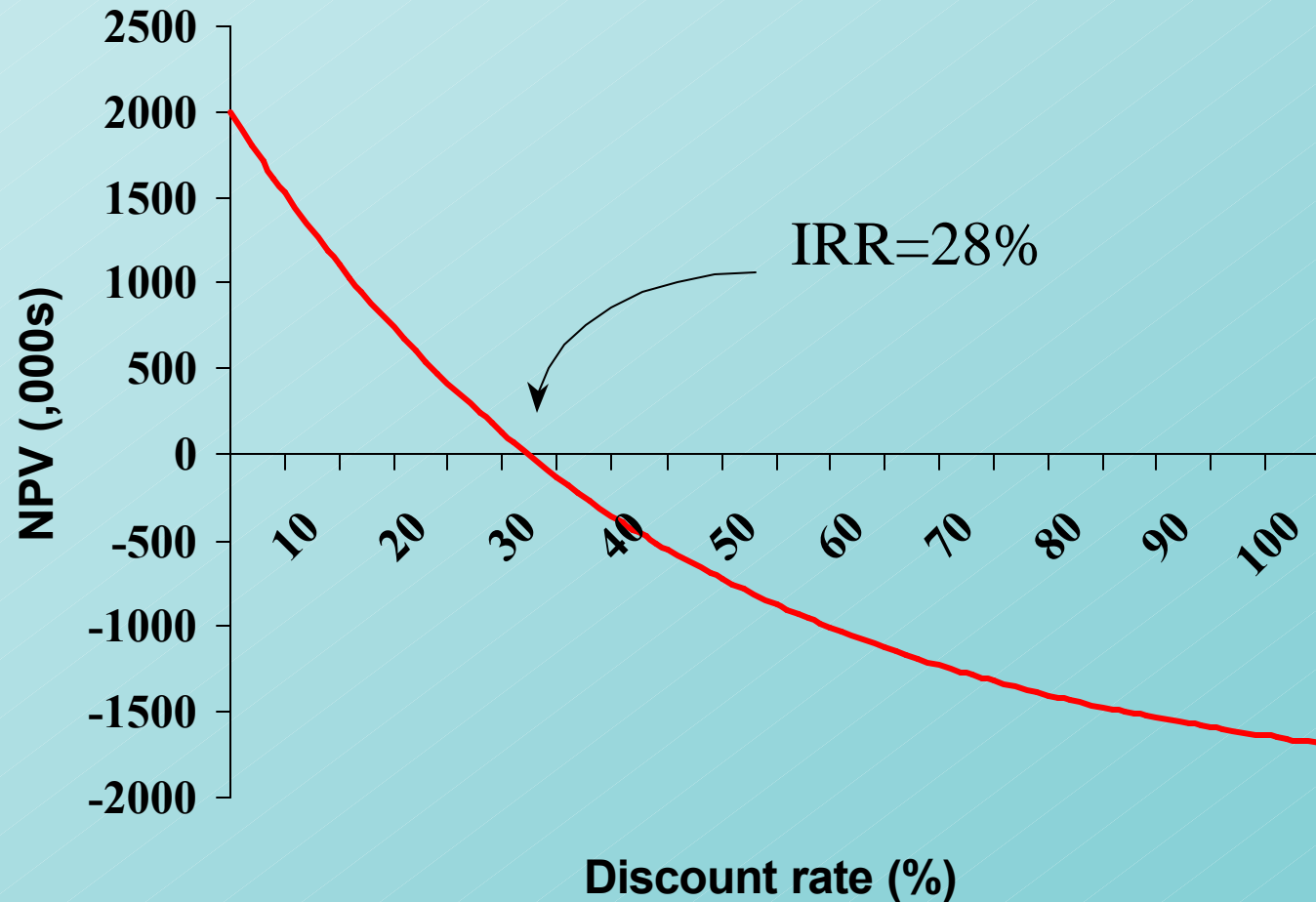
## Example

*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?

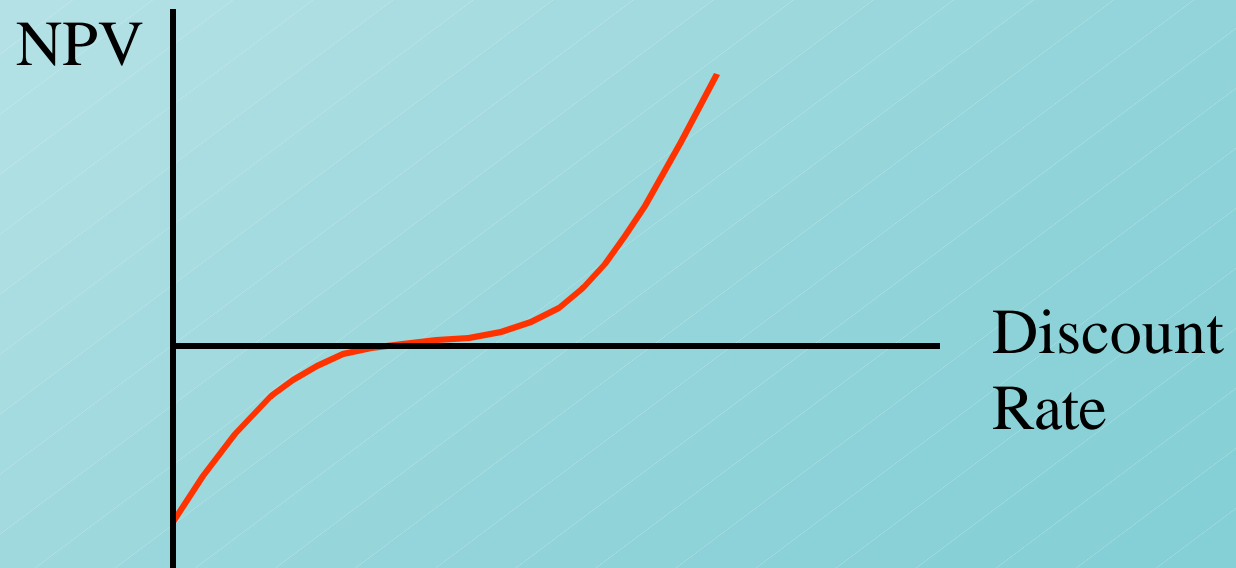
- ◆ With some cash flows (as noted below) the NPV of the project increases as the discount rate increases.
- ◆ This is contrary to the normal relationship between NPV and discount rates.

$C_0$	$C_1$	$C_2$	$C_3$	$IRR$	$NPV @ 10\%$
+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 as 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

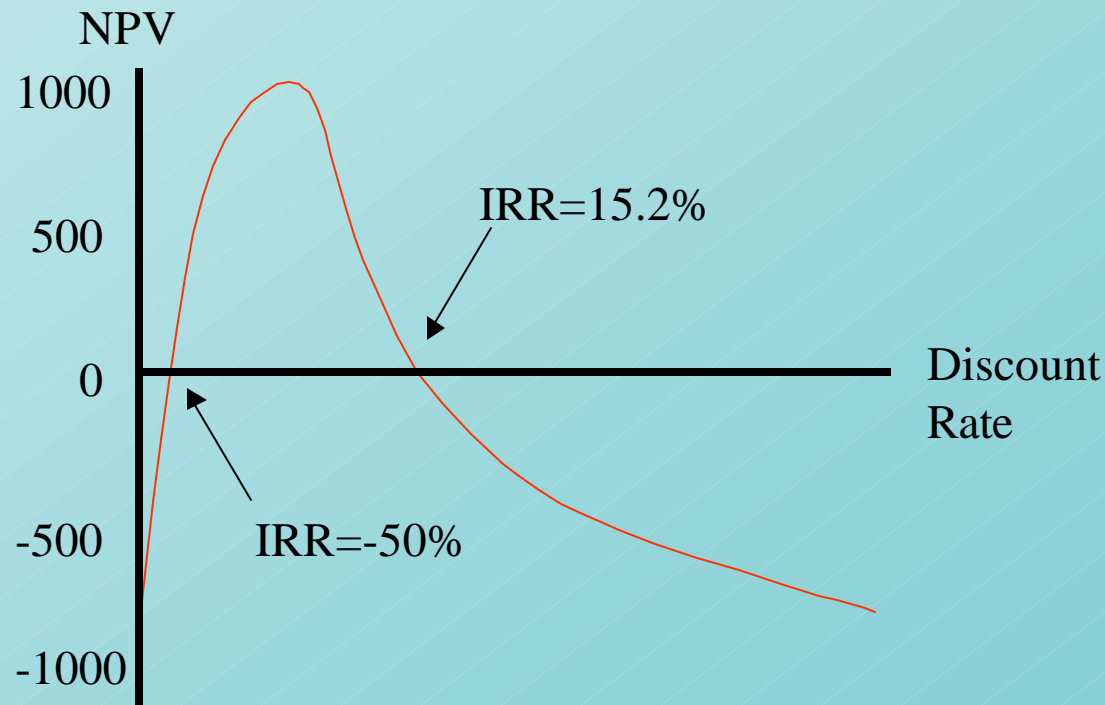
- ◆ Certain cash flows can generate  $NPV=0$  at two different discount rates.
- ◆ The following cash flow generates  $NPV=0$  at both  $(-50\%)$  and  $15.2\%$ .

$C_0$	$C_1$	$C_2$	$C_3$	$C_4$	$C_5$	$C_6$
-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

-350,000	CFj
16,000	CFj
16,000	CFj
466,000	CFj
{ IRR/YR }	

## EL-733A

-350,000	CFi
16,000	CFfi
16,000	CFi
466,000	CFi
IRR	

## BAII Plus

CF	
2nd	{ CLR Work }
-350,000	ENTER ↓
16,000	ENTER ↓
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

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

## Example

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

<u>Proj</u>	<u>NPV</u>	<u>Investment</u>	<u>PI</u>
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

<u>Proj</u>	<u>NPV</u>	<u>Investment</u>	<u>PI</u>
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

$$\begin{aligned}
 \text{WAPI (BD)} &= \frac{1.13(125)}{(300)} + \frac{1.08(150)}{(300)} + \frac{1.0(25)}{(300)} \\
 &= 1.09
 \end{aligned}$$

# Profitability Index

## Example - continued

<u>Proj</u>	<u>NPV</u>	<u>Investment</u>	<u>PI</u>
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

$$\text{WAPI (BD)} = 1.09$$

$$\text{WAPI (A)} = 1.10$$

$$\text{WAPI (BC)} = 1.12$$



# Linear Programming

- ♦ Maximize Cash flows or NPV
- ♦ Minimize costs

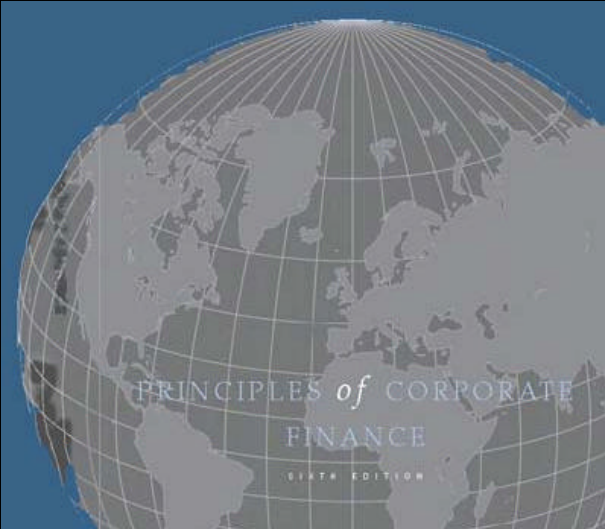
## Example

$$\text{Max NPV} = 21X_n + 16 X_b + 12 X_c + 13 X_d$$

subject to

$$10X_a + 5X_b + 5X_c + 0X_d \leq 10$$

$$-30X_a - 5X_b - 5X_c + 40X_d \leq 12$$



# Principles of Corporate Finance

Brealey and Myers

Sixth Edition

## ◆ Making Investment Decisions with the Net Present Value Rule

## Chapter 6

# Topics Covered

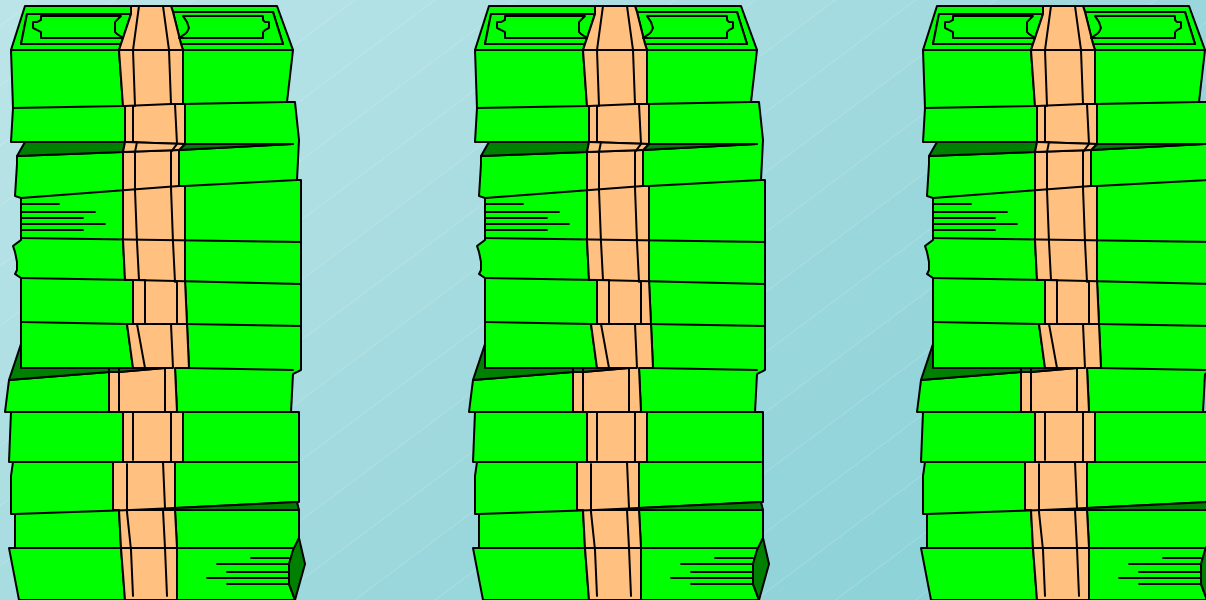
- ◆ What To Discount
- ◆ IM&C Project
- ◆ Project Interaction
  - Timing
  - Equivalent Annual Cost
  - Replacement
  - Cost of Excess Capacity
  - Fluctuating Load Factors

# What To Discount

***Only Cash Flow is Relevant***

# What To Discount

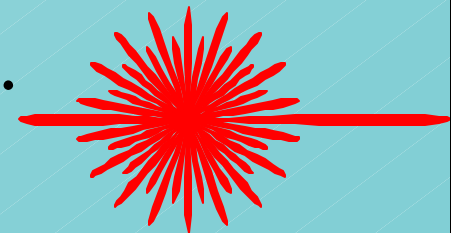
***Only Cash Flow is Relevant***



# What To Discount

## *Points to “Watch Out For”*

- ➡ 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

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

# Inflation

## Example - real figures

<u>Year</u>	<u>Cash Flow</u>	<u>PV @ 6.7961%</u>
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	$\frac{8741.82}{1.03^4} = 7766.99$	$\frac{7766.99}{1.068^4} = 5970.78$
		<hr/> = \$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

$$\begin{aligned} NPV = & -12,000 - \frac{1,630}{1.20} + \frac{2,381}{(1.20)^2} + \frac{6,205}{(1.20)^3} + \frac{10,685}{(1.20)^4} + \frac{10,136}{(1.20)^5} \\ & + \frac{6,110}{(1.20)^6} + \frac{3,444}{(1.20)^7} = 3,519 \text{ or } \$3,519,000 \end{aligned}$$

# 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)
<hr/>				
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 <sup>†</sup>
6. Taxes at 35% <sup>‡</sup>	-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 <sup>†</sup>	-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.

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

# 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?

	<i>Harvest Year</i>					
	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?

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

	<i>Harvest Year</i>					
	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					
<u>Machine</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>PV@6%</u>	<u>EAC</u>
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					
<u>Machine</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>PV@6%</u>	<u>EAC</u>
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:	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>NPV @ 10%</u>
	15	5	5	5	27.4

Equivalent annual cost of new machine =  
 $27.4 / (3\text{-year annuity factor}) = 27.4 / 2.5 = 11$

**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% =  $100/8.5 = 11.7$

	<u>0</u>	. . .	<u>5</u>	<u>6</u>	. . .	<u>10</u>	<u>11</u>	...
With project	0		0	11.7		11.7	11.7	
Without project	<u>0</u>		<u>0</u>	<u>0</u>		<u>0</u>	<u>11.7</u>	
Difference	0		0	11.7		11.7	0	

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

# 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 machine	$1,500 / .10 = \$15,000$
PV operating cost of two machines	$2 \times 15,000 = \$30,000$

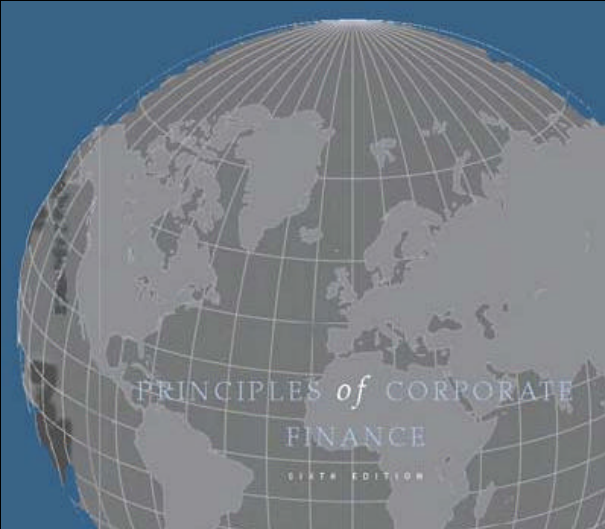
# Fluctuating Load Factors

	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

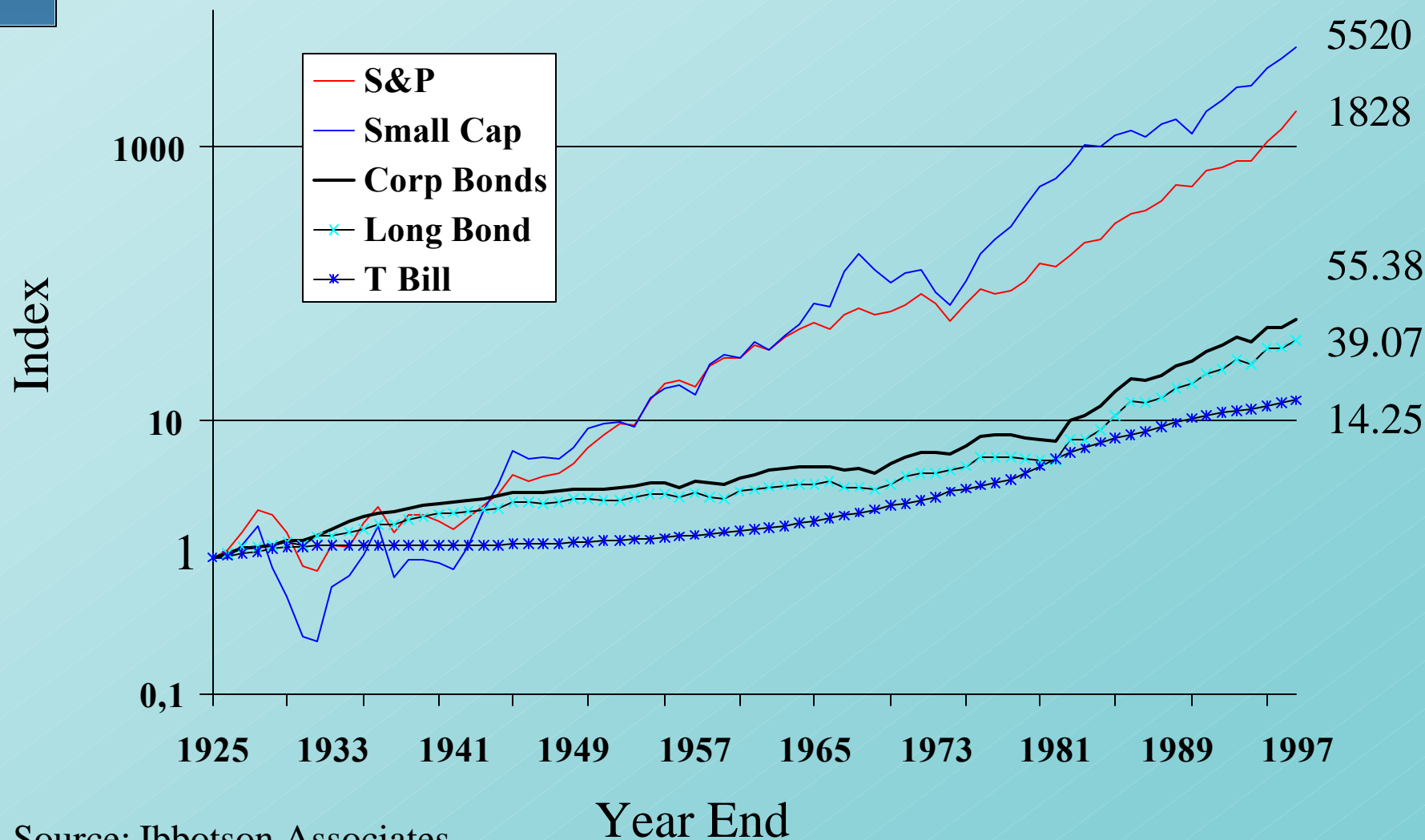
## ◆ Introduction to Risk, Return, and the Opportunity Cost of Capital

## Chapter 7

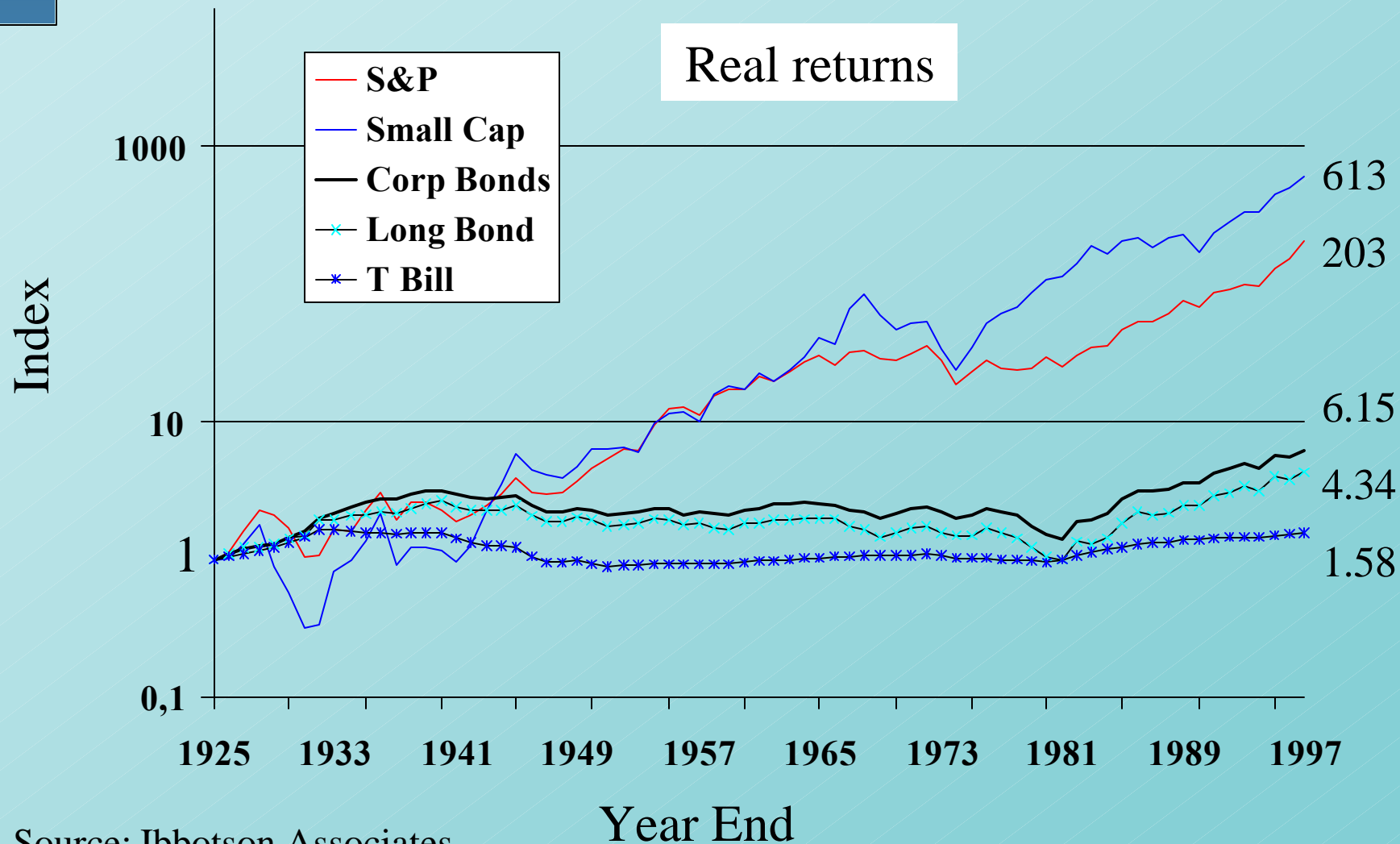
# Topics Covered

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

# The Value of an Investment of \$1 in 1926

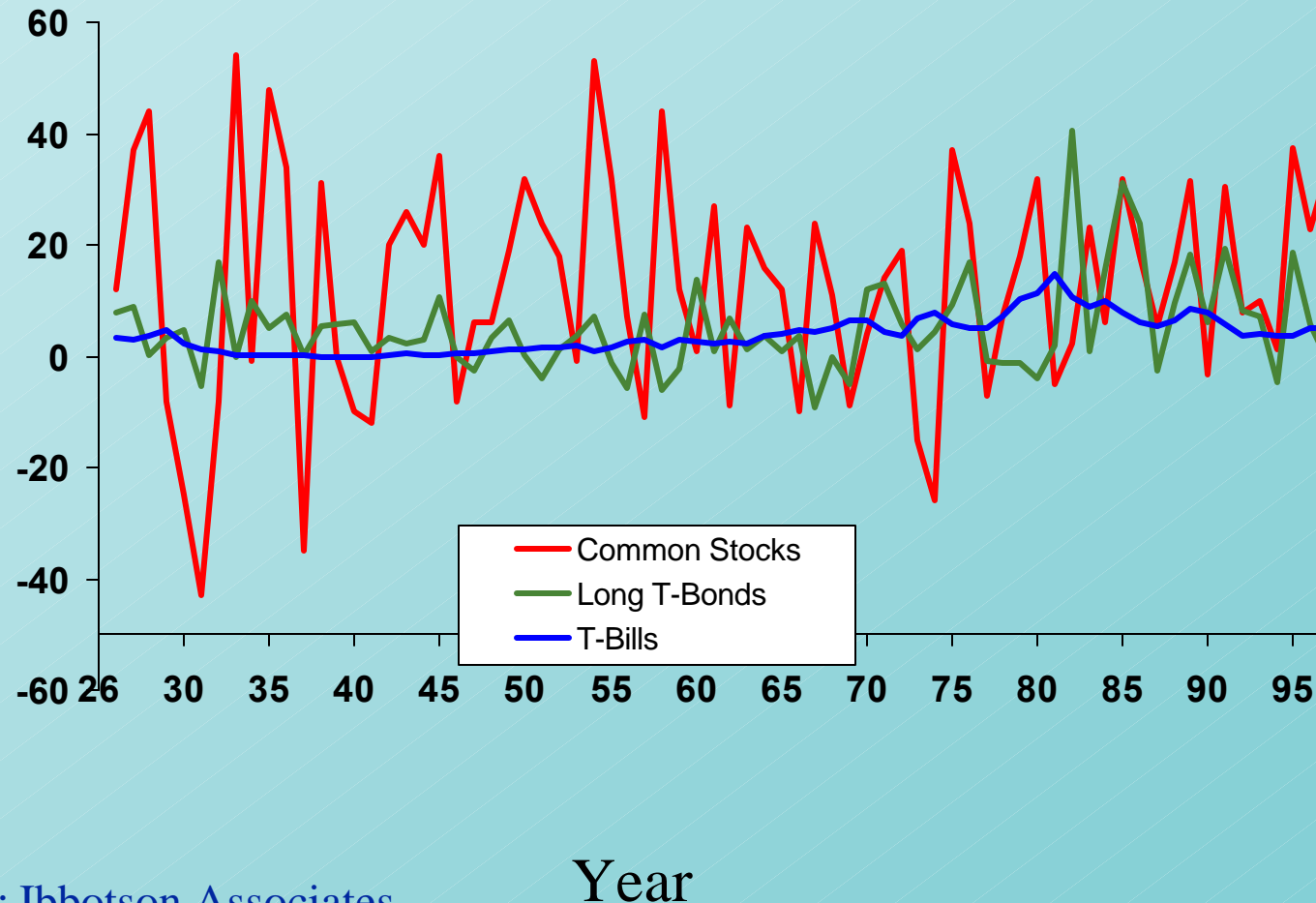


# The Value of an Investment of \$1 in 1926



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

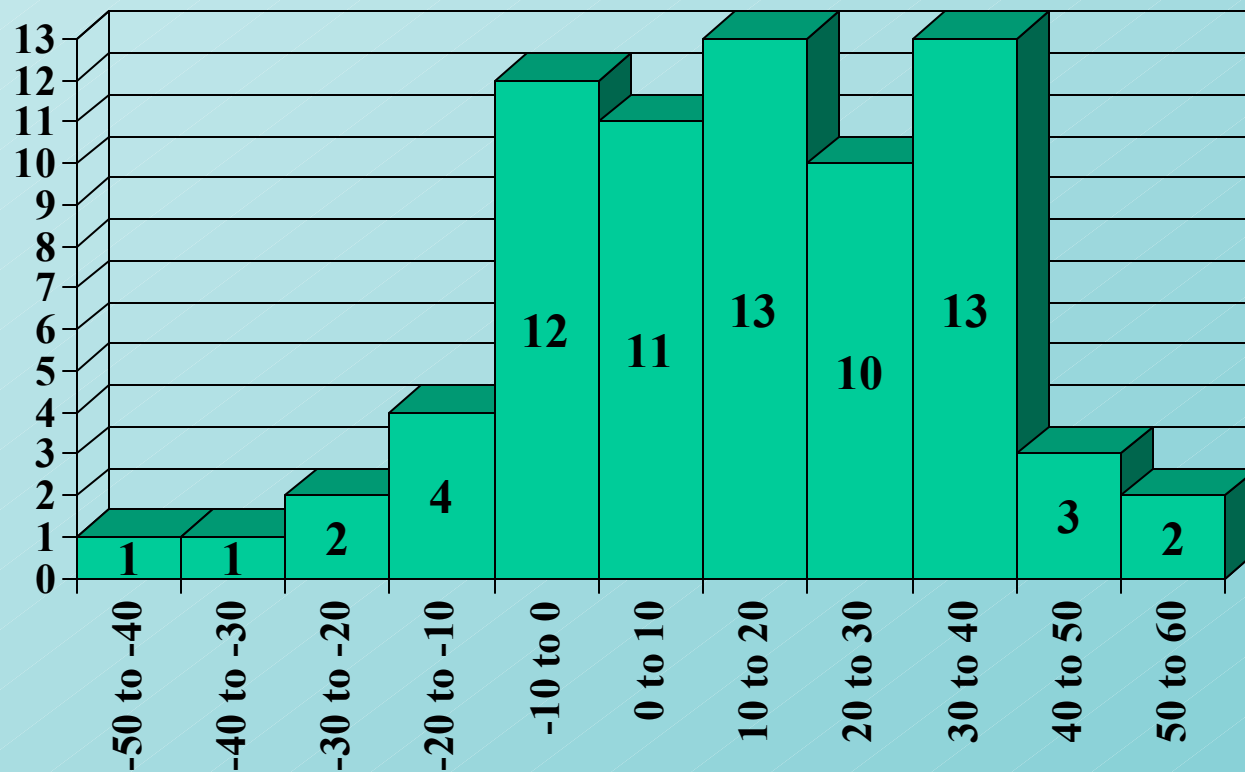
Variance = average of squared deviations =  $1800 / 4 = 450$

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

# Measuring Risk

## *Histogram of Annual Stock Market Returns*

# of Years



Return %



# Measuring Risk

**Diversification** - Strategy designed to reduce risk by spreading the portfolio across many investments.

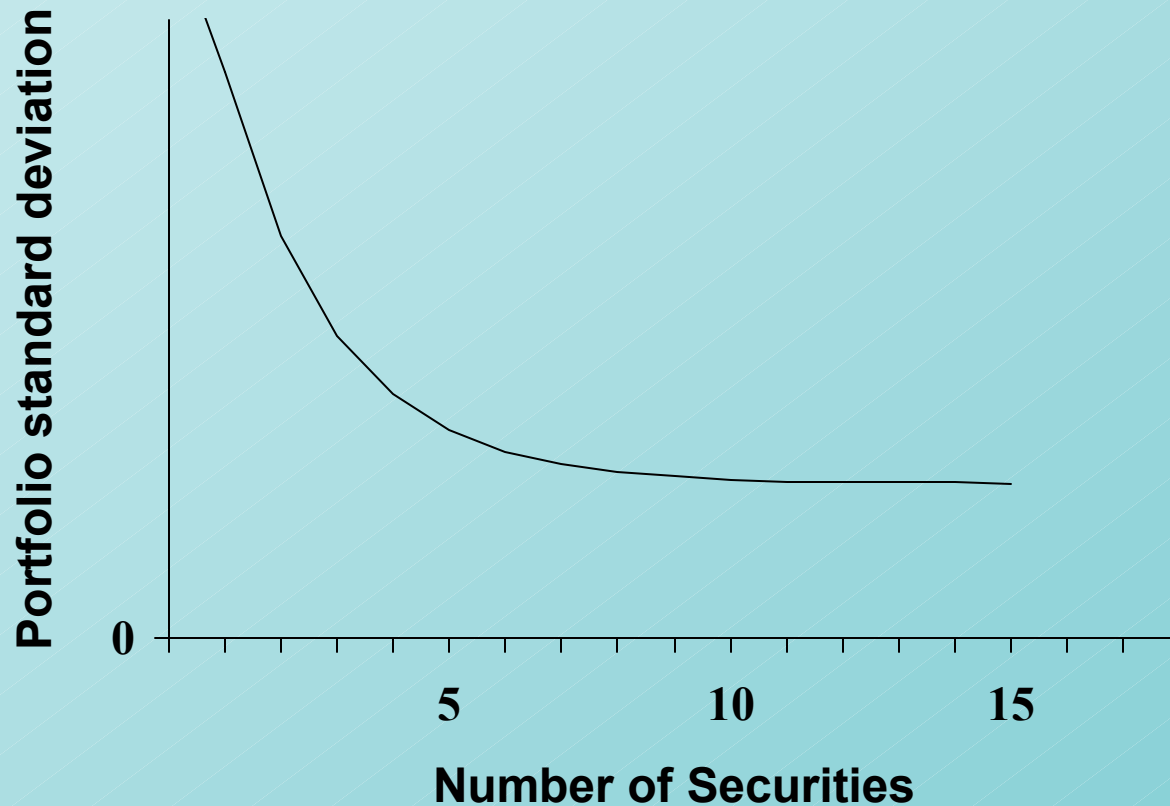
**Unique Risk** - Risk factors affecting only that firm.  
Also called “diversifiable risk.”

**Market Risk** - Economy-wide sources of risk that affect the overall stock market. Also called “systematic risk.”

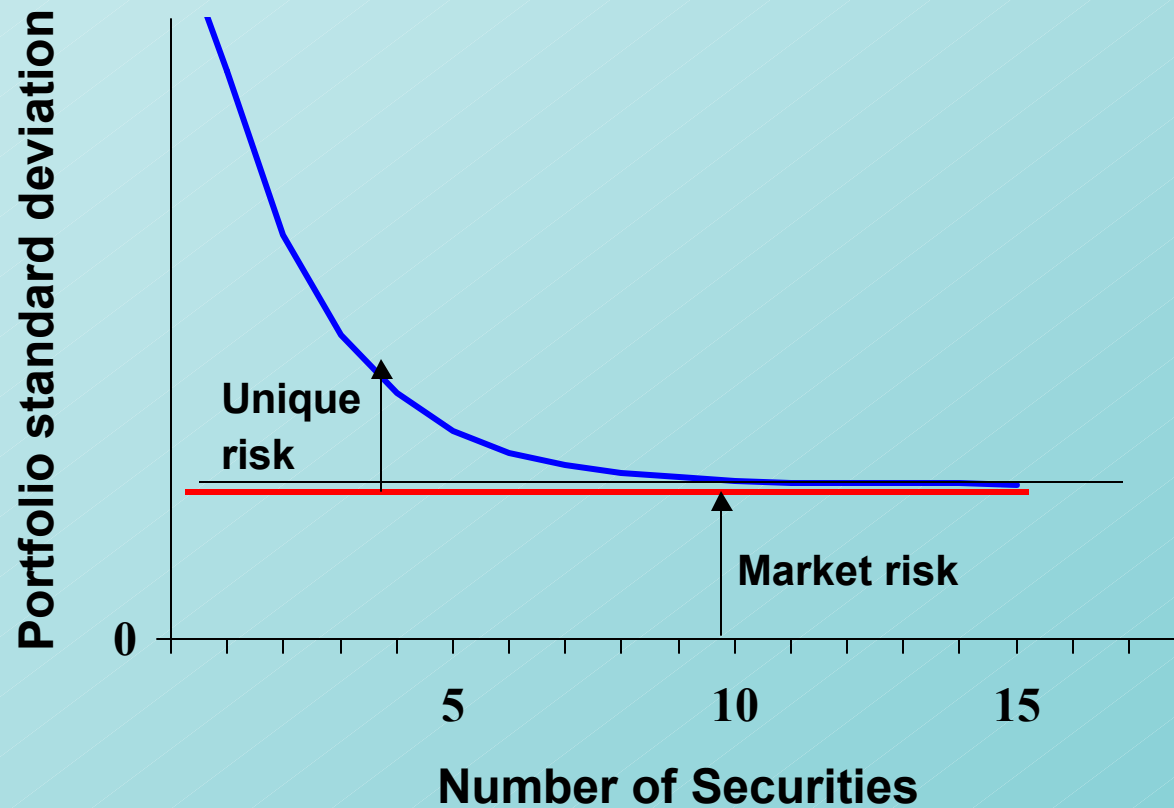
# Measuring Risk

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

# 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	$x_1^2 \sigma_1^2$	$x_1 x_2 \rho_{12} =$ $x_1 x_2 \tilde{\rho}_{12} \sigma_1 \sigma_2$
Stock 2	$x_1 x_2 \rho_{12} =$ $x_1 x_2 \tilde{\rho}_{12} \sigma_1 \sigma_2$	$x_2^2 \sigma_2^2$

# Portfolio Risk

## Example

Suppose you invest \$55 in Bristol-Myers and \$45 in McDonald's. The expected dollar return on your BM is  $.10 \times 55 = 5.50$  and on McDonald's it is  $.20 \times 45 = 9.90$ . The expected dollar return on your portfolio is  $5.50 + 9.90 = 15.40$ . The portfolio rate of return is  $15.40/100 = .154$  or 15.4%. 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  $.10 \times 55 = 5.50$  and on McDonald's it is  $.20 \times 45 = 9.90$ . The expected dollar return on your portfolio is  $5.50 + 9.90 = 15.40$ . The portfolio rate of return is  $15.40/100 = .154$  or 15.4%. Assume a correlation coefficient of 1.

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

# Portfolio Risk

## Example

Suppose you invest \$55 in Bristol-Myers and \$45 in McDonald's. The expected dollar return on your BM is  $.10 \times 55 = 5.50$  and on McDonald's it is  $.20 \times 45 = 9.90$ . The expected dollar return on your portfolio is  $5.50 + 9.90 = 15.40$ . The portfolio rate of return is  $15.40/100 = .154$  or 15.4%. Assume a correlation coefficient of 1.

$$\begin{aligned} \text{Portfolio Variance} &= [(.55)^2 \times (17.1)^2] \\ &\quad + [(.45)^2 \times (20.8)^2] \\ &\quad + 2(.55 \times .45 \times 1 \times 17.1 \times 20.8) = 352.10 \end{aligned}$$

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



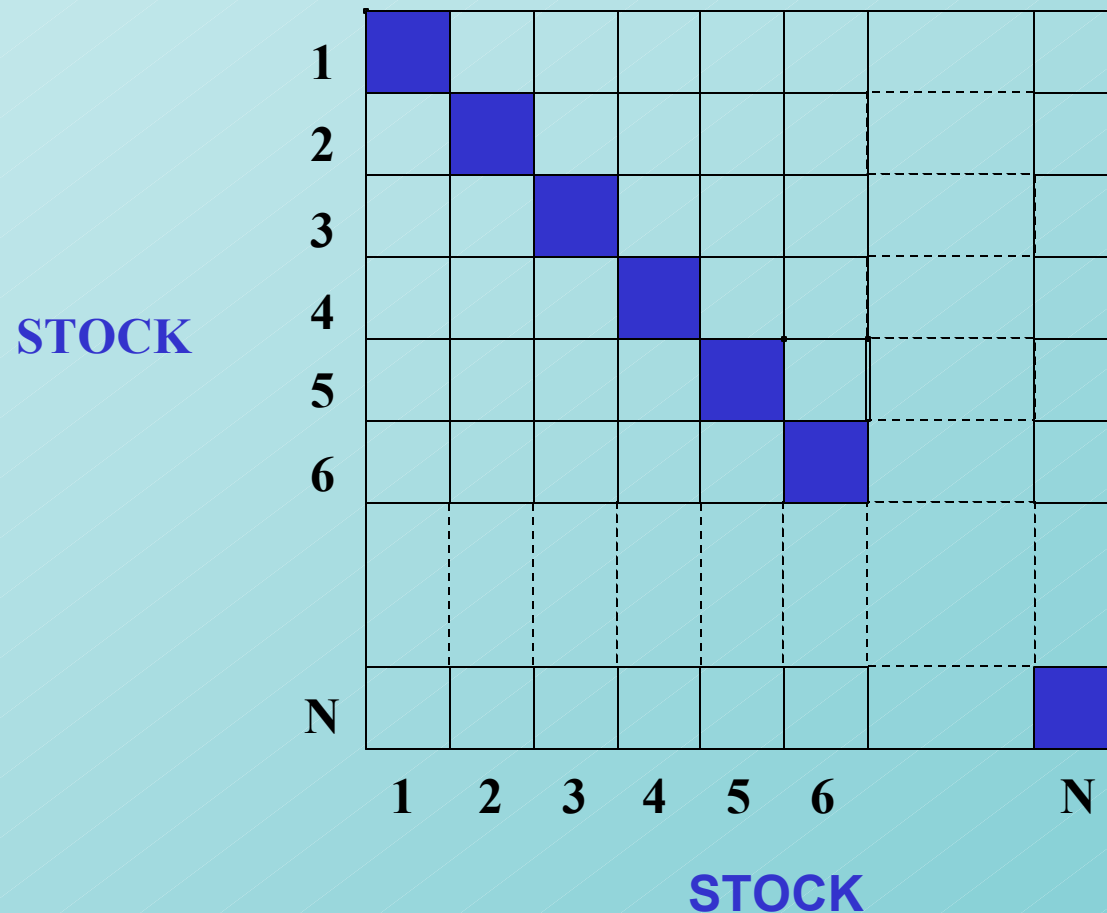
# Portfolio Risk

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

$$\text{Portfolio Variance} = x_1^2 \sigma_1^2 + x_2^2 \sigma_2^2 + 2(x_1 x_2 \tilde{r}_{12} \sigma_1 \sigma_2)$$

# Portfolio Risk

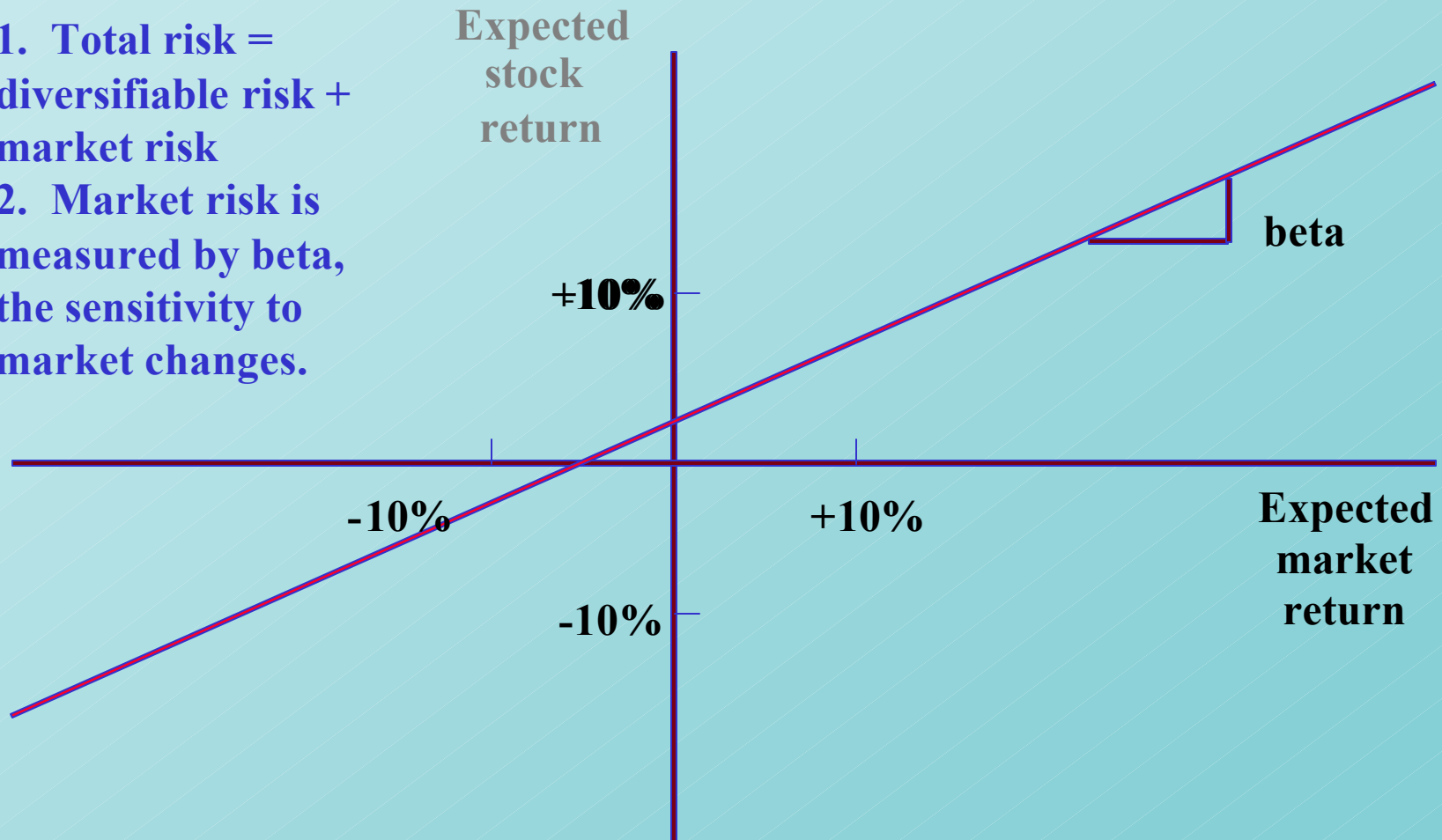
The shaded boxes contain variance terms; the remainder contain covariance terms.



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

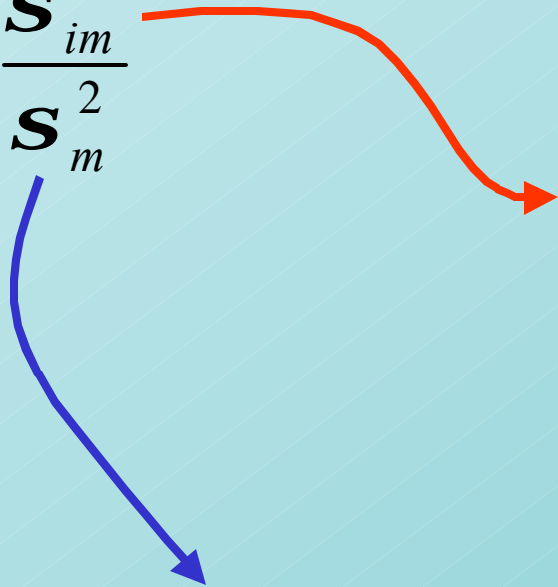
$$B_i = \frac{\mathbf{S}_{im}}{\mathbf{S}_m^2}$$

# 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



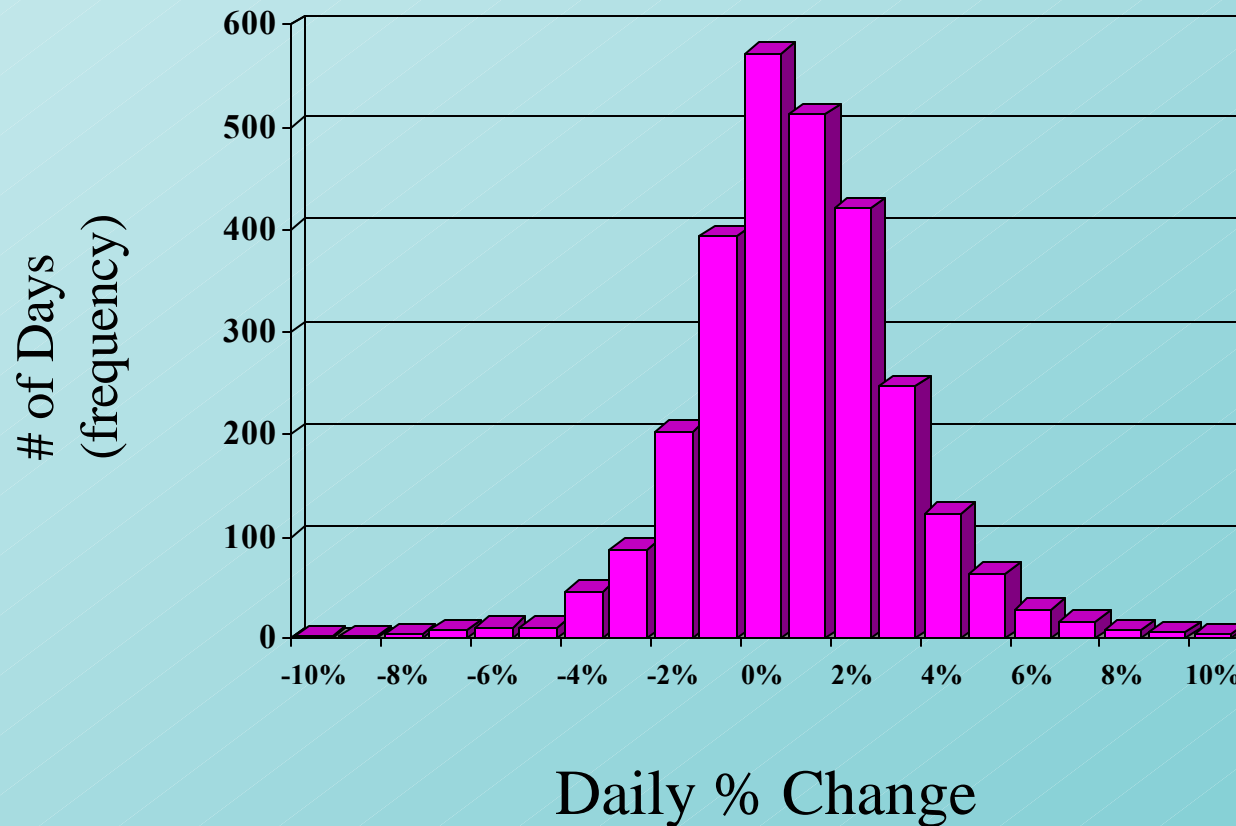
# Markowitz Portfolio Theory

- ◆ 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

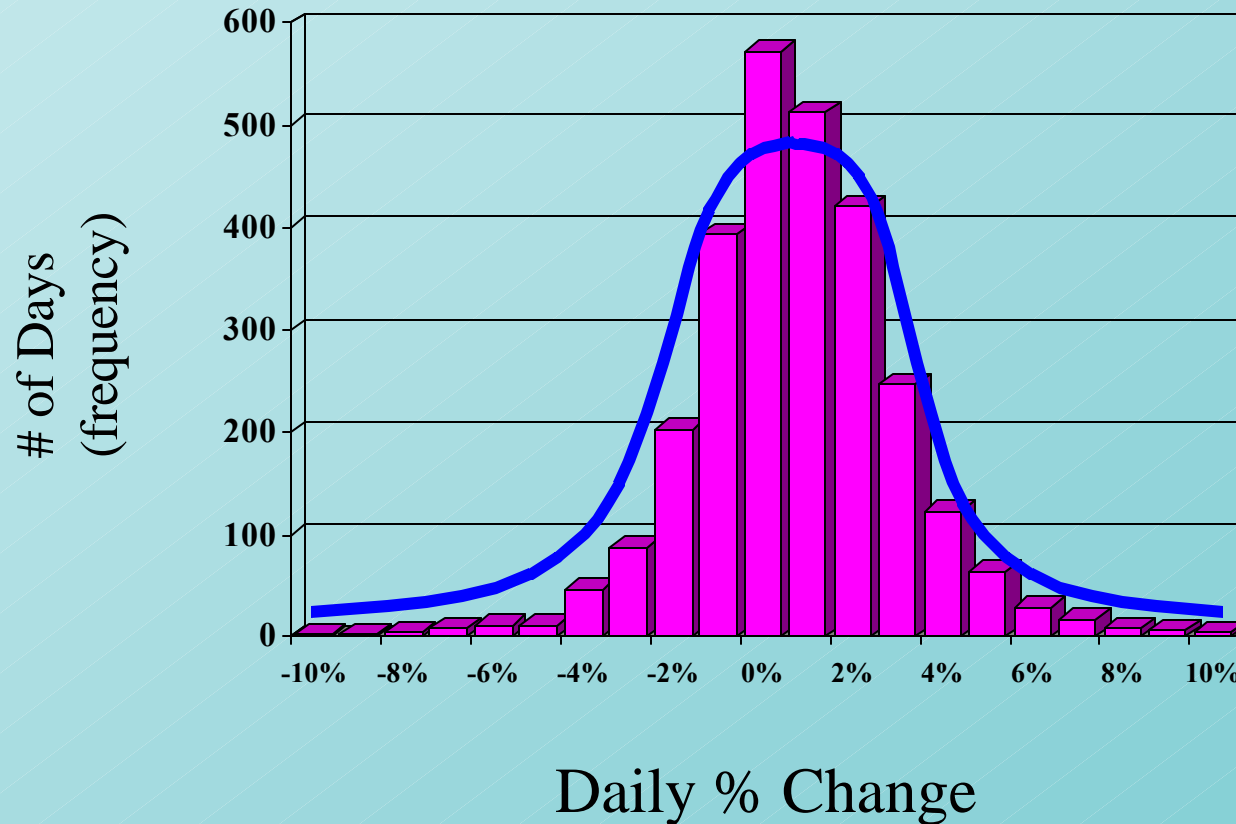
*Microsoft - Daily % change 1986-1997*



# Markowitz Portfolio Theory

Price changes vs. Normal distribution

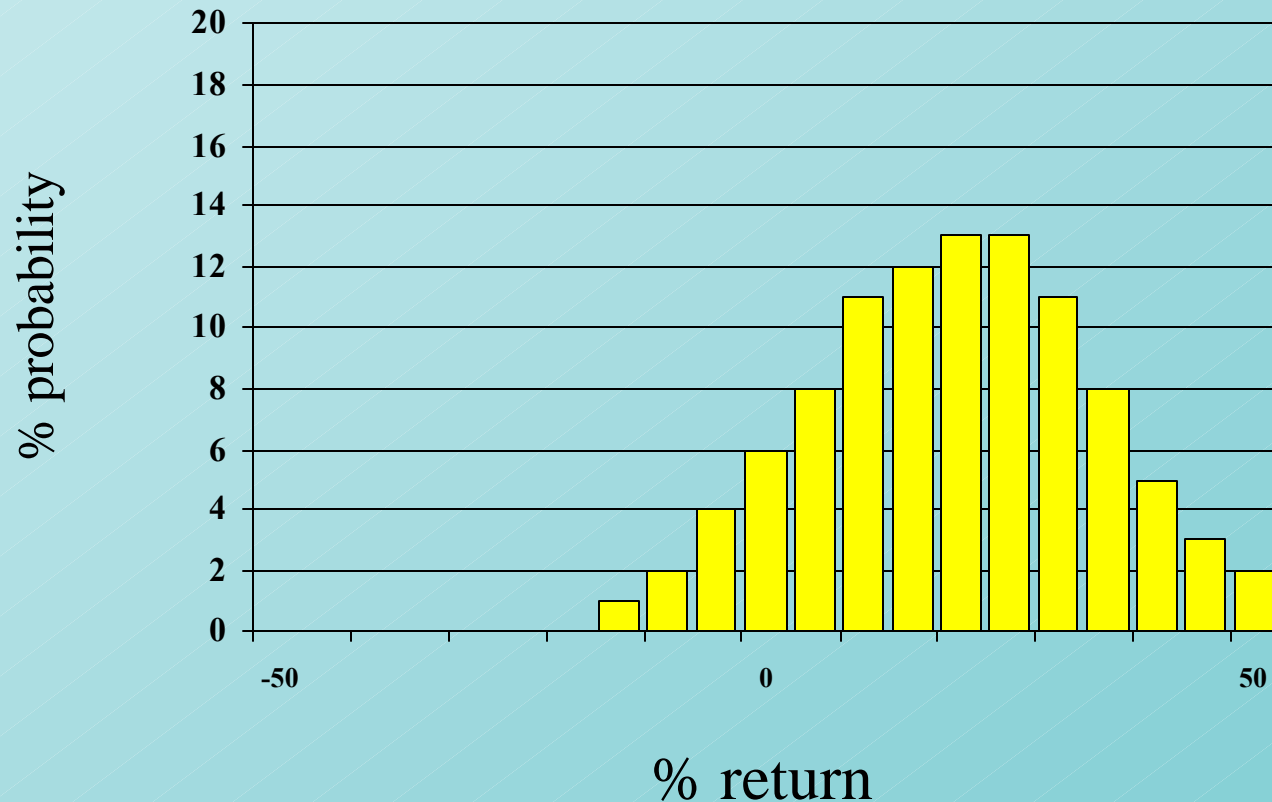
*Microsoft - Daily % change 1986-1997*



# Markowitz Portfolio Theory

Standard Deviation VS. Expected Return

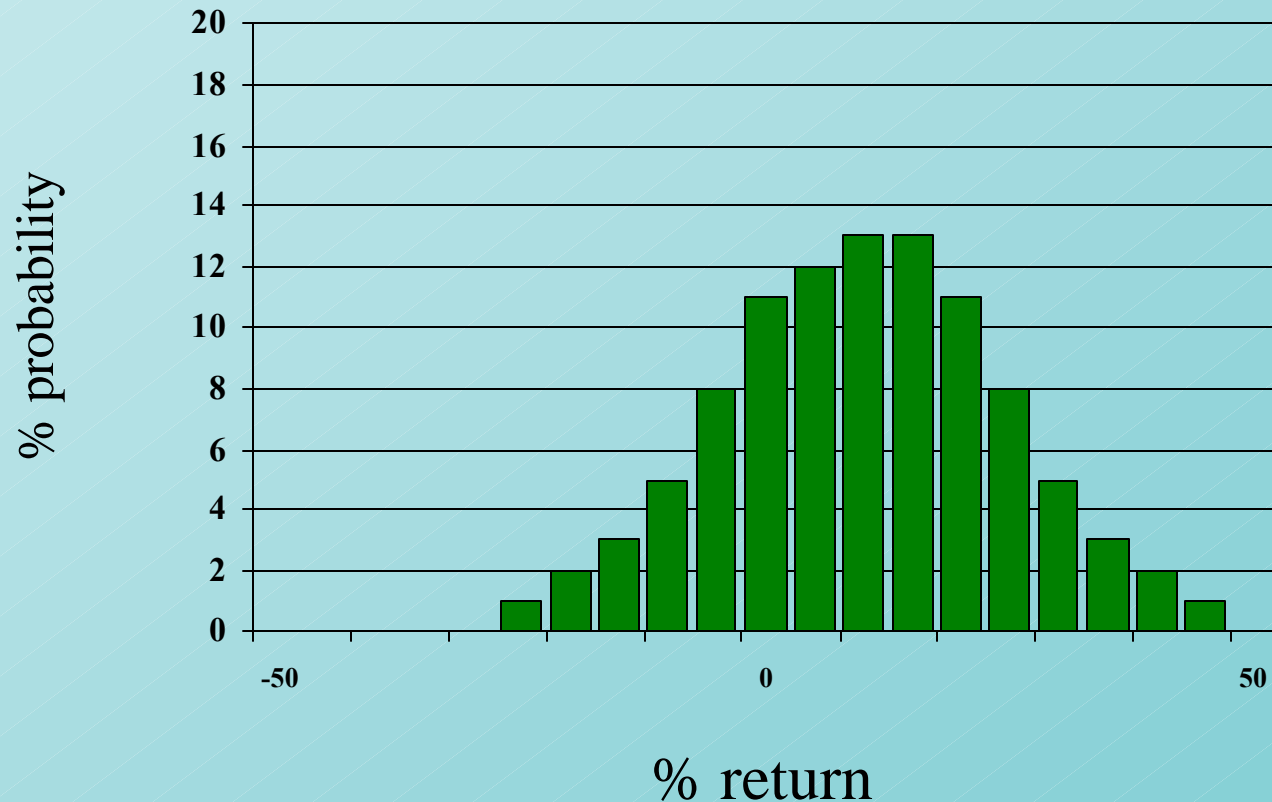
*Investment C*



# Markowitz Portfolio Theory

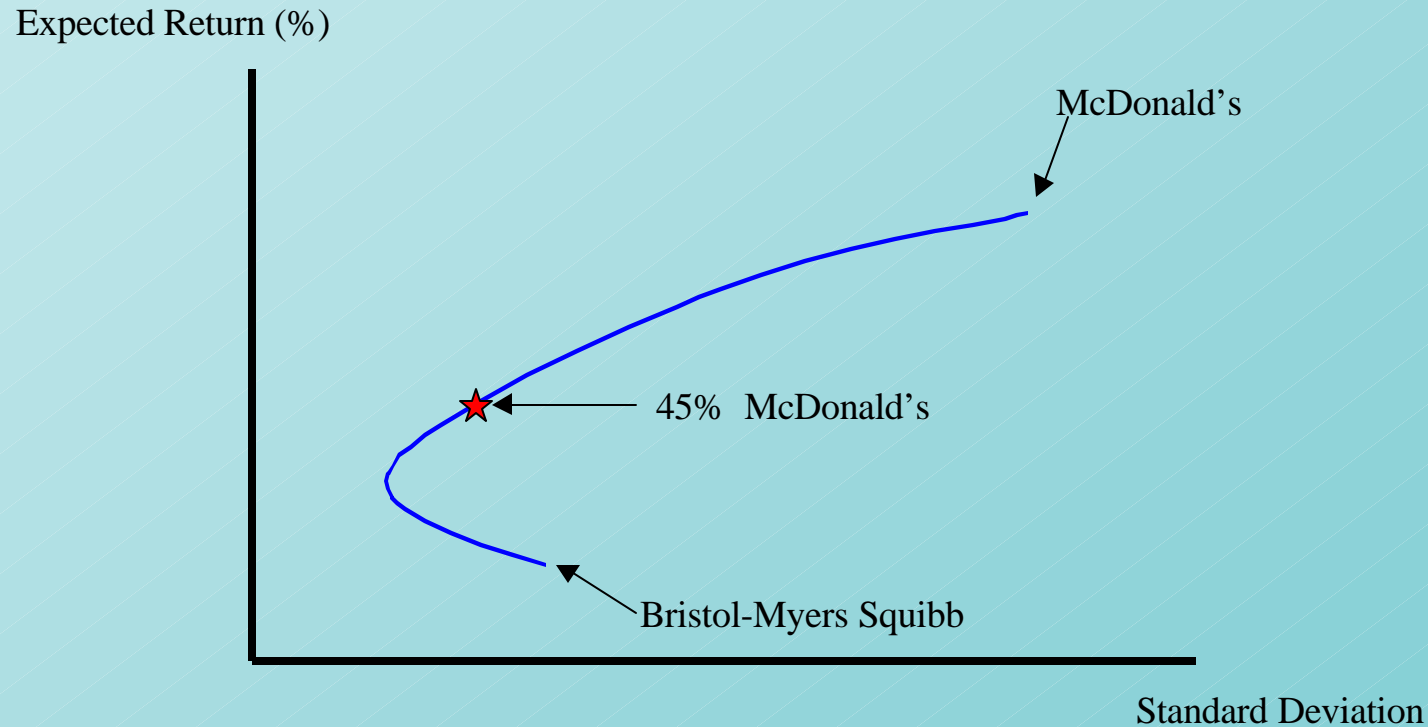
Standard Deviation VS. Expected Return

*Investment D*



# Markowitz Portfolio Theory

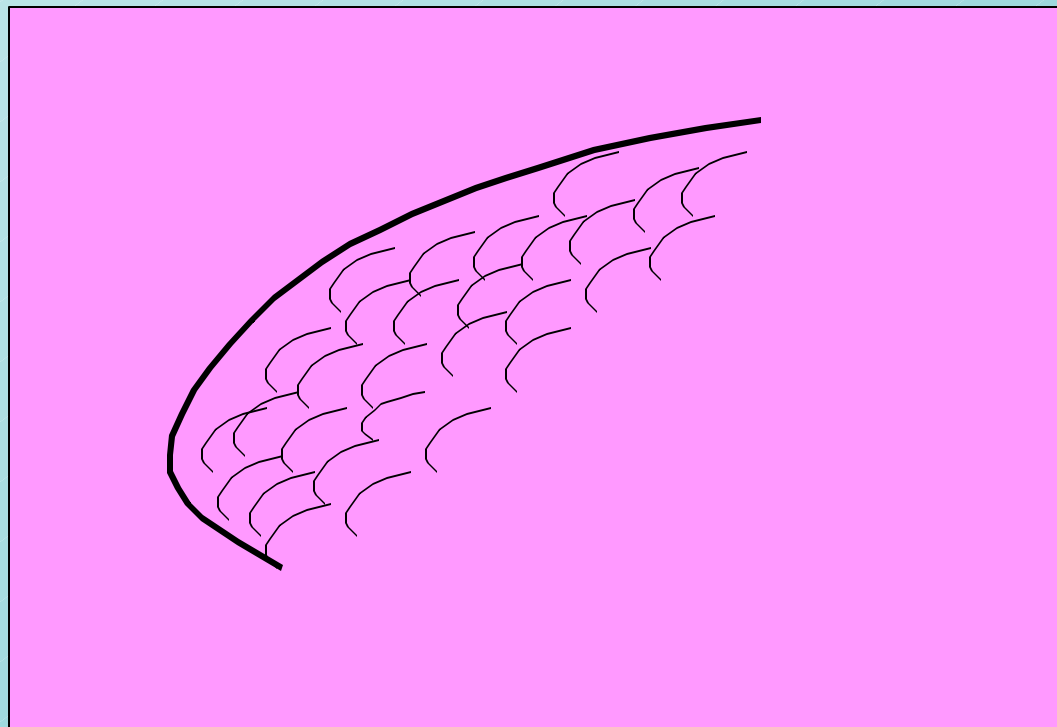
- ◆ Expected Returns and Standard Deviations vary given different weighted combinations of the stocks.



# Efficient Frontier

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

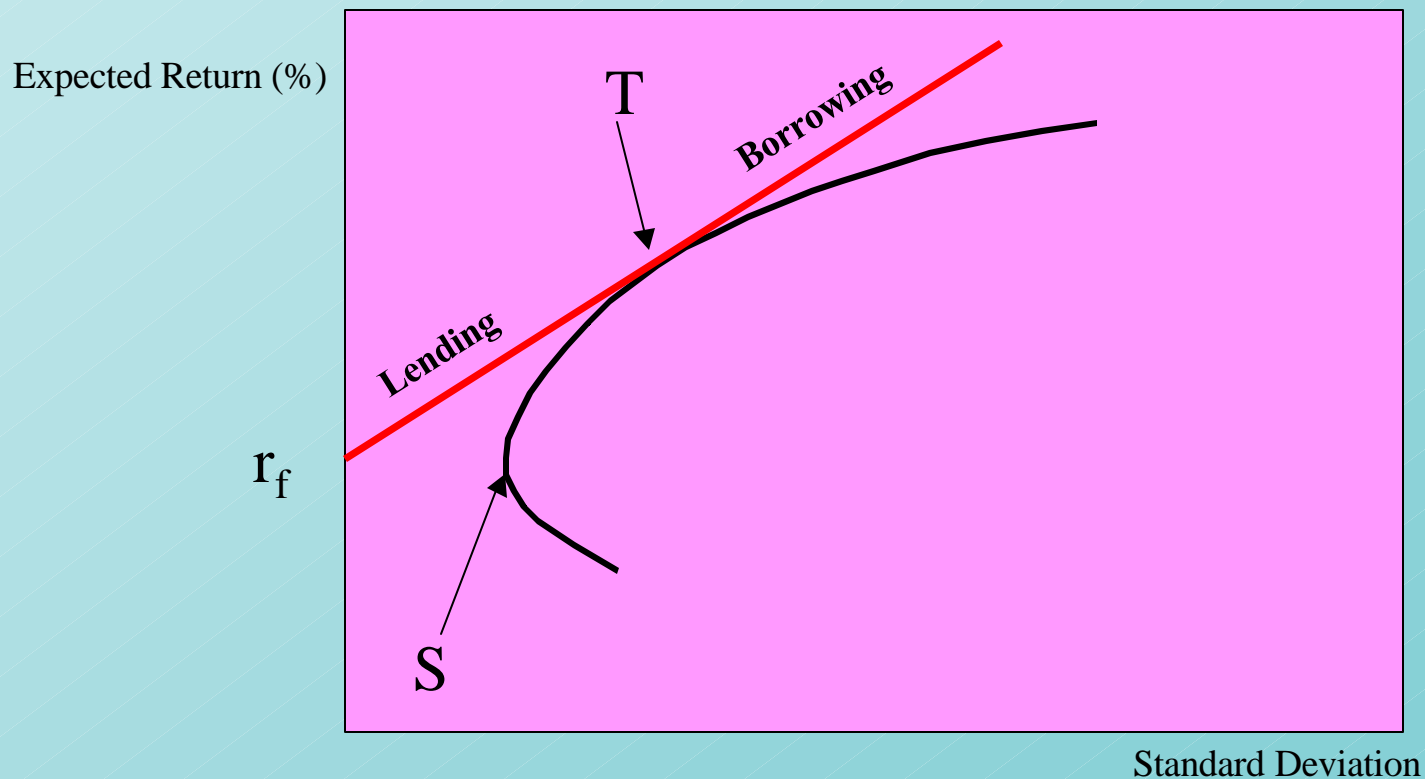
Expected Return (%)



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

<u>Stocks</u>	<u><i>S</i></u>	<u>% of Portfolio</u>	<u>Avg Return</u>
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

## Example

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 = 33.6

Standard Deviation = Portfolio = 28.1

Return = weighted avg = Portfolio = 17.4%

Let's Add stock New Corp to the portfolio

# Efficient Frontier

## Example

Correlation Coefficient = .3

<u>Stocks</u>	<u><i>S</i></u>	<u>% of Portfolio</u>	<u>Avg Return</u>
Portfolio	28.1	50%	17.4%
<i>New Corp</i>	<i>30</i>	<i>50%</i>	<i>19%</i>

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

<u>Stocks</u>	<u><i>S</i></u>	<u>% of Portfolio</u>	<u>Avg Return</u>
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

<u>Stocks</u>	<u><i>S</i></u>	<u>% of Portfolio</u>	<u>Avg Return</u>
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?

# Efficient Frontier

## Example

Correlation Coefficient = .3

<u>Stocks</u>	<u><i>S</i></u>	<u>% of Portfolio</u>	<u>Avg Return</u>
Portfolio	28.1	50%	17.4%
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NEW Standard Deviation = weighted avg = 31.80

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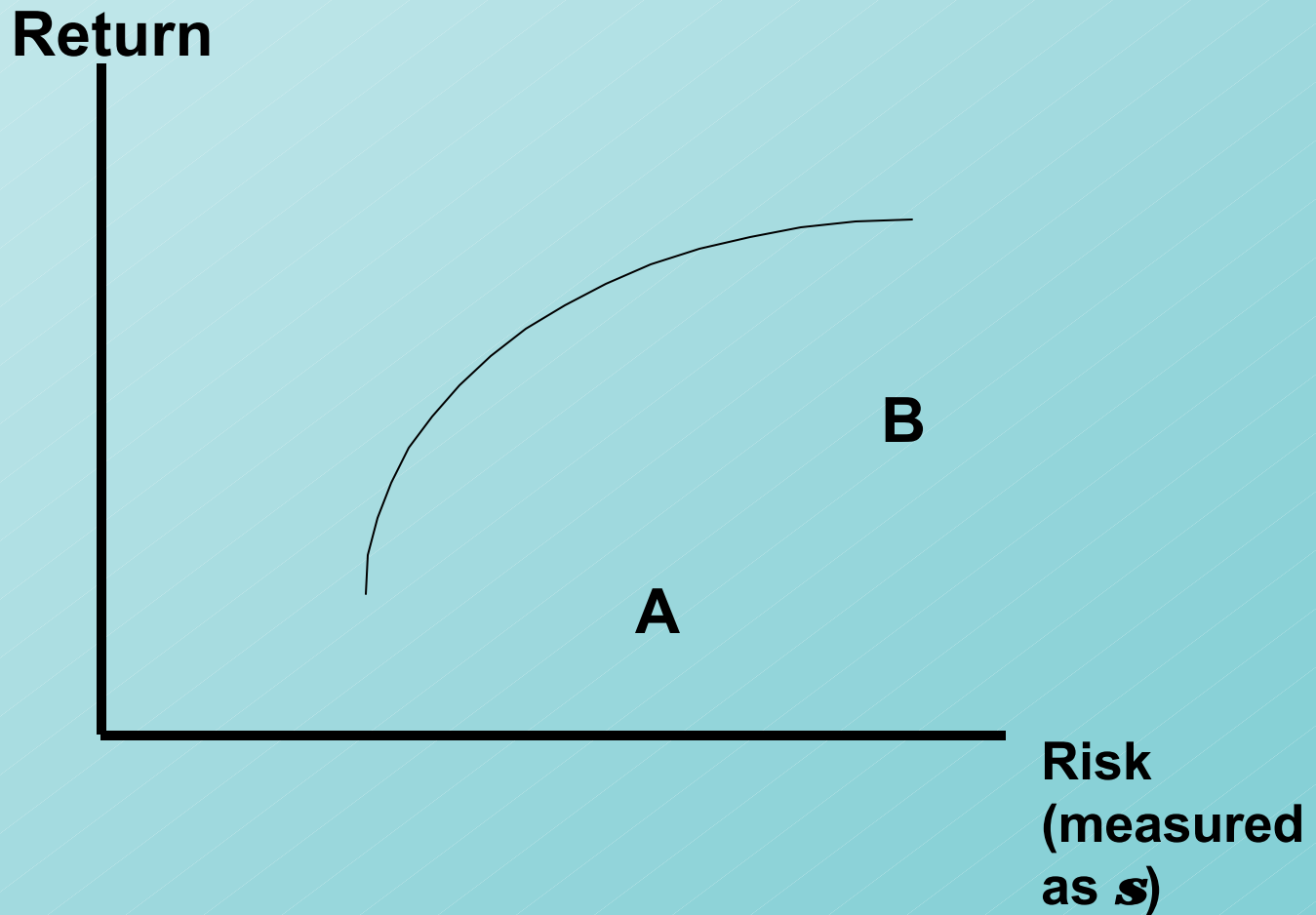
NEW Return = weighted avg = Portfolio = 18.20%

NOTE: Higher return & Lower risk

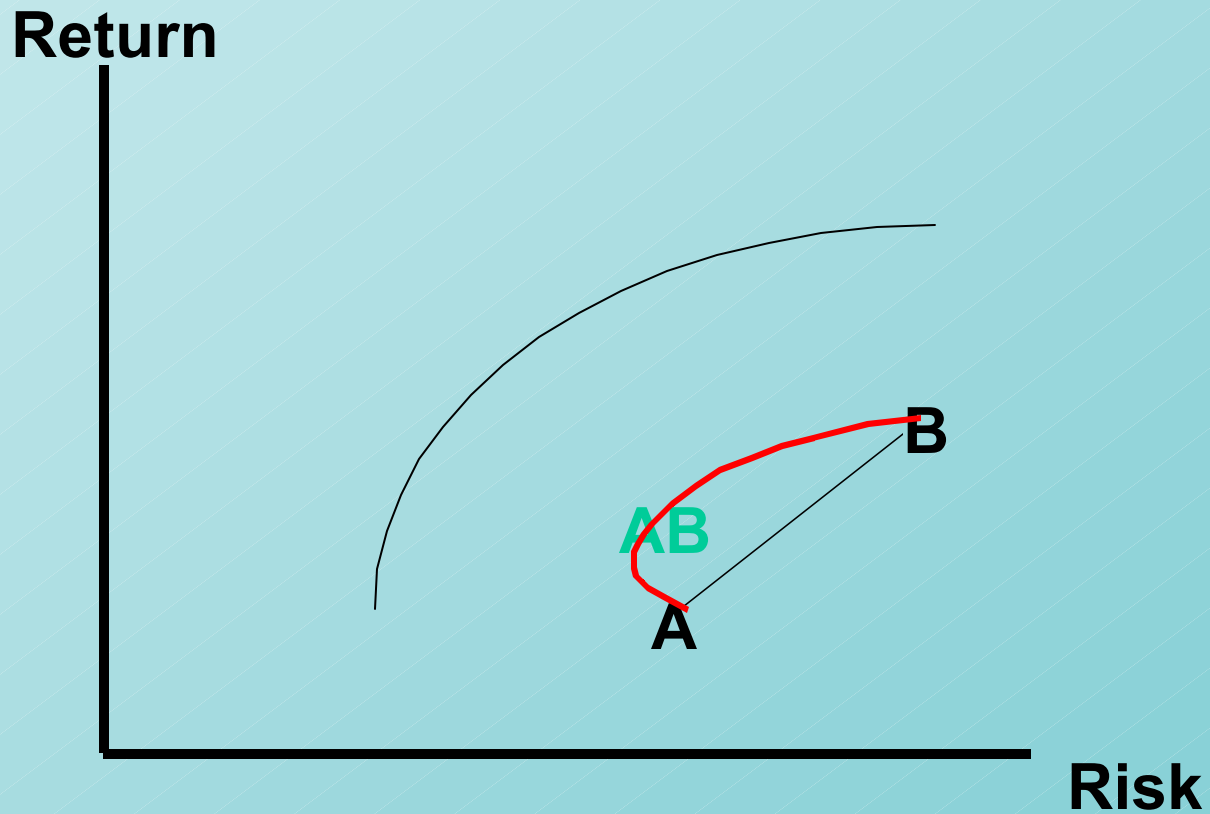
How did we do that?

DIVERSIFICATION

# Efficient Frontier

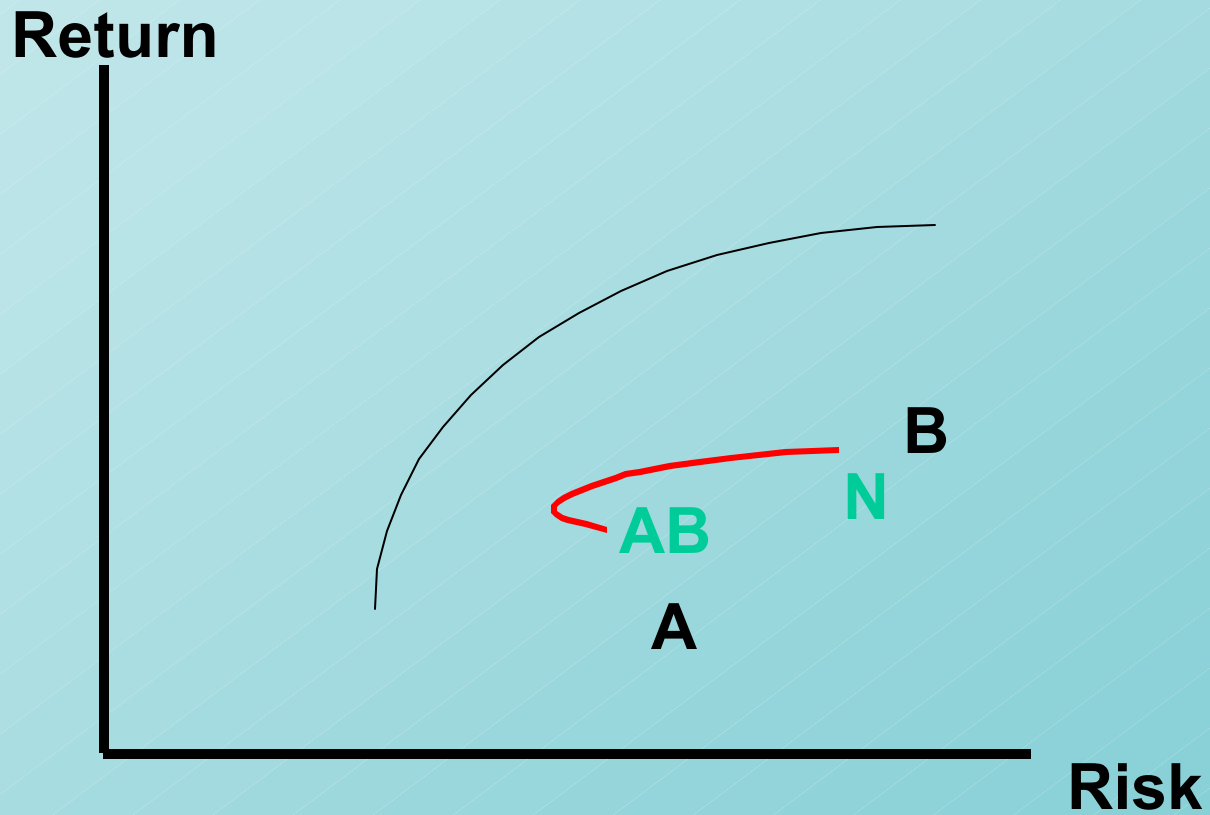


# Efficient Frontier

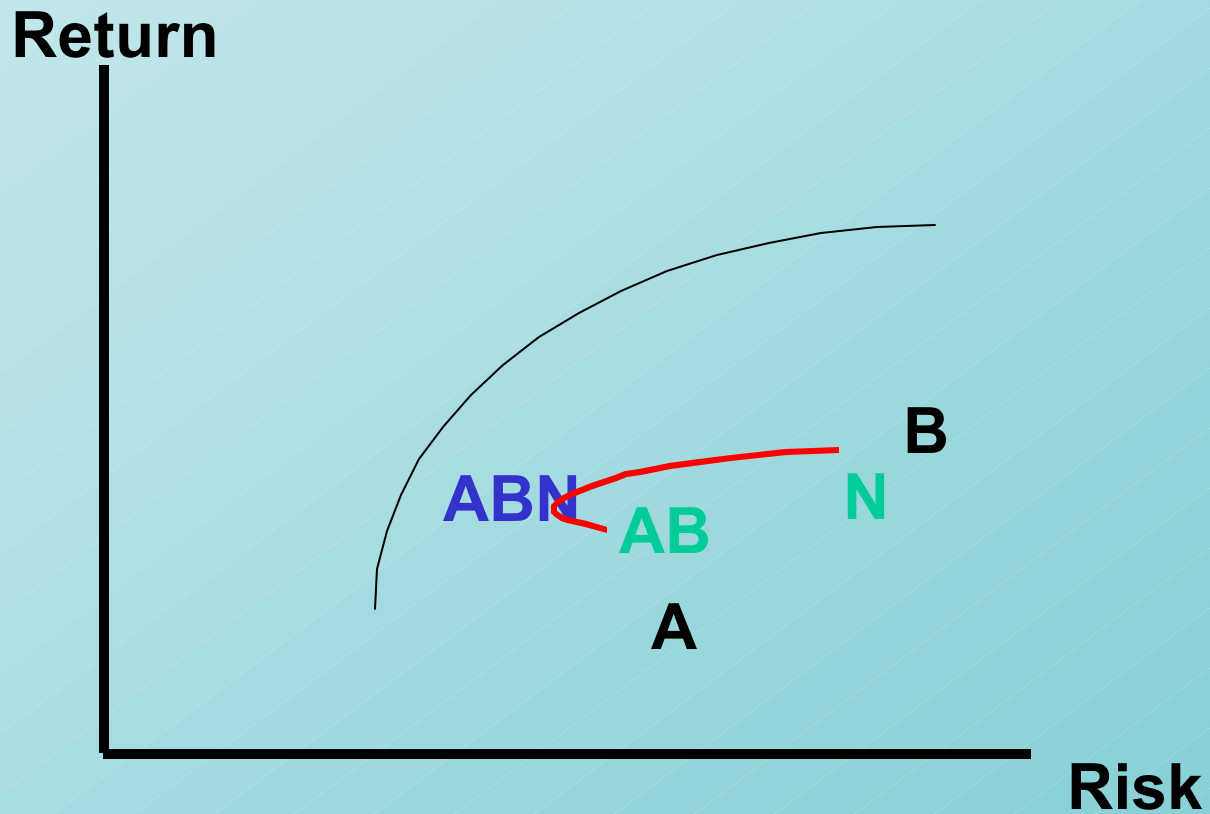




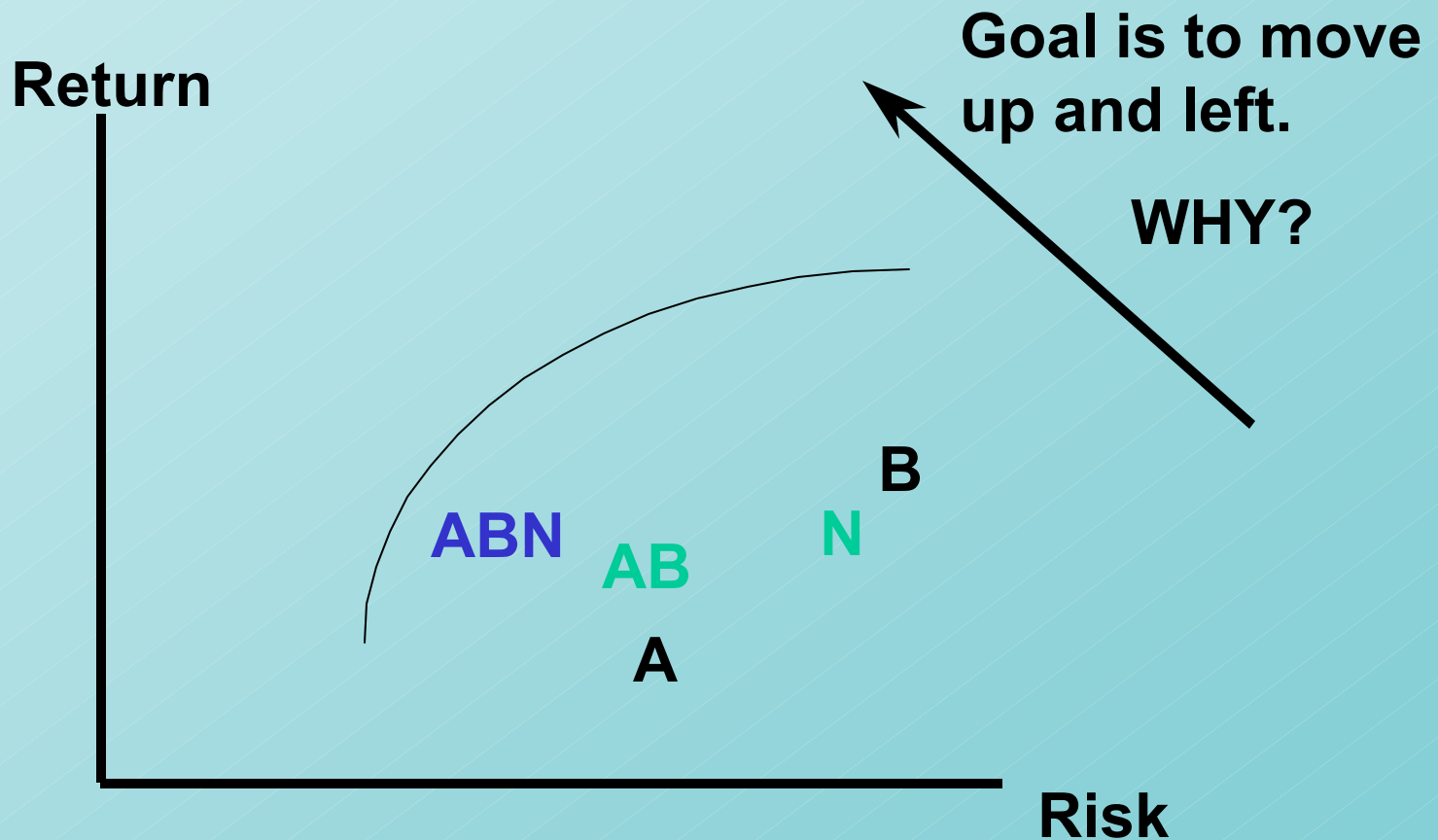
# Efficient Frontier



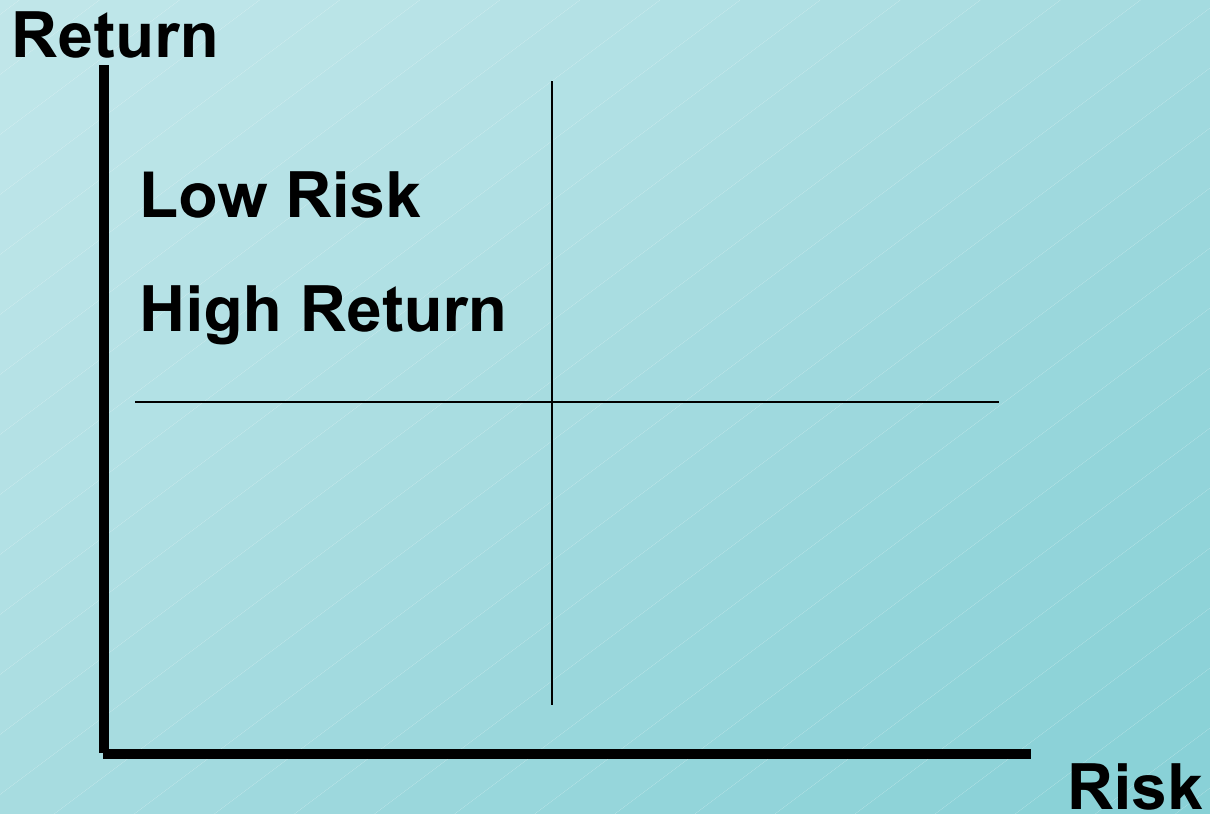
# Efficient Frontier



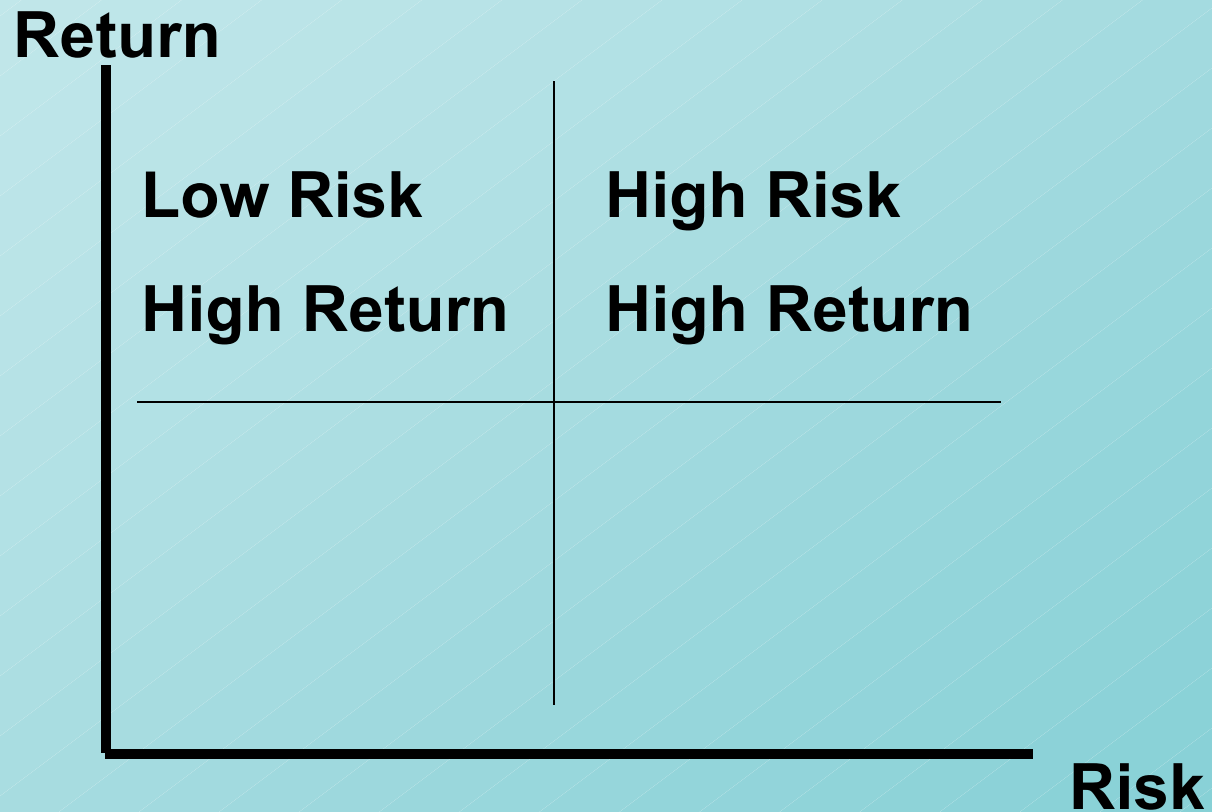
# Efficient Frontier



# Efficient Frontier



# Efficient Frontier



# Efficient Frontier



# Efficient Frontier

**Return**

**Low Risk**

**High Return**

**High Risk**

**High Return**

**Low Risk**

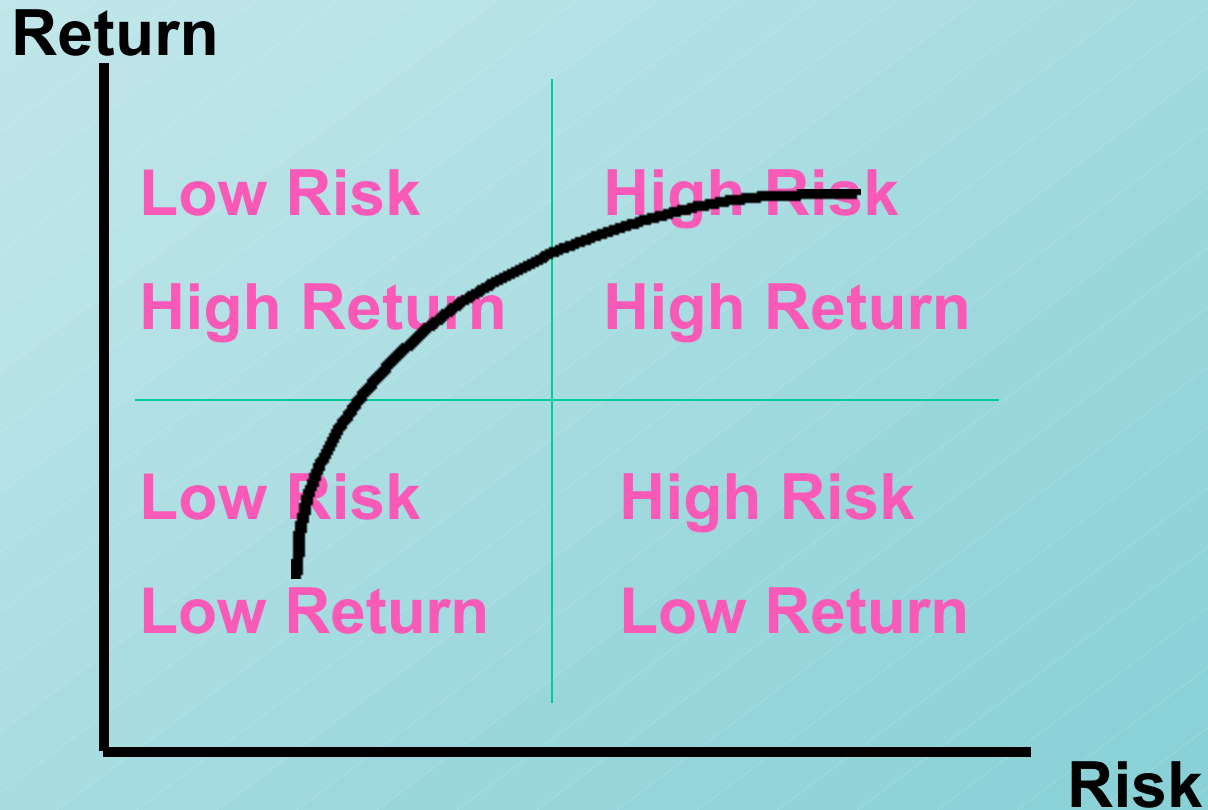
**Low Return**

**High Risk**

**Low Return**

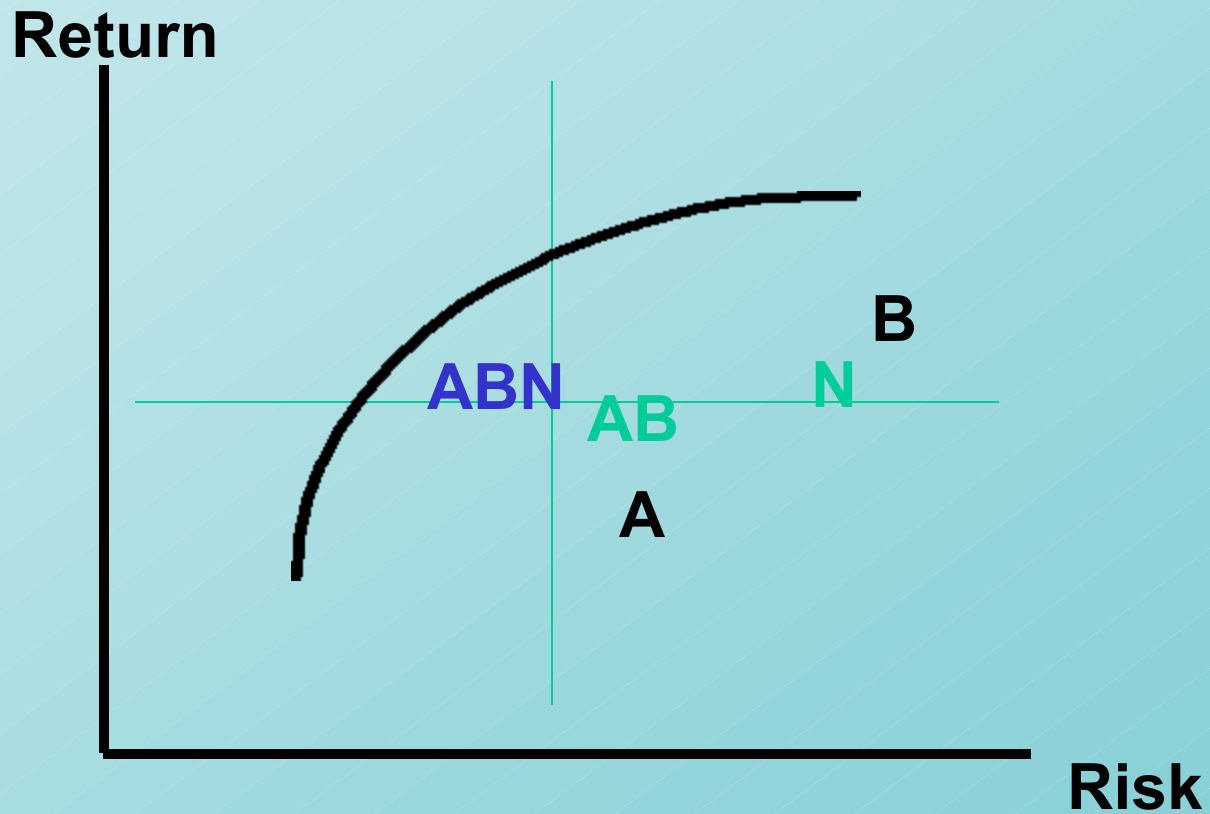
**Risk**

# Efficient Frontier

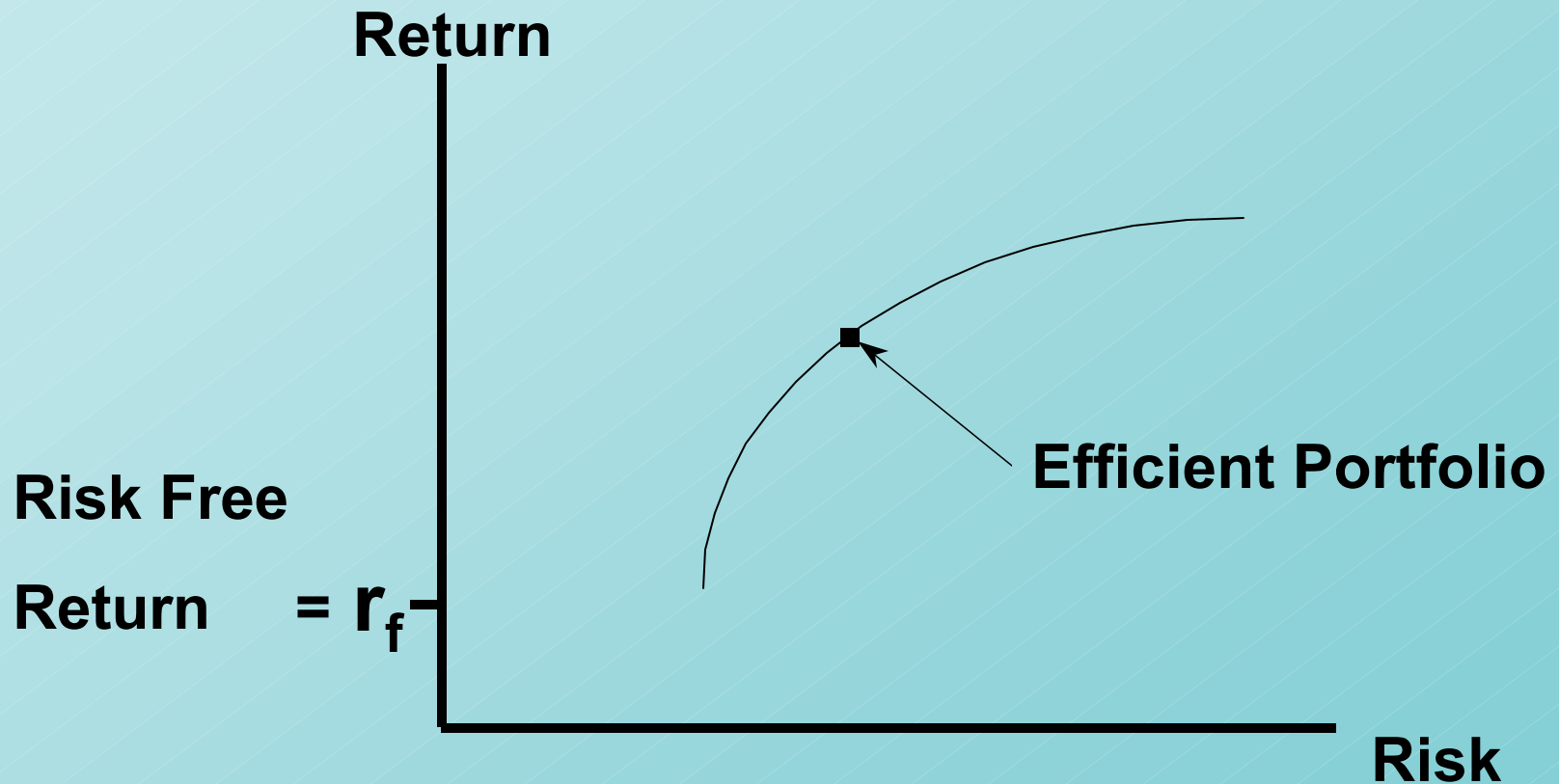




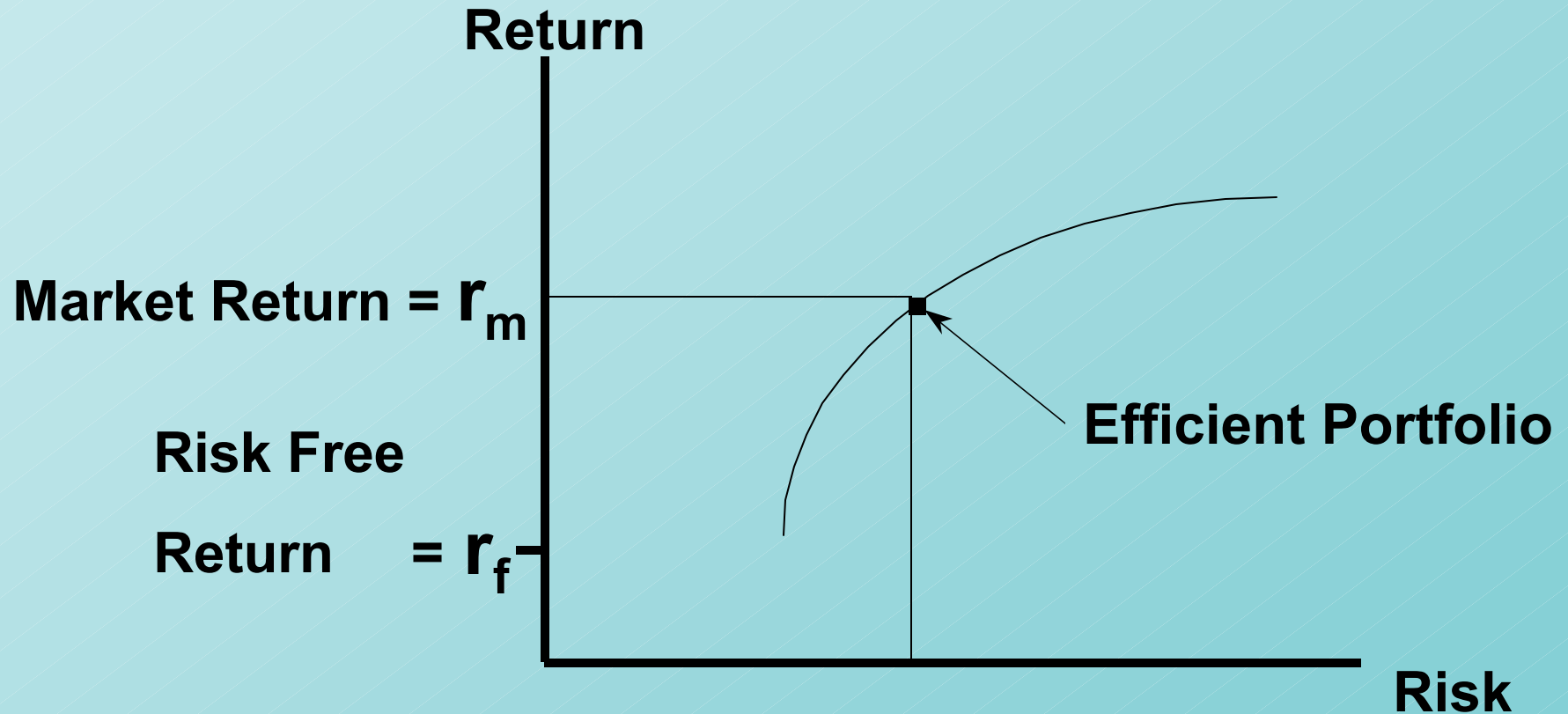
# Efficient Frontier



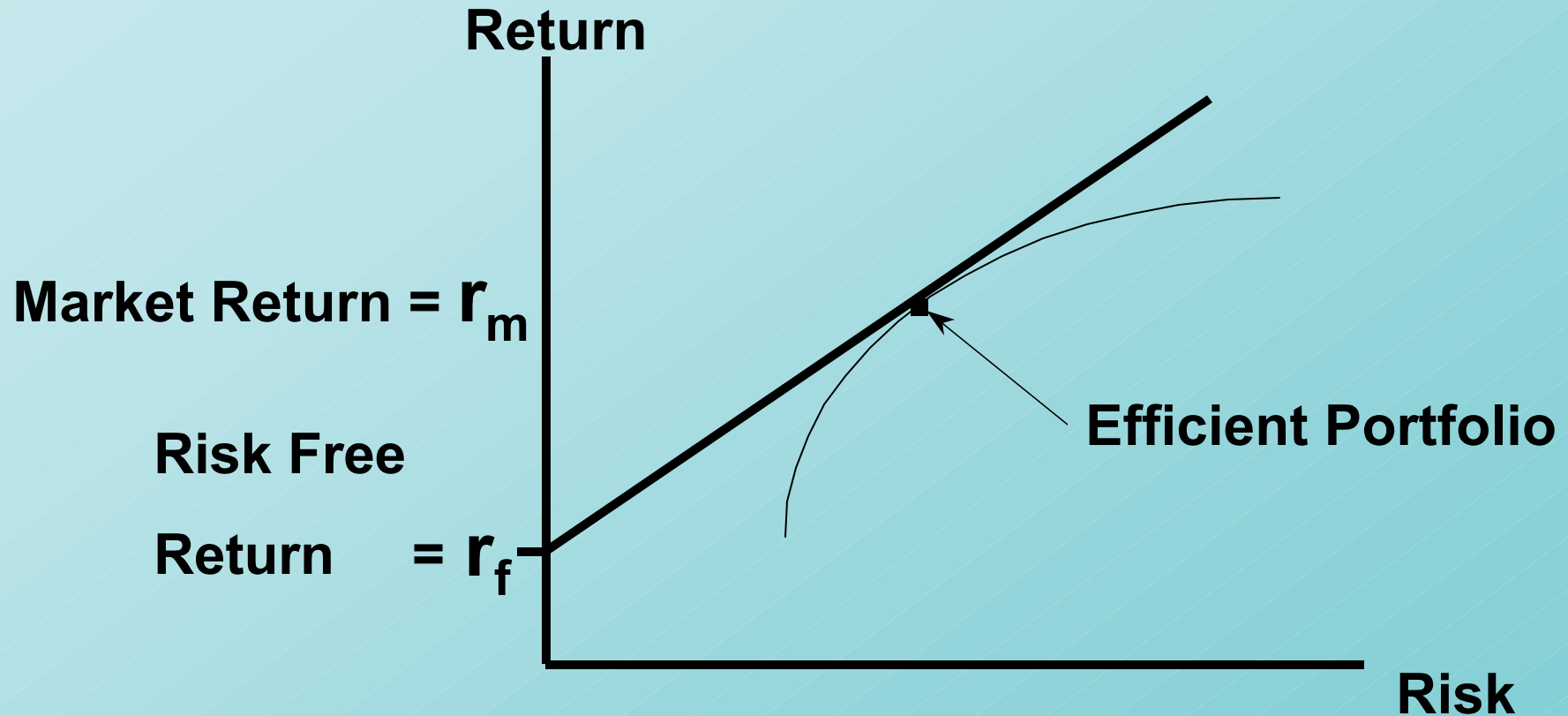
# Security Market Line



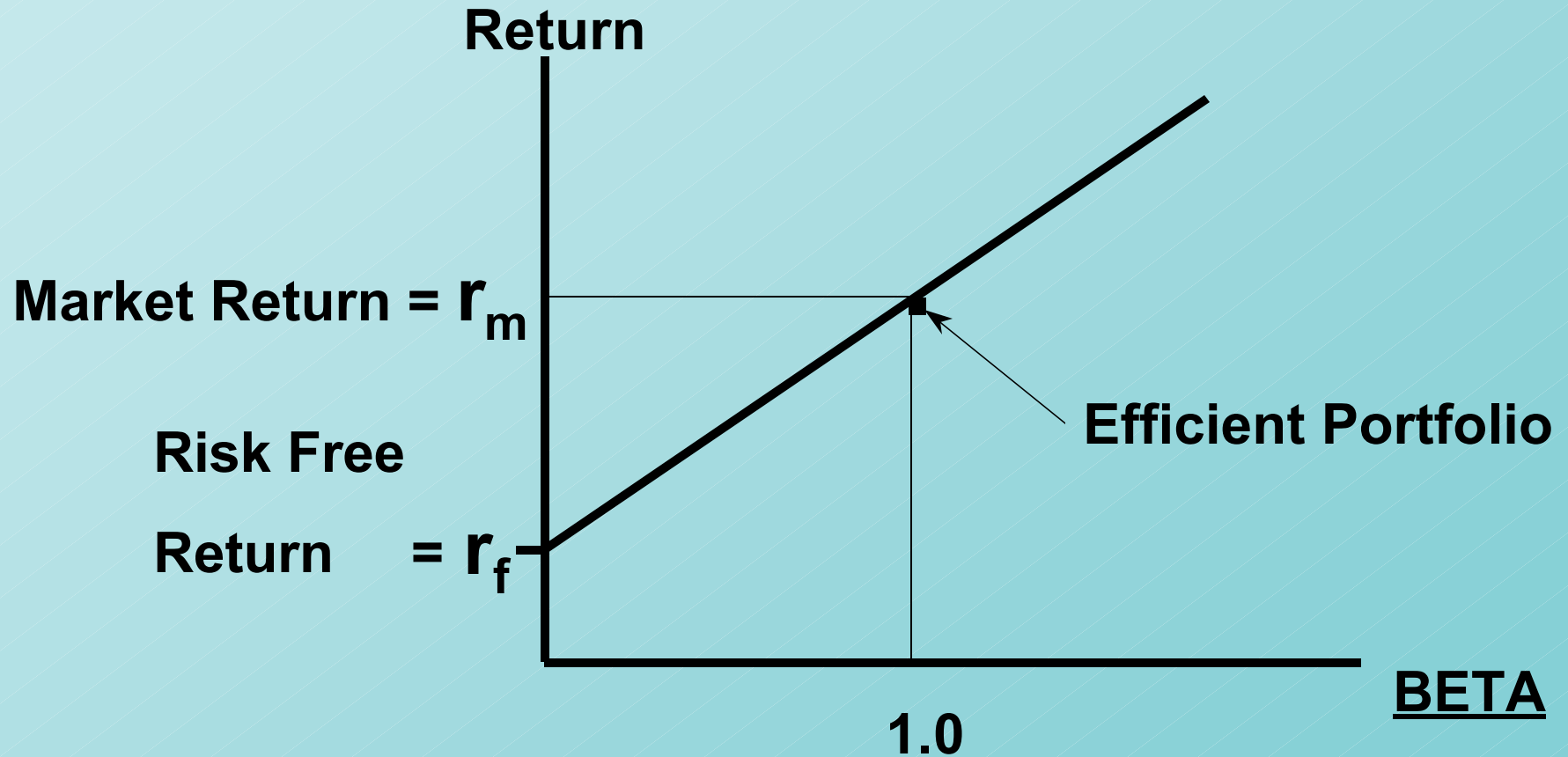
# Security Market Line



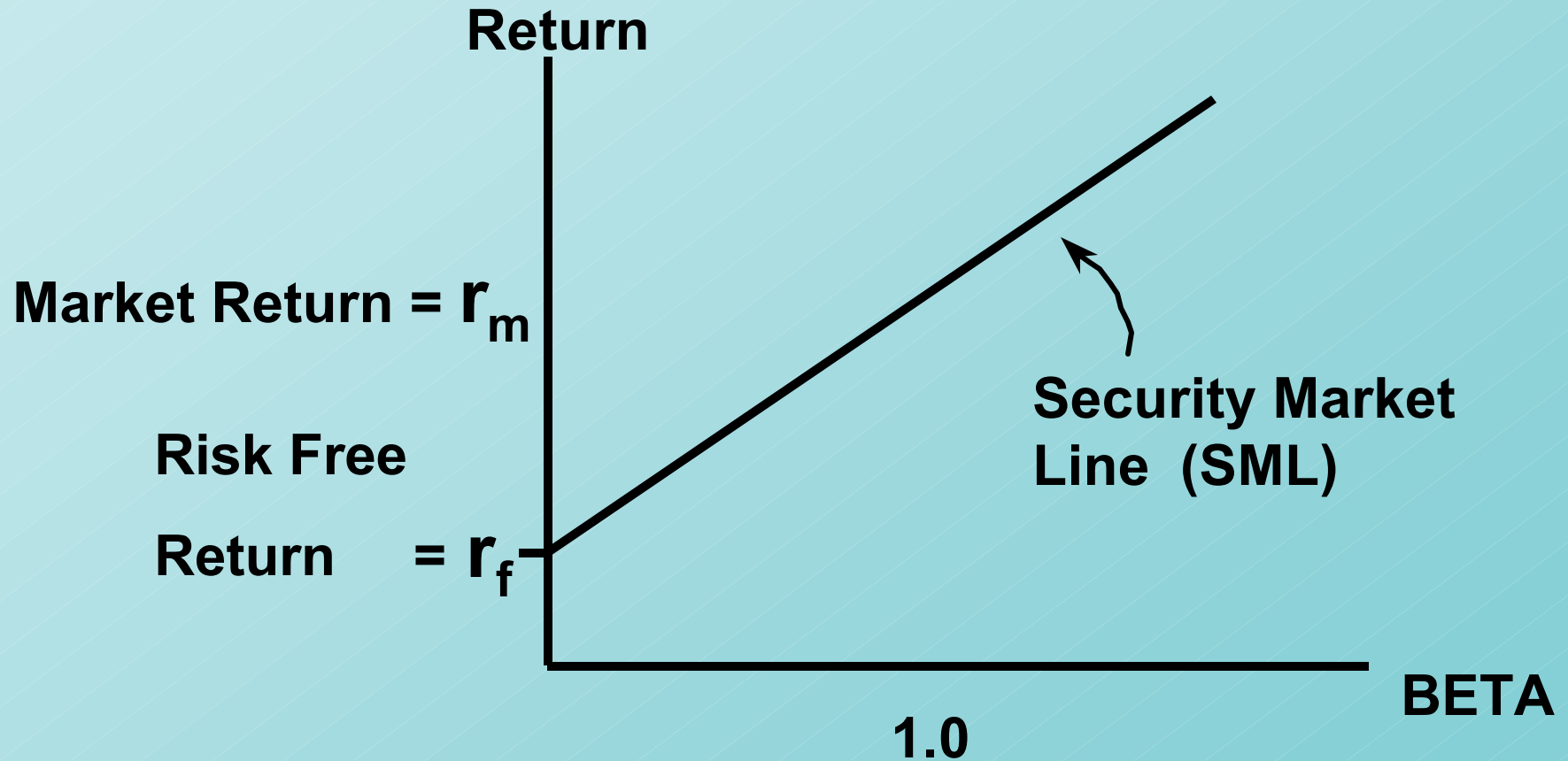
# Security Market Line



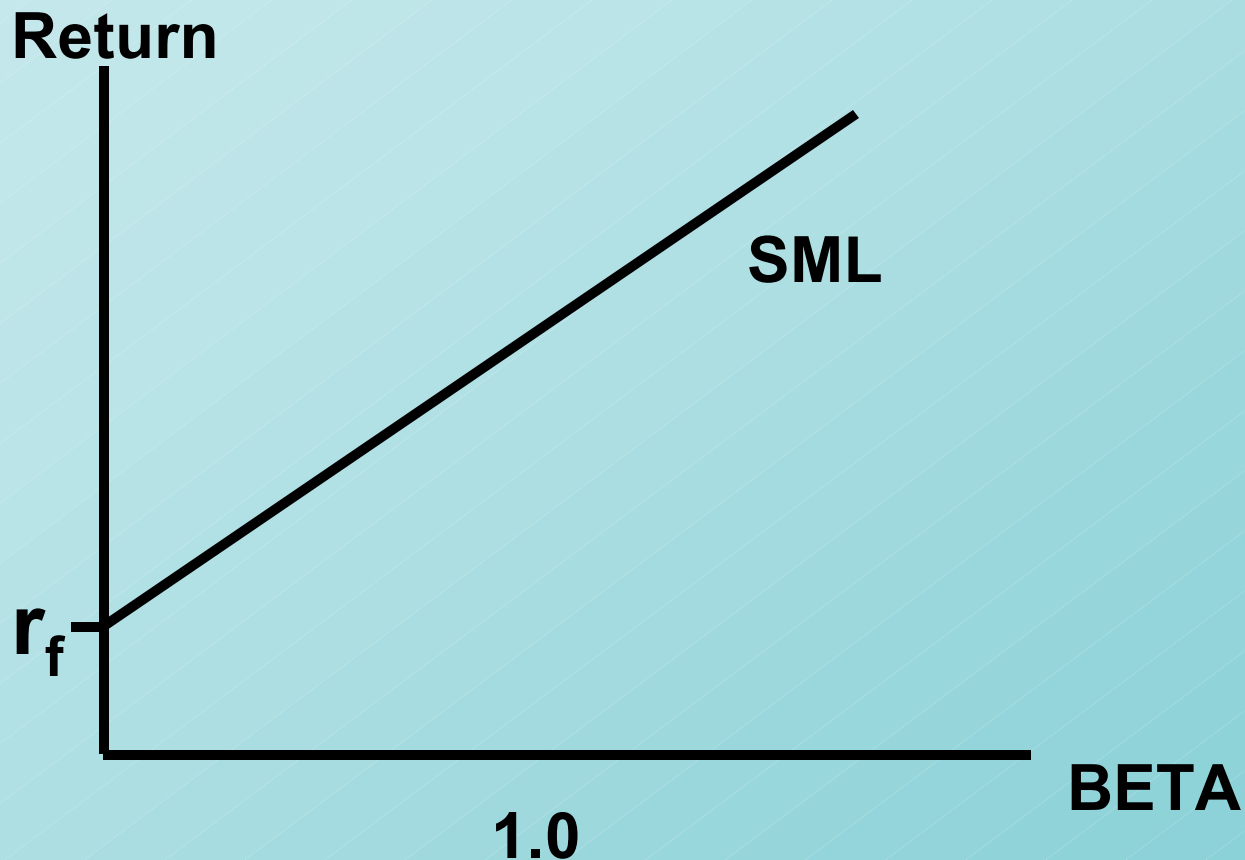
# Security Market Line



# Security Market Line



# Security Market Line



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

# Capital Asset Pricing Model

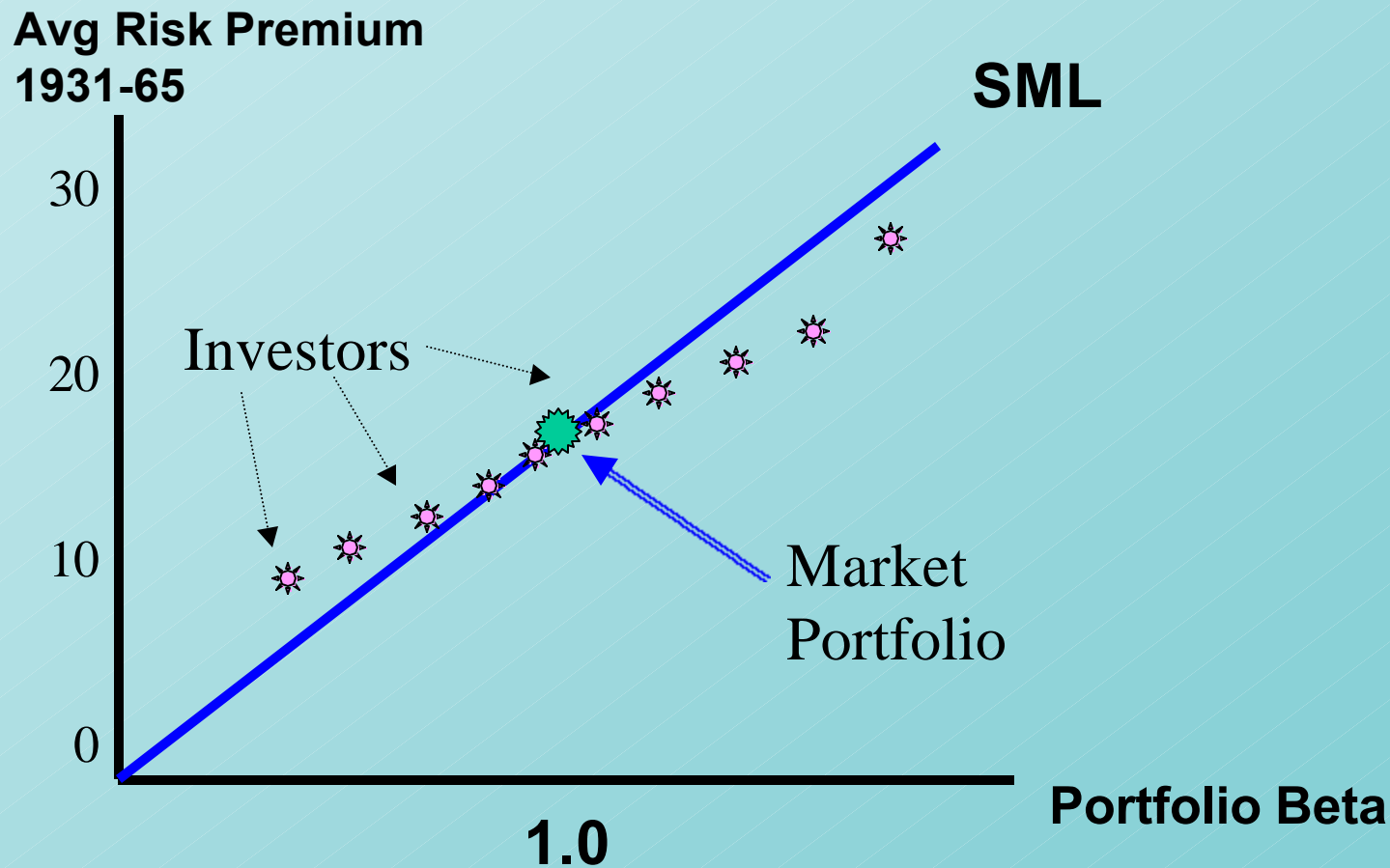
$$R = r_f + B ( r_m - r_f )$$

CAPM



# Testing the CAPM

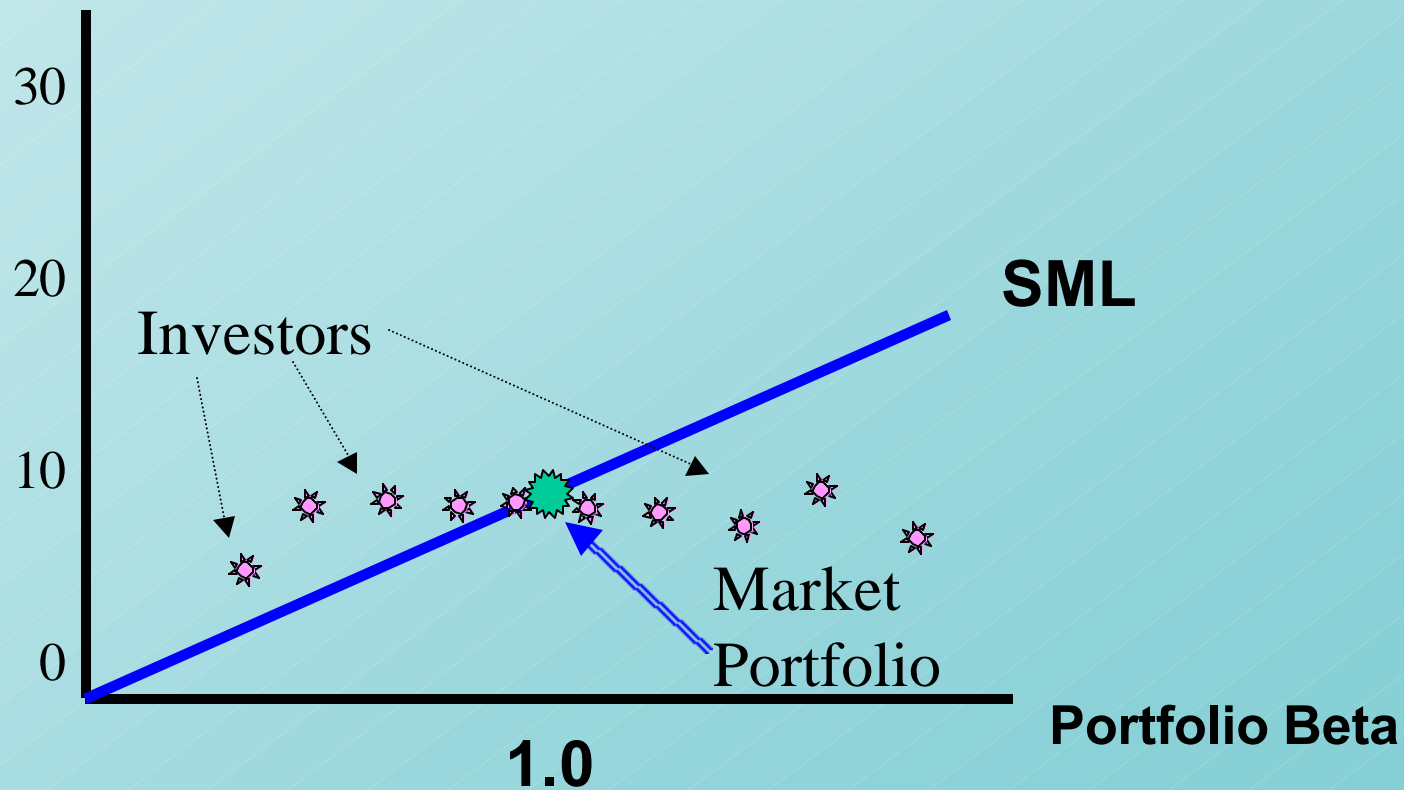
## Beta vs. Average Risk Premium



# Testing the CAPM

## Beta vs. Average Risk Premium

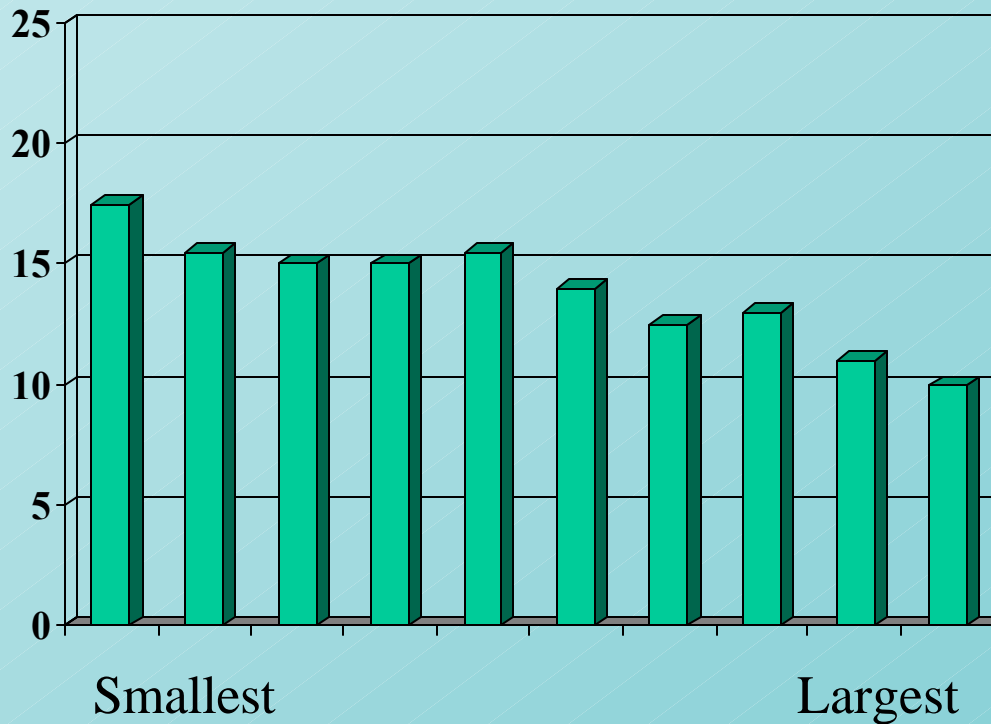
Avg Risk Premium  
1966-91



# Testing the CAPM

## Company Size vs. Average Return

Average Return (%)

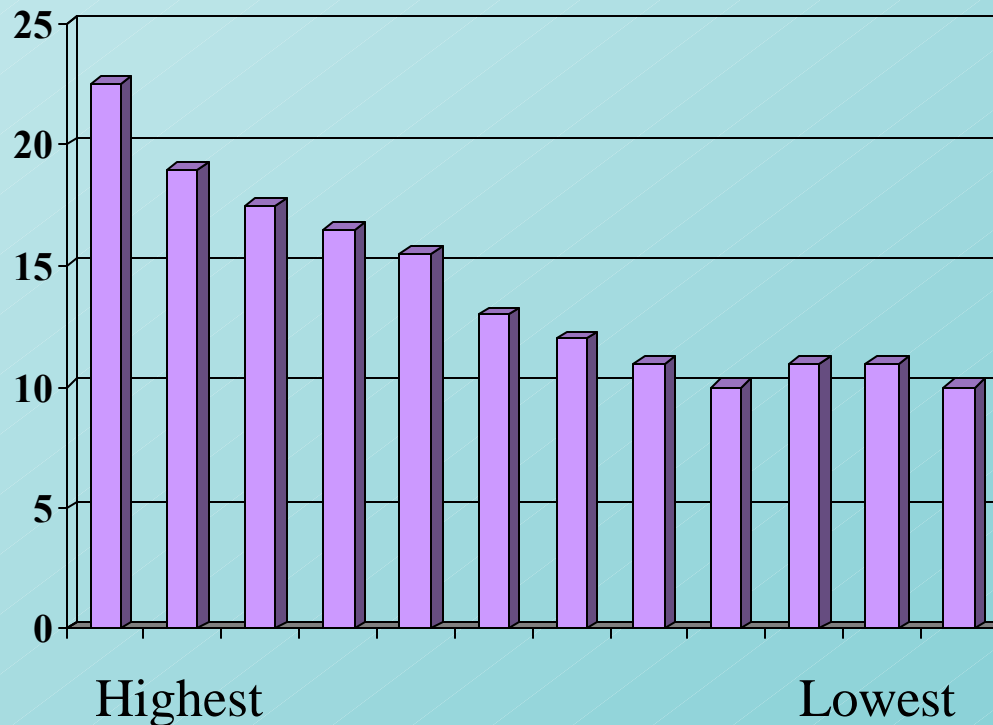


Company size

# Testing the CAPM

## Book-Market vs. Average Return

Average Return (%)



Book-Market Ratio

# Consumption Betas vs Market Betas

Stocks  
(and other risky assets)

Wealth = market  
portfolio

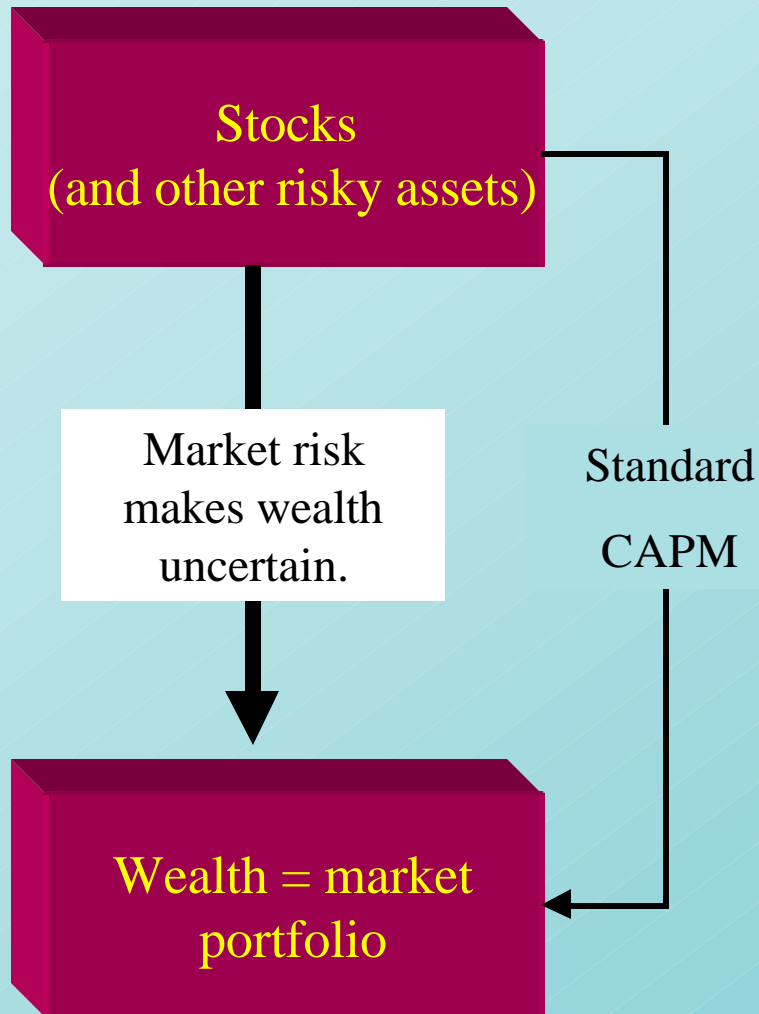
# Consumption Betas vs Market Betas

Stocks  
(and other risky assets)

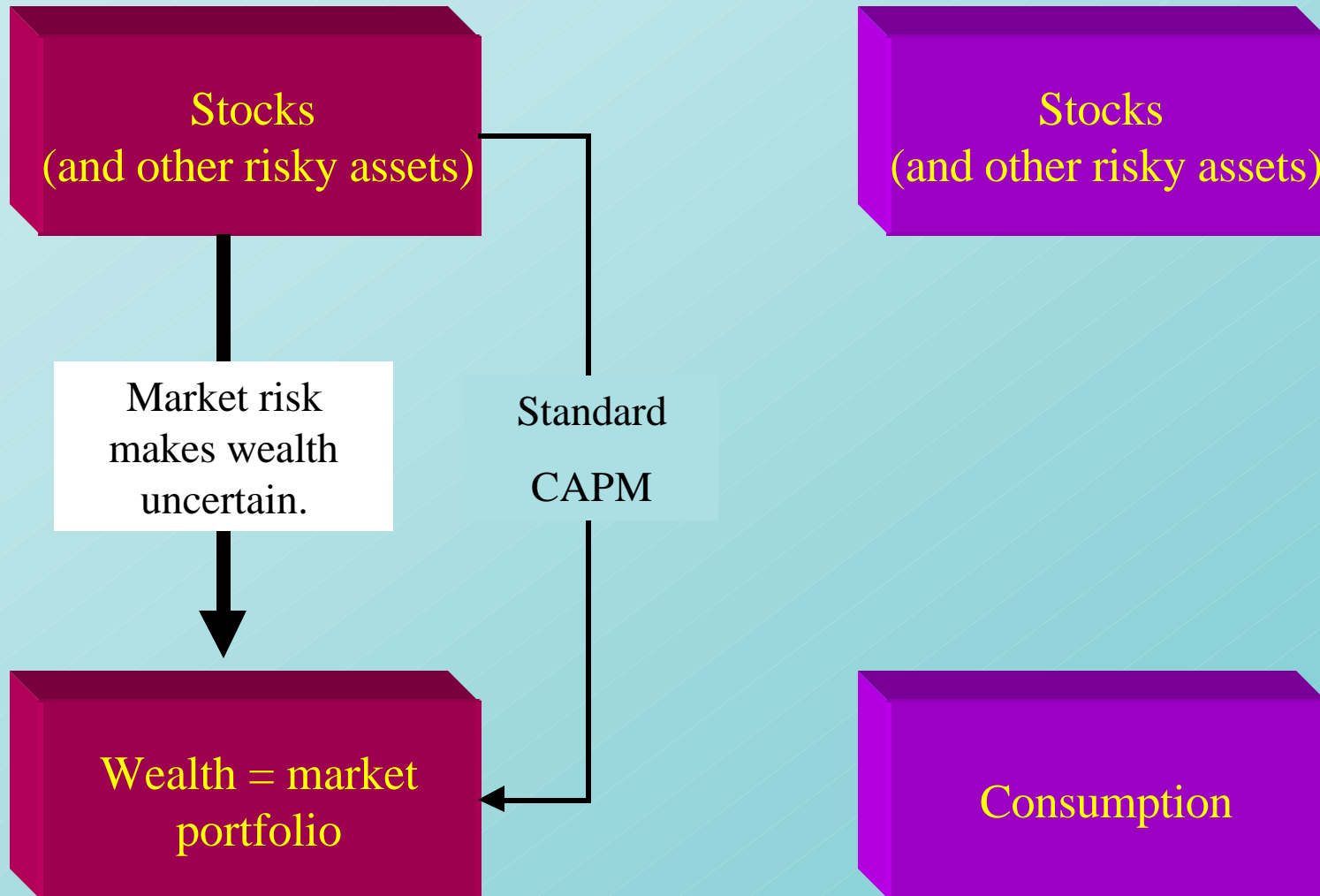
Market risk  
makes wealth  
uncertain.

Wealth = market  
portfolio

# Consumption Betas vs Market Betas

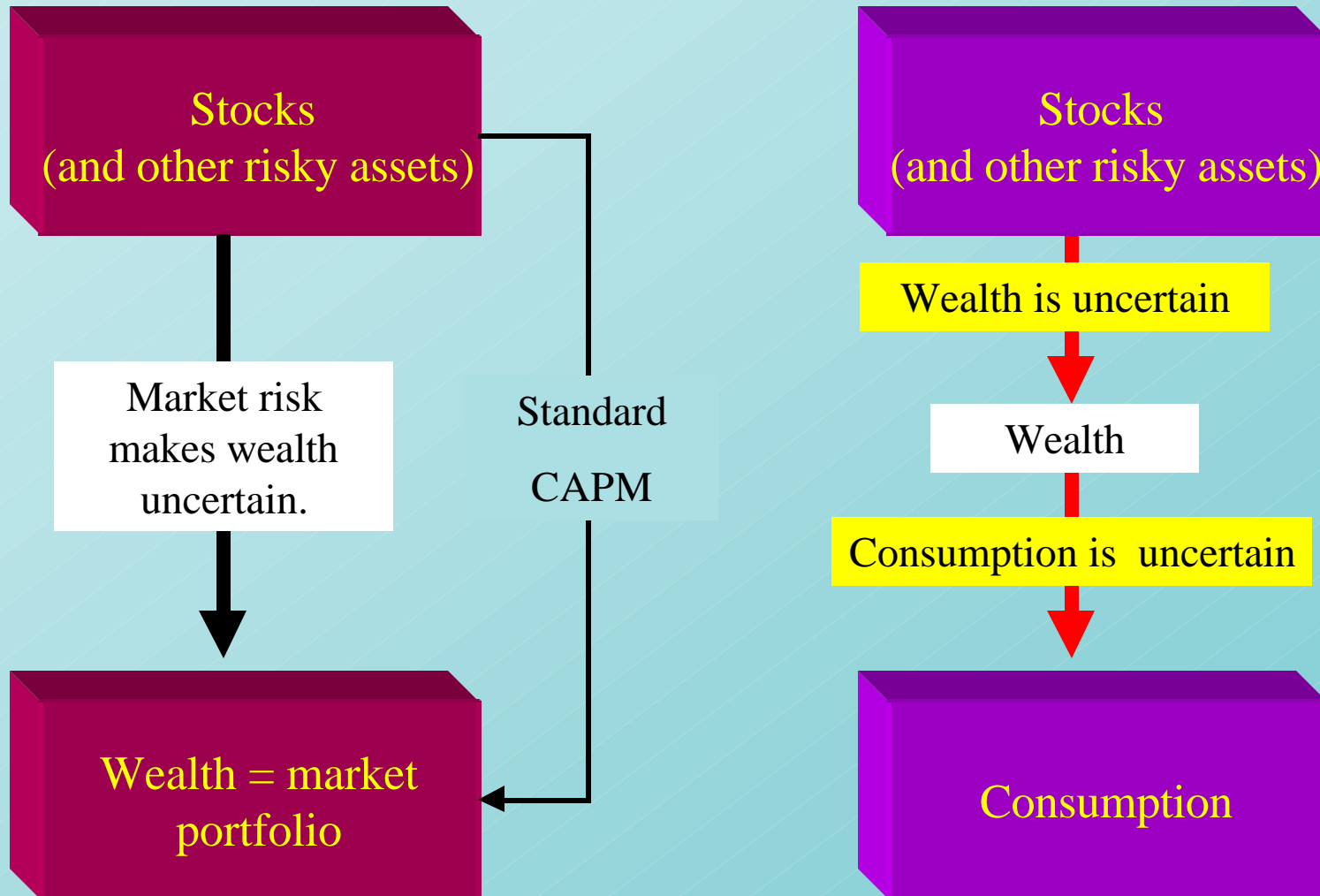


# Consumption Betas vs Market Betas

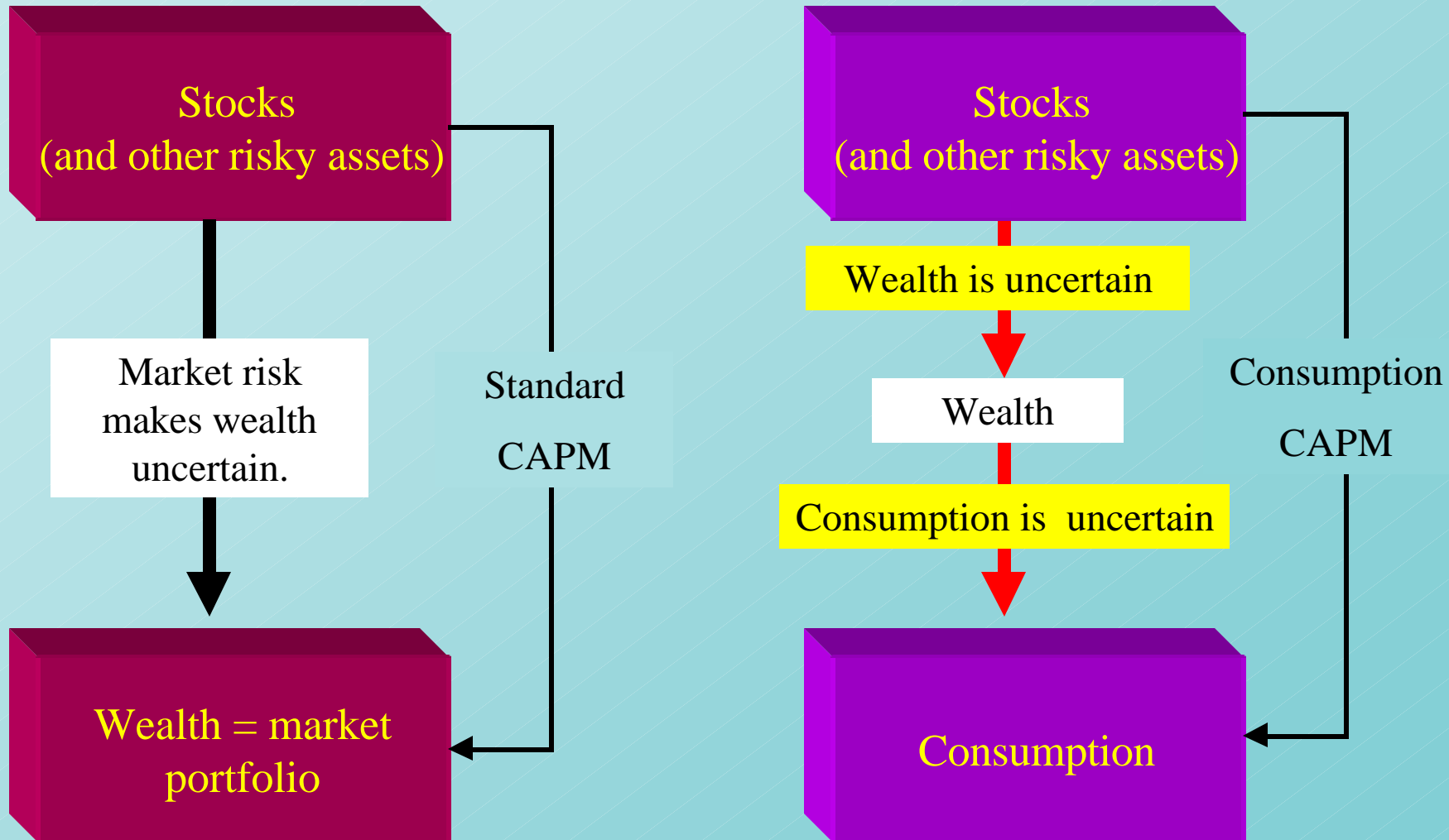




# Consumption Betas vs Market Betas



# Consumption Betas vs Market Betas



# Arbitrage Pricing Theory

## Alternative to CAPM

Expected Risk

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

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

# Arbitrage Pricing Theory

## Alternative to CAPM

Expected Risk

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

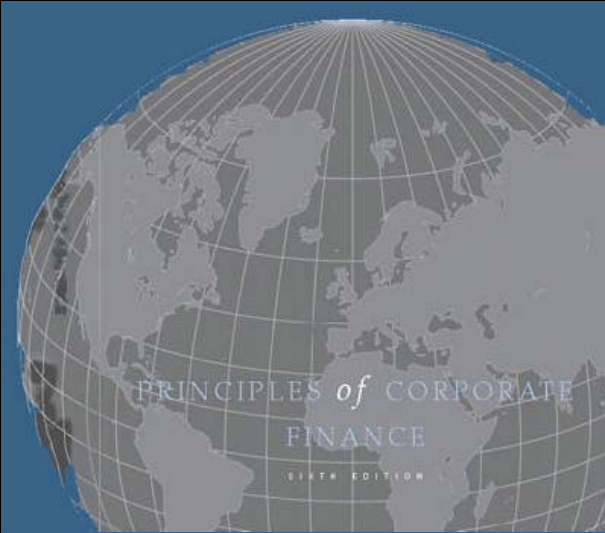
$$= B_{\text{factor1}}(r_{\text{factor1}} - r_f) + B_{f2}(r_{f2} - r_f) + \dots$$

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

# Arbitrage Pricing Theory

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

Factor	Estimated Risk Premium ( $r_{\text{factor}} - r_f$ )
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

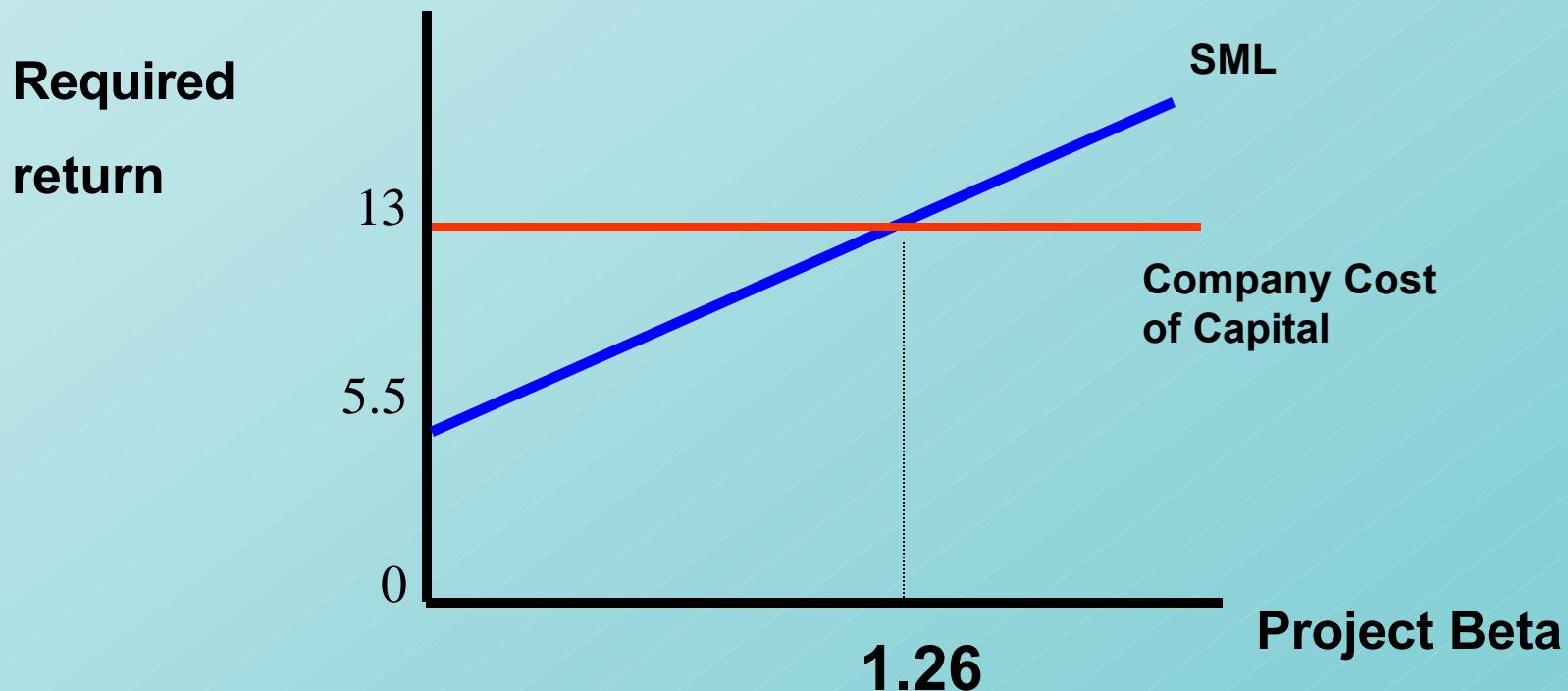
- ◆ A firm's value can be stated as the sum of the value of its various assets.

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



# 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

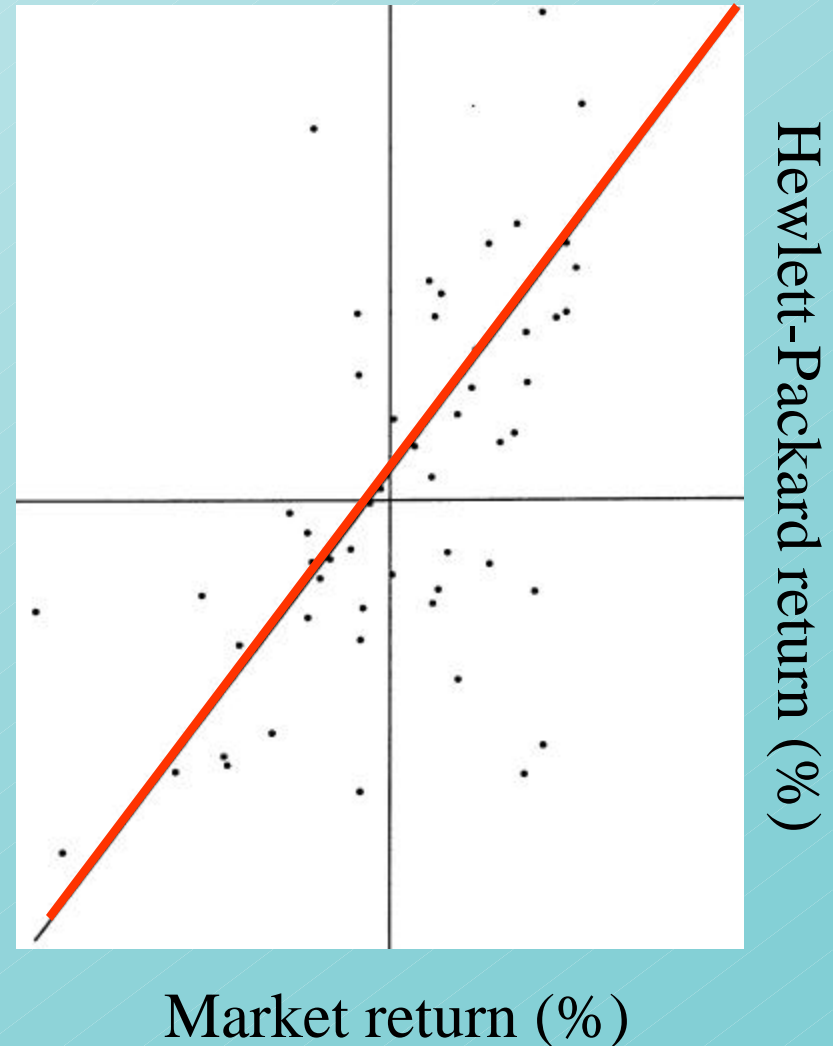
## Hewlett Packard Beta

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

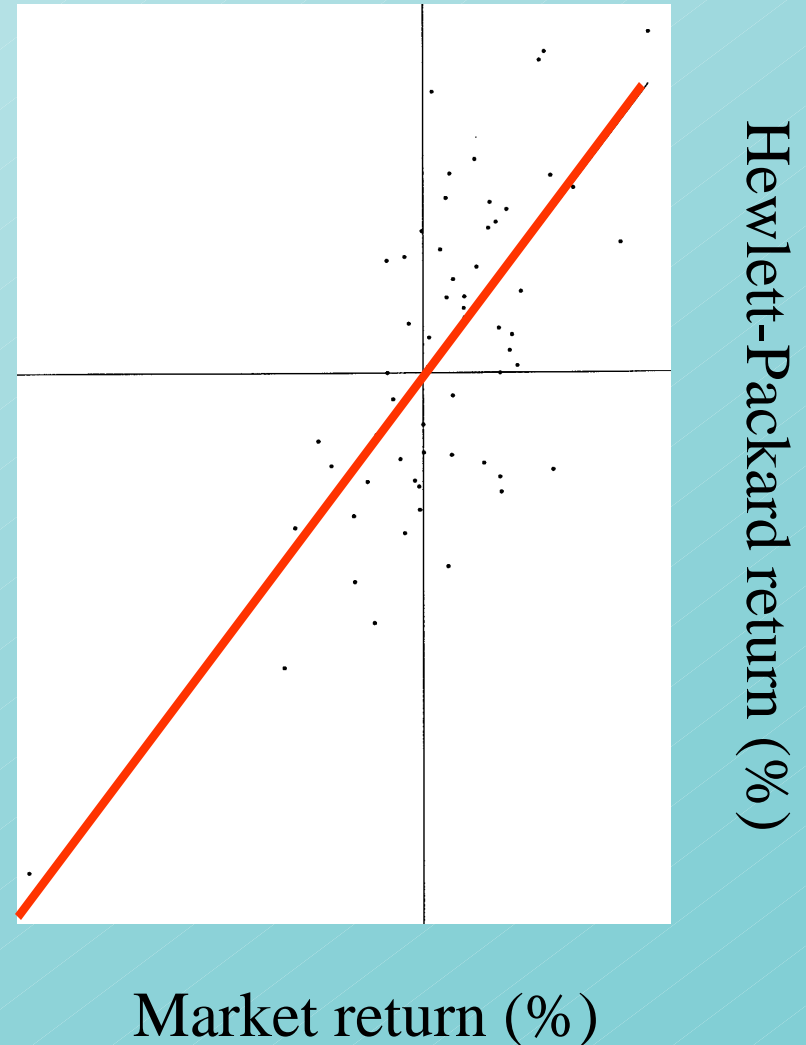
## Hewlett Packard Beta

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

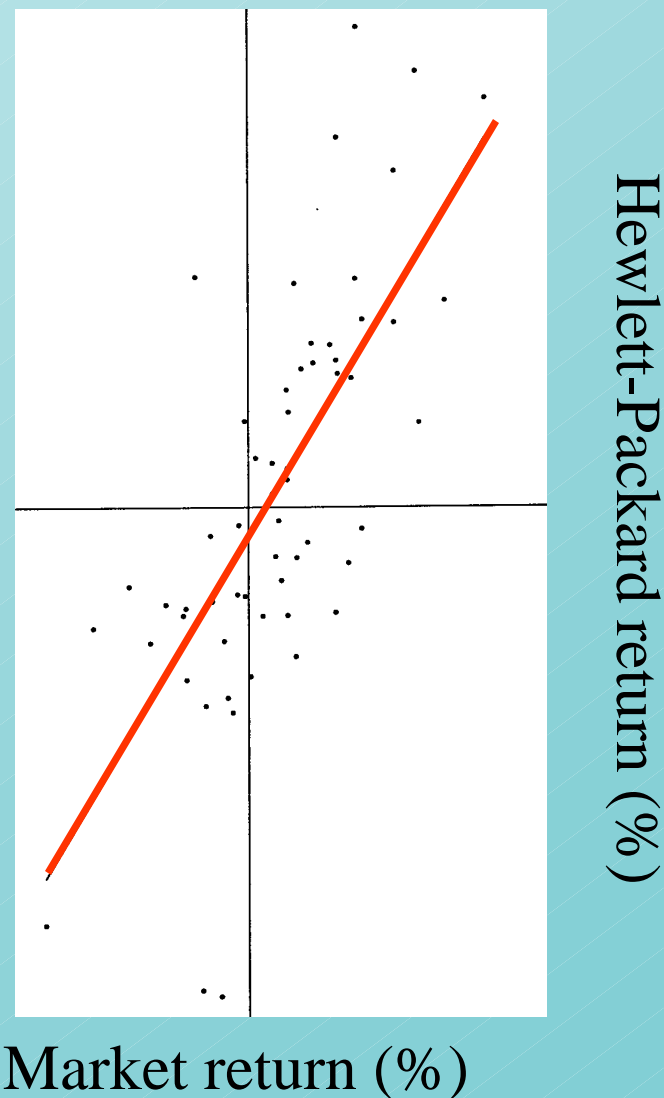
## Hewlett Packard Beta

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

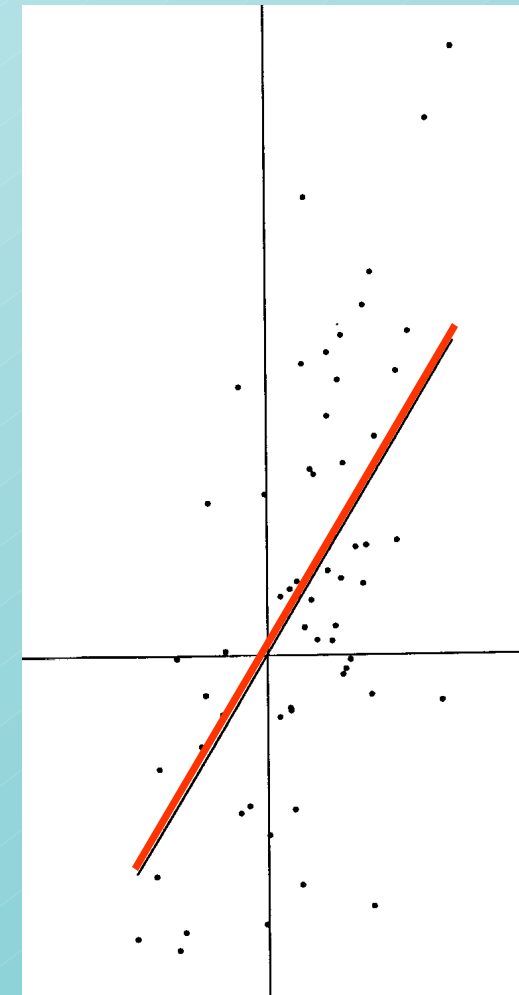
Hewlett Packard Beta

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.



Market return (%)

Hewlett-Packard return (%)

# Measuring Betas

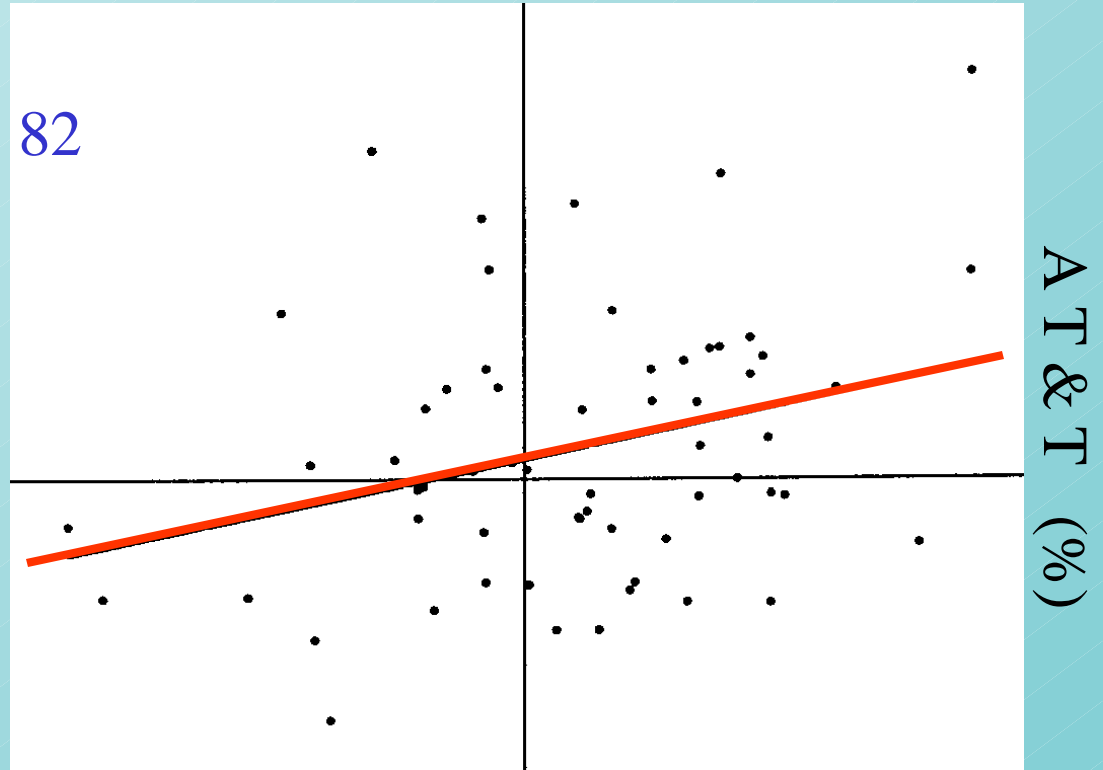
A T & T Beta

Price data - Jan 78 - Dec 82

$$R^2 = .28$$

$$B = 0.21$$

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



Market return (%)

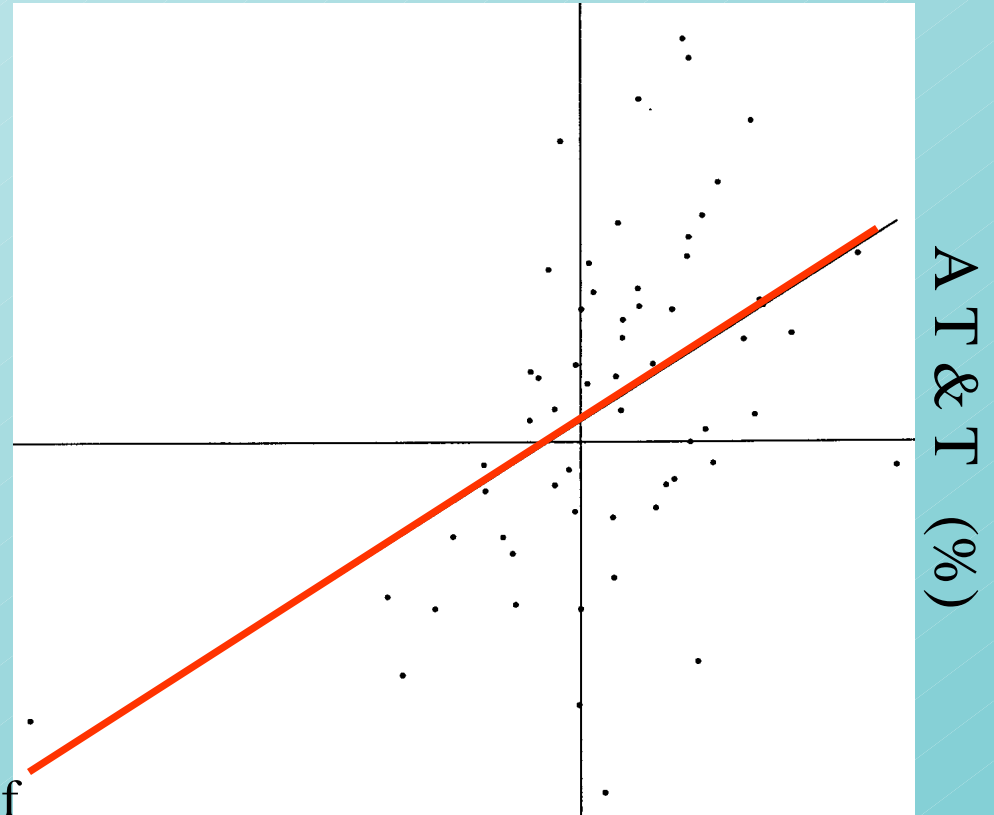
# Measuring Betas

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.

Market return (%)



# Measuring Betas

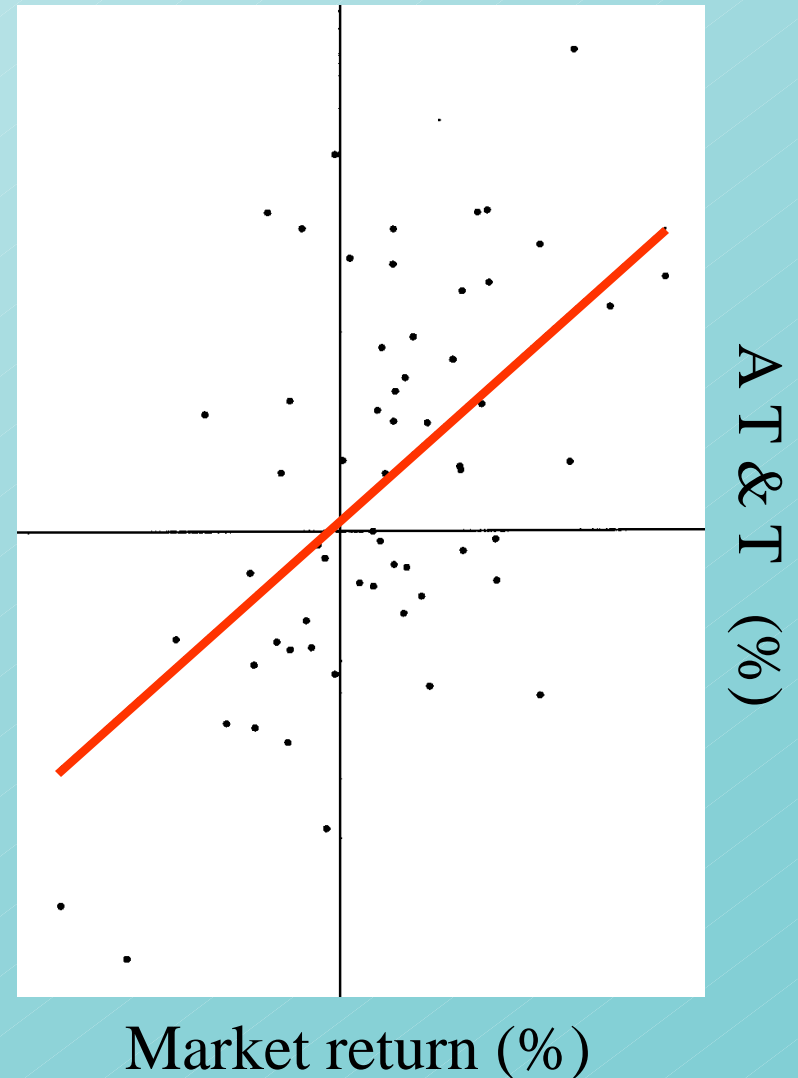
A T & T Beta

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

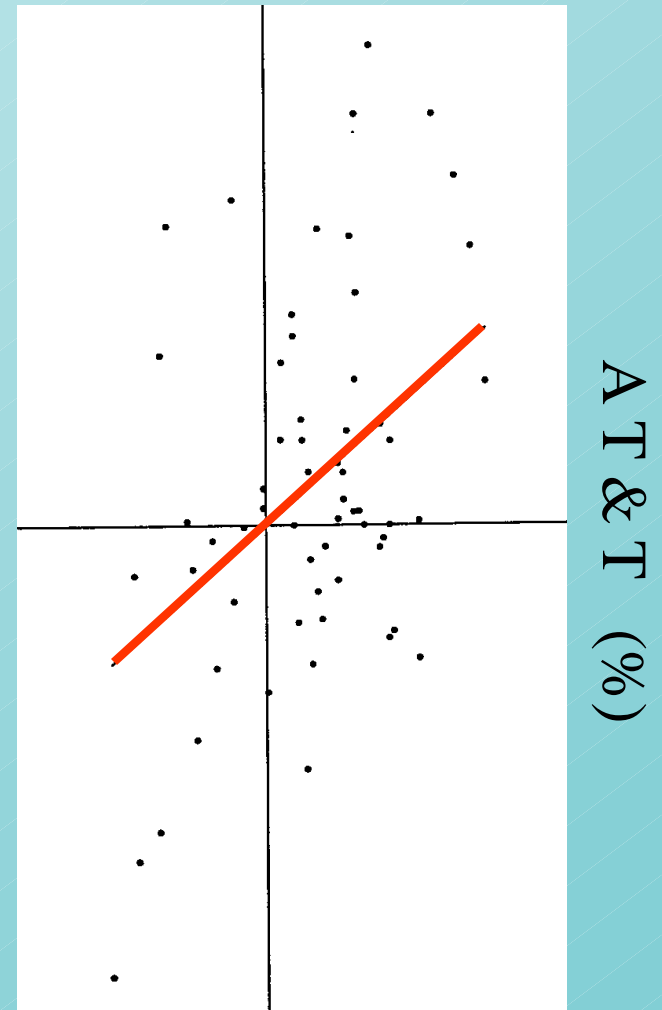
A T & T Beta

Price data - Jan 93 - Dec 97

$$R^2 = .17$$

$$B = .90$$

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



Market return (%)

# Beta Stability

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

**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.

### Example

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

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

# Capital Structure & COC

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



# Capital Structure & COC

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

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

# Capital Structure & COC

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

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

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

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

# Capital Structure & COC

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

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

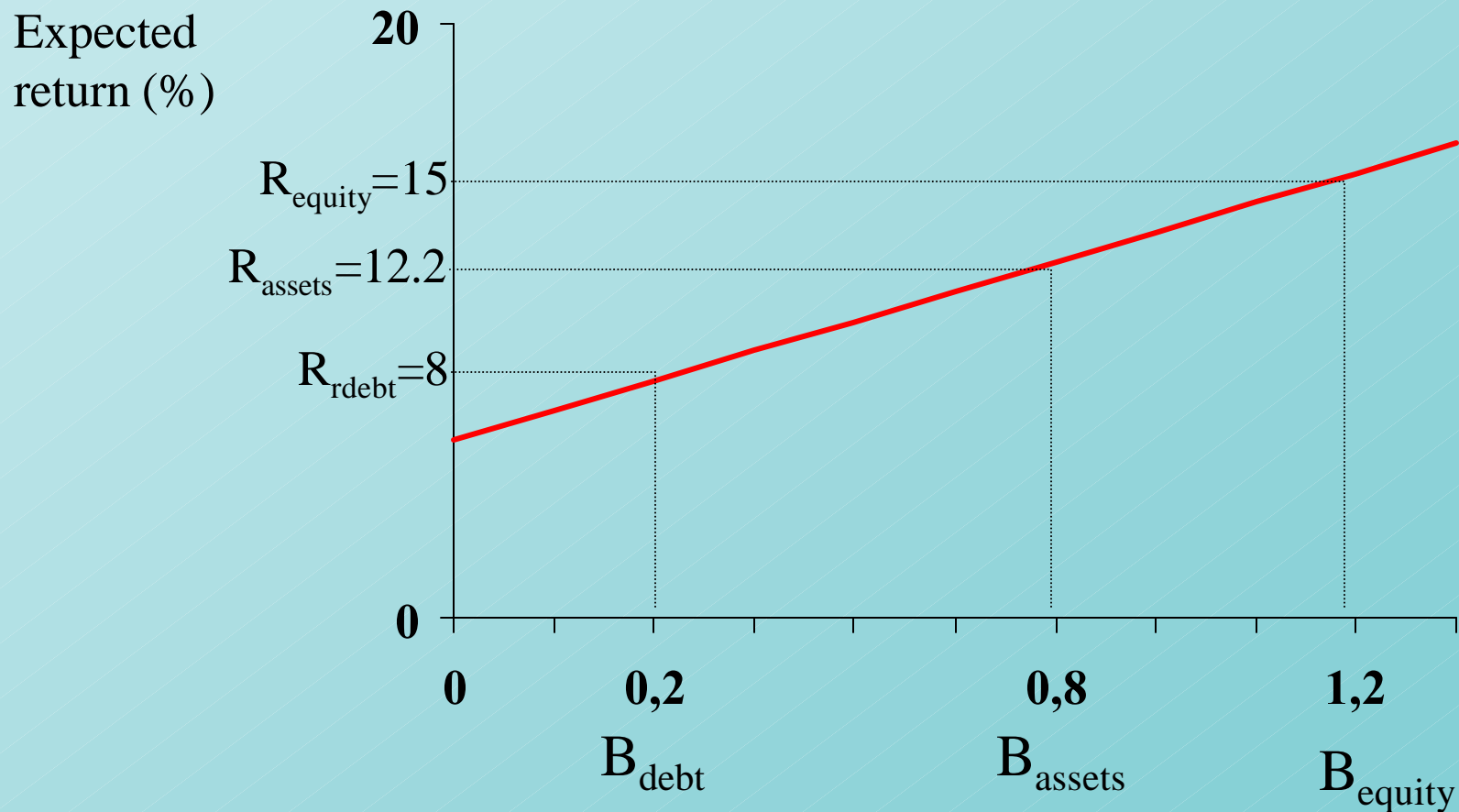
$$r_{\text{equity}} = r_f + B_{\text{equity}} (r_m - r_f)$$

**IMPORTANT**

E, D, and V are  
all market values

# Capital Structure & COC

Expected Returns and Betas prior to refinancing



# Pinnacle West Corp.

$$\begin{aligned} R_{\text{equity}} &= r_f + B ( r_m - r_f ) \\ &= .045 + .51(.08) = .0858 \text{ or } 8.6\% \end{aligned}$$

$$\begin{aligned} R_{\text{debt}} &= \text{YTM on bonds} \\ &= 6.9 \% \end{aligned}$$

# 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.

$$\begin{aligned}COC = r_{assets} &= \frac{D}{V} r_{debt} + \frac{E}{V} r_{equity} \\&= .35(.08) + .65(.10) \\&= .093 \text{ or } 9.3\%\end{aligned}$$



# International Risk

	<i>s</i> 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 million
1.0	.50	.5	
0.8	.25	.2	

# Asset Betas

Cash flow = revenue - fixed cost - variable cost

$PV(\text{asset}) = PV(\text{revenue}) - PV(\text{fixed cost}) - PV(\text{variable cost})$

or

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

# 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

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

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

# 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?

$$\begin{aligned} r &= r_f + B(r_m - r_f) \\ &= 6 + .75(8) \\ &= 12\% \end{aligned}$$

# 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?

$$\begin{aligned}
 r &= r_f + B(r_m - r_f) \\
 &= 6 + .75(8) \\
 &= 12\%
 \end{aligned}$$

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

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$$\begin{aligned}
 r &= r_f + B(r_m - r_f) \\
 &= 6 + .75(8) \\
 &= 12\%
 \end{aligned}$$

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	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

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.

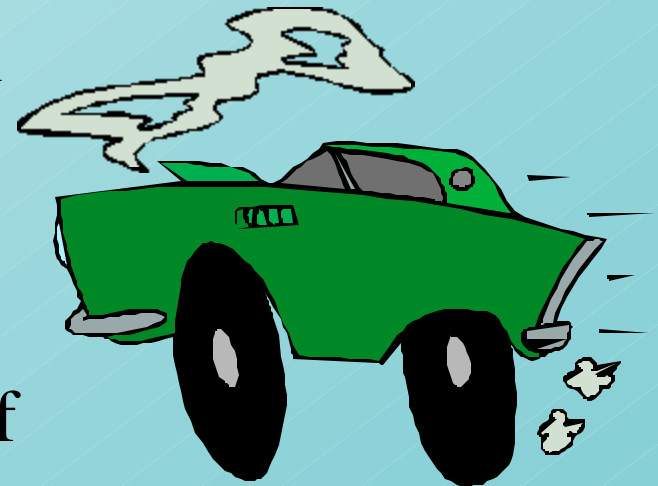
Simulation Analysis - Estimation of the probabilities of different possible outcomes.

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

# Sensitivity Analysis

## Example

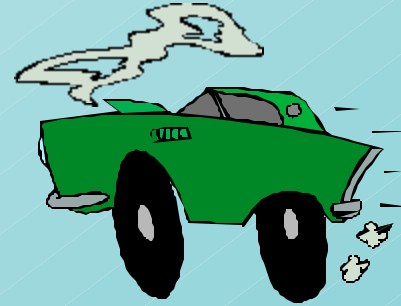
Given the expected cash flow forecasts for Otoban Company's Motor Scooter project, listed on the next slide, determine the NPV of the project given changes in the cash flow components using a 10% cost of capital. Assume that all variables remain constant, except the one you are changing.



# Sensitivity Analysis

## Example - continued

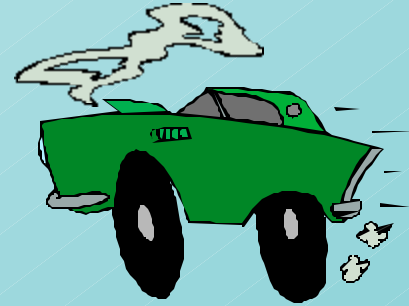
	Year 0	Years 1 - 10
Investment	-15	
Sales		37.5
Variable Costs		30
Fixed Costs		3
Depreciation		1.5
Pretax profit		3
Taxes @ 50%		1.5
Profit after tax		1.5
Operating cash flow		3.0
Net Cash Flow	-15	3



**NPV= 3.43 billion Yen**

# Sensitivity Analysis

Example - continued



## *Possible Outcomes*

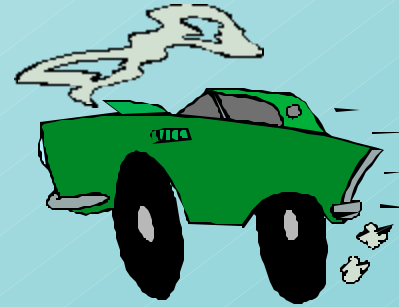
	<i>Range</i>		
<i>Variable</i>	<i>Pessimistic</i>	<i>Expected</i>	<i>Optimistic</i>
Market Size	.9 mil	51 mil	1.1 mil
Market Share	.04	.1	.16
Unit price	350,000	375,000	380,000
Unit Var Cost	360,000	300,000	275,000
Fixed Cost	4 bil	3 bil	2 bil

# Sensitivity Analysis

Example - continued

*NPV Calculations for Pessimistic Market Size Scenario*

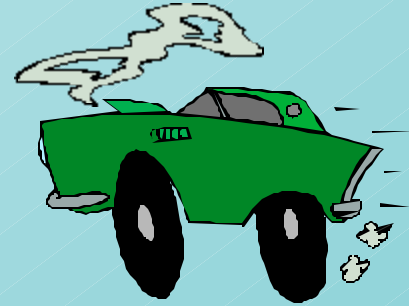
	Year 0	Years 1 - 10
Investment	-15	
Sales		41.25
Variable Costs		33
Fixed Costs		3
Depreciation		1.5
Pretax profit		3.75
.Taxes @ 50%		1.88
Profit after tax		1.88
Operating cash flow		3.38
Net Cash Flow	-15	+ 3.38



**NPV= +5.7 bil yen**

# Sensitivity Analysis

Example - continued

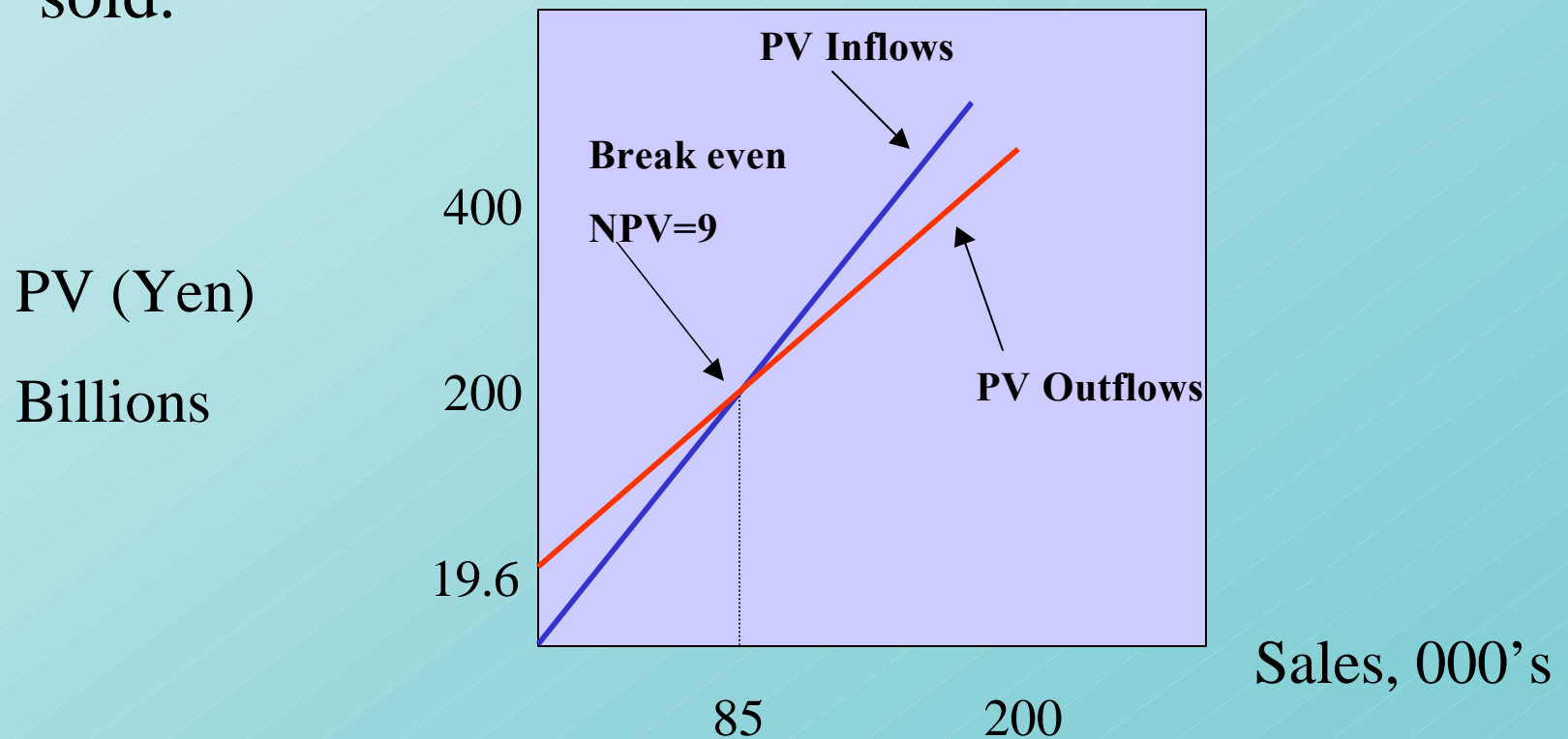


## *NPV Possibilities (Billions Yen)*

<i>Variable</i>	<i>Range</i>		
	<i>Pessimistic</i>	<i>Expected</i>	<i>Optimistic</i>
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.



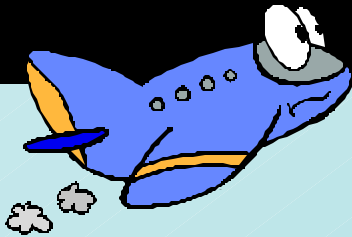
# Monte Carlo Simulation

## Modeling Process

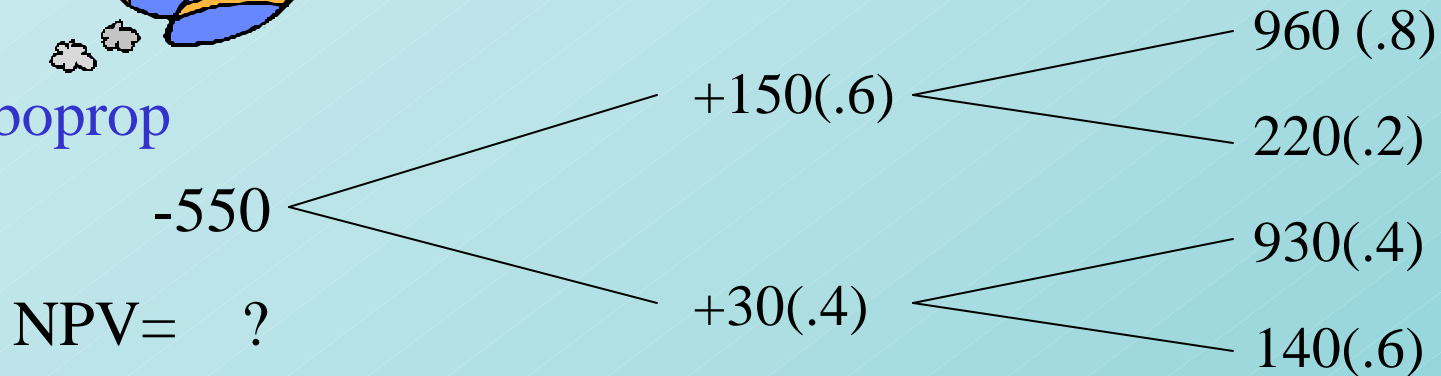
- ◆ Step 1: Modeling the Project
- ◆ Step 2: Specifying Probabilities
- ◆ Step 3: Simulate the Cash Flows



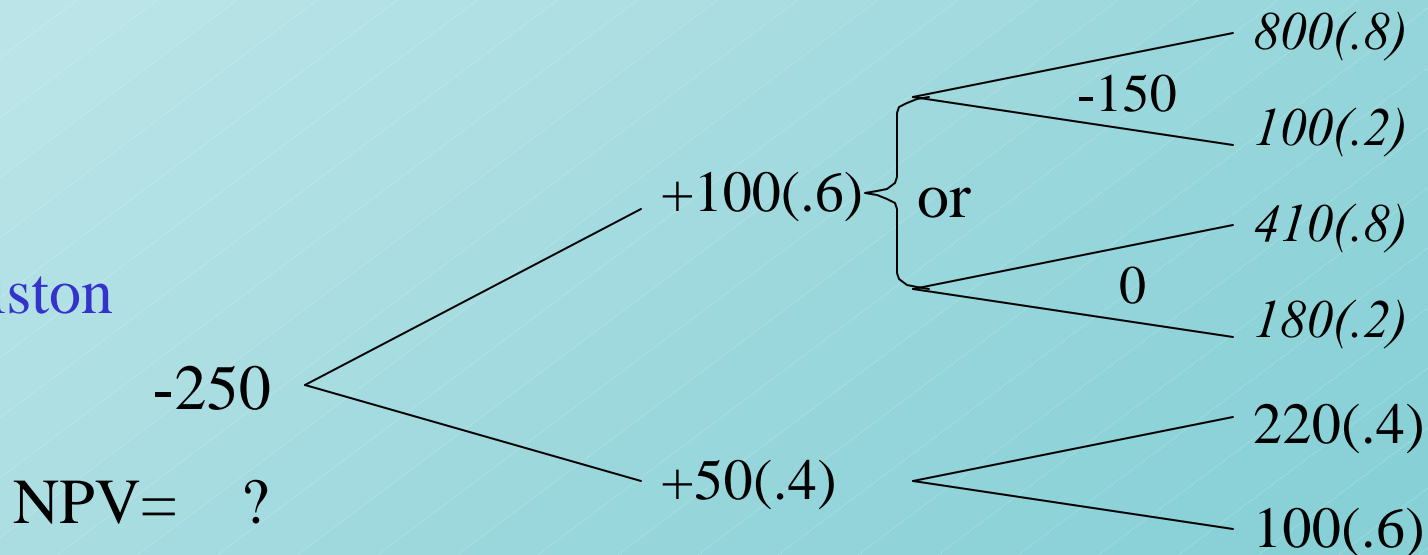
# Decision Trees



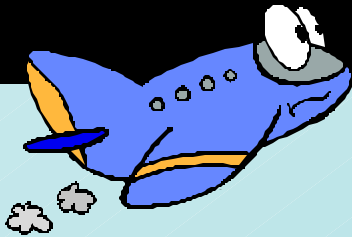
Turboprop



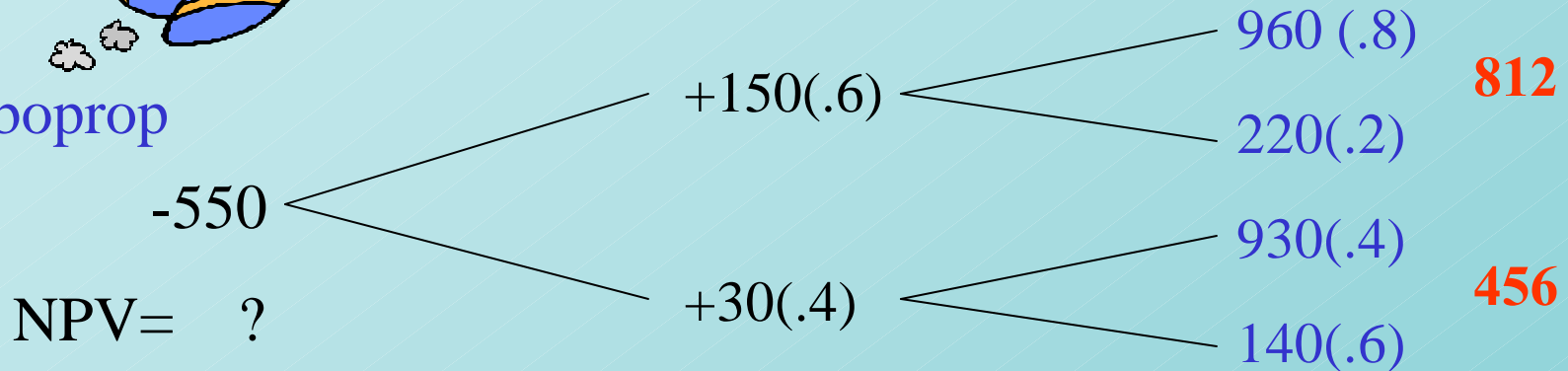
Piston



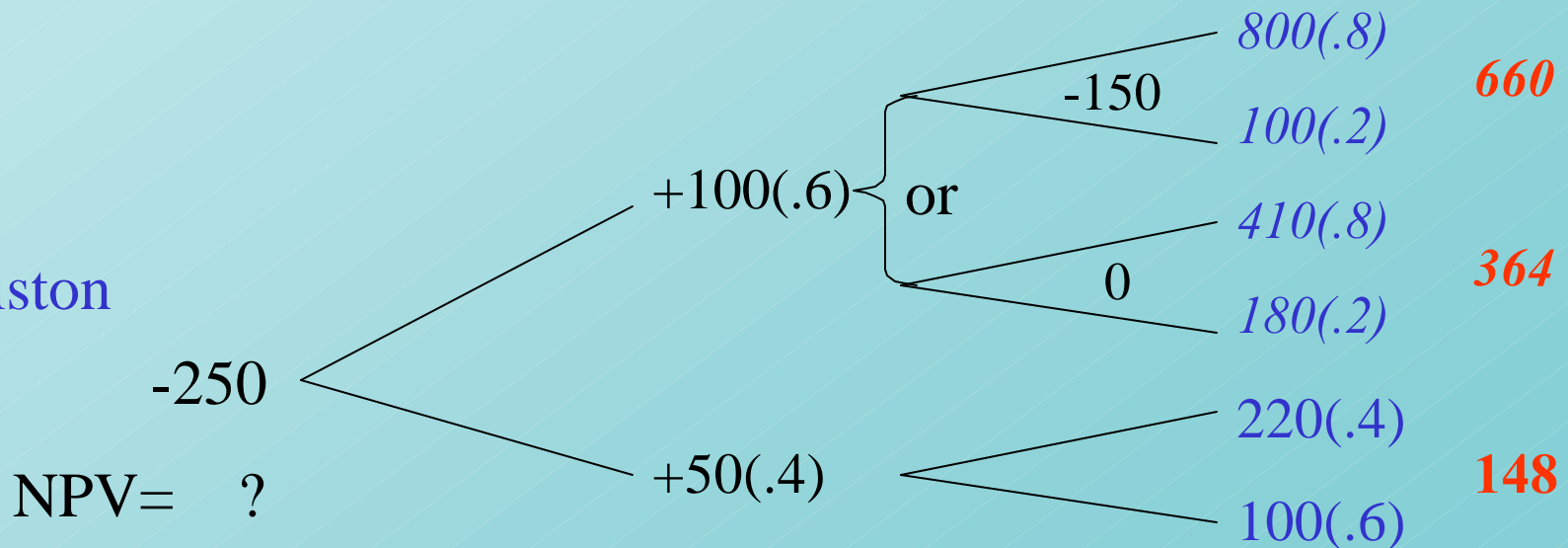
# Decision Trees



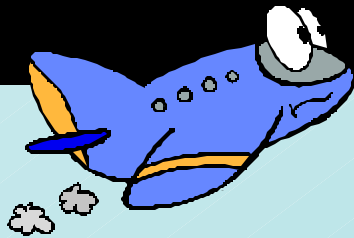
Turboprop



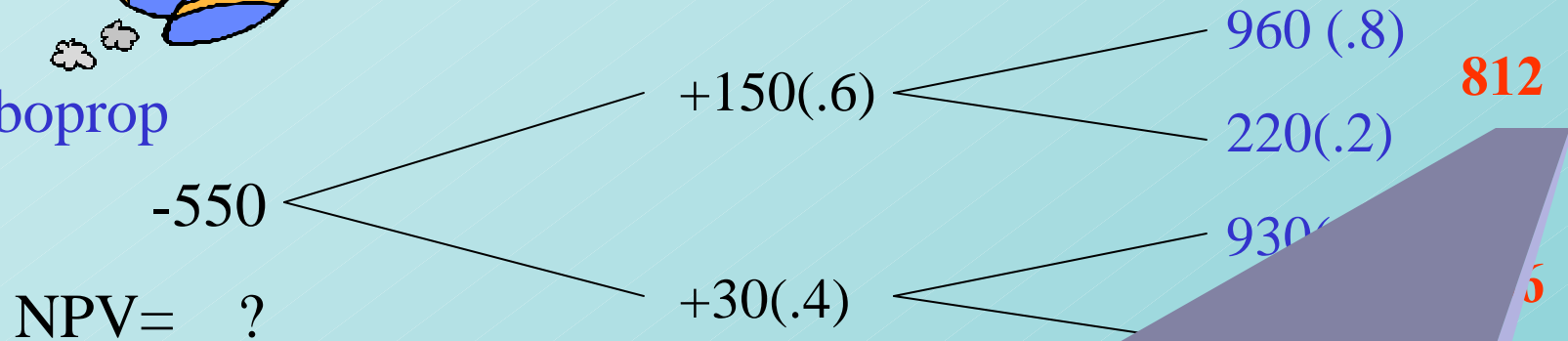
Piston



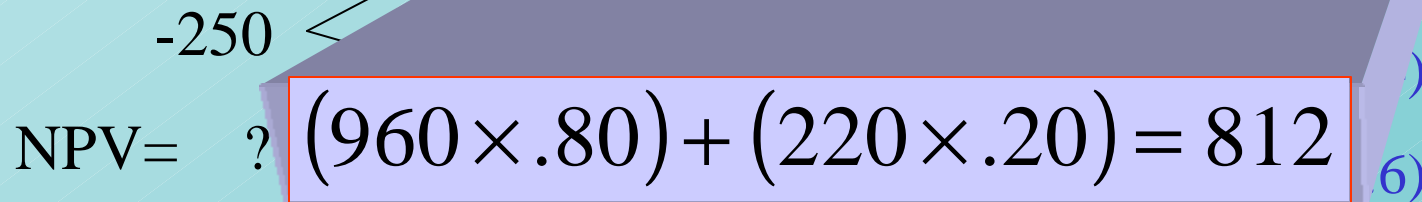
# Decision Trees

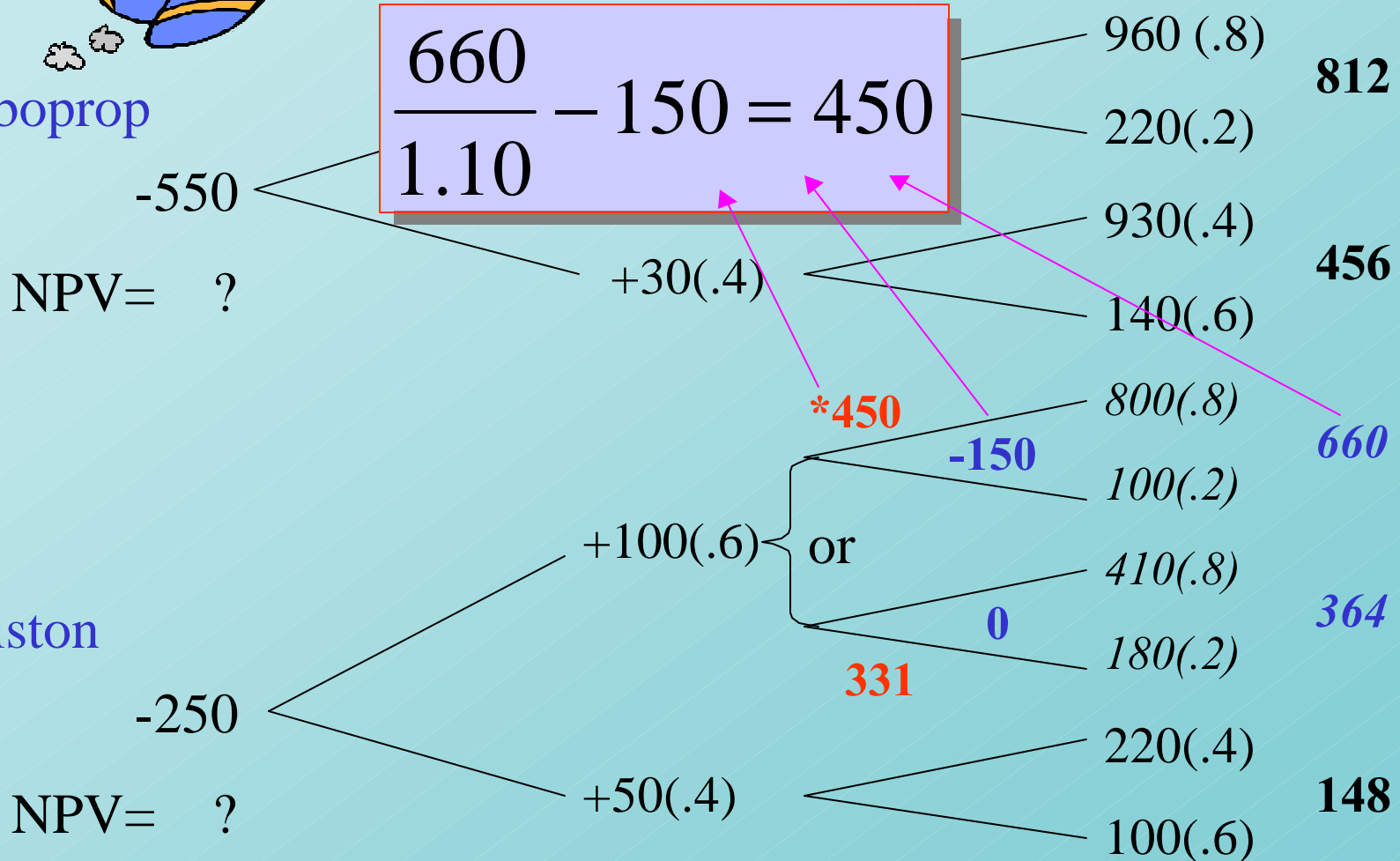


Turboprop

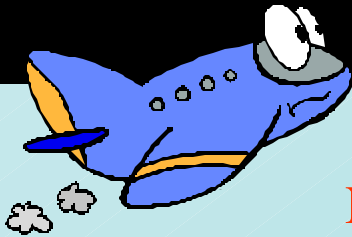


Piston

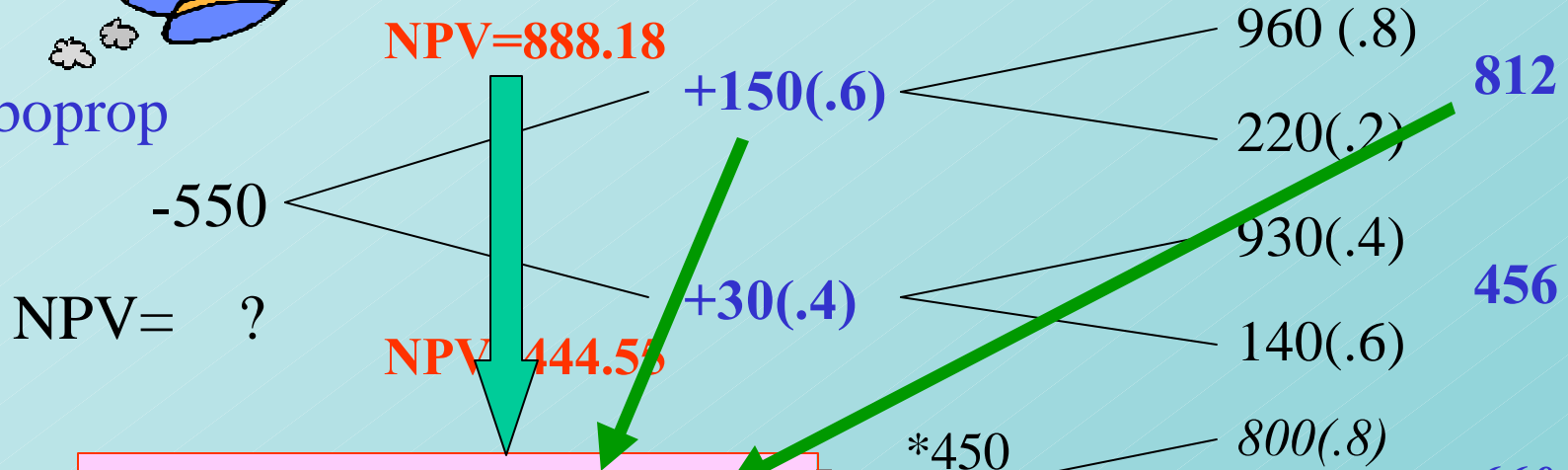




# Decision Trees

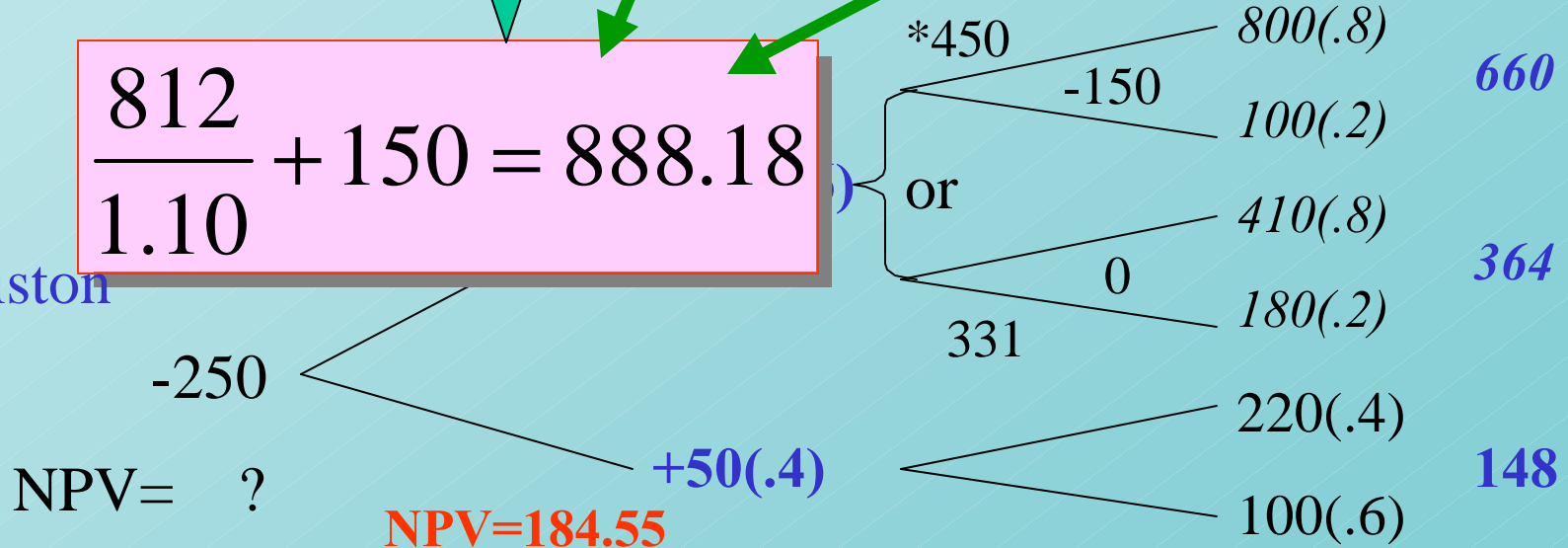


Turboprop

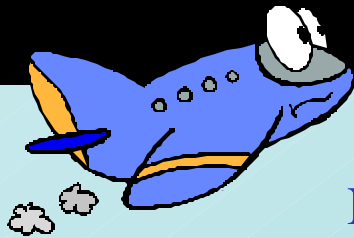


$$\frac{812}{1.10} + 150 = 888.18$$

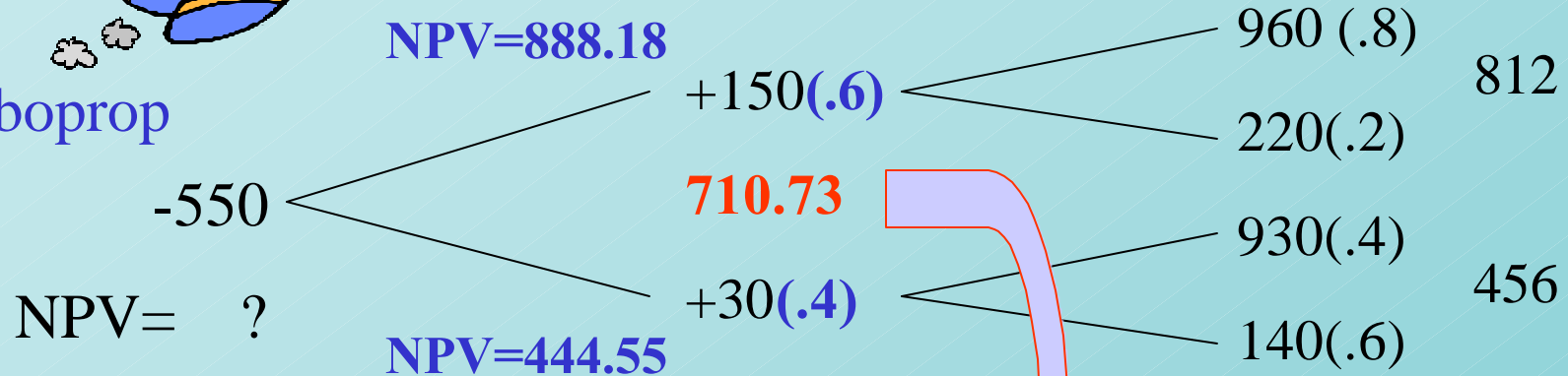
Piston



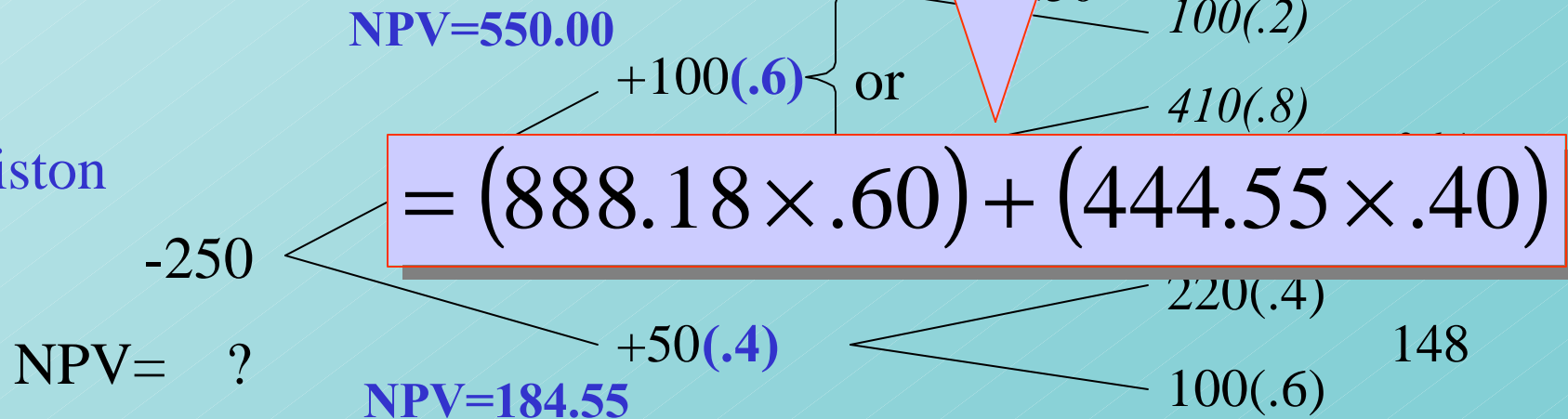
# Decision Trees



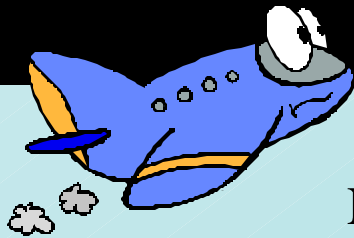
Turboprop



Piston



# Decision Trees



Turboprop

-550

**NPV=96.12**

NPV=888.18

+150(.6)

**710.73**

+30(.4)

NPV=444.55

960 (.8)

812

220(.2)

930(.4)

456

140(.6)

\*450

800(.8)

660

-150

100(.2)

80

364

20

40

148

100(.6)

Piston

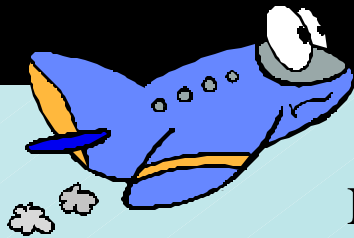
-250

**NPV=117.00**

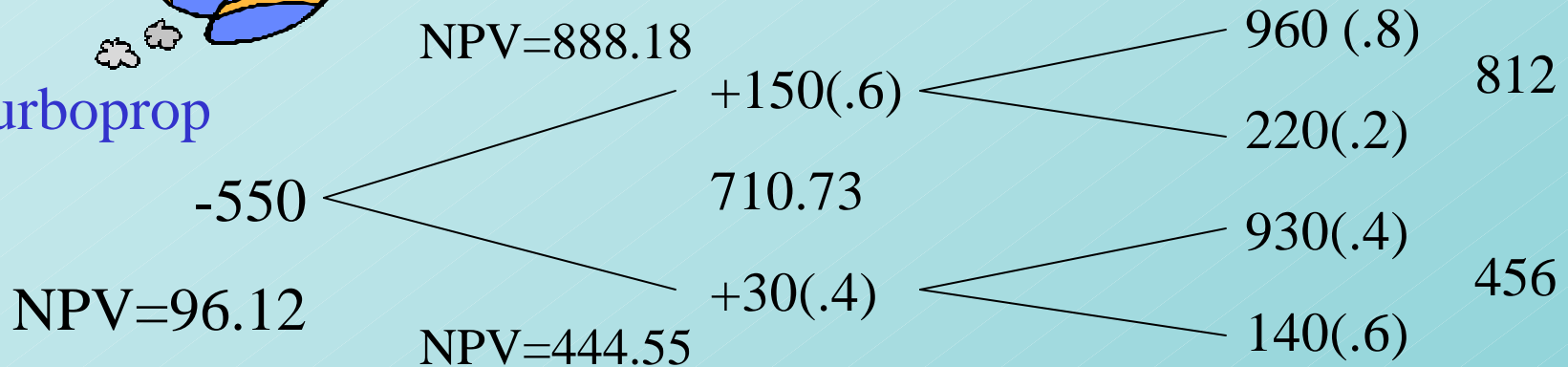
NPV=184.55

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

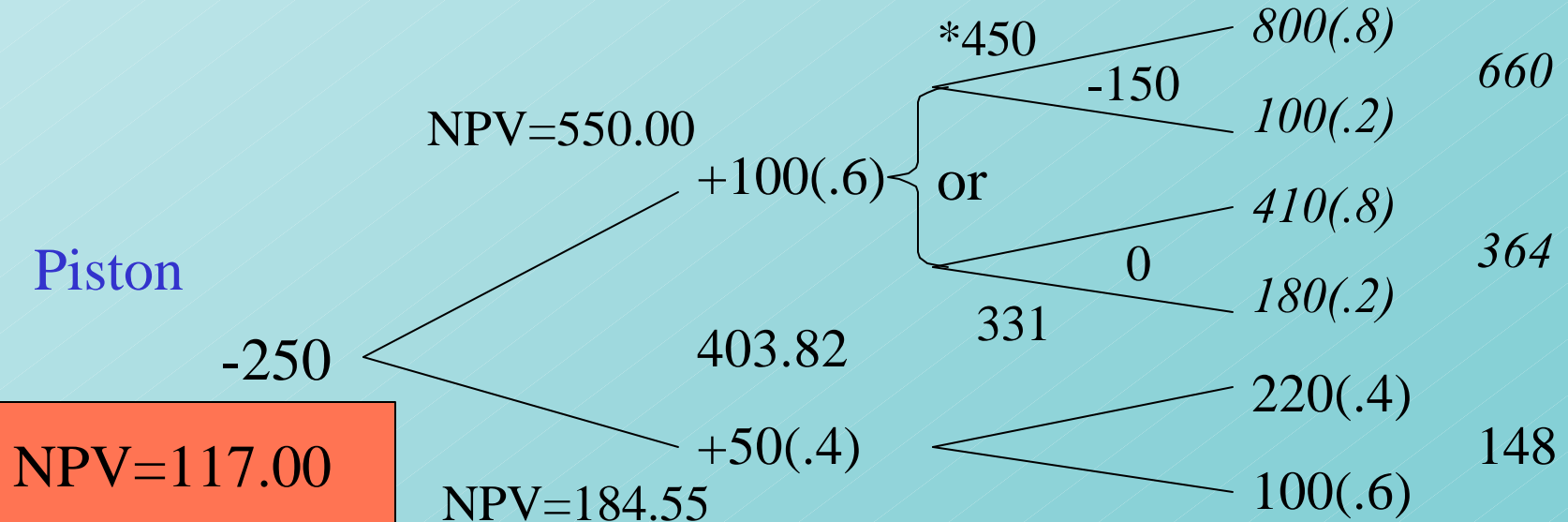
# Decision Trees



Turboprop



Piston







# Principles of Corporate Finance

Brealey and Myers

Sixth Edition

## ◆ 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

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

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

$$\text{Rental yield} = 10 - 3 = 7\%$$

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

# 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.:

$$\text{NPV} = -200 + (.1(420 - 200))/1.10 + (.1(441 - 200))/1.10^2 + \dots = - \$10 \text{ m.}$$

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

$$\begin{aligned} \text{NPV} &= -\text{investment} + \text{PV revenues} - \text{PV costs} \\ &= 200 + 400 - S ((.1 \times 200)/1.10^t) = \$77 \text{ million} \end{aligned}$$

# Do Projects Have Positive NPVs?

- ◆ **Rents = profits that more than cover the cost of capital.**
- ◆  **$NPV = PV(\text{rents})$**
- ◆ **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

<u>Technology</u>	<u>Capacity</u>		<u>Unit cost</u>		<u>Salvage value</u>
	<u>Industry</u>	<u>Marvin</u>	<u>Capital</u>	<u>Prod.</u>	
1. 2011	120	-	17.5	5	2.5
2. 2019	120	24	17.5	5	2.5

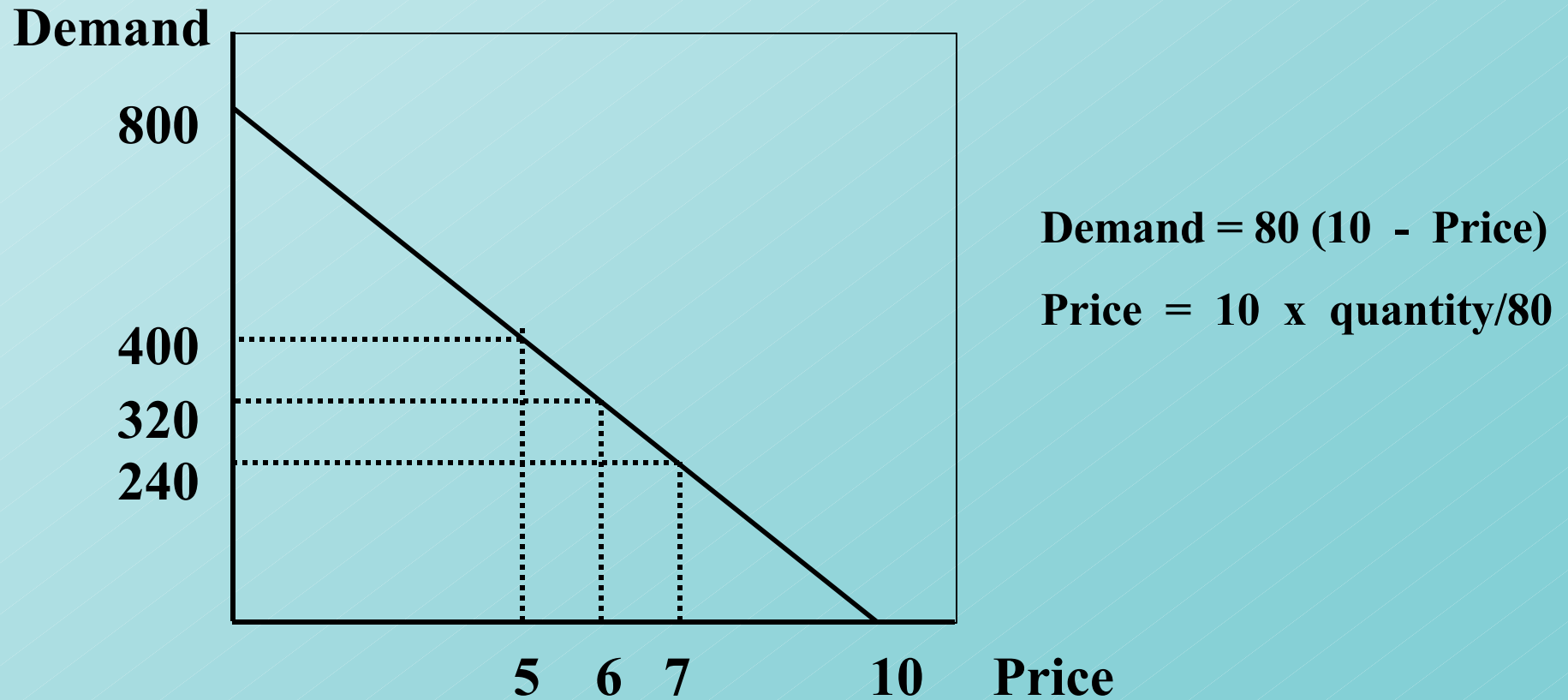
\* Proposed

# Marvin Enterprises

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

# Marvin Enterprises

## Demand for Garbage Blasters





# Marvin Enterprises

## Value of Garbage Blaster Investment

$$\begin{aligned}\text{NPV new plant} &= 100 \times [-10 + \Sigma ((6 - 3)/1.2^t) + 10/1.25] \\ &= \$299 \text{ million}\end{aligned}$$

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

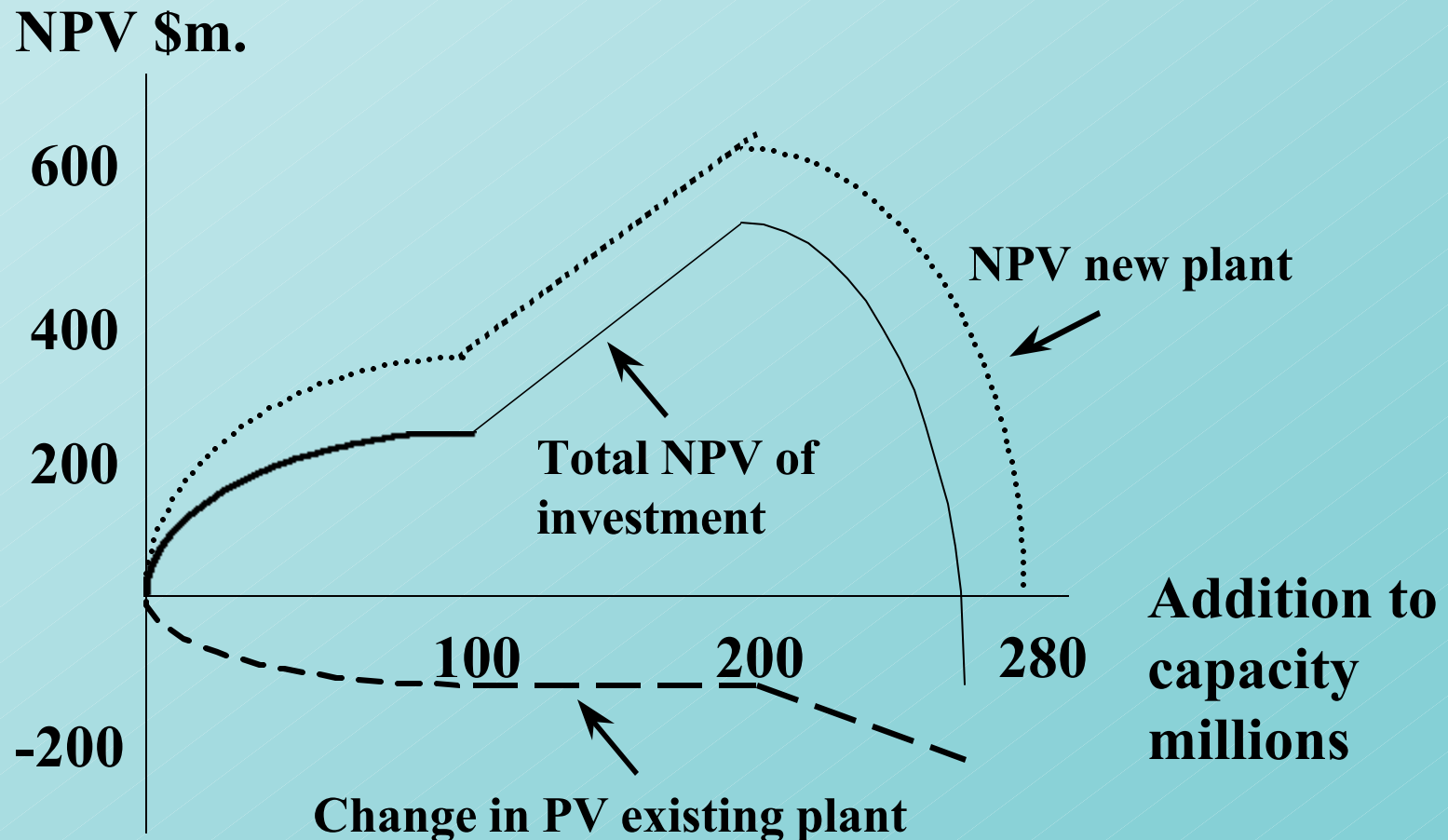
$$\text{Net benefit} = 299 - 72 = \$227 \text{ million}$$

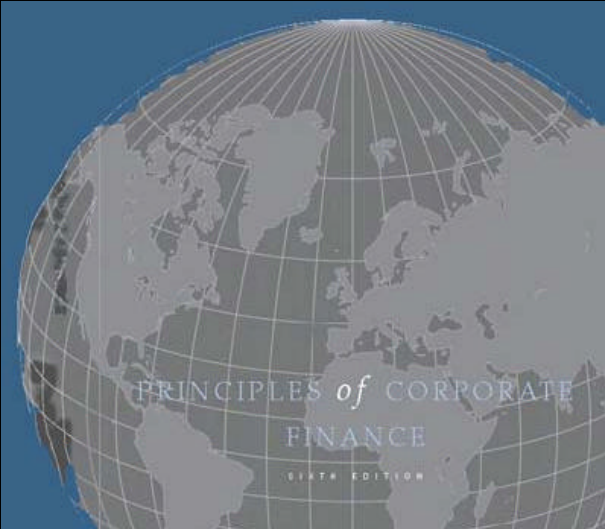
# Marvin Enterprises

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

***Question:*** Who has the power?

Managers = Employees

***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





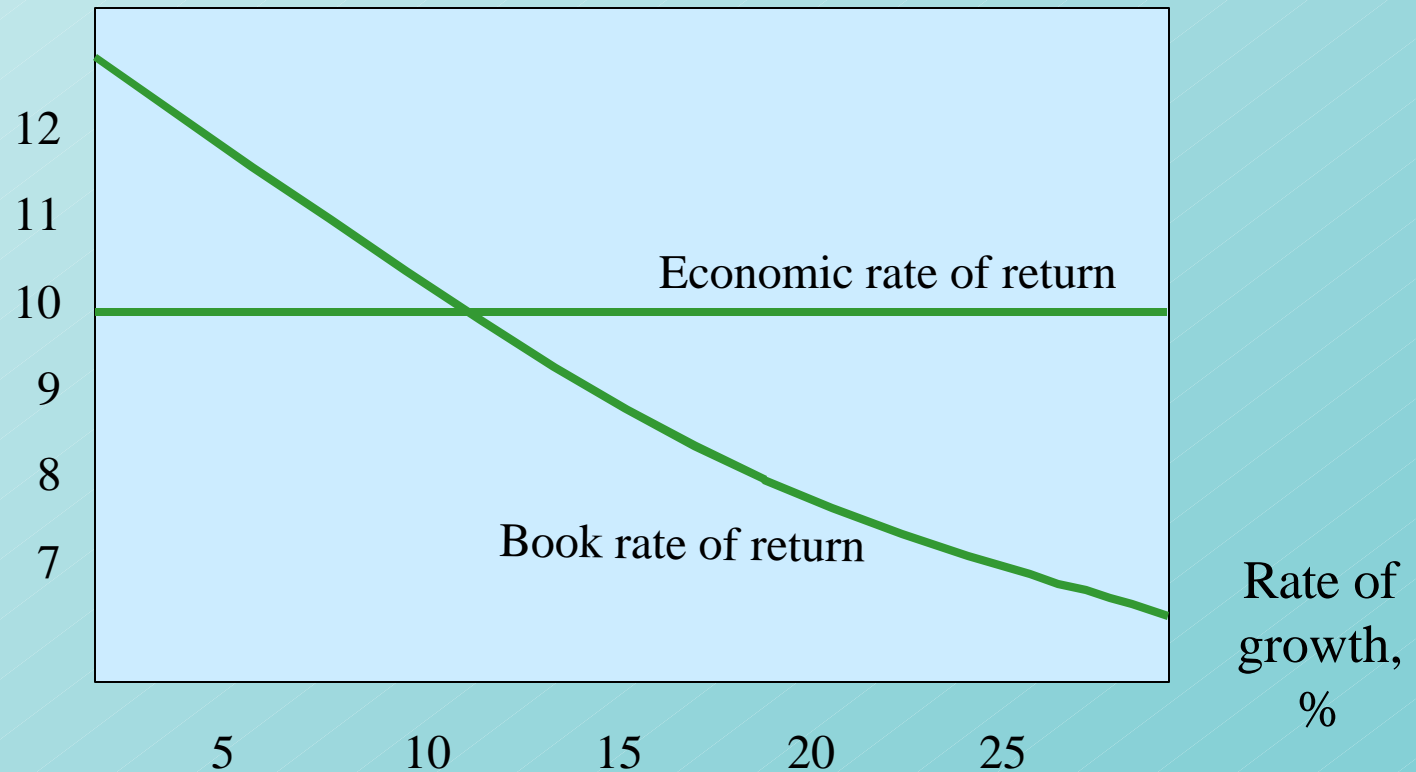
# Information Problems

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



# Growth and Returns

Rate of return, %



# 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)

<u>Income</u>		<u>Assets</u>	
Sales	550	Net W.C.	80
COGS	275	Property, plant and equipment	1170
Selling, G&A	75	<u>less depr.</u>	<u>360</u>
	<u>200</u>	Net Invest..	810
<u>taxes @ 35%</u>	<u>70</u>	<u>Other assets</u>	<u>110</u>
Net Income	\$130	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.

$$EVA = \text{Residual Income}$$

$$= \text{Income Earned} - \text{income required}$$

$$= \text{Income Earned} - [\text{Cost of Capital} \times \text{Investment}]$$

# Residual Income & EVA

## Quayle City Subduction Plant (\$mil)

Given COC = 12%

$$\begin{aligned} EV &= \text{Residual Income} \\ &= 130 - (.12 \times 1,000) \\ &= +\$10\text{million} \end{aligned}$$

# Economic Profit

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

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

# Economic Profit

## Quayle City Subduction Plant (\$mil)

Example at 12% COC continued.

$$\begin{aligned} EP &= (ROI - r \times \text{Capital Invested}) \\ &= (.13 - .12) \times 1,000 \\ &= \$10\text{million} \end{aligned}$$

# 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

$$\begin{aligned}\text{Rate of return} &= \frac{\text{cash receipts} + \text{change in price}}{\text{beginning price}} \\ &= \frac{C_1 + (P_1 - P_0)}{P_0}\end{aligned}$$

# Accounting Measurements

$$\begin{aligned}\text{Rate of return} &= \frac{\text{cash receipts} + \text{change in price}}{\text{beginning price}} \\ &= \frac{C_1 + (P_1 - P_0)}{P_0}\end{aligned}$$

---

Economic income = cash flow + change in present value

---

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



# Accounting Measurements

## ECONOMIC

Cash flow +  
change in PV =  
Cash flow -  
economic depreciation

## Economic income

PV at start of year

## ACCOUNTING

Cash flow +  
change in book value =  
Cash flow -  
accounting depreciation

## Accounting income

BV at start of year

INCOME

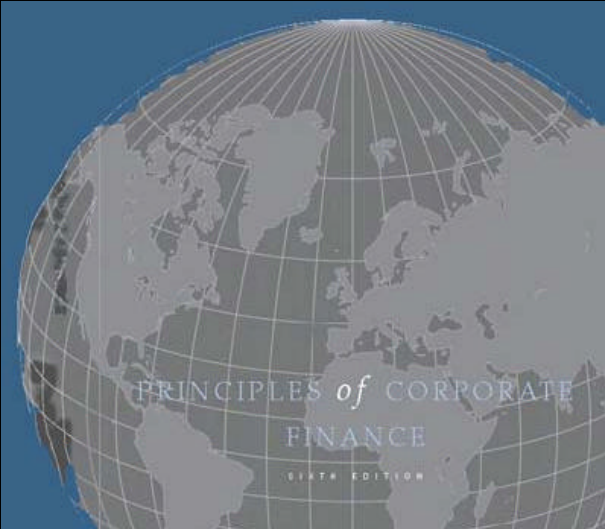
RETURN

# Nodhead Store Forecasts

	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

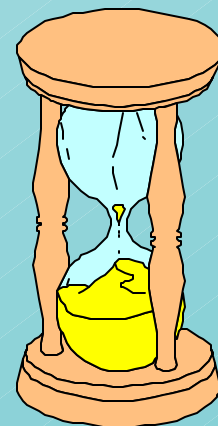
## Chapter 13

# 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

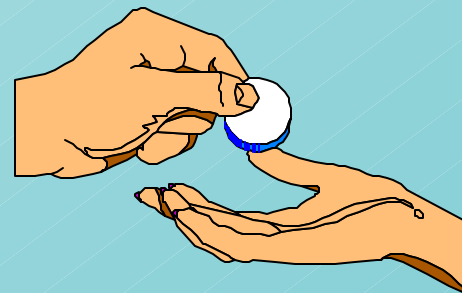
- ◆ NPV employs discount rates.
- ◆ These discount rates are risk adjusted.
- ◆ The risk adjustment is a byproduct of market established prices.
- ◆ Adjustable discount rates change asset values.



# 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?



$$\begin{aligned} \text{NPV} = & \text{amount borrowed} - \text{PV of interest pmts} \\ & - \text{PV of loan repayment} \end{aligned}$$

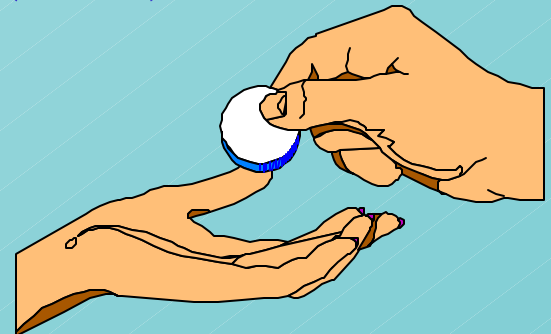
# Return to NPV

## 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%.

$$\begin{aligned} \text{NPV} &= 100,000 - \left[ \sum_{t=1}^{10} \frac{3,000}{(1.10)^t} \right] - \frac{100,000}{(1.10)^{10}} \\ &= 100,000 - 56,988 \\ &= \$43,012 \end{aligned}$$





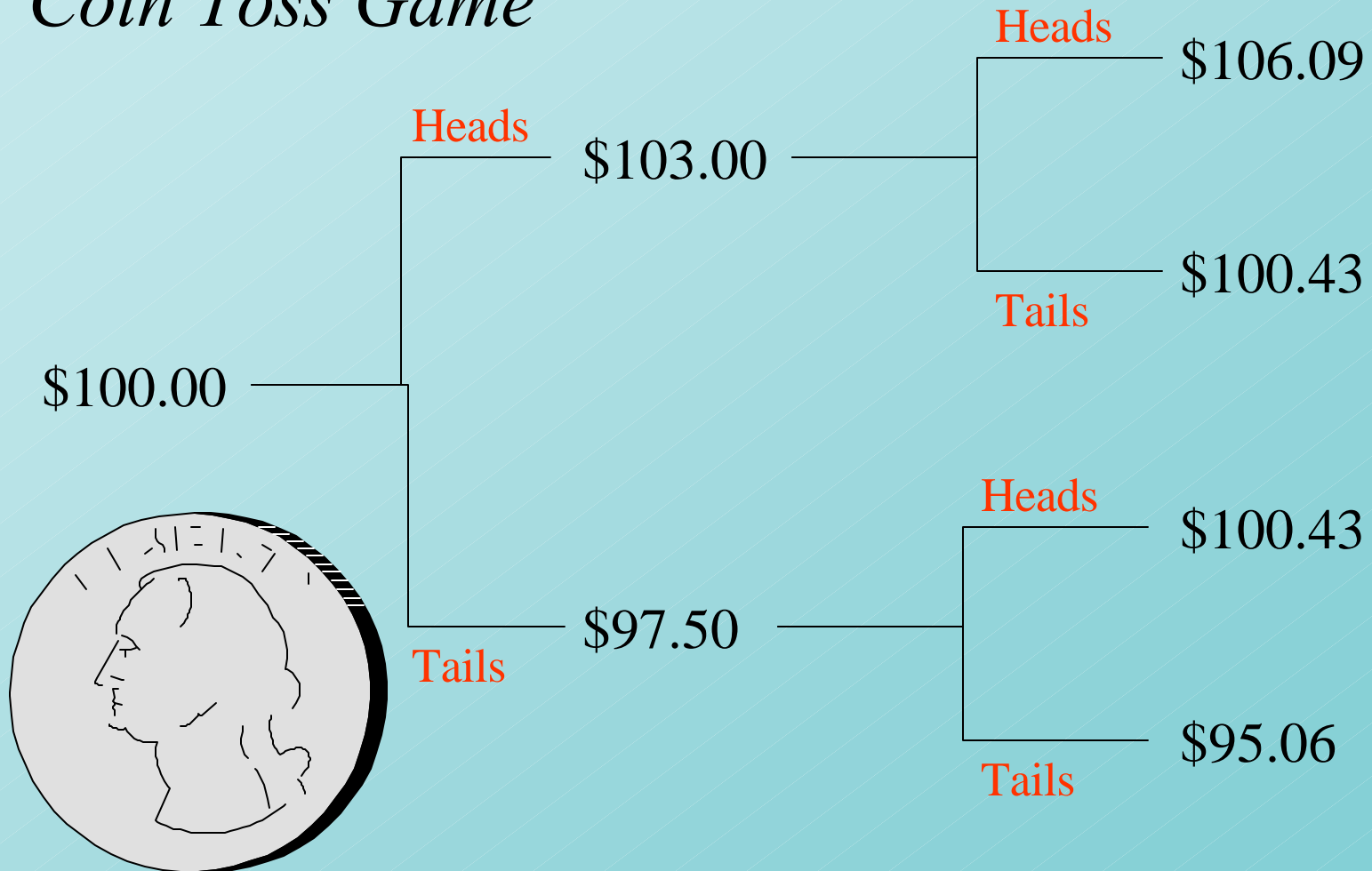
# Random Walk Theory

- ◆ 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*).

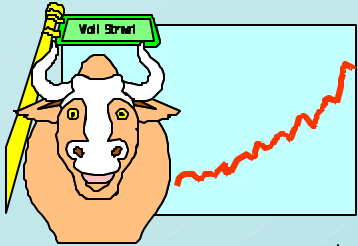


# Random Walk Theory

## *Coin Toss Game*



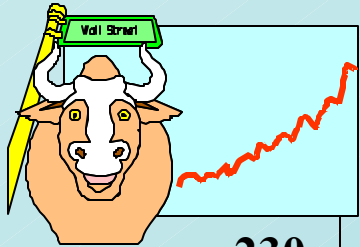
# Random Walk Theory



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



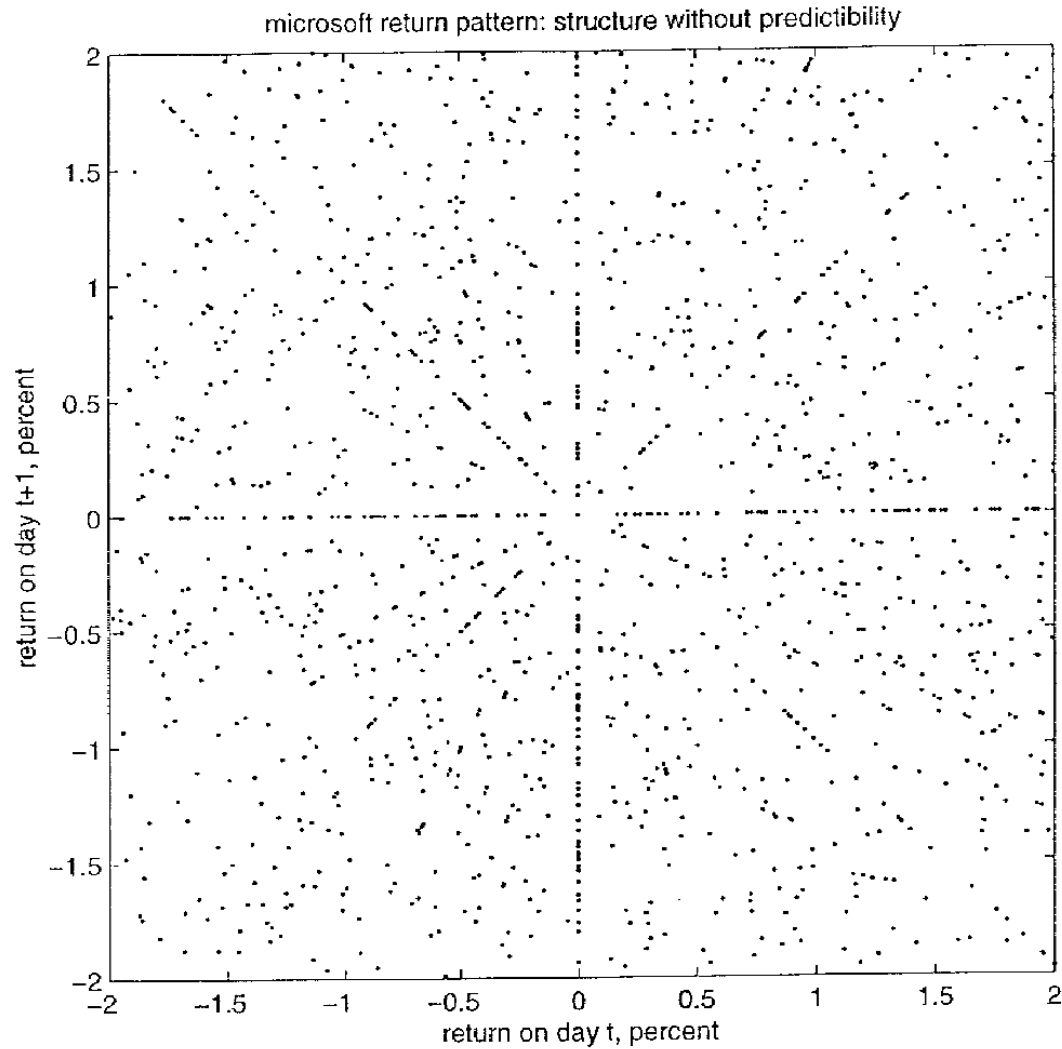
# Random Walk Theory



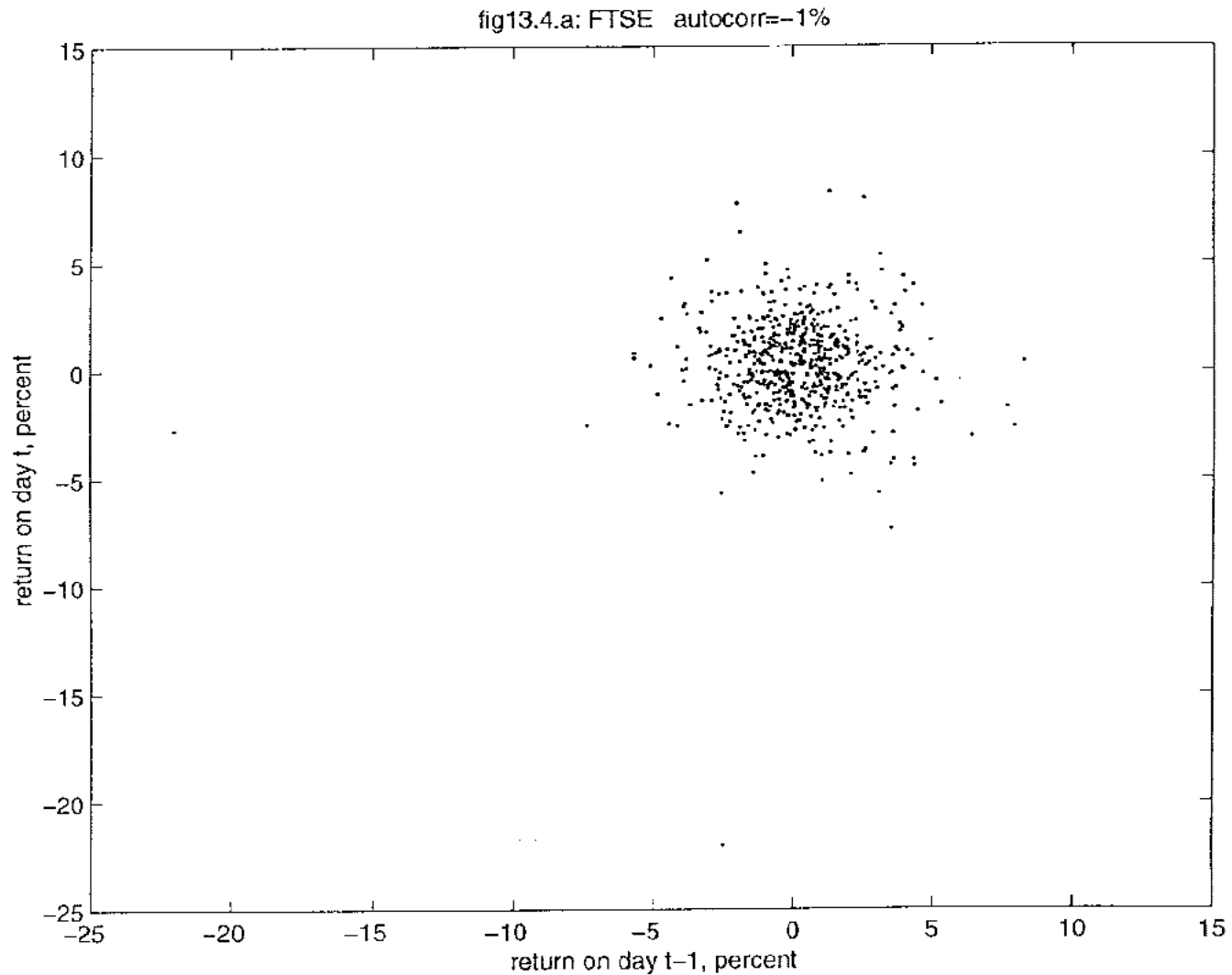
**S&P 500 Five Year Trend?  
or  
5 yrs of the Coin Toss Game?**



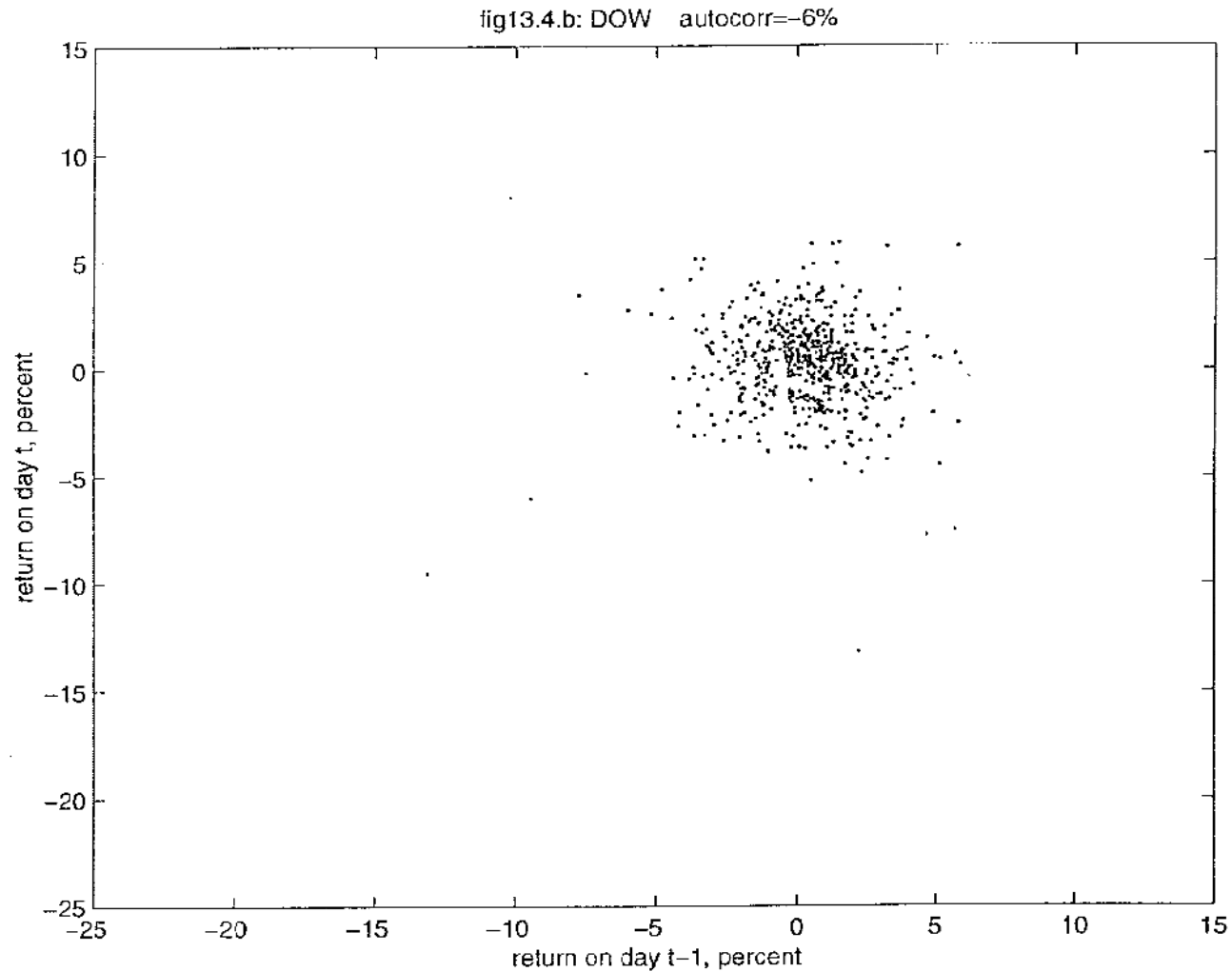
# Random Walk Theory



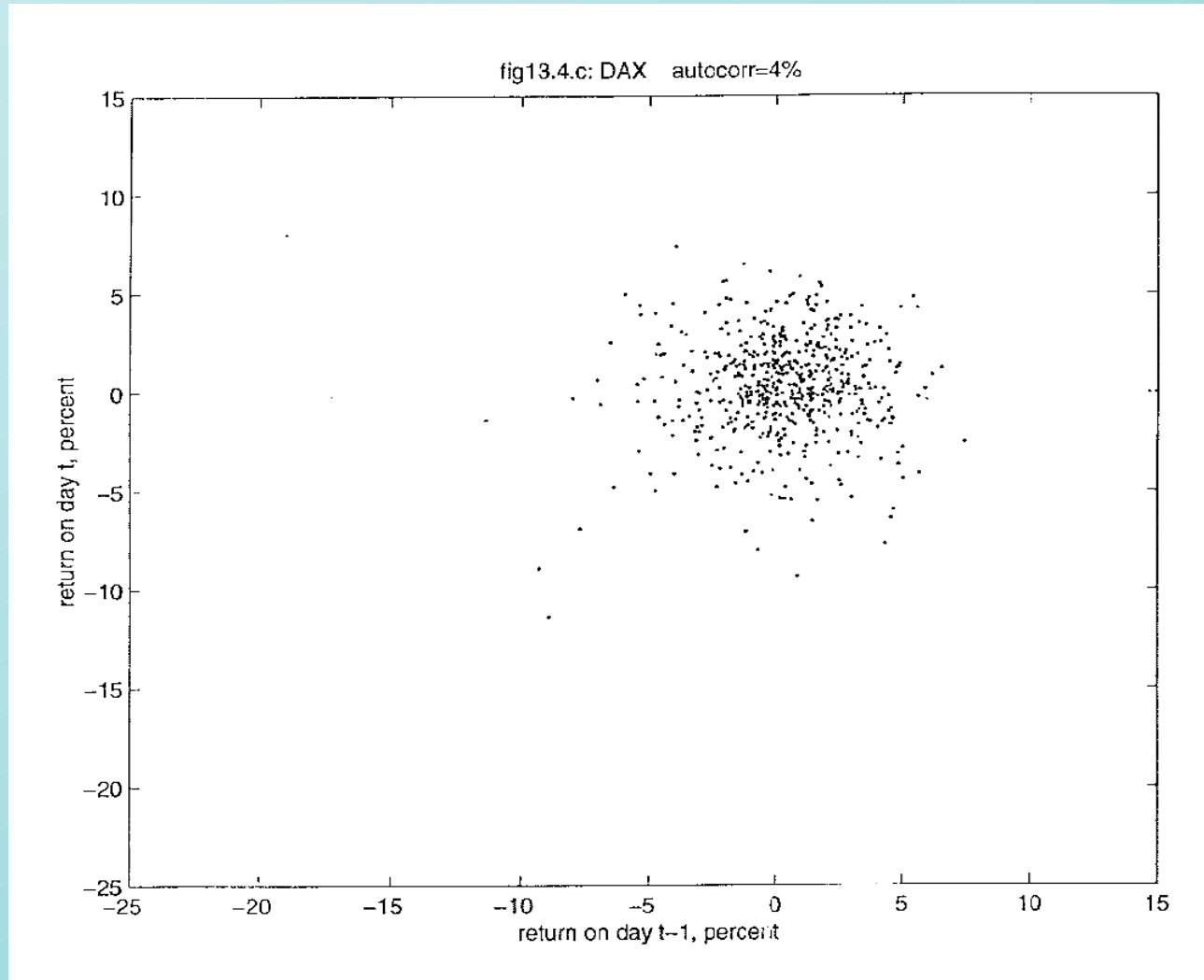
# Random Walk Theory



# Random Walk Theory

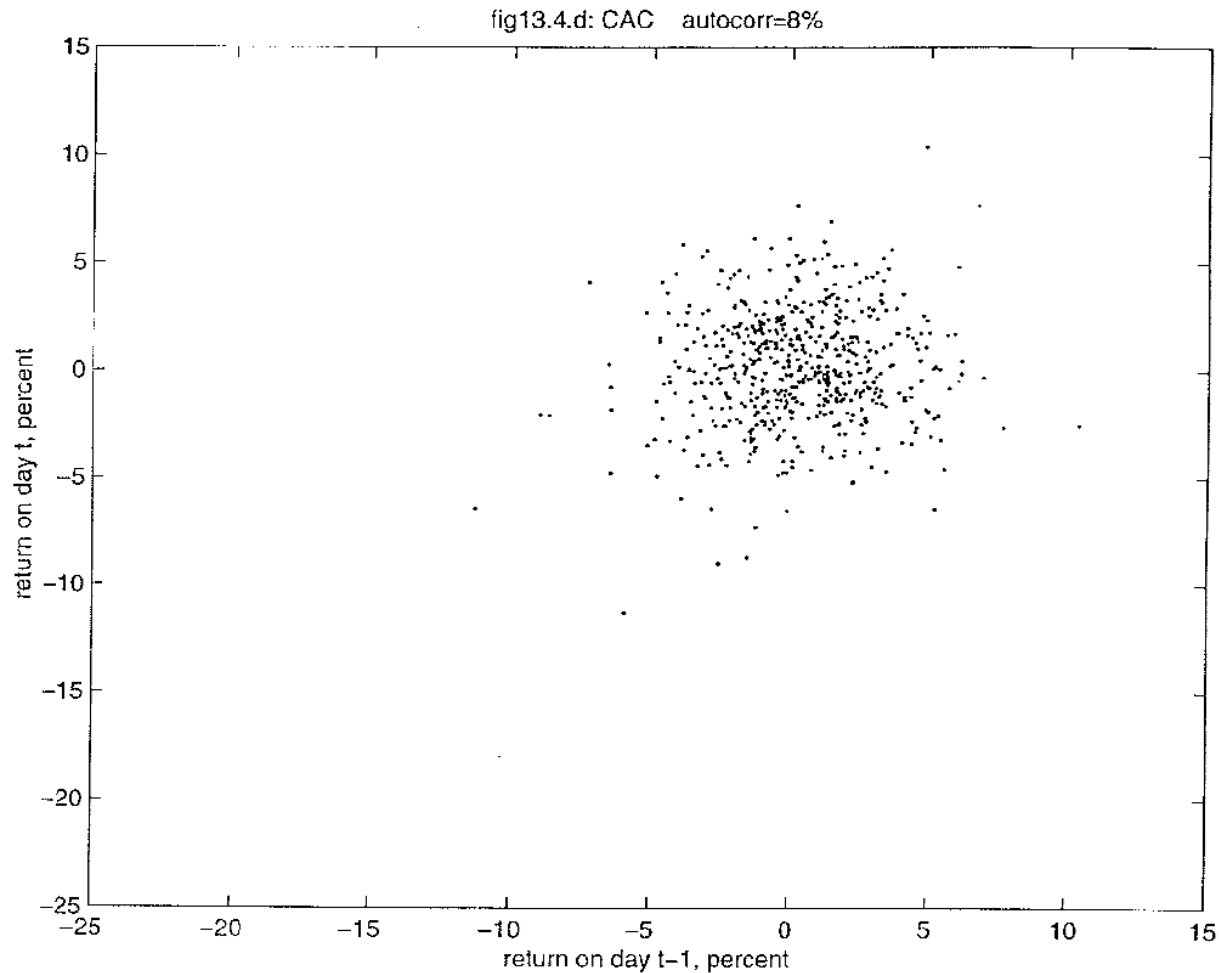


# Random Walk Theory





# Random Walk Theory



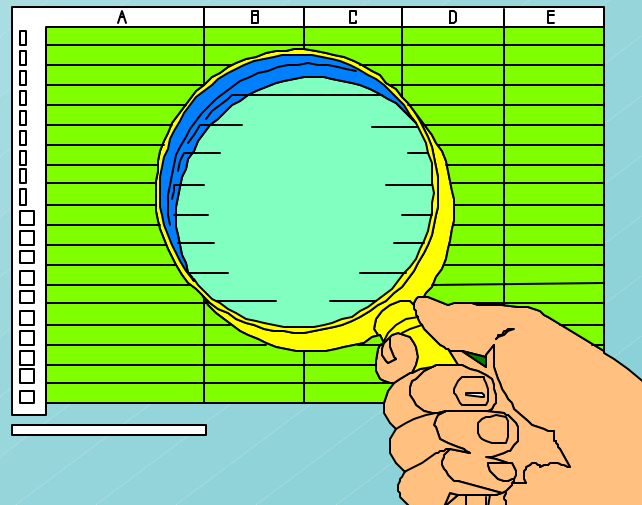
# Efficient Market Theory

- ◆ 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

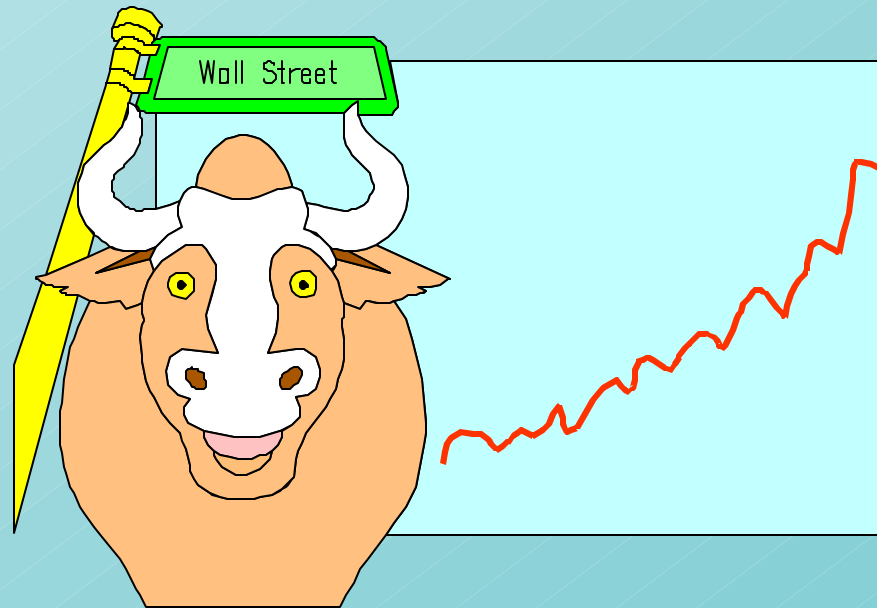
→ Research the value of stocks using NPV and other measurements of cash flow.



# Efficient Market Theory

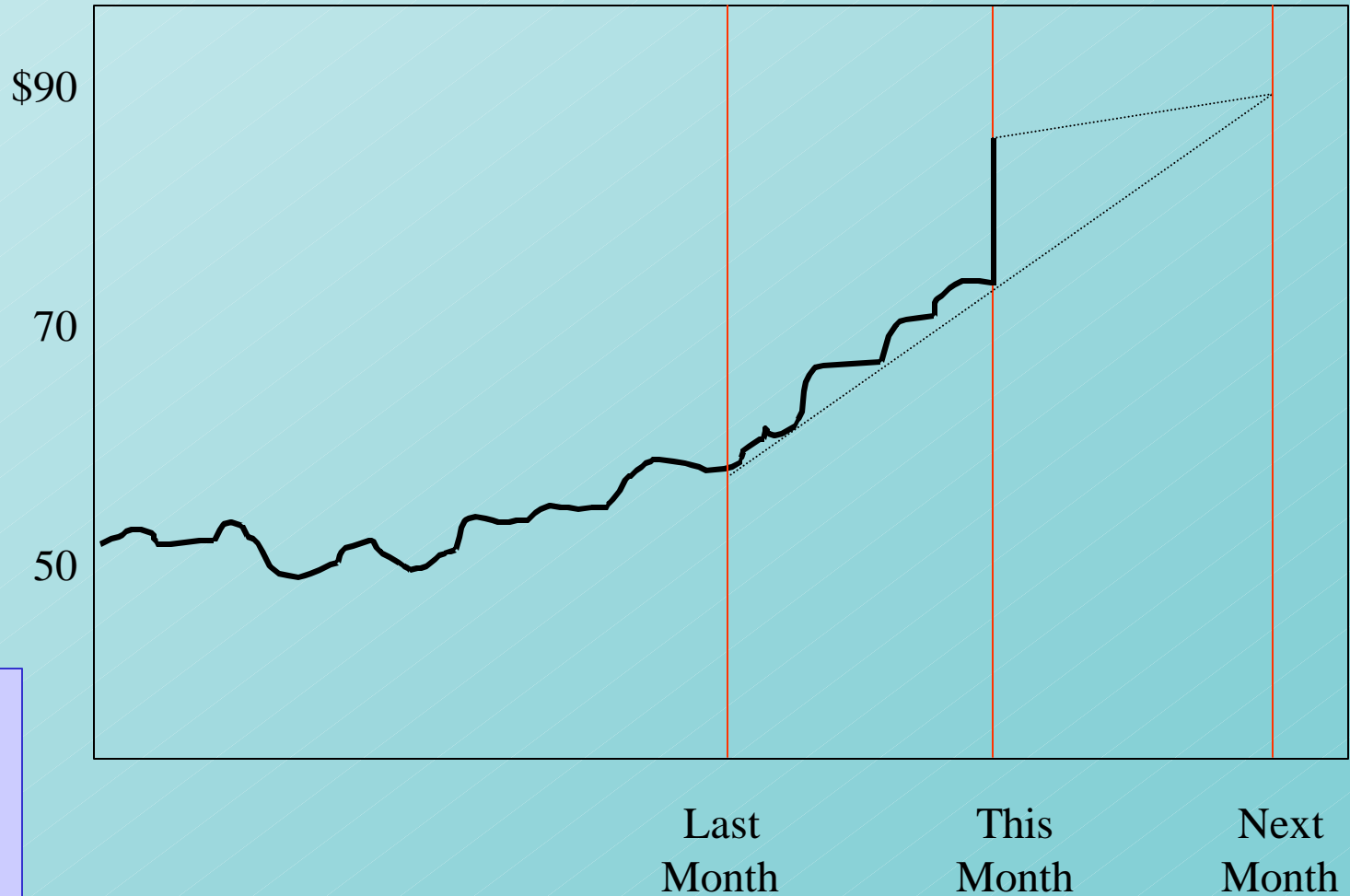
## ◆ Technical Analysts

- Forecast stock prices based on the watching the fluctuations in historical prices (thus “*wiggle watchers*”).



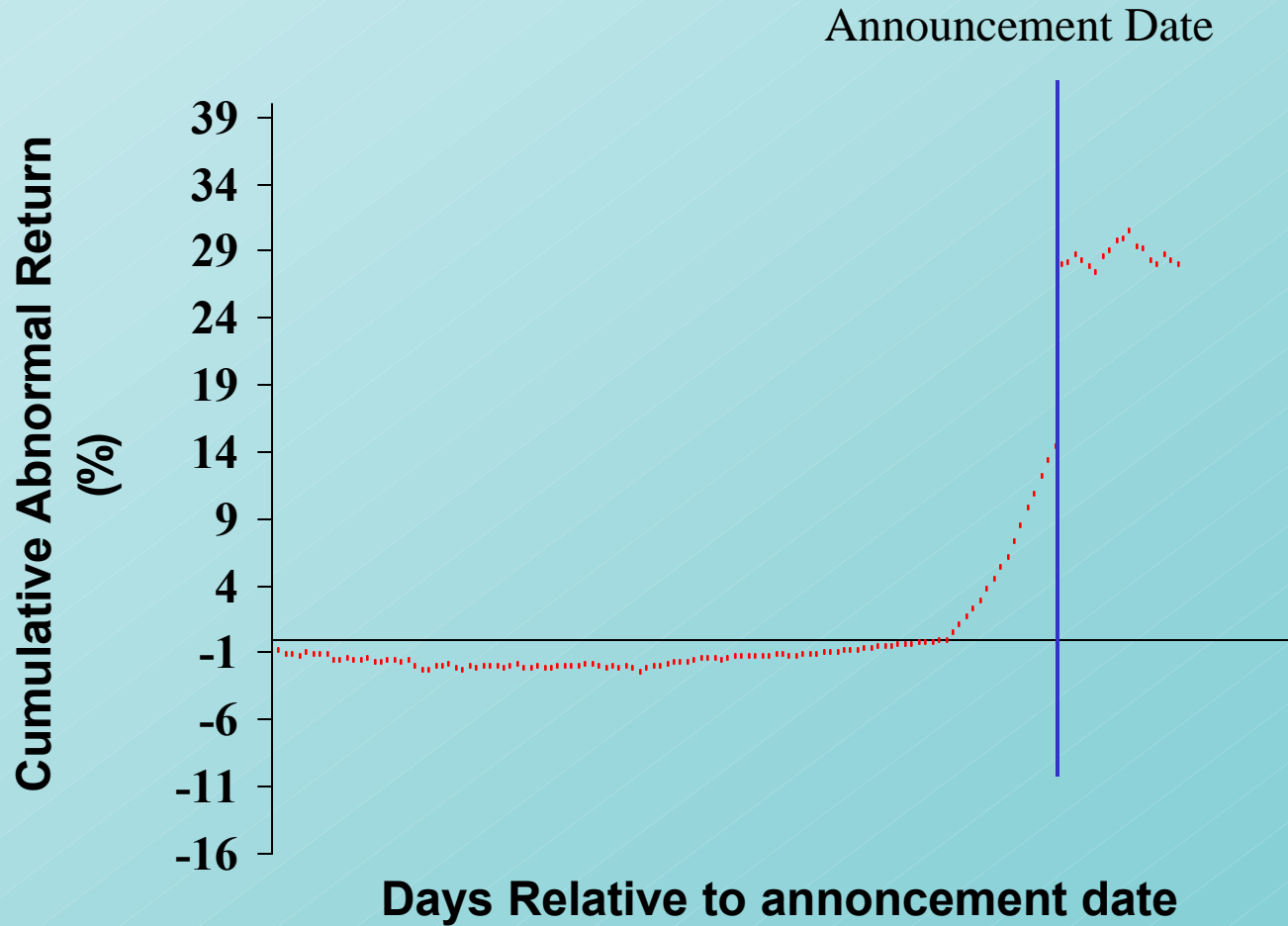
# Efficient Market Theory

*Microsoft  
Stock Price*



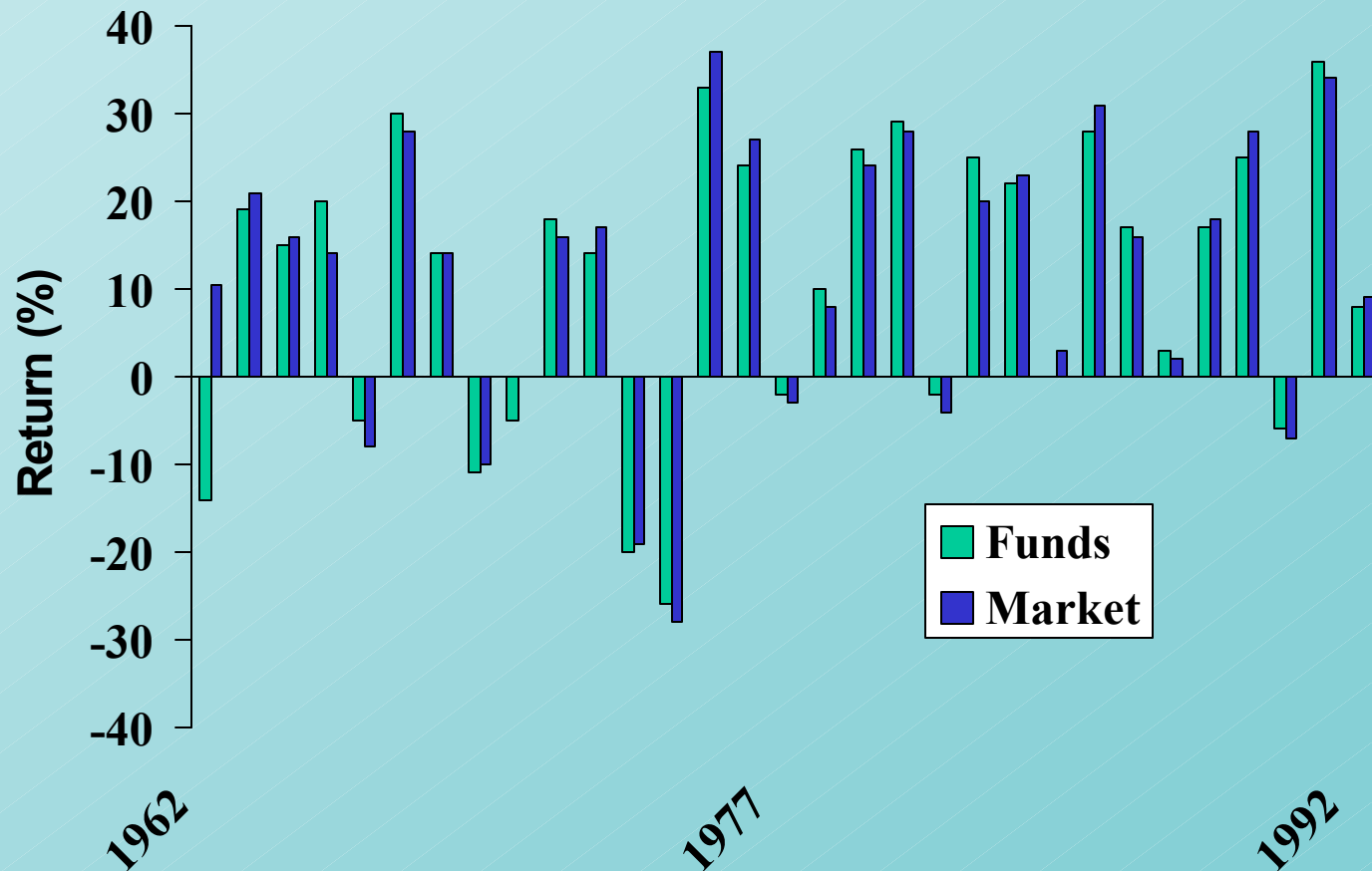
Cycles  
disappear  
once  
identified

# Efficient Market Theory



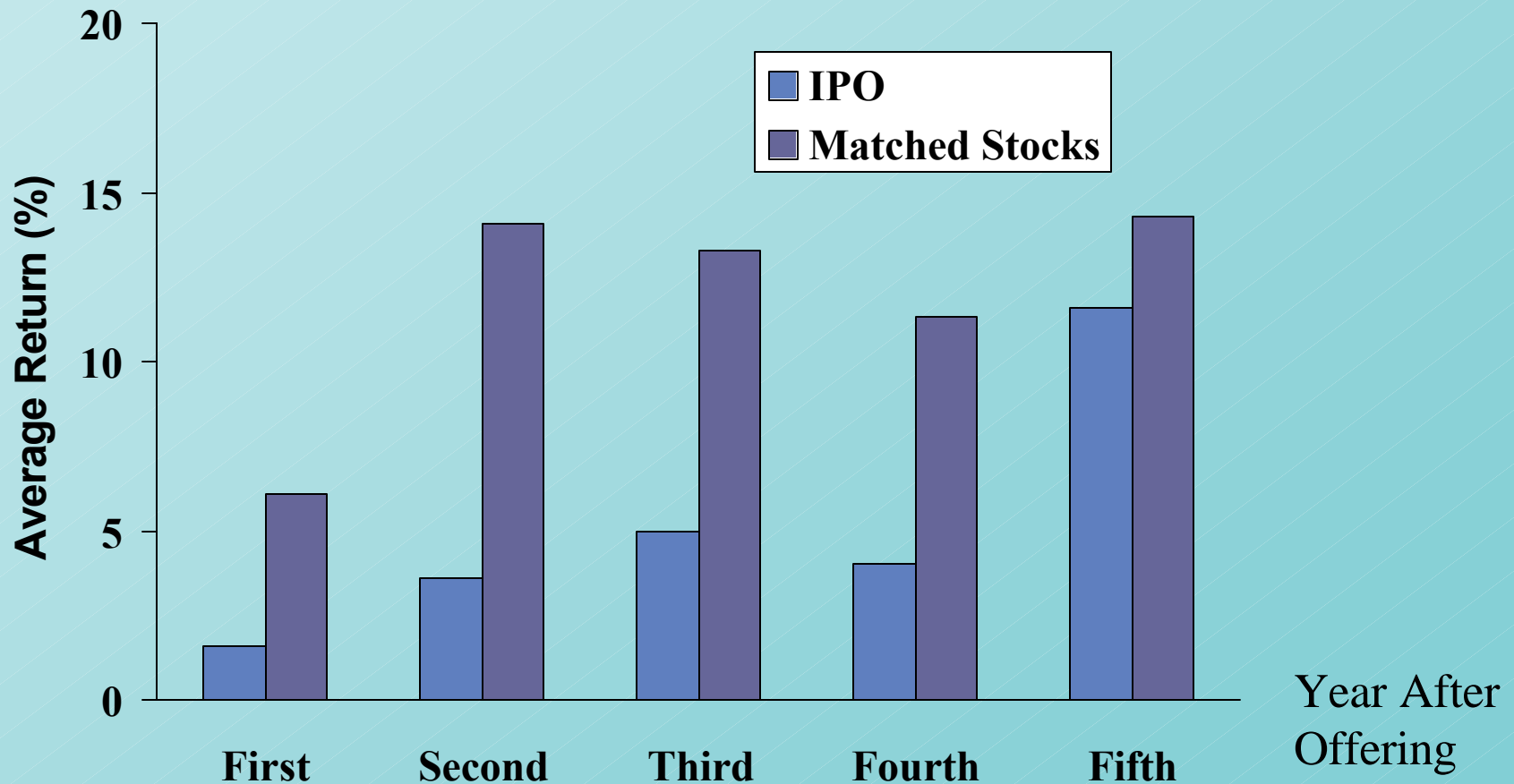
# Efficient Market Theory

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

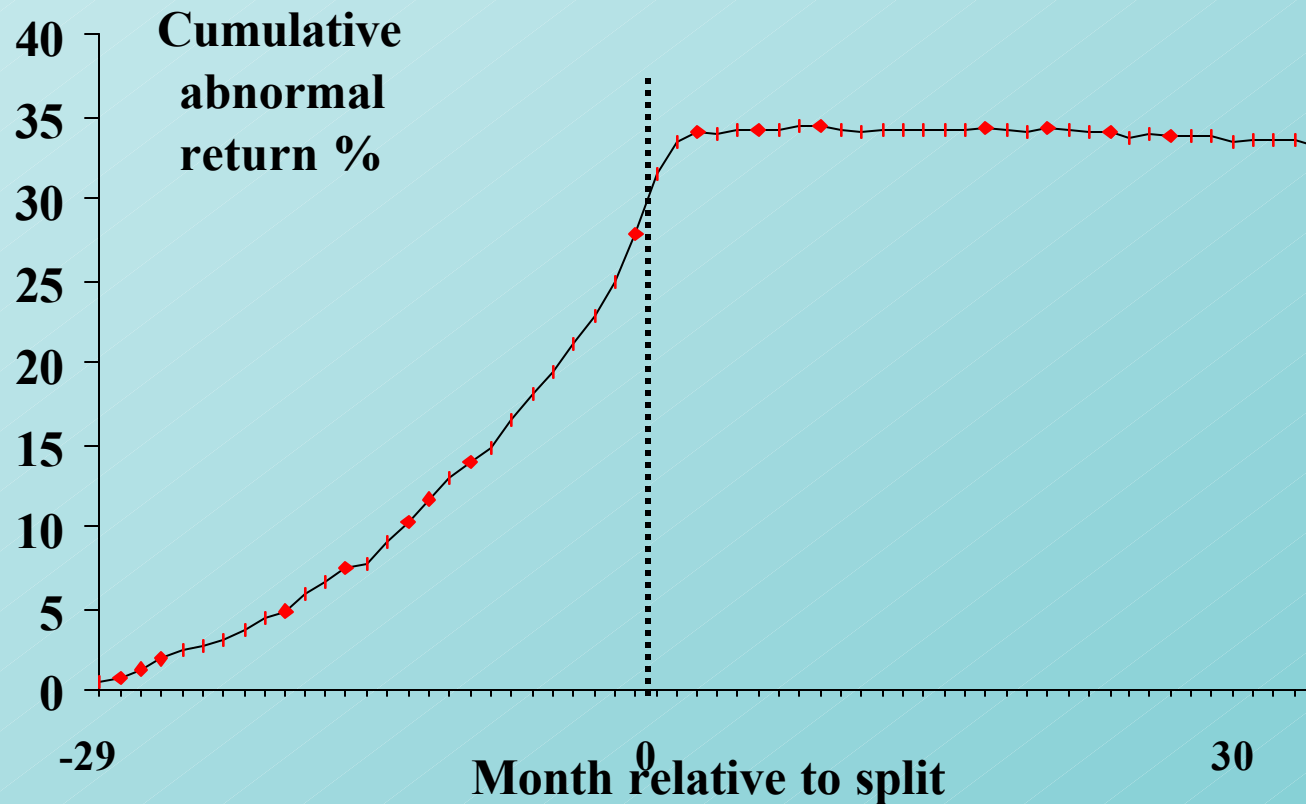
$$PV(index)_{\text{pre crash}} = \frac{Div}{r - g} = \frac{16.7}{.114 - .10} = 1193$$

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

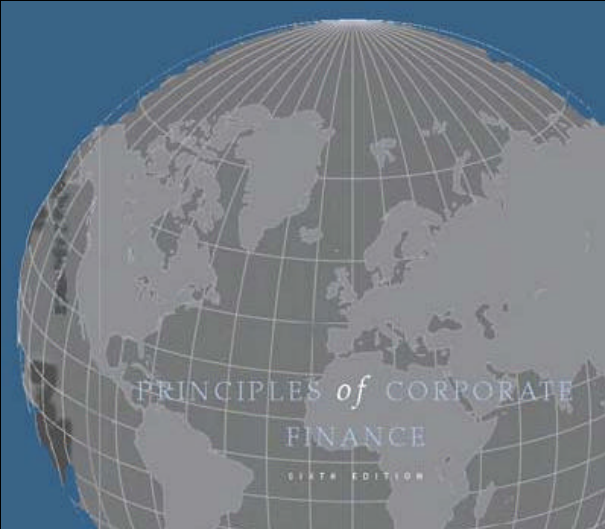
# Lessons of Market Efficiency

- ⇒ 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

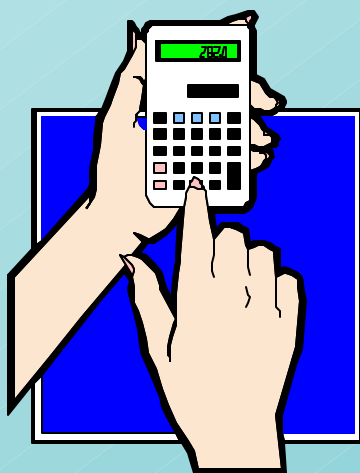
## Chapter 14

# 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
<i>Uses.<sup>a</sup></i>										
1. Capital expenditures	74	87	87	98	73	89	92	77	81	83
2. Investment in net working capital and other uses <sup>a</sup>	26	13	13	2	27	19	20	23	19	17
3. Total investment	100	100	100	100	100	100	100	100	100	100
<i>Sources:</i>										
4. Internally generated cash <sup>b</sup>	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	1,097	Other long term	576
depreciation		liabilities	
<b><i>Net fixed assets</i></b>	<b><i>1,085</i></b>	<b><i>Total long term liabilities</i></b>	<b><i>1,391</i></b>
Other long term	1,491	Stockholders' equity	1,508
<b><i>Total assets</i></b>	<b><i>3,896</i></b>	<b><i>Total liabilities and stockholders' equity</i></b>	<b><i>3,896</i></b>

# 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*

	<b>Book</b>	<b>Book, Adjusted</b>	<b>Market</b>	<b>Market, Adjusted</b>
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

$$\begin{array}{rcl} \text{Dec 1997 Market price} & = & \$72/\text{sh} \\ \text{\# of shares} & & \times 783.4 \\ \hline \text{Market Value} & = & \$56.4 \text{ billion} \end{array}$$





# 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).*

<b>Debt Security</b>	<b>1996</b>	<b>1997</b>
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).*

<b>Debt Security</b>	<b>1996</b>	<b>1997</b>
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

## Venture Capital

Money invested to finance a new firm

# Venture Capital

## Venture Capital

Money invested to finance a new firm

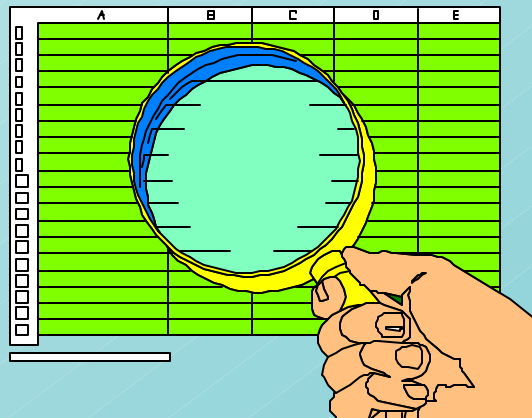


Since success of a new firm is highly dependent on the effort of the managers, restrictions are placed on management by the venture capital company and funds are usually dispersed in stages, after a certain level of success is achieved.

# 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

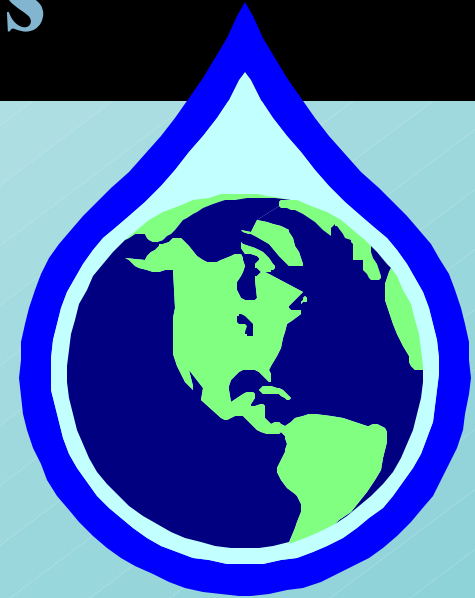


# The Underwriters

## *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

<p><b>12,937,500 Shares</b></p> <p><b>THE MONY GROUP</b></p> <p><b>The MONY Group Inc.</b></p> <p><b>Common Stock</b> (per value \$0.01 per share)</p> <hr/> <p><b>Price \$23.50 Per Share</b></p> <hr/> <p><small>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.</small></p> <p><b>10,925,000 Shares</b></p> <p><small>This portion of the offering is being offered in the United States by the undersigned:</small></p> <table border="0"> <tr> <td><b>Goldman, Sachs &amp; Co.</b></td> <td><b>Donaldson, Lufkin &amp; Jenrette</b></td> </tr> <tr> <td><b>Morgan Stanley Dean Witter</b></td> <td><b>Salomon Smith Barney</b></td> </tr> <tr> <td><b>CIBC Oppenheimer</b></td> <td><b>Conning &amp; Company</b></td> </tr> <tr> <td><b>Fox-Pitt, Kelton Inc.</b></td> <td><b>Schroder &amp; Co. Inc.</b></td> </tr> <tr> <td><b>Robert W. Baird &amp; Co.</b> <small>Incorporated</small></td> <td><b>Chatsworth Securities LLC</b></td> </tr> <tr> <td><b>Edward D. Jones &amp; Co., L.P.</b></td> <td><b>Legg Mason Wood Walker</b> <small>Incorporated</small></td> </tr> <tr> <td></td> <td><b>A.G. Edwards &amp; Sons, Inc.</b></td> </tr> <tr> <td></td> <td><b>Alien &amp; Company</b> <small>Incorporated</small></td> </tr> <tr> <td></td> <td><b>Doley Securities, Inc.</b></td> </tr> <tr> <td></td> <td><b>Stephens Inc.</b></td> </tr> </table> <hr/> <p><b>2,012,500 Shares</b></p> <p><small>This portion of the offering is being offered outside the United States by the undersigned:</small></p> <table border="0"> <tr> <td><b>Goldman Sachs International</b></td> <td><b>Donaldson, Lufkin &amp; Jenrette</b></td> </tr> <tr> <td><b>Morgan Stanley Dean Witter</b></td> <td><b>Salomon Smith Barney International</b></td> </tr> </table>			<b>Goldman, Sachs &amp; Co.</b>	<b>Donaldson, Lufkin &amp; Jenrette</b>	<b>Morgan Stanley Dean Witter</b>	<b>Salomon Smith Barney</b>	<b>CIBC Oppenheimer</b>	<b>Conning &amp; Company</b>	<b>Fox-Pitt, Kelton Inc.</b>	<b>Schroder &amp; Co. Inc.</b>	<b>Robert W. Baird &amp; Co.</b> <small>Incorporated</small>	<b>Chatsworth Securities LLC</b>	<b>Edward D. Jones &amp; Co., L.P.</b>	<b>Legg Mason Wood Walker</b> <small>Incorporated</small>		<b>A.G. Edwards &amp; Sons, Inc.</b>		<b>Alien &amp; Company</b> <small>Incorporated</small>		<b>Doley Securities, Inc.</b>		<b>Stephens Inc.</b>	<b>Goldman Sachs International</b>	<b>Donaldson, Lufkin &amp; Jenrette</b>	<b>Morgan Stanley Dean Witter</b>	<b>Salomon Smith Barney International</b>
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# 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

<u>Type</u>	<u>Company</u>	<u>Issue amount, millions of dollars</u>	<u>Underwriter's spread, percent</u>
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
<i>Seasoned</i>	<i>Coulter Pharmaceuticals</i>	<i>60.0</i>	<i>5.48</i>
<i>Seasoned</i>	<i>Stillwater Mining</i>	<i>61.5</i>	<i>5.00</i>
<i>Seasoned</i>	<i>Metronet Communications Corp.</i>	<i>232.6</i>	<i>5.00</i>
<i>Seasoned</i>	<i>Staples, Inc.</i>	<i>446.6</i>	<i>3.25</i>
<i>Seasoned</i>	<i>Safeway, Inc.</i>	<i>1125.0</i>	<i>2.75</i>
<i>Seasoned</i>	<i>Media One Group</i>	<i>1511.3</i>	<i>2.74</i>
Debt:			
2-year notes	General Motors Acceptance Corp.	100	0.18
30-year debentures	Bausch & Lomb, Inc.	200	0.88
6-year notes	Ararnark Corp.	300	0.63
15-year subordinated notes	Banque Paribas	400	0.75
Convertible zero-coupon bonds	Aspect Telecommunications	490	3.00
10-year notes	Federal Home Loan Mortgage Corp	1500	0.15

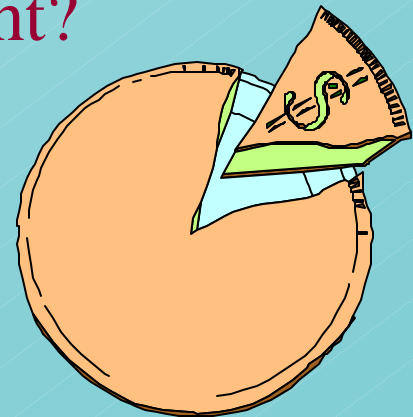
# Rights Issue

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

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**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?

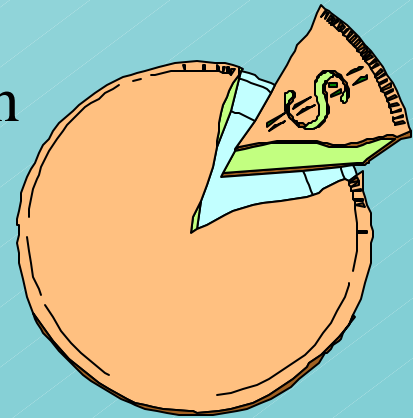
⇒ Current Market Value = 11 mil x \$24 = \$264 mil

⇒ Total Shares = 11 mil + 1 mil = 12 mil

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

⇒ New Share Price =  $(264 + 22) / 12 = \$23.83/\text{sh}$

⇒ 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.

# Dividend Payments

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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.

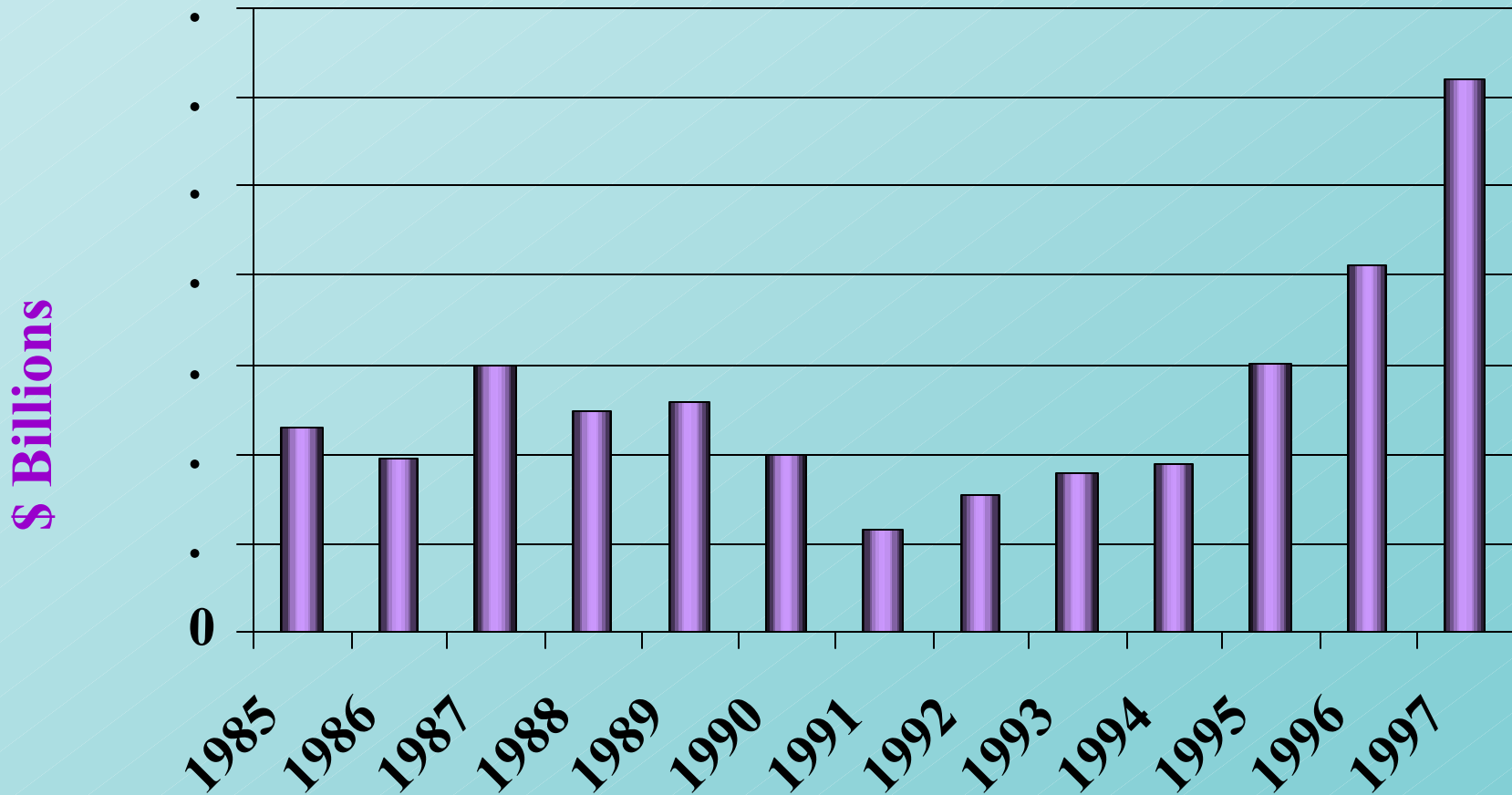
**Stock Splits** - Issue of additional shares to firm's stockholders.

**Stock Repurchase** - Firm buys back stock from its shareholders.



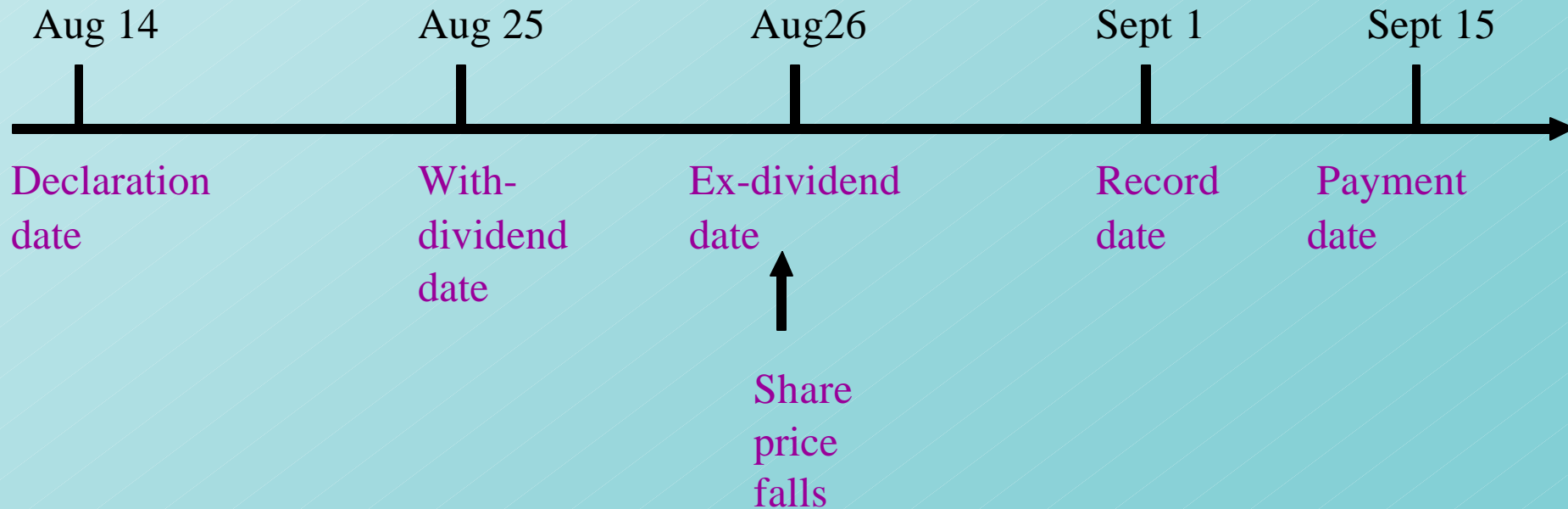
# Stock Repurchases

*U.S. Stock Repurchases 1985-1997*



# Dividend Payments

## *Maytag's Quarterly Dividend*



# The Dividend Decision

## *Lintner's "Stylized Facts"*

### *(How Dividends are Determined)*

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

$$\begin{aligned} \text{DIV}_1 &= \text{target dividend} \\ &= \text{target ratio} \times \text{EPS}_1 \end{aligned}$$

- ◆ Dividend Change

$$\begin{aligned} \text{DIV}_1 - \text{DIV}_0 &= \text{target change} \\ &= \text{target ratio} \times \text{EPS}_1 - \text{DIV}_0 \end{aligned}$$

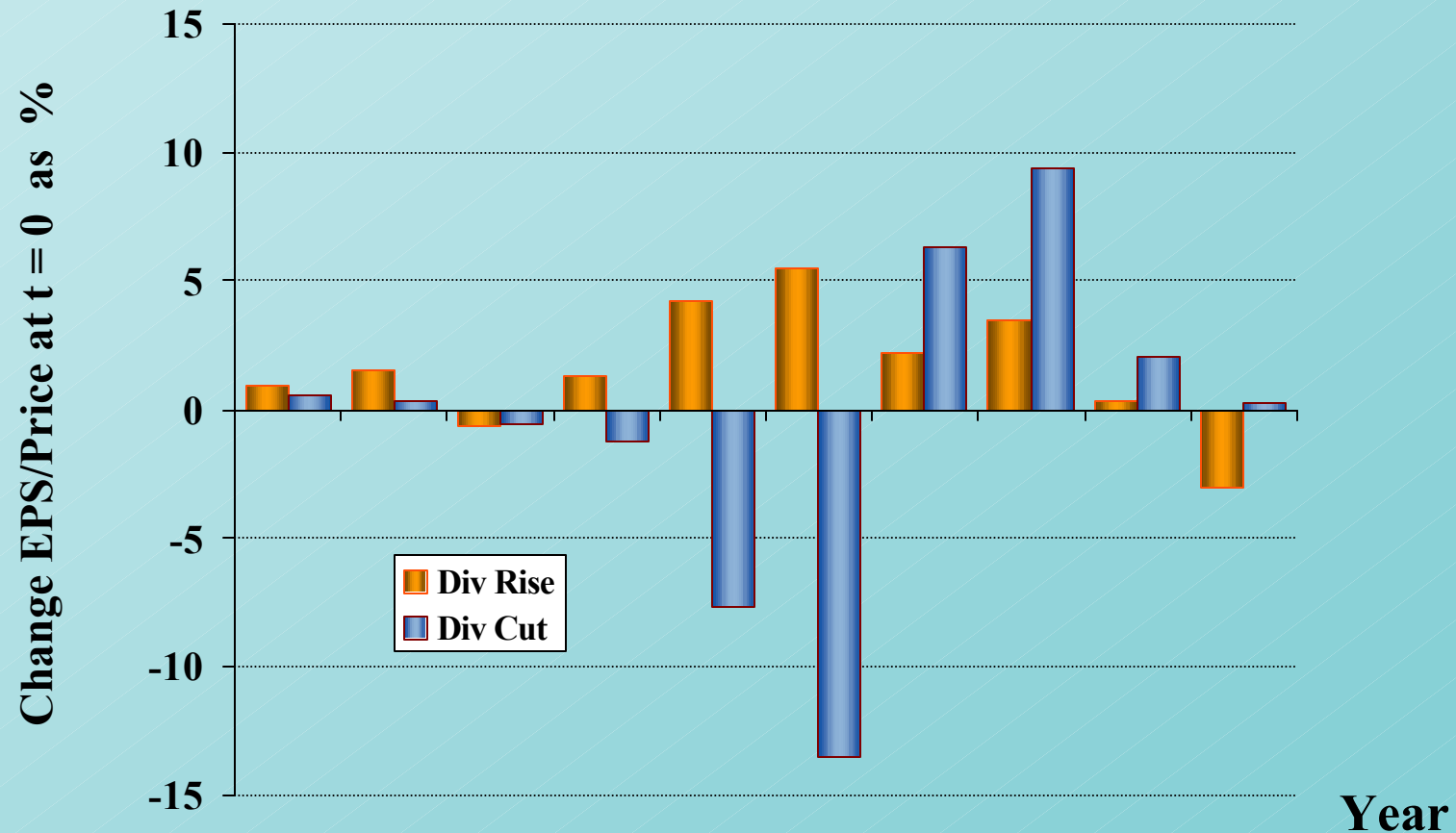
# The Dividend Decision

- ◆ Dividend changes confirm the following:

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

# Dividend Policy

## *Impact of Dividend Changes on EPS*



*Source: Healy & Palepu (1988)*

# Dividend Policy is Irrelevant

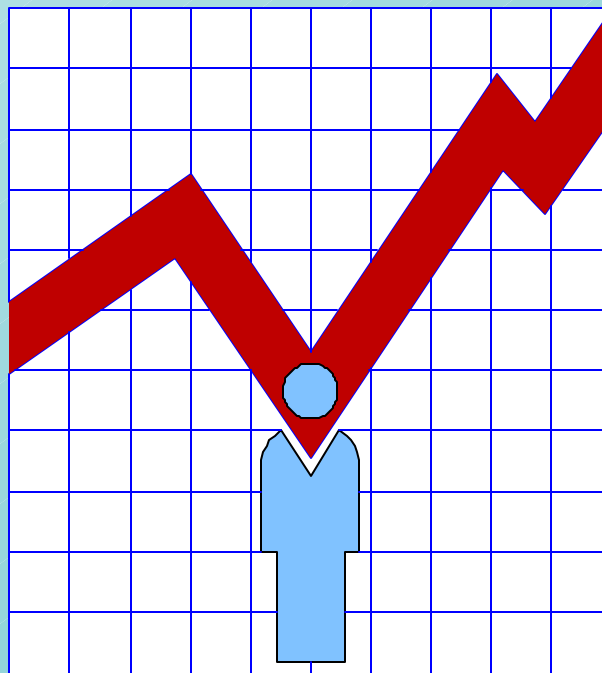
- ◆ Since investors do not need dividends to convert shares to cash they will not pay higher prices for firms with higher dividend payouts. In other words, dividend policy will have no impact on the value of the firm.

# 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
<u>Asset Value</u>	<u>9,000</u>
Total Value	10,000 +
New Proj NPV	2,000
<u># of Shares</u>	<u>1,000</u>
price/share	\$12

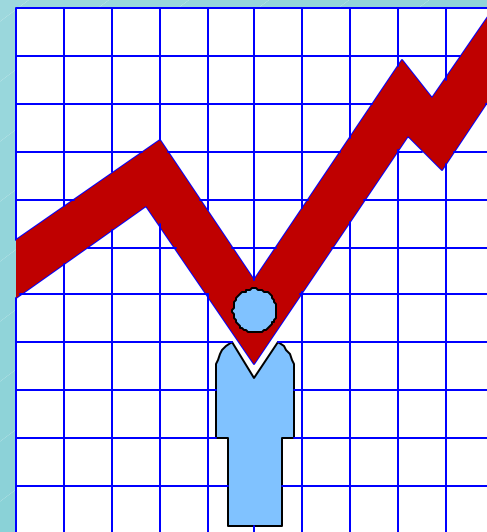




# Dividend Policy is Irrelevant

**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.

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

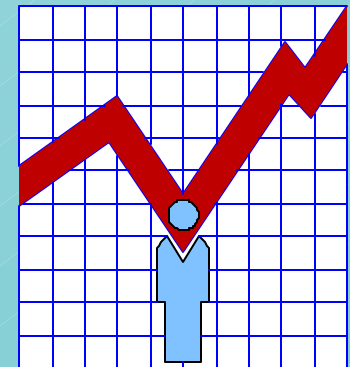


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<u>Record Date</u>		<u>Pmt Date</u>	<u>Post Pmt</u>
Cash	1,000	0	1,000 (910sh @ \$11)
<u>Asset Value</u>	<u>9,000</u>	<u>9,000</u>	<u>9,000</u>
Total Value	10,000 +	9,000	10,000
New Proj NPV	2,000	2,000	2,000
<u># of Shares</u>	<u>1,000</u>	<u>1,000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

**NEW SHARES ARE ISSUED**



# Dividend Policy is Irrelevant

## Example - continued - Shareholder Value

	<u>Record</u>
Stock	12,000
Cash	0
 Total Value	 12,000

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

# Dividend Policy is Irrelevant

## Example - continued - Shareholder Value

	<u>Record</u>	<u>Pmt</u>
Stock	12,000	11,000
Cash	0	1,000
Total Value	12,000	12,000

$$\text{Stock} = 1,000\text{sh @ } \$11 = 11,000$$

# Dividend Policy is Irrelevant

## Example - continued - Shareholder Value

	<u>Record</u>	<u>Pmt</u>	<u>Post</u>
Stock	12,000	11,000	<b>12,000</b>
Cash	0	1,000	<b>0</b>
Total Value	12,000	12,000	<b>12,000</b>

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

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

# Dividends Increase Value

## Market Imperfections and Clientele Effect

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

## Dividends as Signals

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*

<i><u>Income Bracket</u></i>		
<b>Marginal Tax Rate</b>	<b>Single</b>	<b>Married (joint return)</b>
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)

	<i>Rate of Income tax</i>	
	0%	39.60%
Operating Income	100	100
Corporate tax ( $T_c=.35$ )	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)

	<i>Rate of Income tax</i>		
	15%	33%	47%
Operating Income	100	100	100
Corporate tax ( $T_c=.33$ )	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

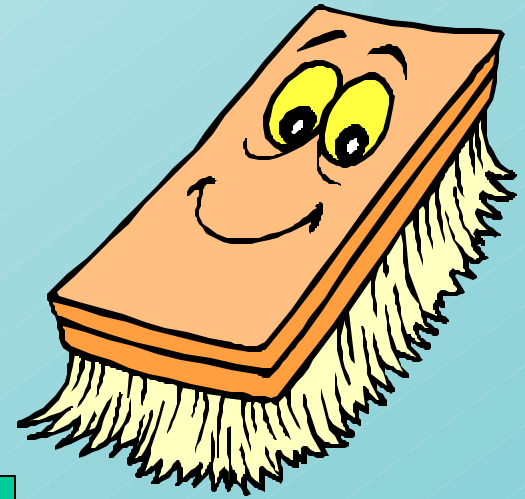
- ◆ By issuing 1 security rather than 2, company diminishes investor choice. This does not reduce value if:
  - Investors do not need choice, OR
  - There are sufficient alternative securities
- ◆ Capital structure does not affect cash flows e.g...
  - No taxes
  - No bankruptcy costs
  - No effect on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

# M&M (Debt Policy Doesn't Matter)

## Example - 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)

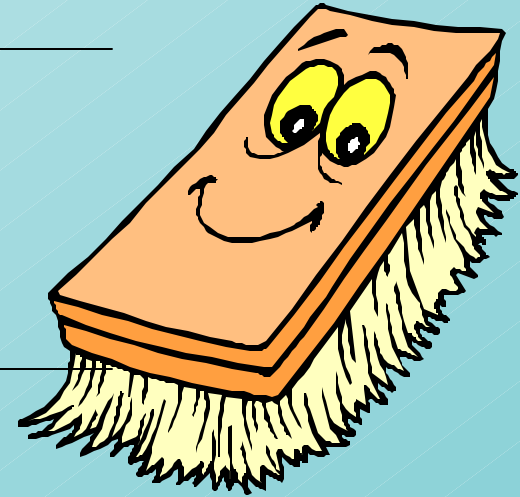
## Example

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
<i>Return on shares (%)</i>	<i>0%</i>	<i>15</i>	<i>25</i>	<i>30</i>

# M&M (Debt Policy Doesn't Matter)

Example - 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
<i>Return on \$10 investment (%)</i>	<i>0%</i>	<i>10</i>	<i>20</i>	<i>30</i>

# 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:	Proposed Structure:
	All Equity	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

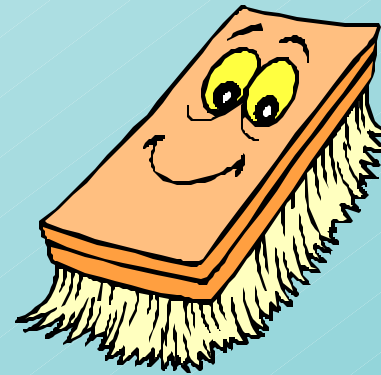
$$\text{Expected return on assets} = r_a = \frac{\text{expected operating income}}{\text{market value of all securities}}$$

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

# M&M Proposition II

Macbeth continued

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



$$\begin{aligned} r_E = r_A &= \frac{\text{expected operating income}}{\text{market value of all securities}} \\ &= \frac{1500}{10,000} = .15 \end{aligned}$$

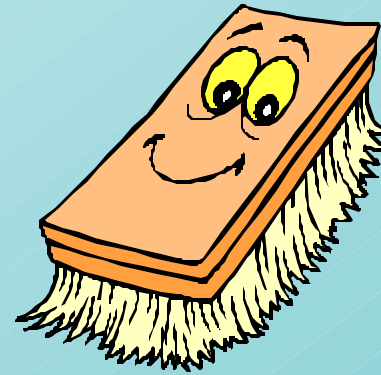


# M&M Proposition II

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

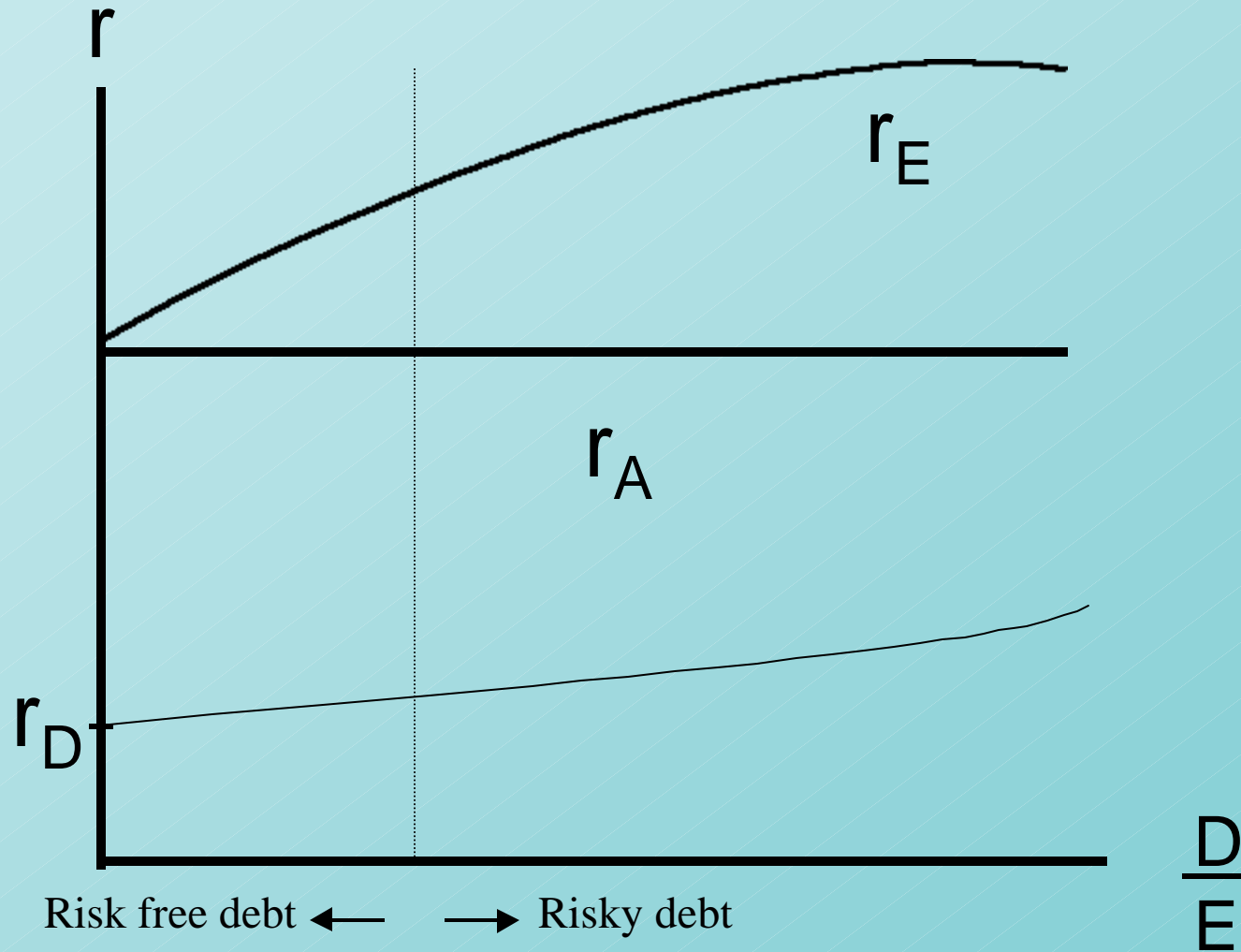
*Macbeth continued*

$$\begin{aligned} r_E = r_A &= \frac{\text{expected operating income}}{\text{market value of all securities}} \\ &= \frac{1500}{10,000} = .15 \end{aligned}$$



$$\begin{aligned} r_E &= .15 + \frac{5000}{5000} (.15 - .10) \\ &= .20 \text{ or } 20\% \end{aligned}$$

# M&M Proposition II



# Leverage and Risk

## Macbeth continued

Leverage increases the risk of Macbeth shares

		Operating \$500	Income \$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

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

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

# 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

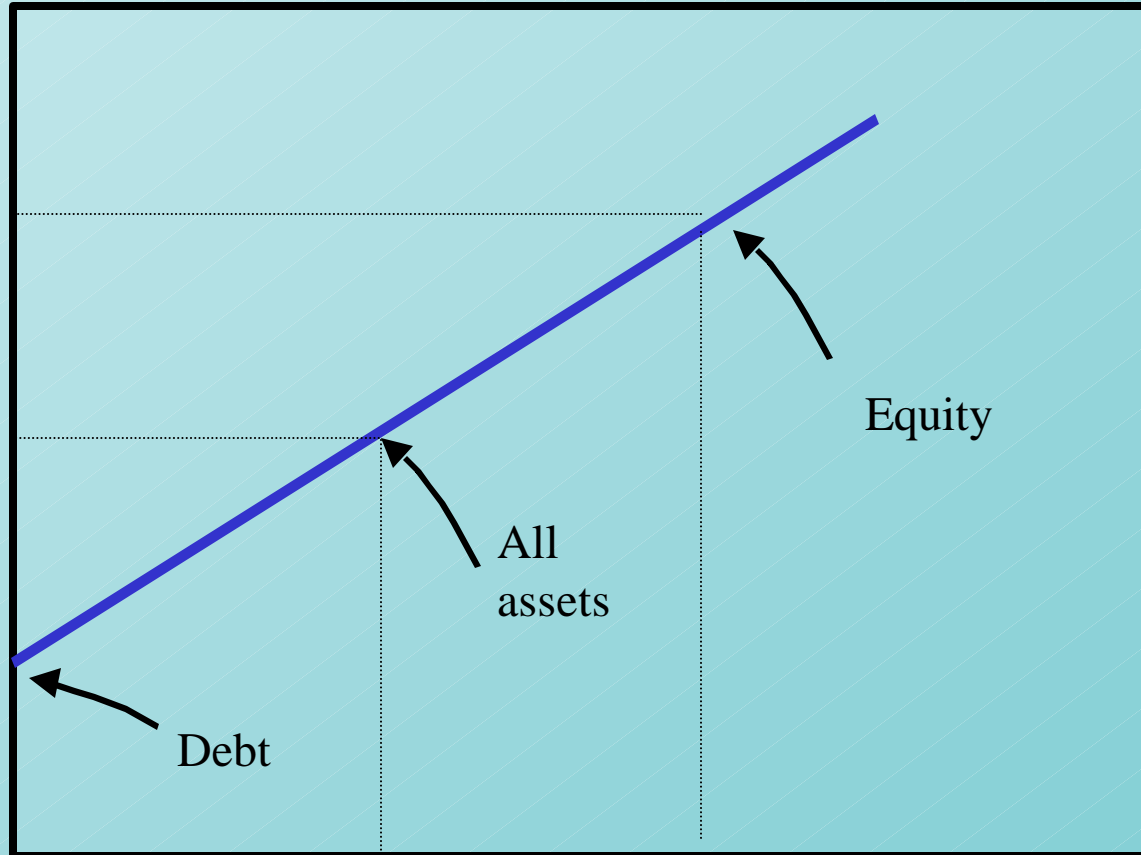
Debt

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?

$$D = \$2 \text{ million}$$

$$E = 100,000 \text{ shares} \times \$30 \text{ per share} = \$3 \text{ million}$$

$$V = D + E = 2 + 3 = \$5 \text{ million}$$

# 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?

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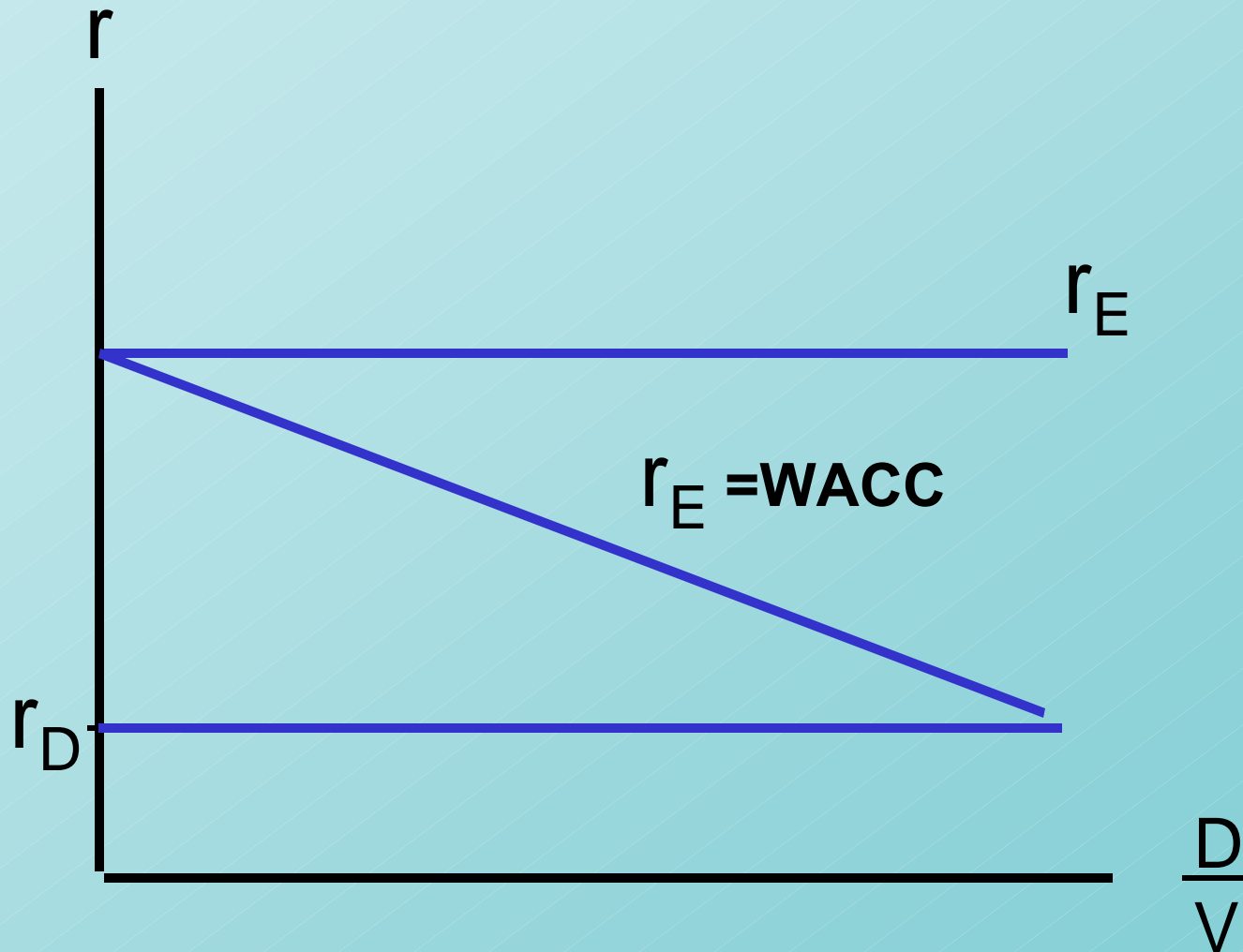
$$E = 100,000 \text{ shares} \times \$30 \text{ per share} = \$3 \text{ million}$$

$$V = D + E = 2 + 3 = \$5 \text{ million}$$

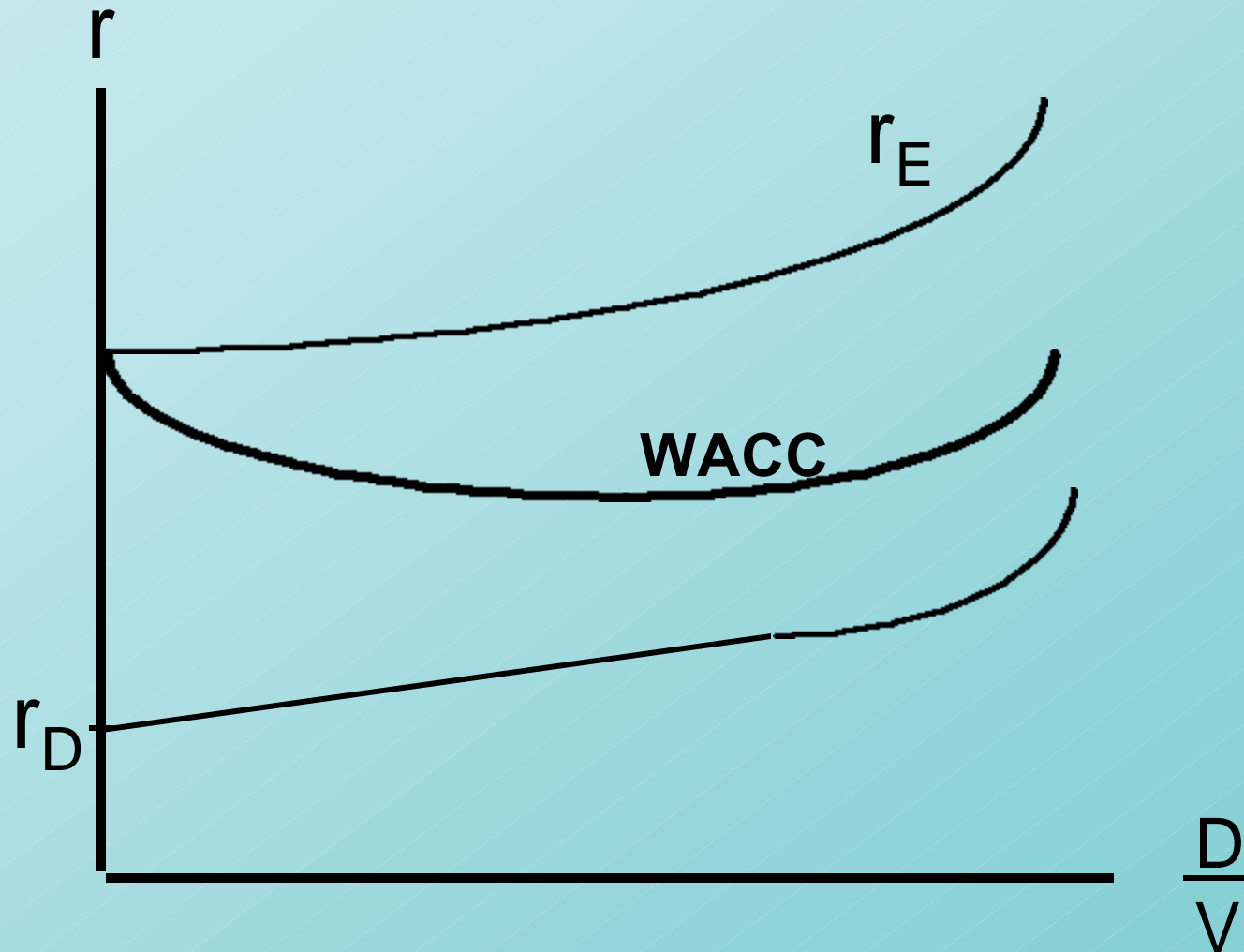
$$\begin{aligned} WACC &= \left( \frac{D}{V} \times r_D \right) + \left( \frac{E}{V} \times r_E \right) \\ &= \left( \frac{2}{5} \times .08 \right) + \left( \frac{3}{5} \times .15 \right) \\ &= .122 \text{ or } 12.2\% \end{aligned}$$



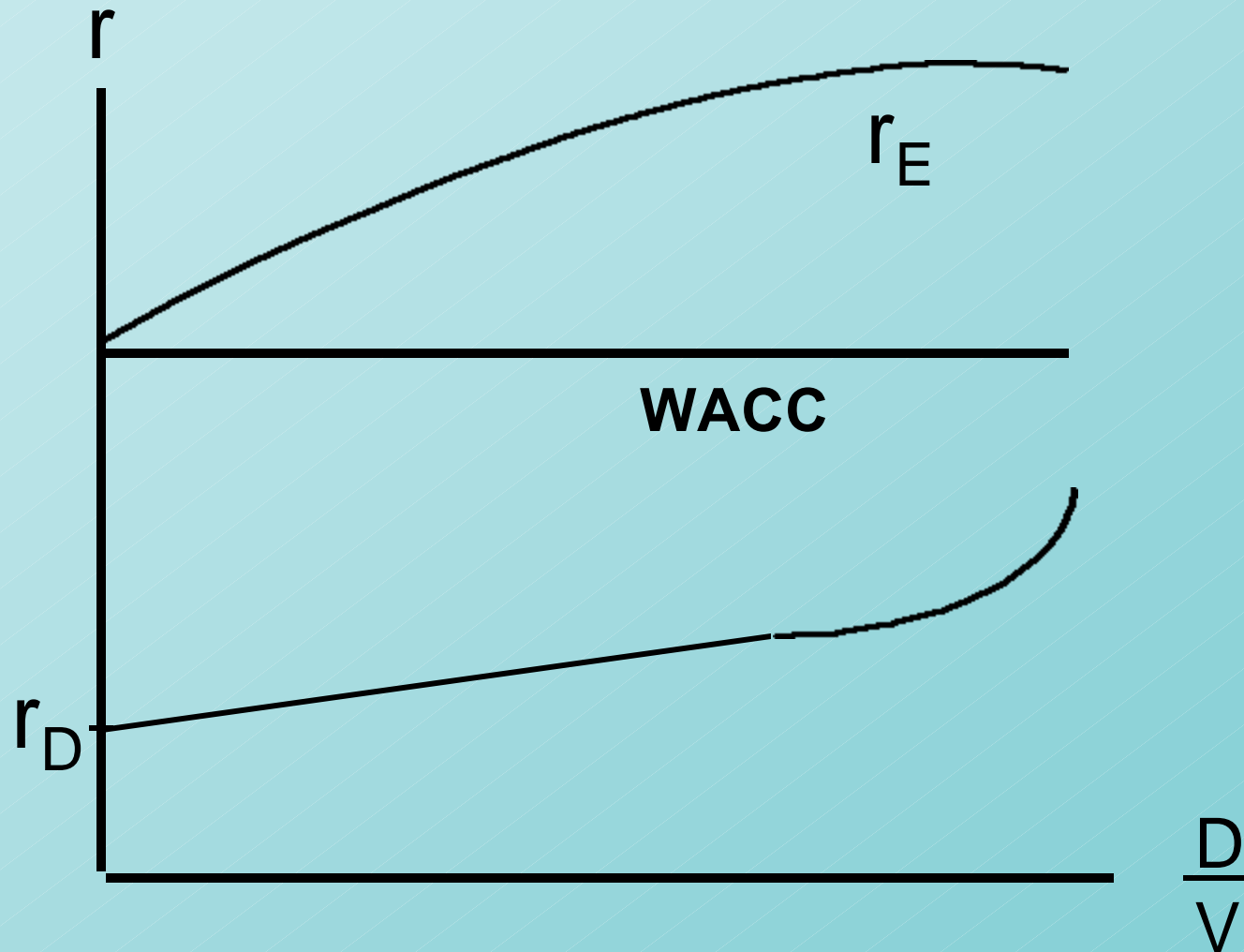
# WACC



# 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?

---

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





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Should you do this and why?

---

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



# 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?



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

## Total Cash Flow

All Equity = 600

**\*1/2 Debt = 640**

(540 + 100)

# Capital Structure

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

(assume perpetuity)

# Capital Structure

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

(assume perpetuity)

Example:

$$\text{Tax benefit} = 1000 \times (.10) \times (.40) = \$40$$

# Capital Structure

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

(assume perpetuity)

## Example:

$$\text{Tax benefit} = 1000 \times (.10) \times (.40) = \$40$$

$$\text{PV of 40 perpetuity} = 40 / .10 = \$400$$

# Capital Structure

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

(assume perpetuity)

## Example:

$$\text{Tax benefit} = 1000 \times (.10) \times (.40) = \$40$$

$$\text{PV of 40 perpetuity} = 40 / .10 = \$400$$

$$\text{PV Tax Shield} = D \times T_c = 1000 \times .4 = \underline{\$400}$$

# 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

## Example

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

PV Tax Shield = 400

Firm Value with 1/2 Debt = \$6,400

# 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 )

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

Advantage

RAF > 1

Debt

RAF < 1

Equity

# C.S. & Taxes (Personal & Corp)

## Example 1

	<u>All Debt</u>	<u>All Equity</u>
Income BT <sub>CP</sub>	1.00	
less TC=.46	<u>0.00</u>	
Income BT <sub>P</sub>	1.00	
Taxes T <sub>P</sub> =.5 T <sub>PE</sub> =0	<u>0.50</u>	
After Tax Income	0.50	

# C.S. & Taxes (Personal & Corp)

## Example 1

	<u>All Debt</u>	<u>All Equity</u>
Income BT <sub>CP</sub>	1.00	1.00
less TC=.46	<u>0.00</u>	<u>0.46</u>
Income BT <sub>P</sub>	1.00	0.54
Taxes T <sub>P</sub> =.5 T <sub>PE</sub> =0	<u>0.50</u>	<u>0.00</u>
After Tax Income	0.50	0.54

# C.S. & Taxes (Personal & Corp)

## Example 1

	<u>All Debt</u>	<u>All Equity</u>
Income BT <sub>CP</sub>	1.00	1.00
less TC=.46	<u>0.00</u>	<u>0.46</u>
Income BT <sub>P</sub>	1.00	0.54
Taxes T <sub>P</sub> =.5   T <sub>PE</sub> =0	<u>0.50</u>	<u>0.00</u>
After Tax Income	0.50	0.54

RAF = .926   Advantage Equity

# C.S. & Taxes (Personal & Corp)

## Example 2

	<u>All Debt</u>	<u>All Equity</u>
Income BT <sub>CP</sub>	1.00	
less TC=.34	<u>0.00</u>	
Income BT <sub>P</sub>	1.00	
Taxes T <sub>P</sub> =.28    T <sub>PE</sub> =.21	<u>0.28</u>	
After Tax Income	0.72	



# C.S. & Taxes (Personal & Corp)

## Example 2

	<u>All Debt</u>	<u>All Equity</u>
Income BT <sub>CP</sub>	1.00	1.00
less TC=.34	<u>0.00</u>	<u>0.34</u>
Income BT <sub>P</sub>	1.00	0.66
Taxes T <sub>P</sub> =.28    T <sub>PE</sub> =.21	<u>0.28</u>	<u>0.139</u>
After Tax Income	0.72	0.521

# C.S. & Taxes (Personal & Corp)

## Example 2

	<u>All Debt</u>	<u>All Equity</u>
Income BT <sub>CP</sub>	1.00	1.00
less TC=.34	<u>0.00</u>	<u>0.34</u>
Income BT <sub>P</sub>	1.00	0.66
Taxes T <sub>P</sub> =.28    T <sub>PE</sub> =.21	<u>0.28</u>	<u>0.139</u>
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)

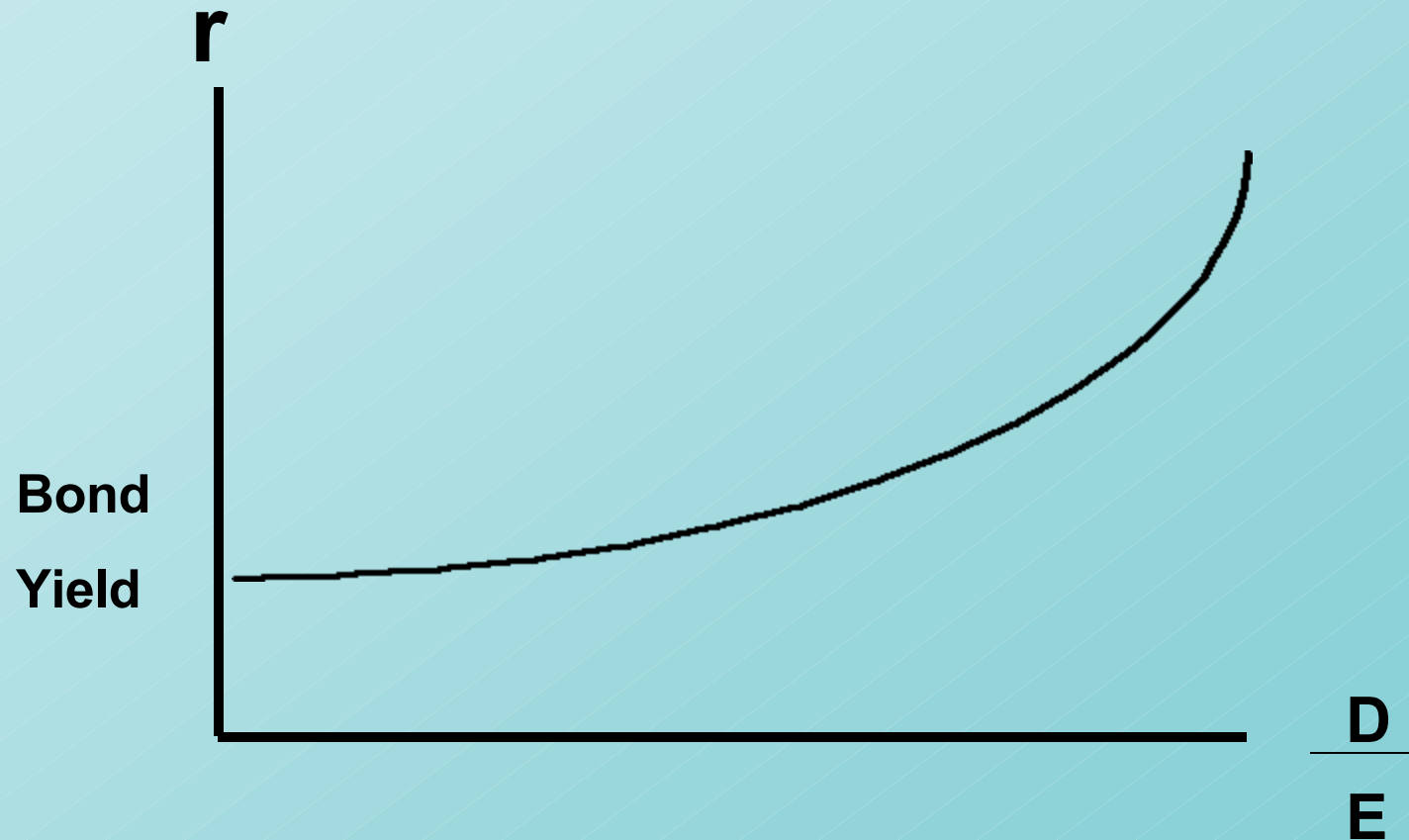
- ♦ Today's RAF & Debt vs Equity preference.

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

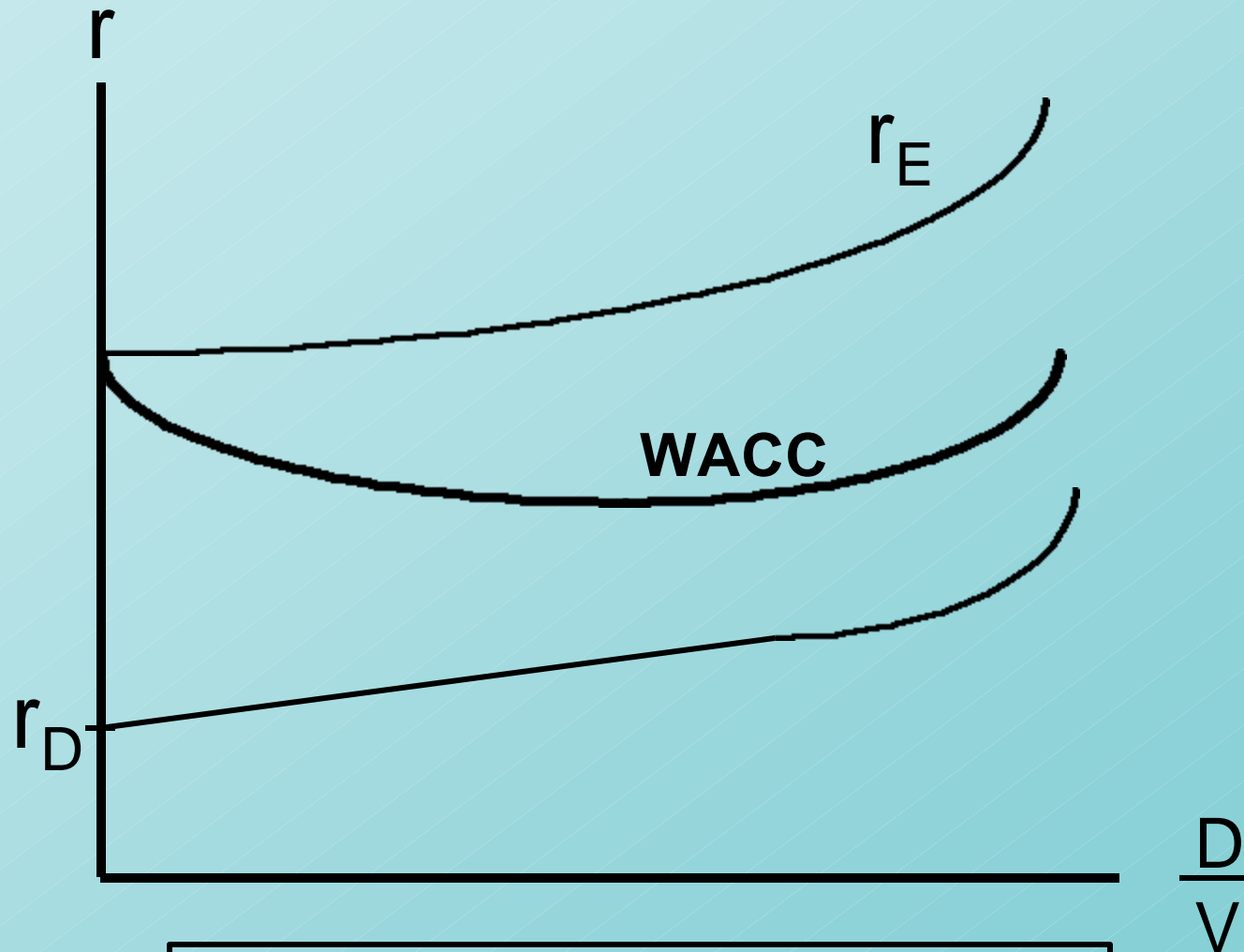
Why are companies not all debt?

# 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.

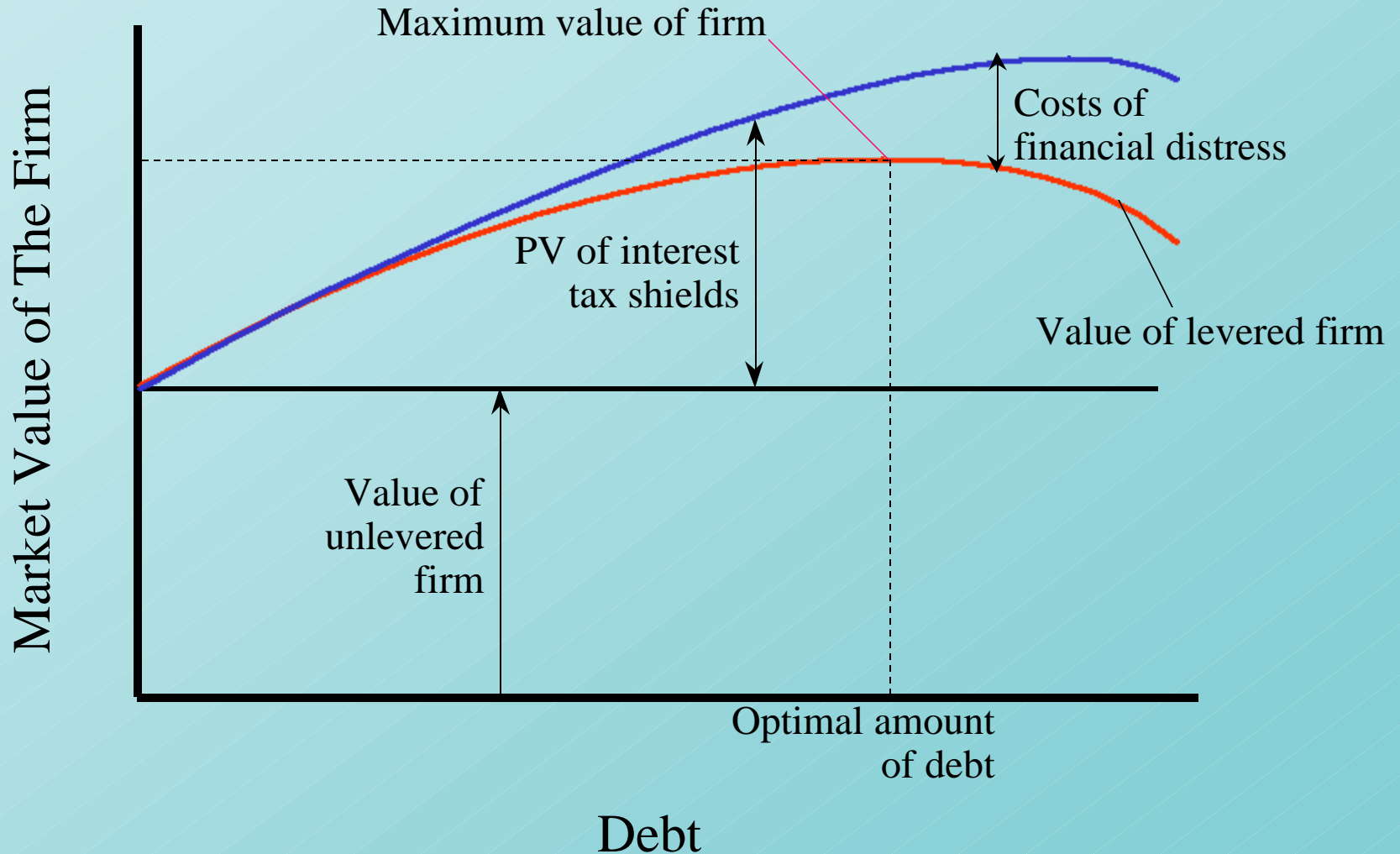


# Financial Distress

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

$$\begin{aligned} \text{Market Value} = & \text{Value if all Equity Financed} \\ & + \text{PV Tax Shield} \\ & - \text{PV Costs of Financial Distress} \end{aligned}$$

# 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	<u>80</u>	<u>50</u>	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	<u>10</u>	<u>5</u>	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	<u>18</u>	<u>8</u>	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	<u>25</u>	<u>12</u>	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.**

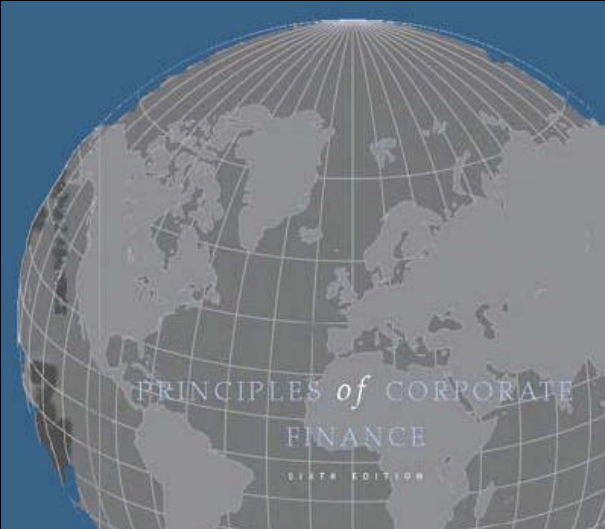
**If external finance is required, firms issue debt first and equity as a last resort.**

**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.

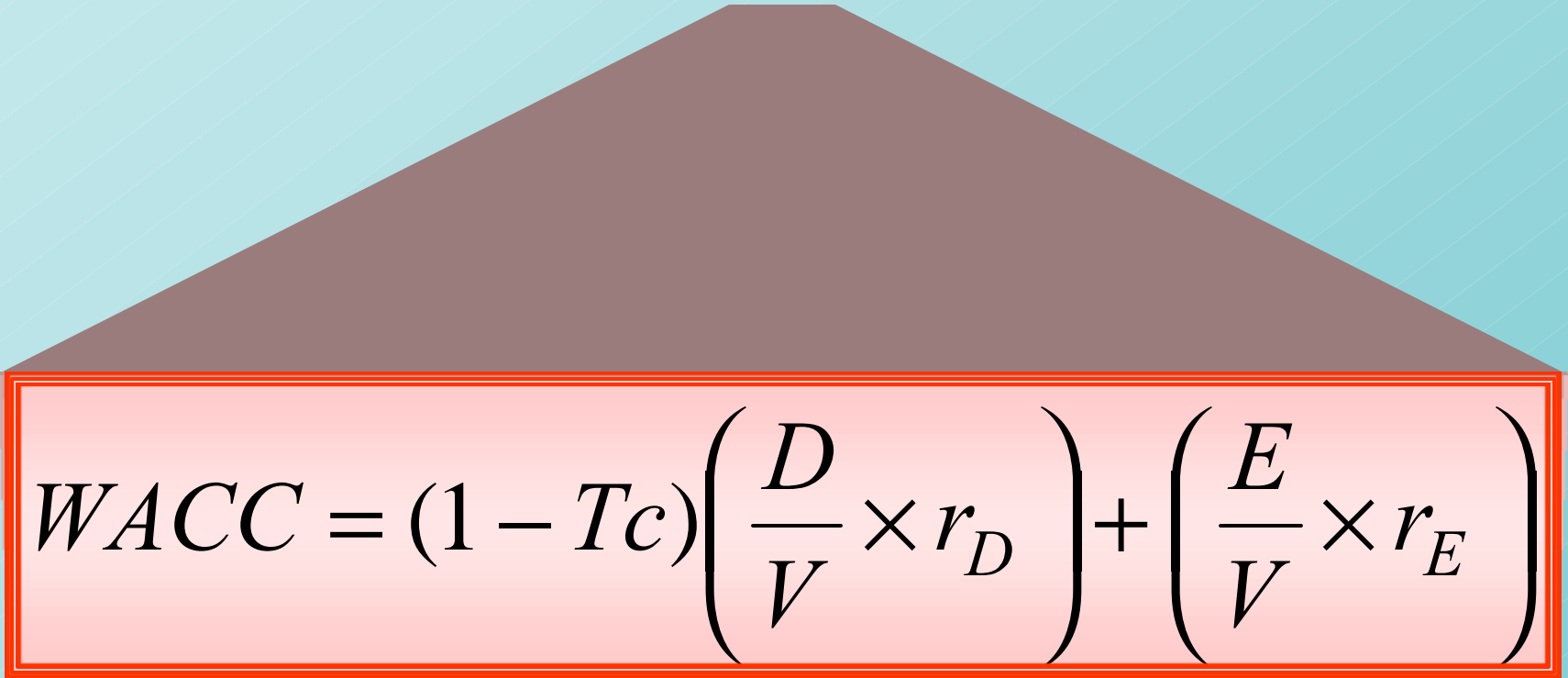
$$WACC = \left( \frac{D}{V} \times r_D \right) + \left( \frac{E}{V} \times r_E \right)$$

Old Formula



# After Tax WACC

*Tax Adjusted Formula*


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

# 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
		<u>50</u>	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%

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

# After Tax WACC

*Example - Sangria Corporation - continued*



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

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

# 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?

$$\begin{aligned} NPV &= C_0 + \frac{C_1}{r - g} \\ &= -12.5 + \frac{1.355}{.1084} \\ &= 0 \end{aligned}$$

# After Tax WACC

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

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

# 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
		<u>50</u>	Common Equity
Total assets	125	125	Total liabilities

$$\begin{aligned}
 WACC &= (1 - .35) \left( \frac{50}{125} \times .08 \right) + \left( \frac{25}{125} \times .10 \right) + \left( \frac{50}{125} \times .146 \right) \\
 &= .1104 \\
 &= 11.04\%
 \end{aligned}$$

# Tricks of the Trade

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

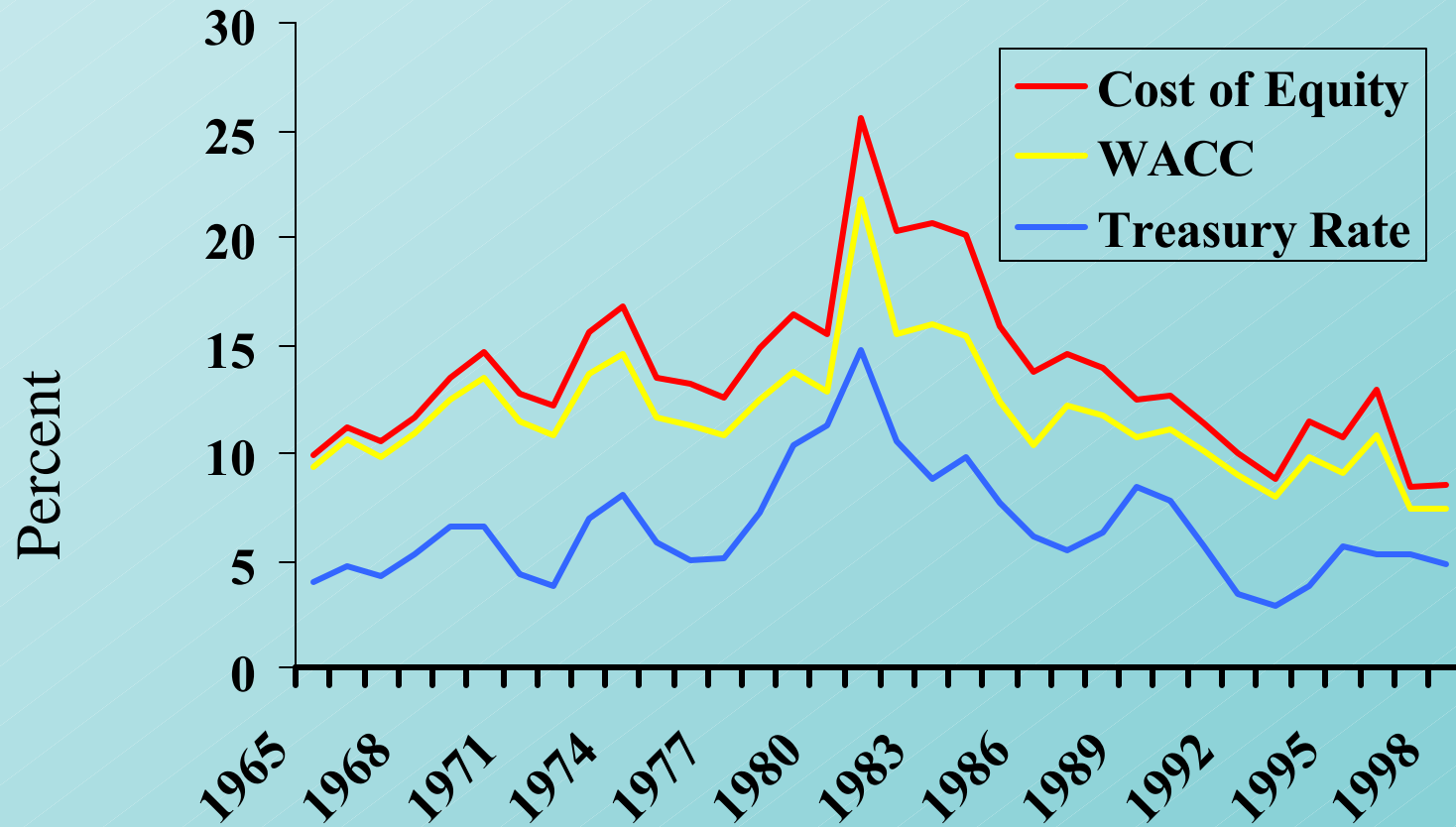


# Tricks of the Trade

- ◆ 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

$$\text{APV} = \text{Base Case NPV} \\ + \text{PV Impact}$$

- ◆ 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

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



# Principles of Corporate Finance

Brealey and Myers

Sixth Edition

## ◆ Spotting and Valuing Options

## Chapter 20



# Topics Covered

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

# Option Terminology

## Call Option

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

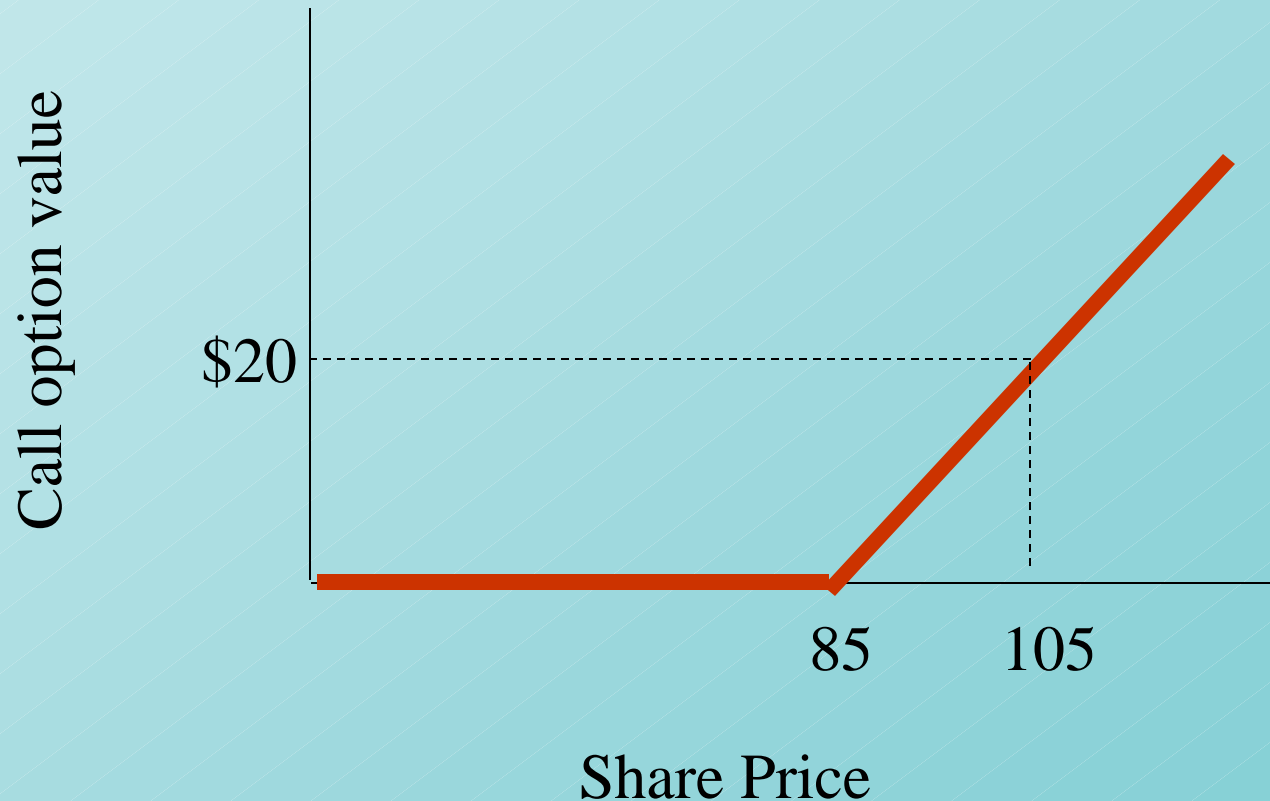
- ♦ The value of an option at expiration is a function of the stock price and the exercise price.

**Example - Option values given a exercise price of \$85**

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

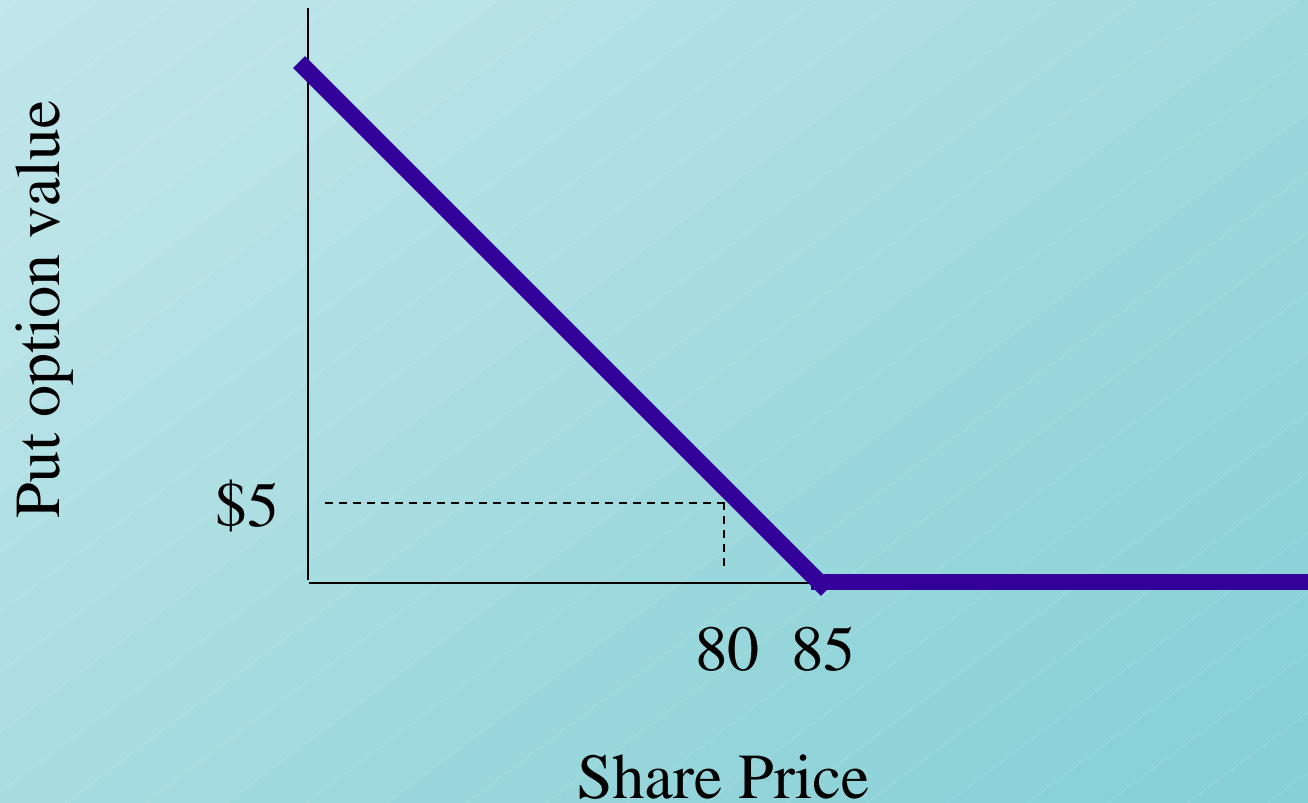
# Option Value

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



# Option Value

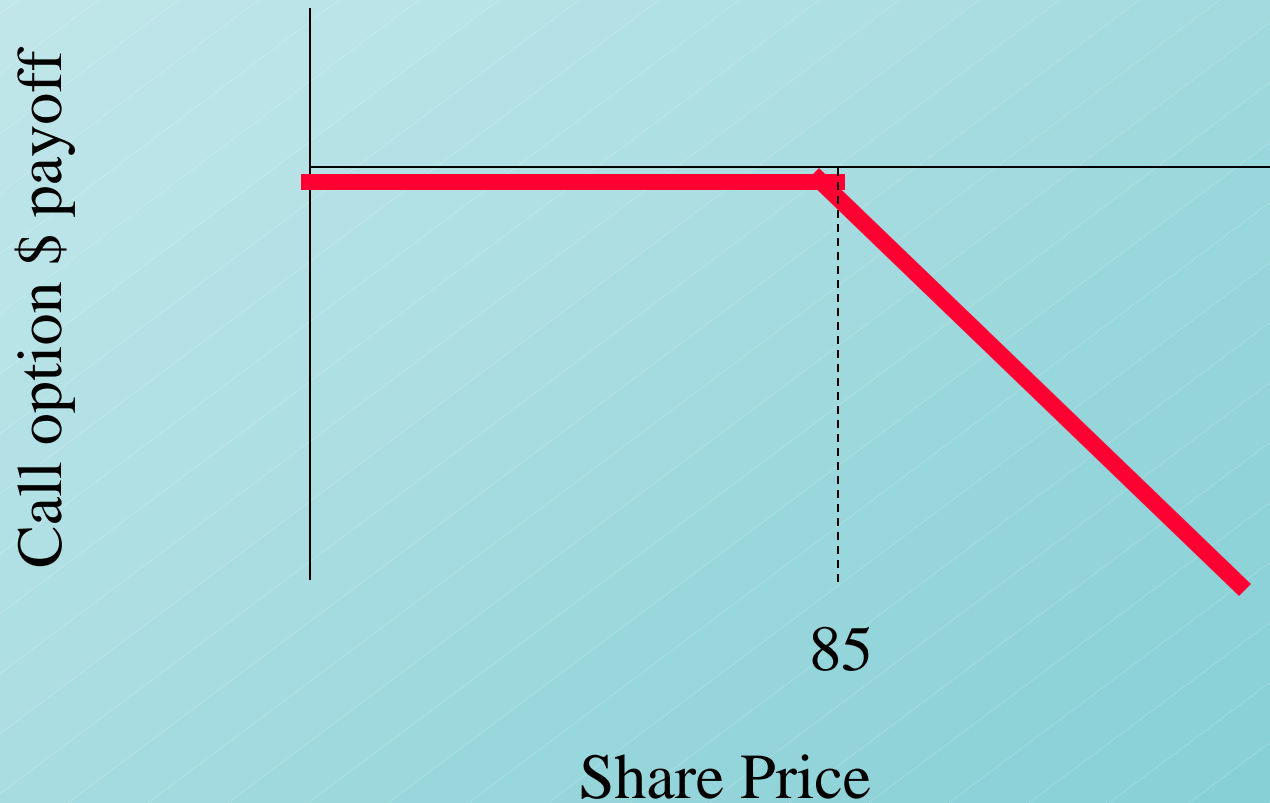
Put option value (graphic) given a \$85 exercise price.





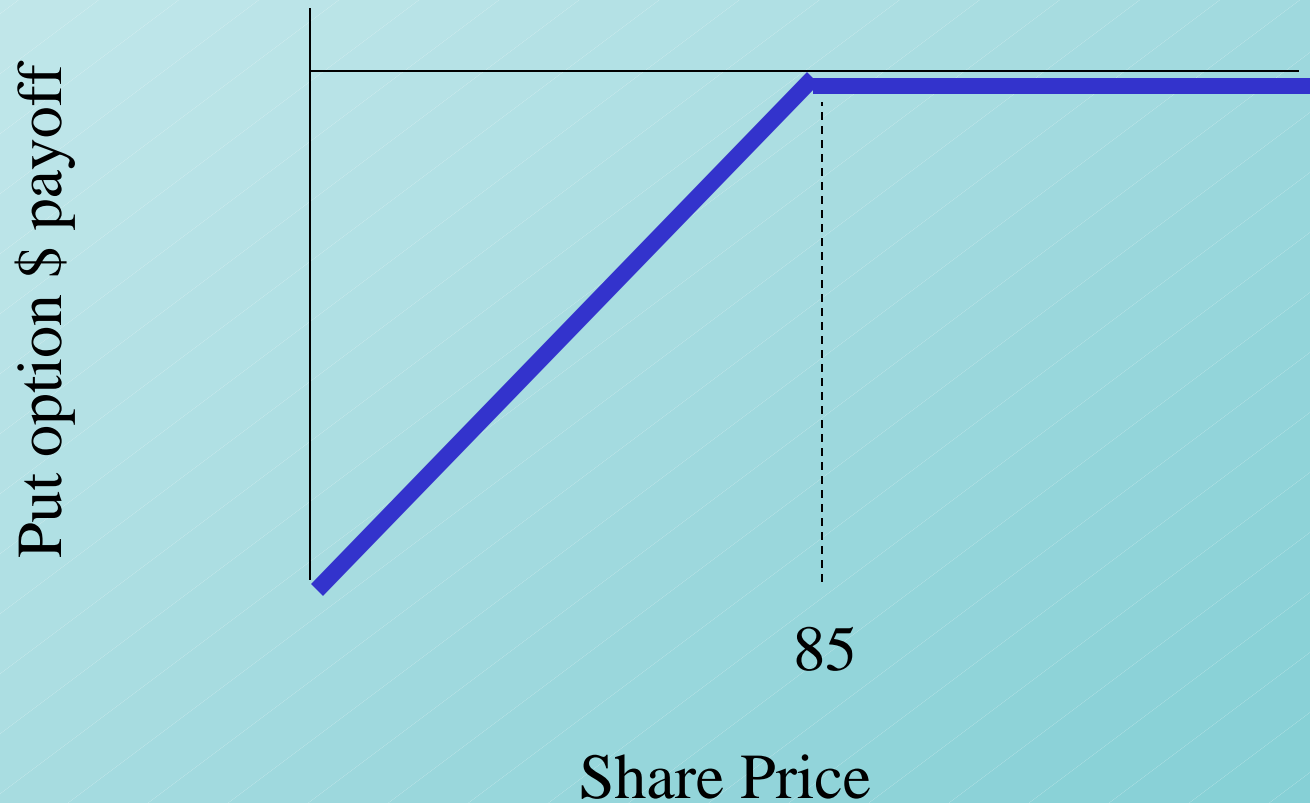
# Option Value

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



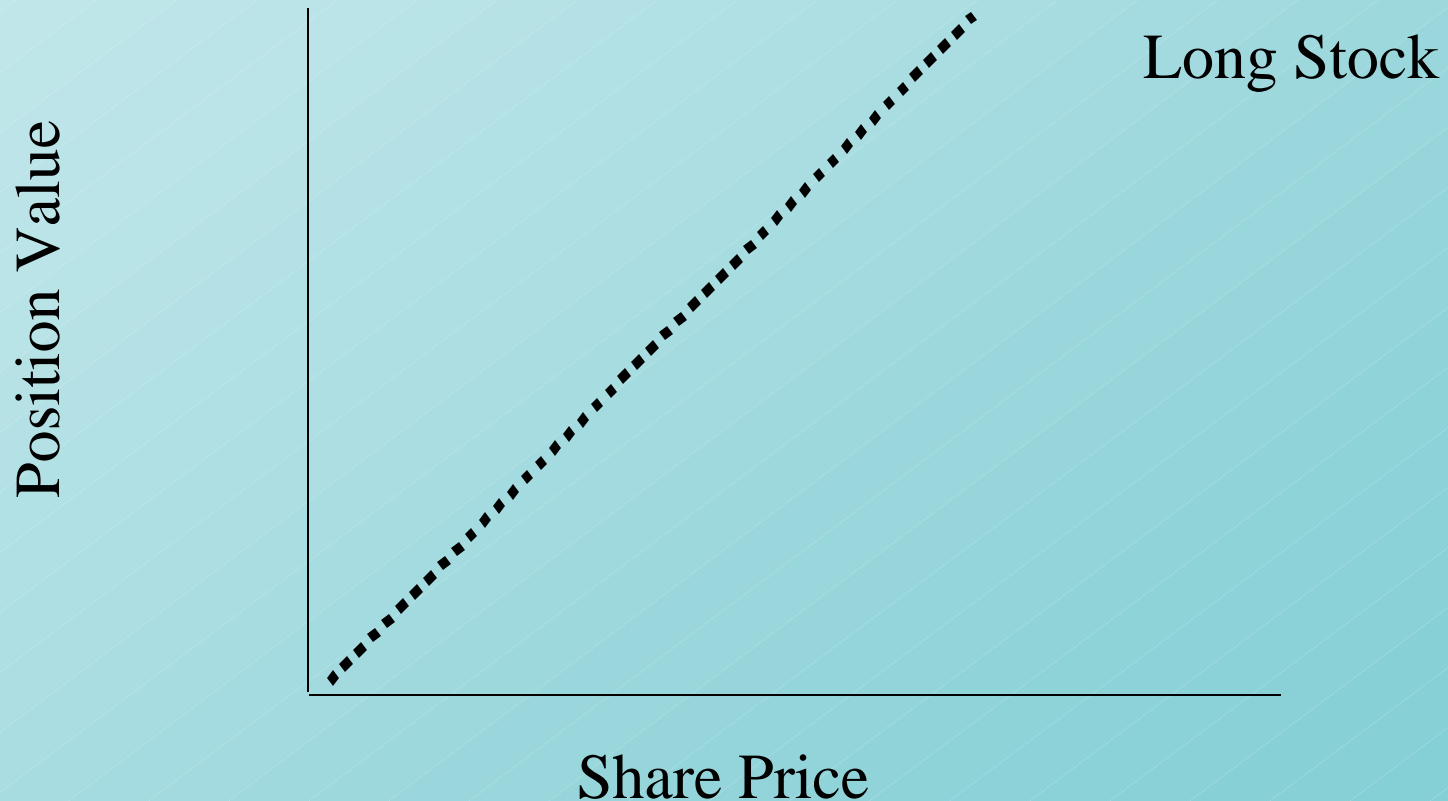
# Option Value

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



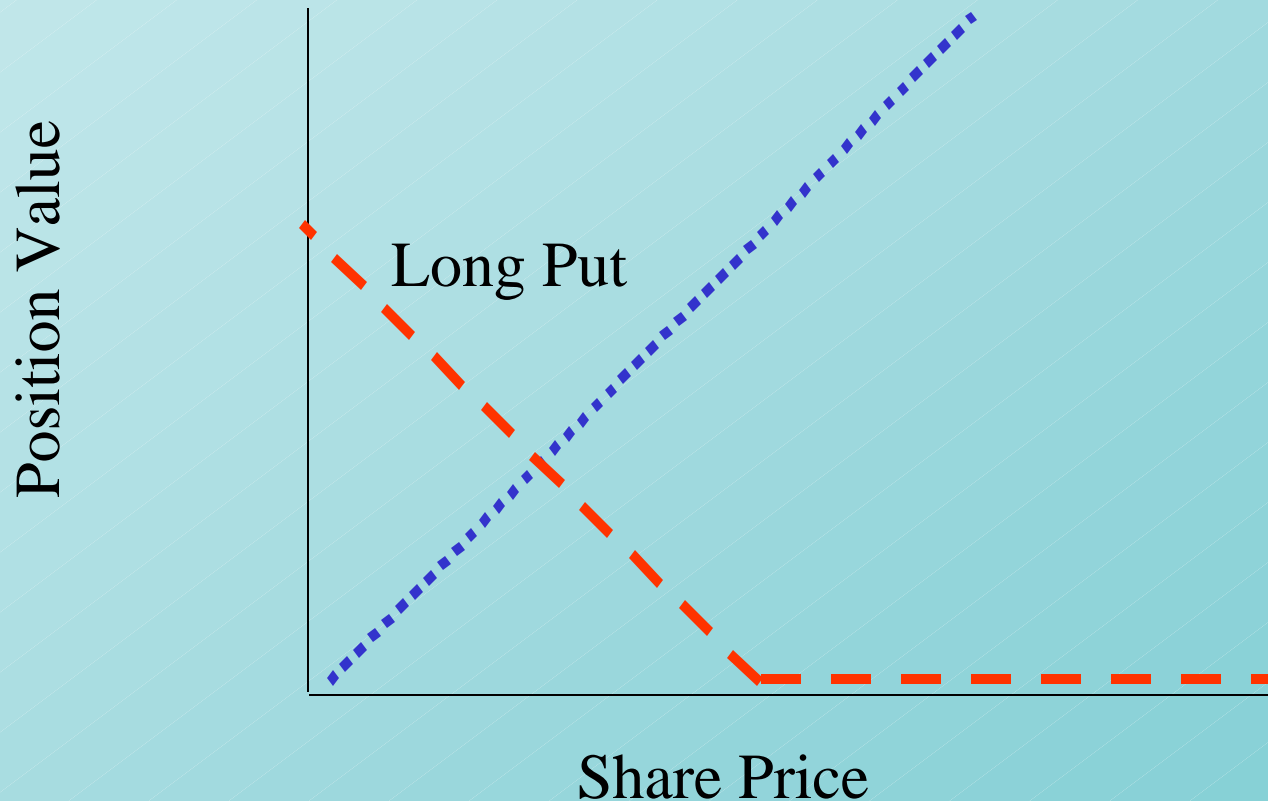
# Option Value

## Protective Put - Long stock and long put



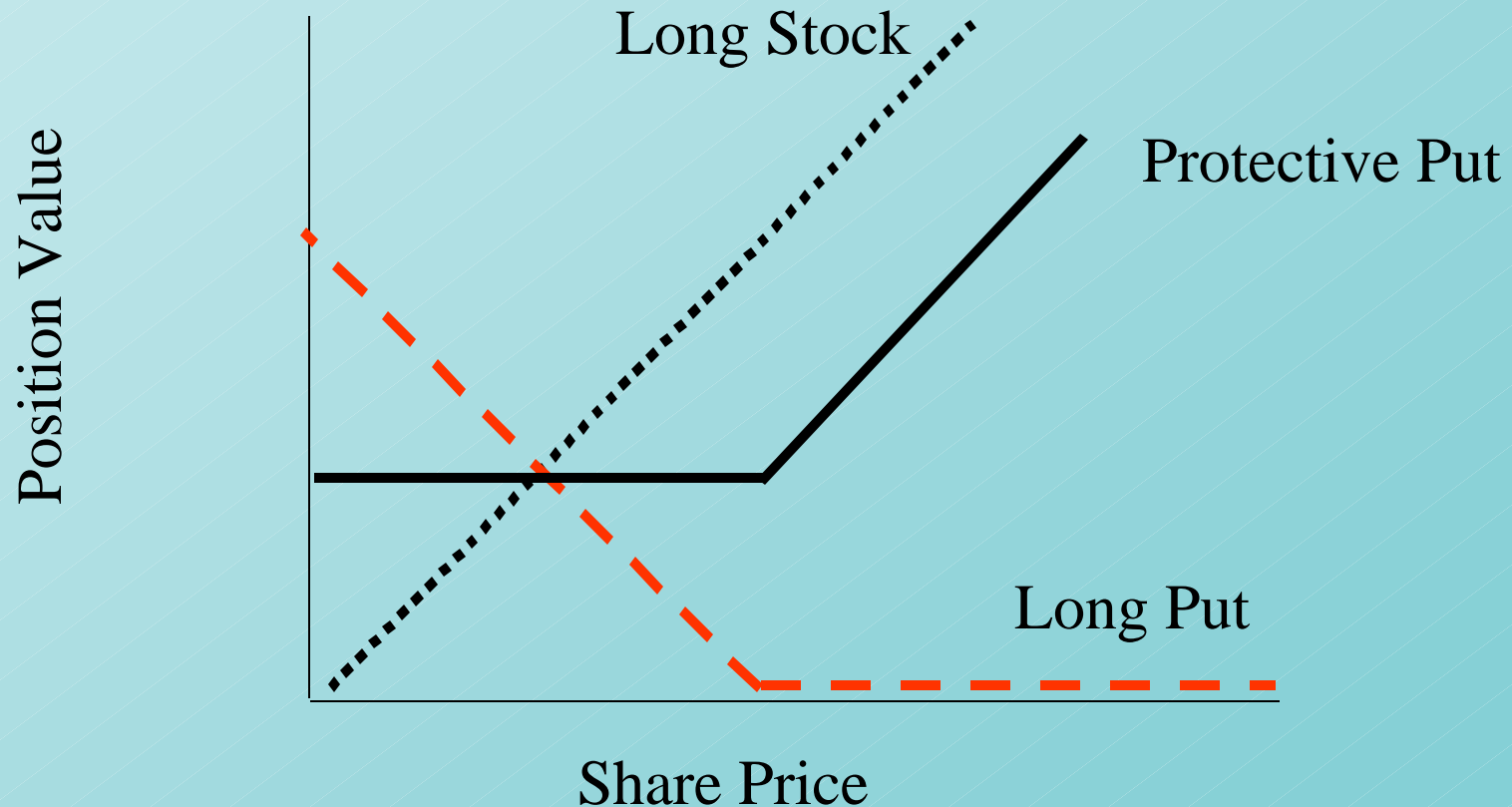
# Option Value

## Protective Put - Long stock and long put



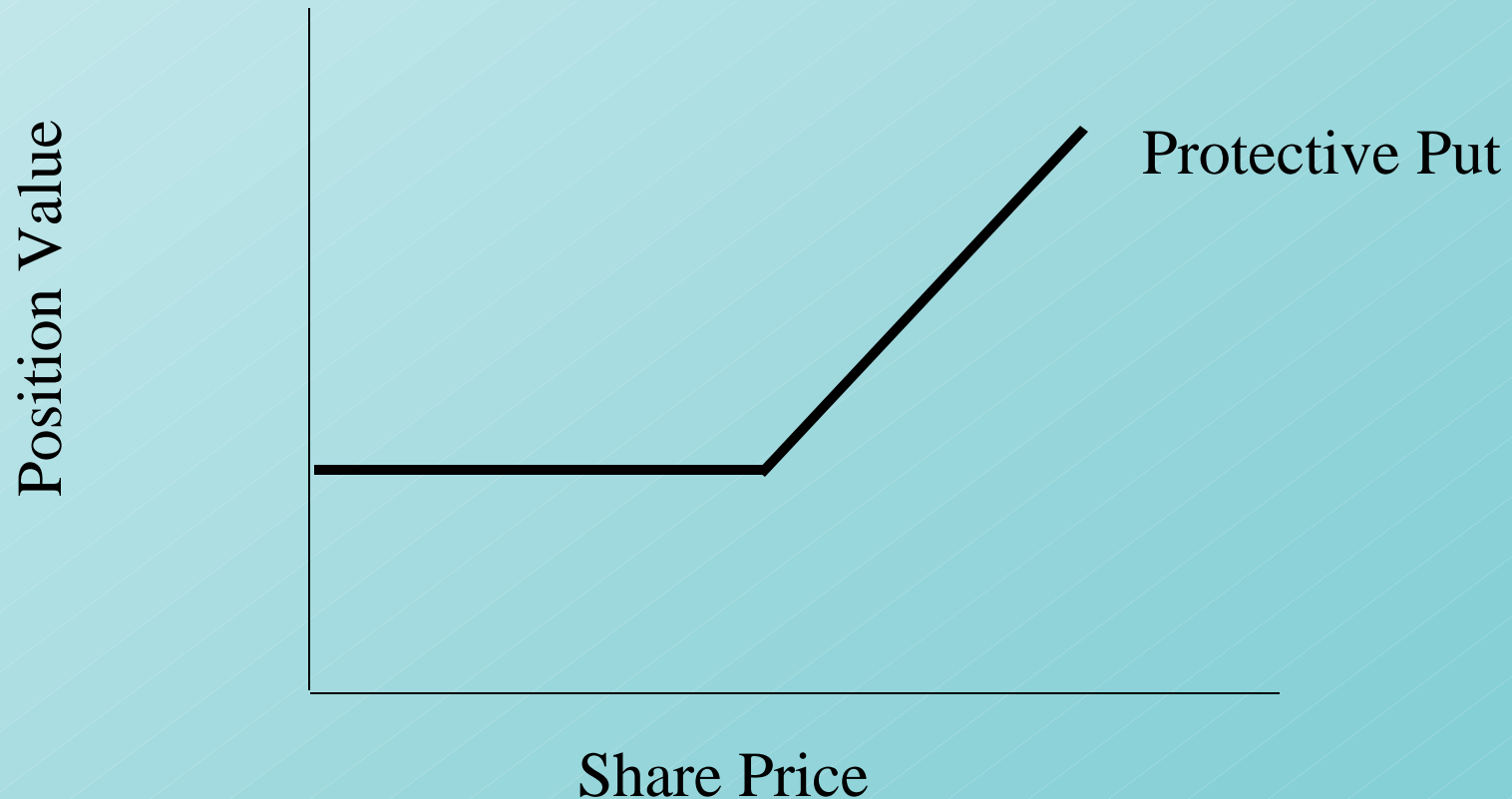
# Option Value

## Protective Put - Long stock and long put



# Option Value

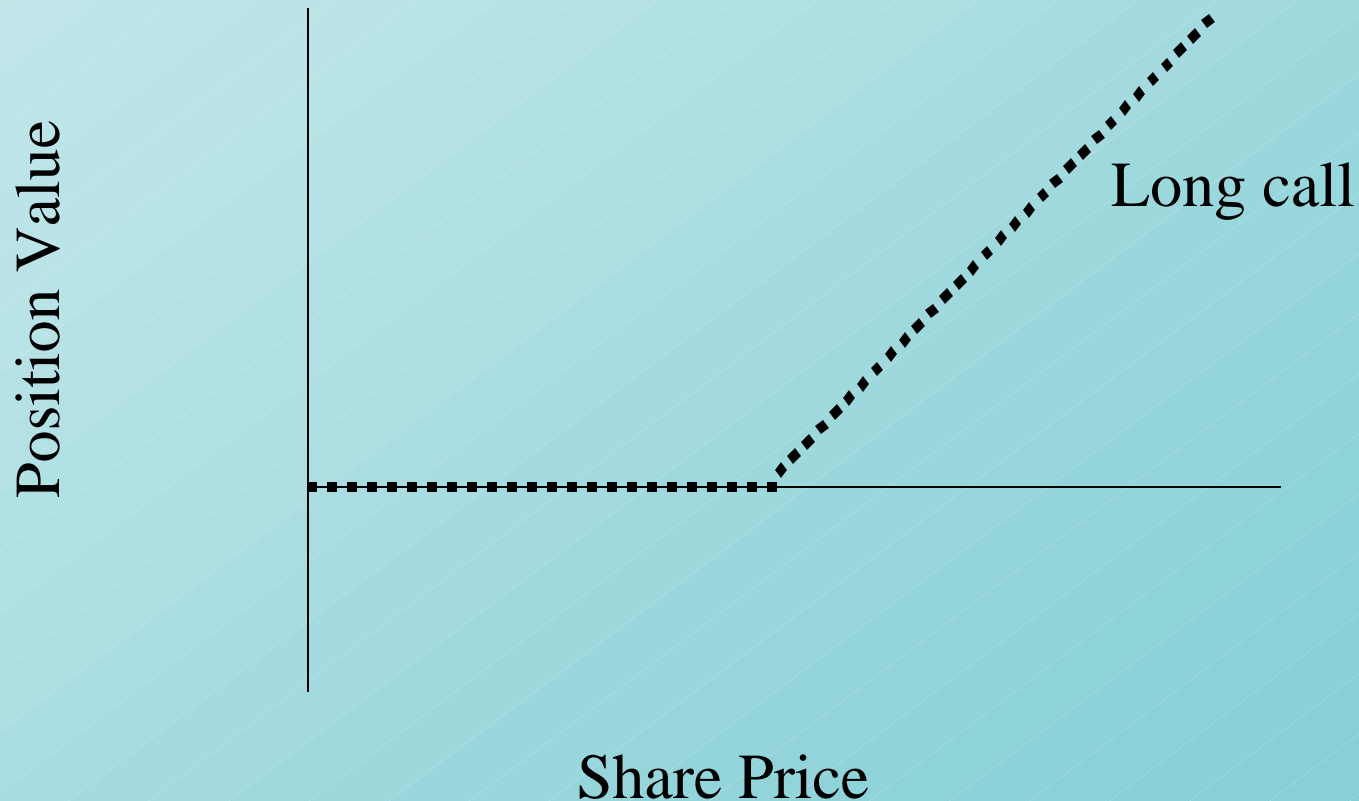
**Protective Put - Long stock and long put**



# Option Value

**Straddle** - Long call and long put

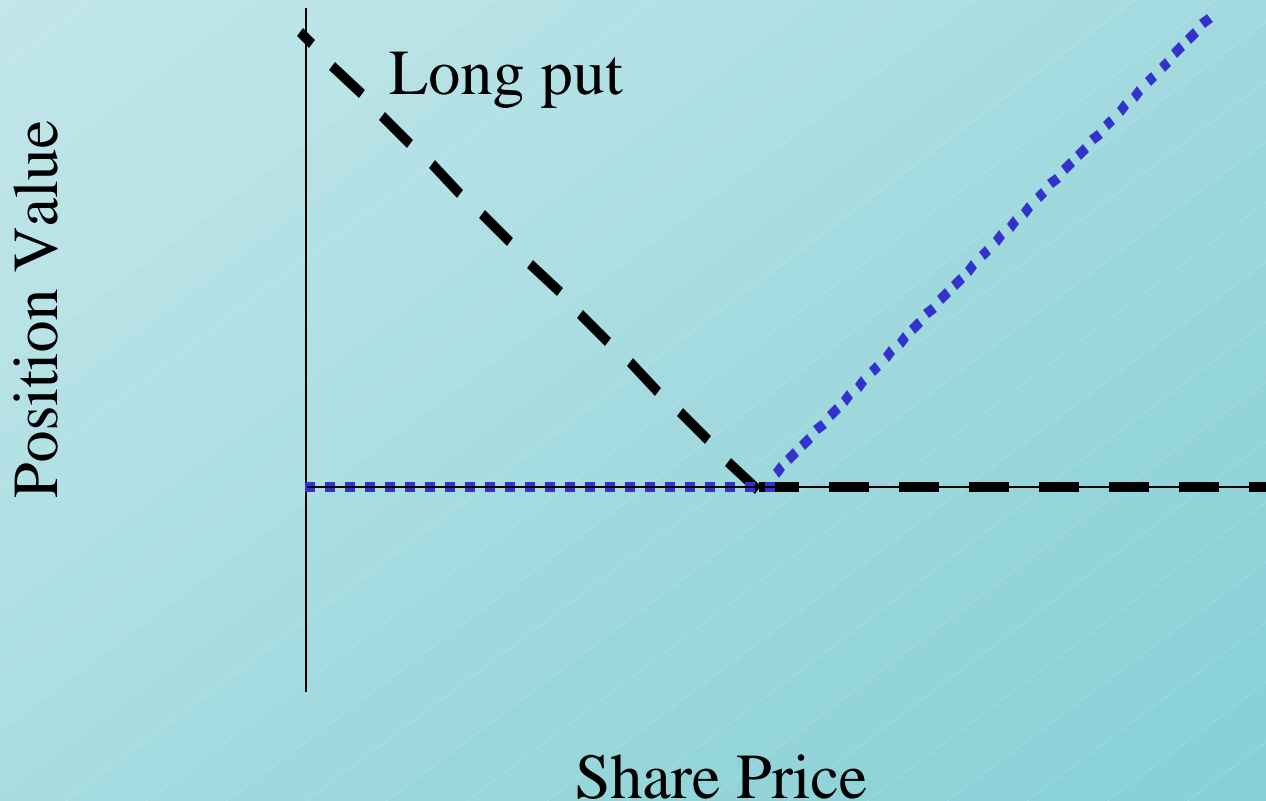
- Strategy for profiting from high volatility



# Option Value

**Straddle** - Long call and long put

- Strategy for profiting from high volatility

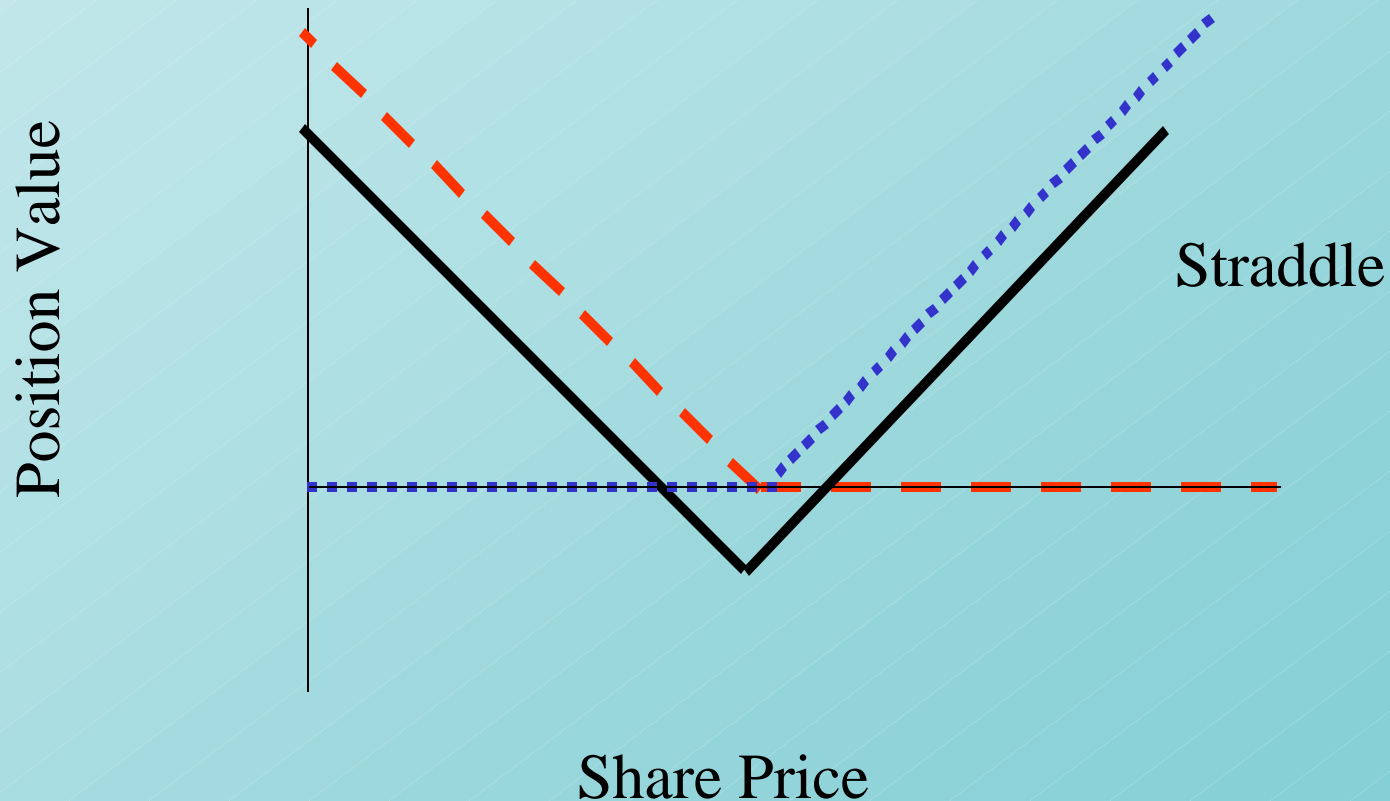




# Option Value

**Straddle** - Long call and long put

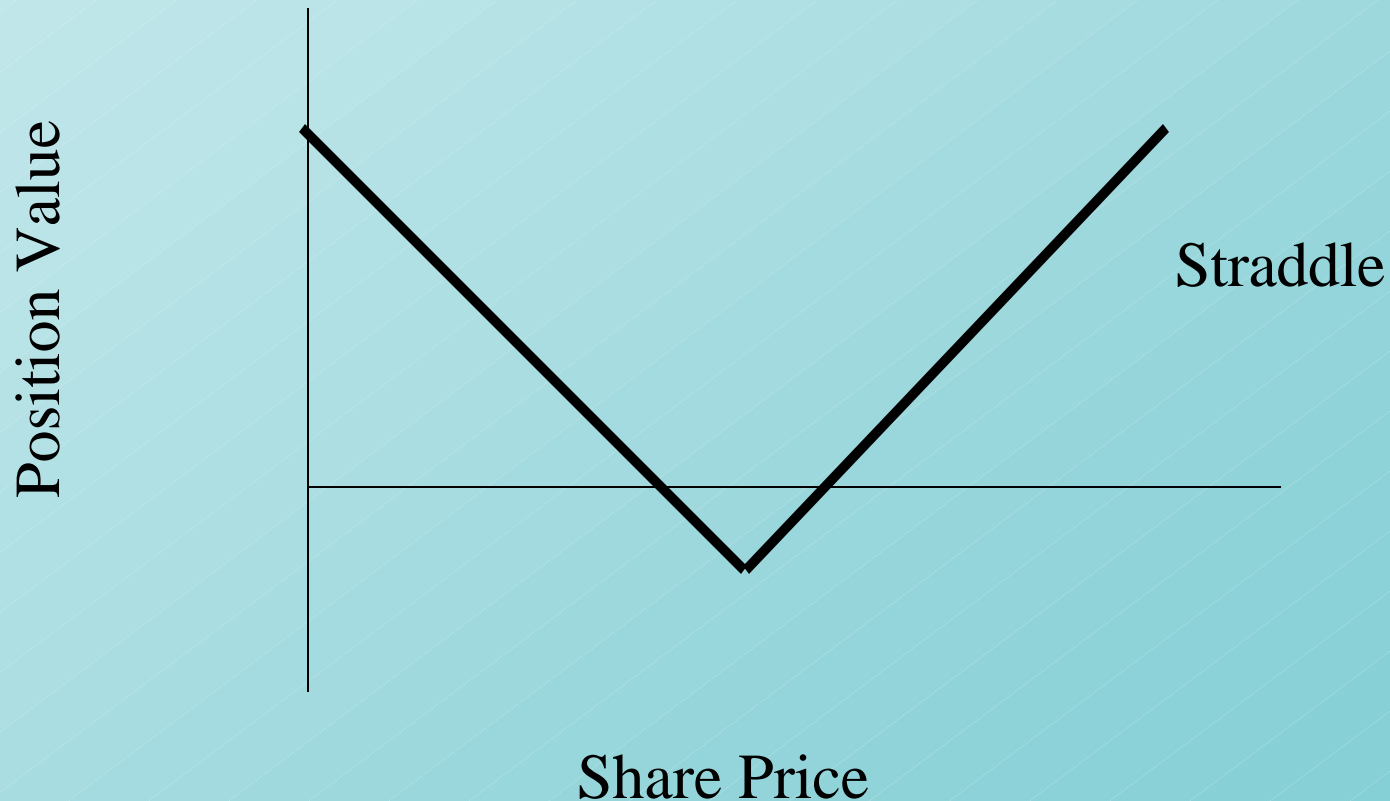
- Strategy for profiting from high volatility



# 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 ( $d_2$ )

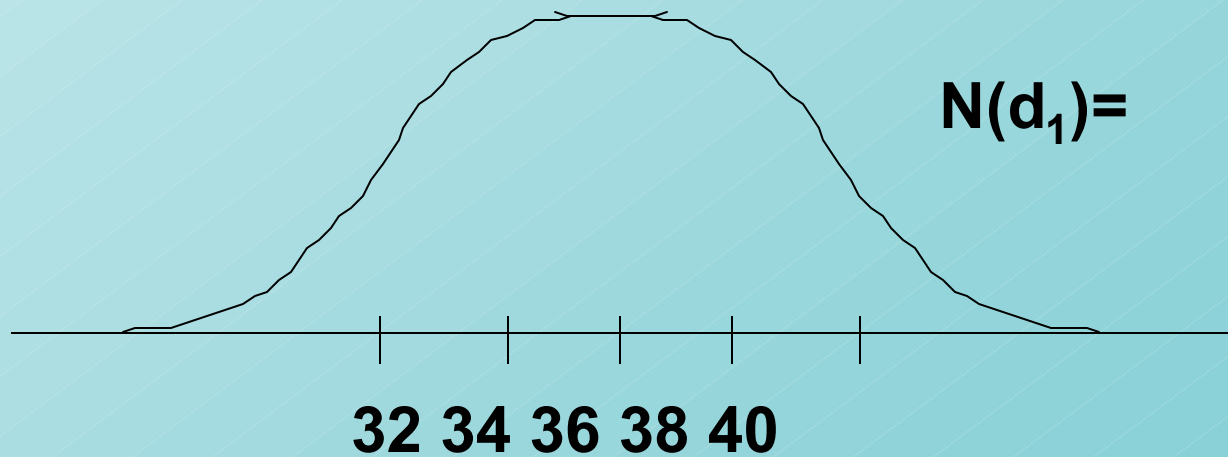
$r$  - discount rate (90 day comm paper rate or risk free rate)

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

$v$  - volatility - annualized standard deviation of daily returns

# Black-Scholes Option Pricing Model

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





# 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?

$$P = 36 \qquad r = 10\% \qquad v = .40$$

$$S = 40 \qquad t = 90 \text{ days} / 365$$

# Call Option

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

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$$S = 40 \qquad t = 90 \text{ days} / 365$$

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

$$(d_1) = - .3070$$

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

# Call Option

## *Example*

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

$$P = 36 \qquad r = 10\% \qquad v = .40$$

$$S = 40 \qquad t = 90 \text{ days} / 365$$

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

$$(d_2) = - .5056$$

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

# Call Option

## *Example*

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

$$P = 36 \qquad r = 10\% \qquad v = .40$$

$$S = 40 \qquad t = 90 \text{ days} / 365$$

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

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

$$O_C = \$ 1.70$$

# Put - Call Parity

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

$$\text{Carrying cost} = r \times S \times t$$

# 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?

$$Op = Oc + S - P - \text{Carrying Cost} + \text{Div.}$$

$$Op = 4 + 40 - 41 - (.10 \times 40 \times .50) + .50$$

$$Op = 3 - 2 + .5$$

$$Op = \$1.50$$





# 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

## 4 types of “Real Options”

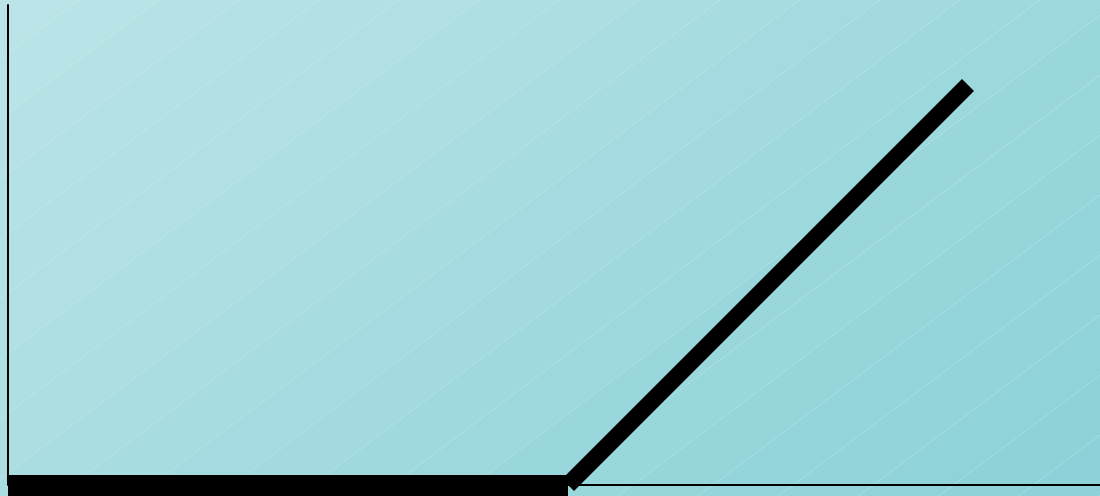
- 1 - The opportunity to make follow-up investments.
- 2 - The opportunity to abandon a project
- 3 - The opportunity to “wait” and invest later.
- 4 - The opportunity to vary the firm’s output or production methods.

$$\text{Value “Real Option”} = \text{NPV with option} \\ - \text{NPV w/o option}$$

# Option to Wait

Intrinsic Value

Option  
Price

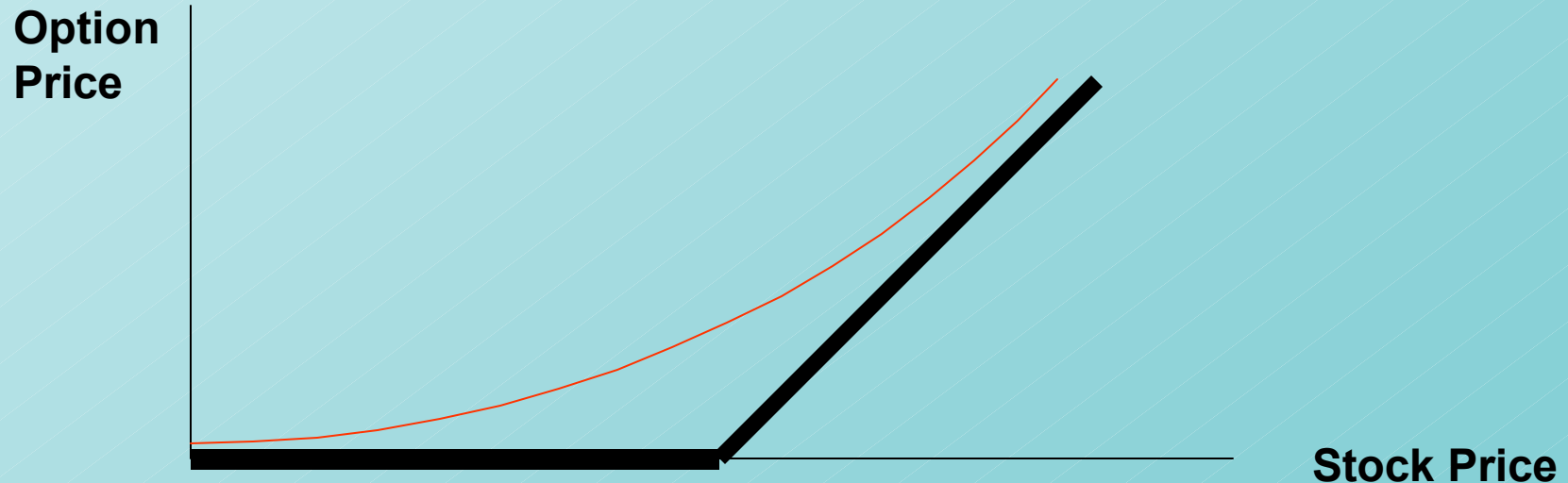


Stock Price

# Option to Wait

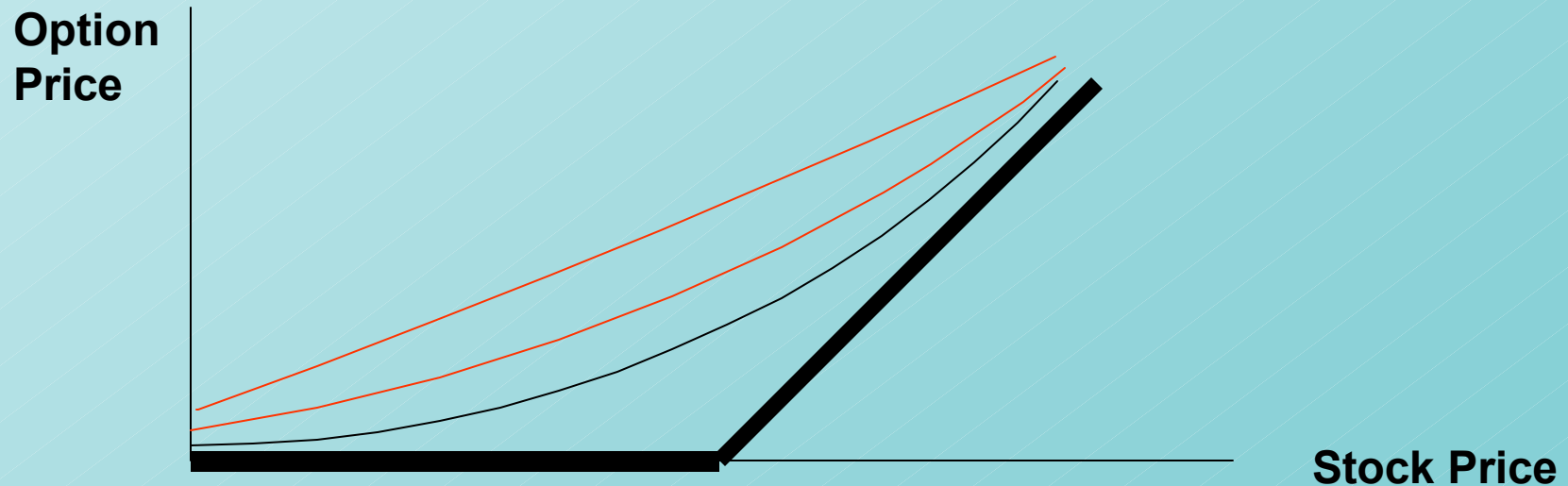
Intrinsic Value + Time Premium = Option Value

Time Premium = Value 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?

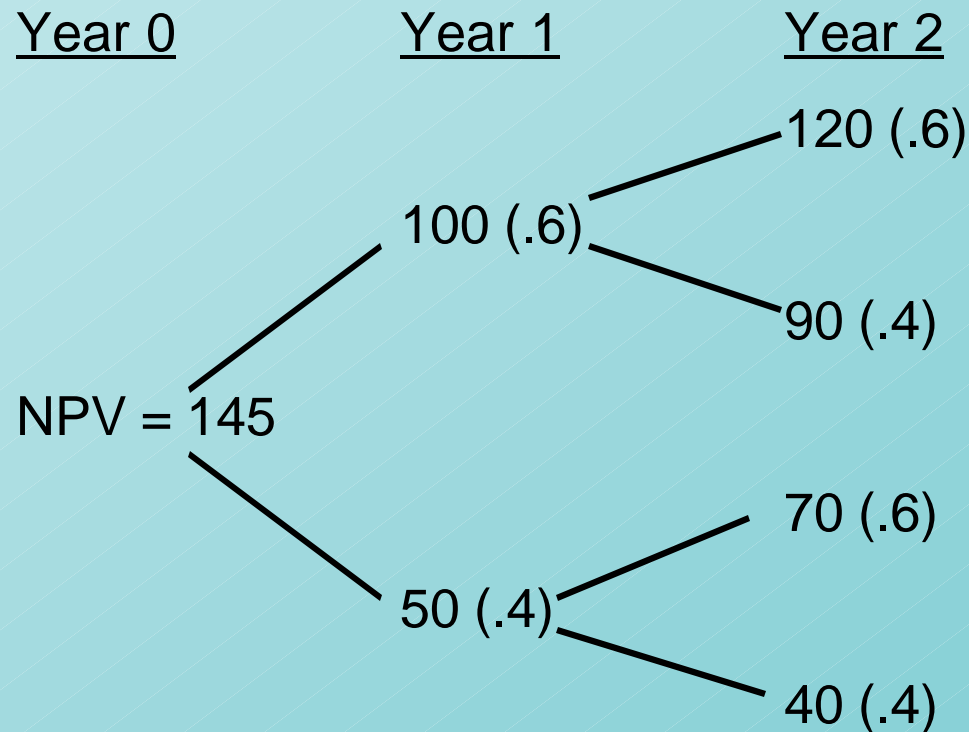
Use a discount rate of 10%

# 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?

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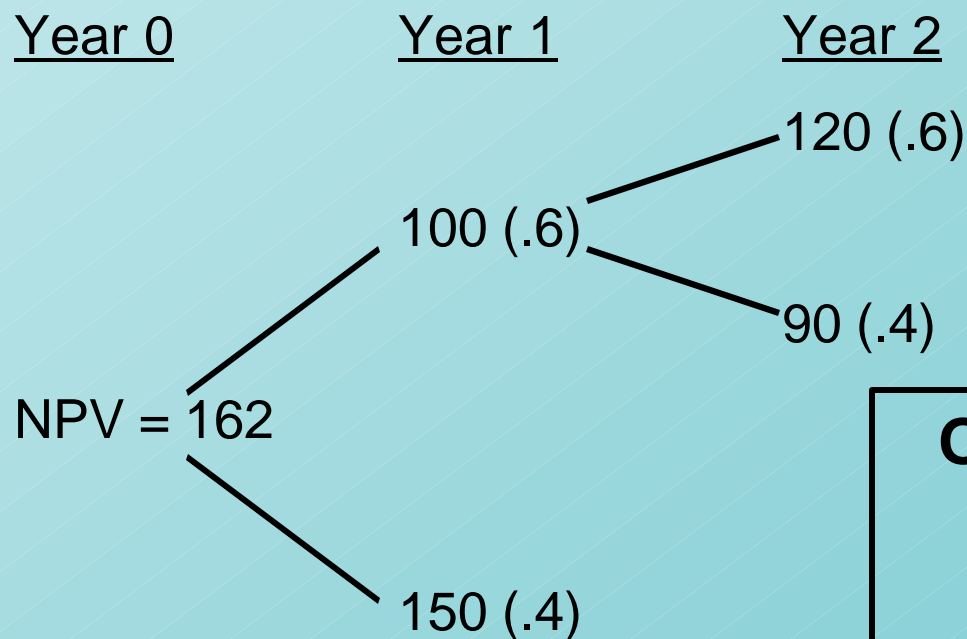




# Option to Abandon

## *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

## Reality

- ◆ 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

$$\text{Probability Up} = p = \frac{(a - d)}{(u - d)} \quad \text{Prob Down} = 1 - p$$

$$a = e^{rDt} \quad d = e^{-S[Dt] \cdot 0.5} \quad u = e^{S[Dt] \cdot 0.5}$$

$Dt$  = time intervals as % of year

# Binomial Pricing

## *Example*

Price = 36       $\sigma = .40$      $t = 90/365$      $\Delta t = 30/365$

Strike = 40       $r = 10\%$

$a = 1.0083$

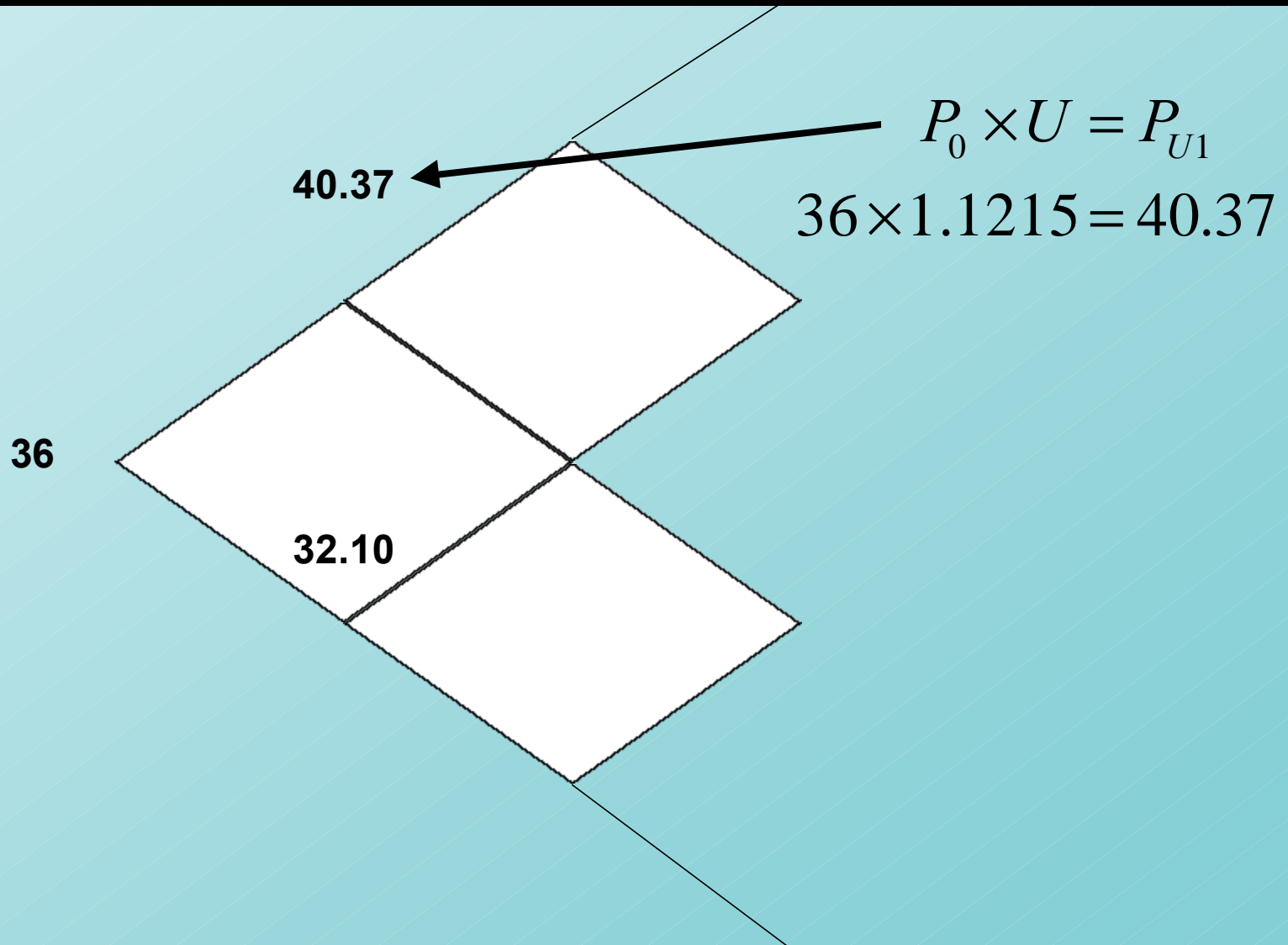
$u = 1.1215$

$d = .8917$

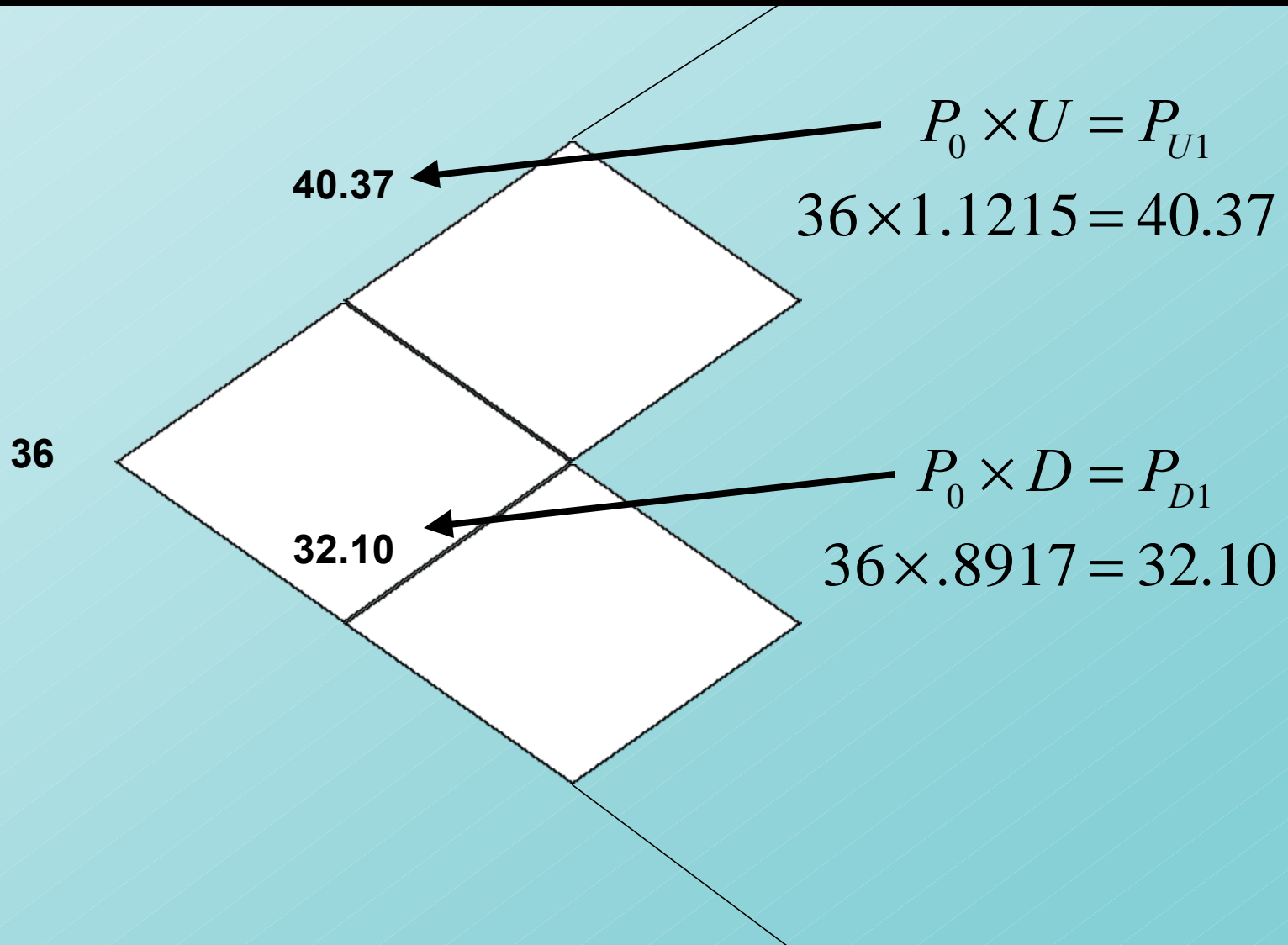
$P_u = .5075$

$P_d = .4925$

# Binomial Pricing



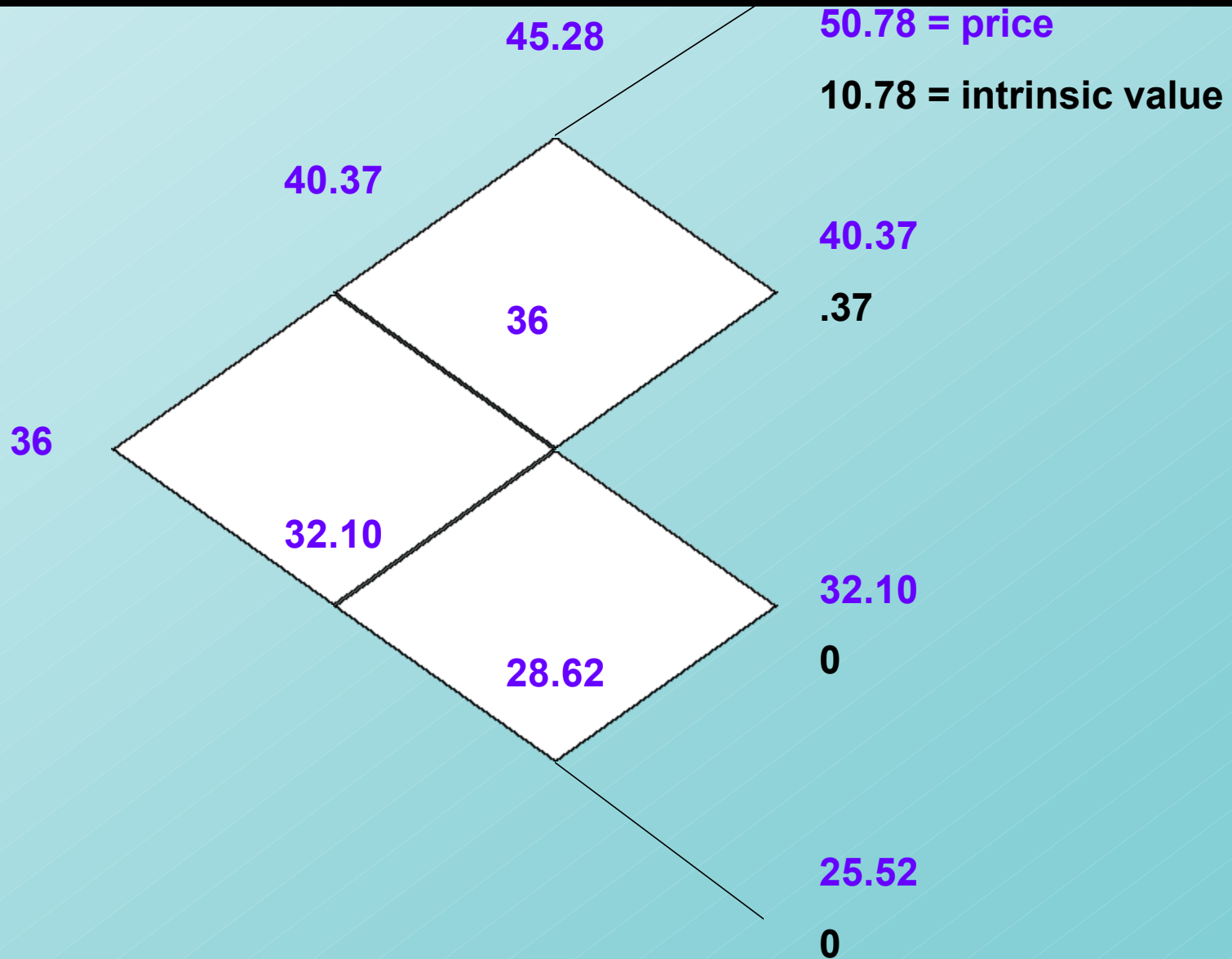
# Binomial Pricing



# Binomial Pricing

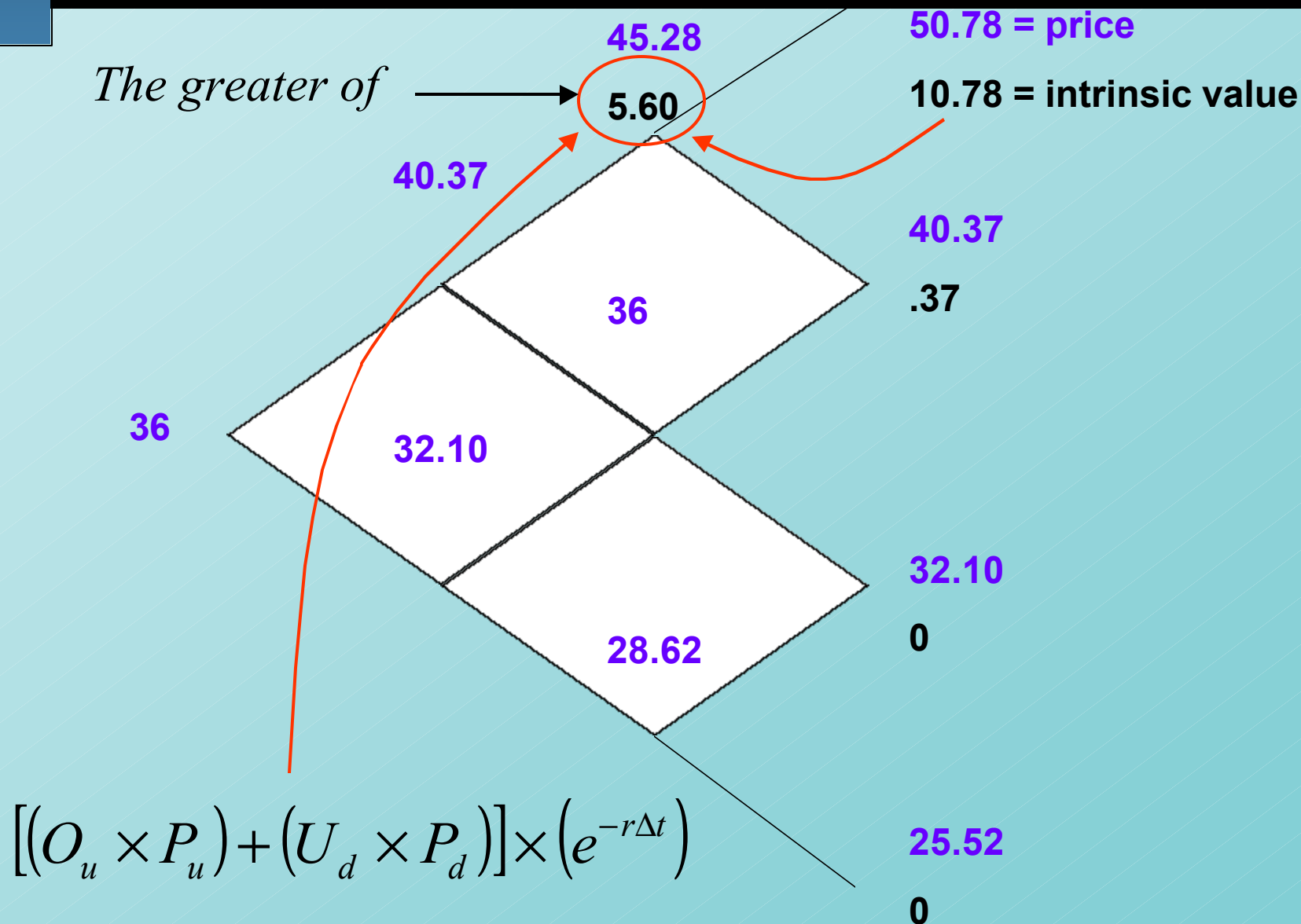


# Binomial Pricing

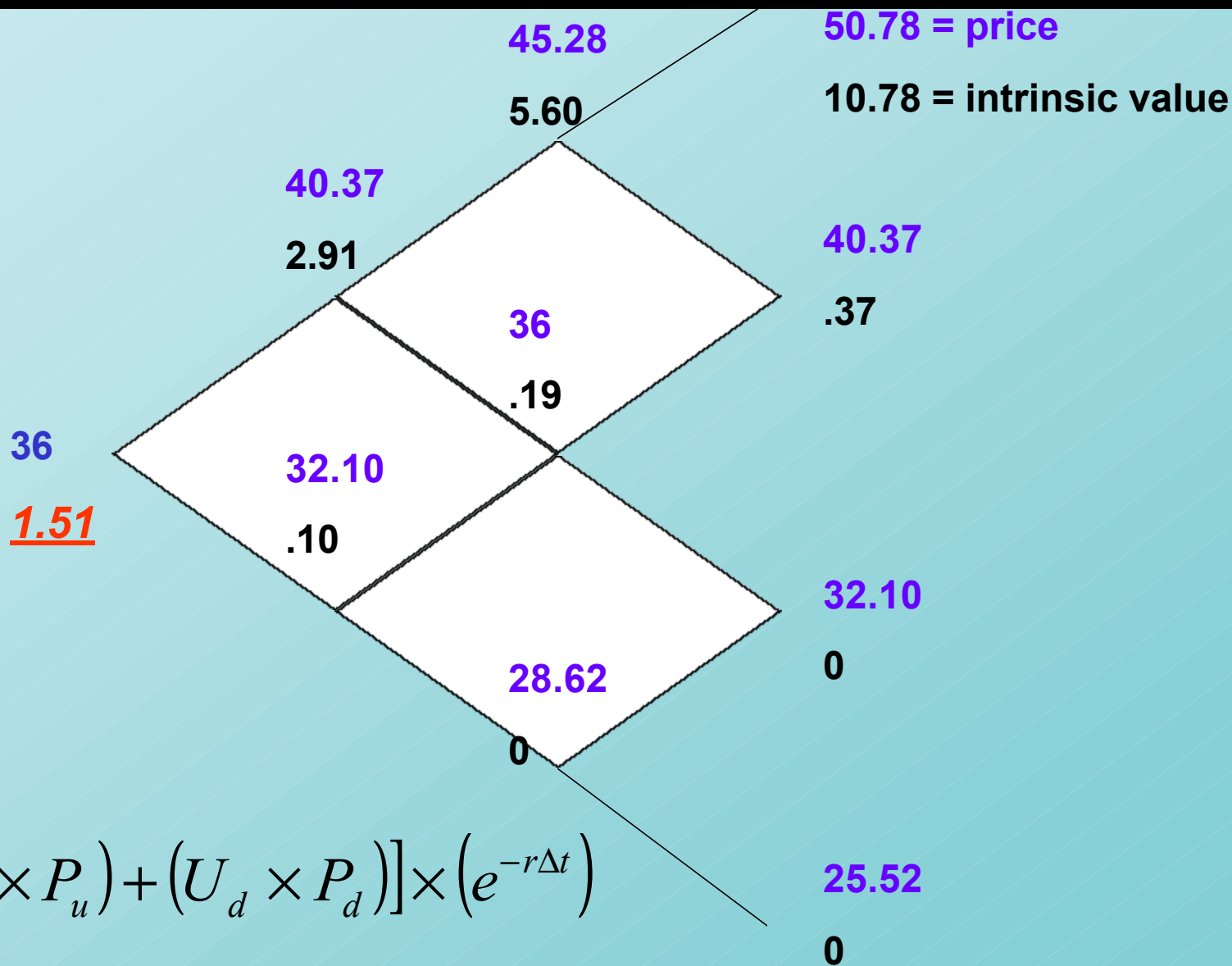




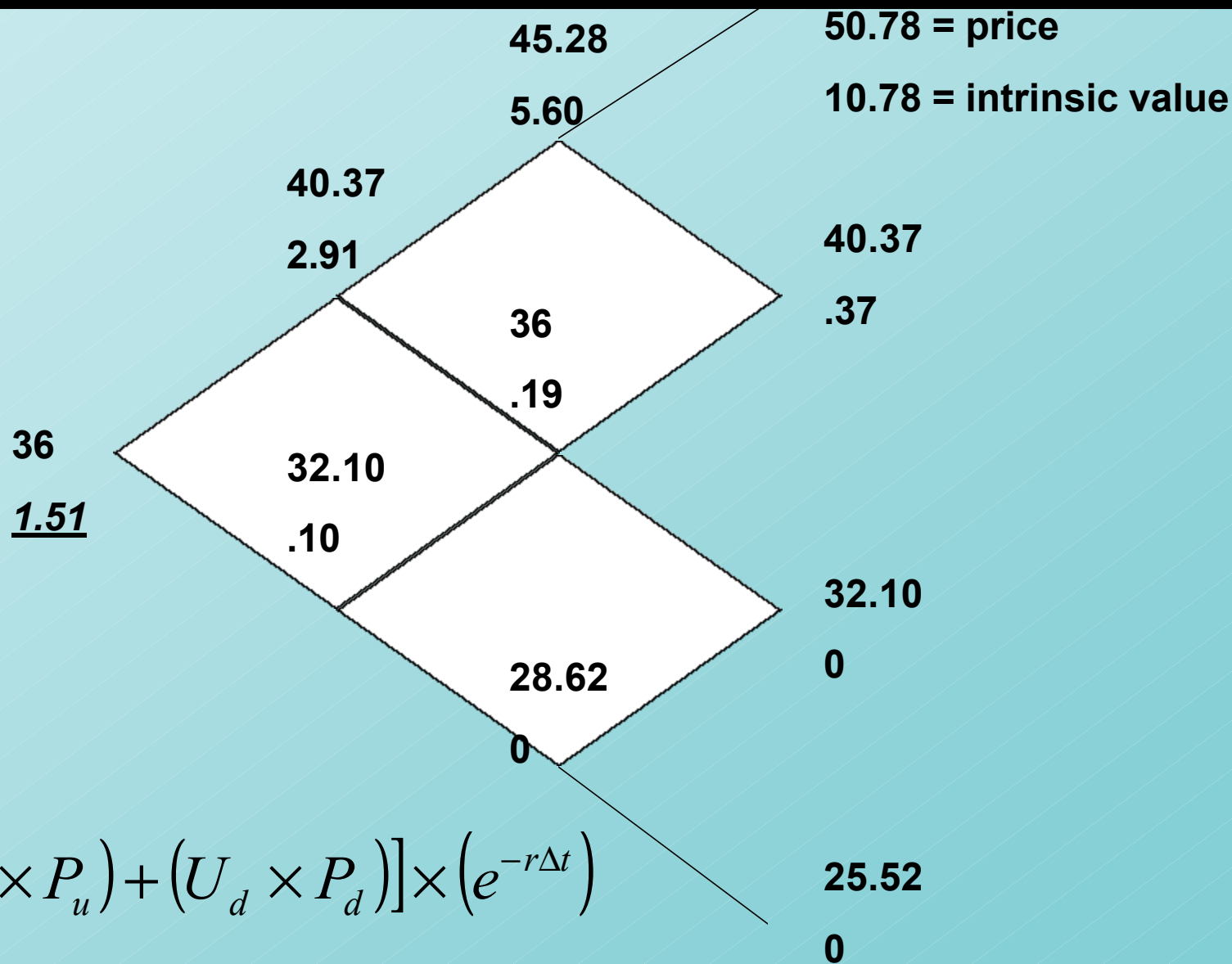
# Binomial Pricing



# Binomial Pricing

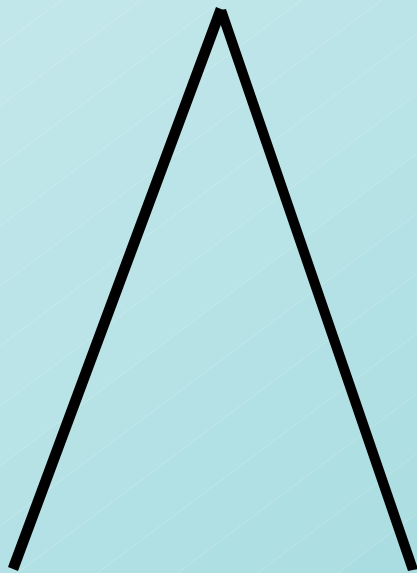


# Binomial Pricing



# Binomial vs. Black Scholes

Expanding the binomial model to allow more possible price changes



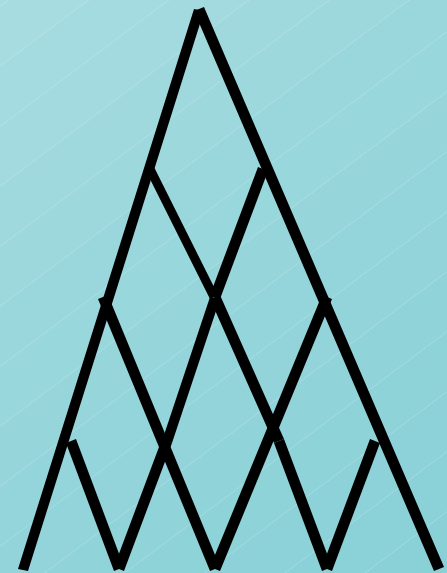
1 step

(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

<u>No. of steps</u>	<u>Estimated value</u>
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:*

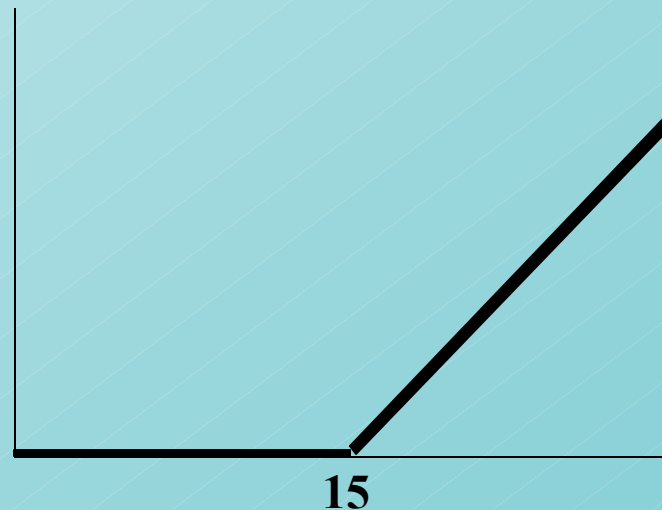
BJ Services warrants, January 1999

Exercise price      \$ 15

Warrant price      \$ 9

Share price        \$ 16

Warrant price at maturity

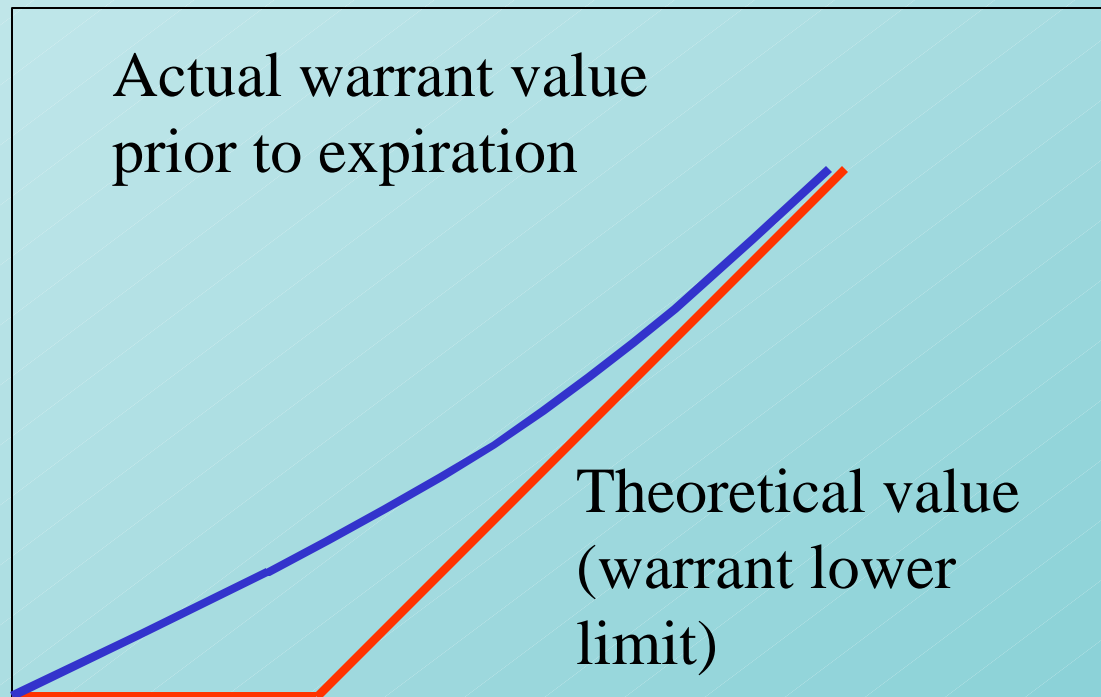


BJ Services share price



# Warrant Value vs. Stock Price

Value of  
warrant



Exercise price = \$15

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.

Cost of warrants = total financing - 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.

$$\begin{aligned}\text{Warrant} &= 12[.865] - [.620]\{10/1.1^4\} \\ &= \$6.15\end{aligned}$$

# 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

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

$$V = 18 - 5.5 = \$12.5 \text{million}$$

# 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

$$\begin{array}{l} \text{Current share price of} \\ \text{alternative firm} \end{array} = \frac{V}{N} = \frac{12.5 \text{ million}}{1 \text{ million}} = \$12.50$$

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

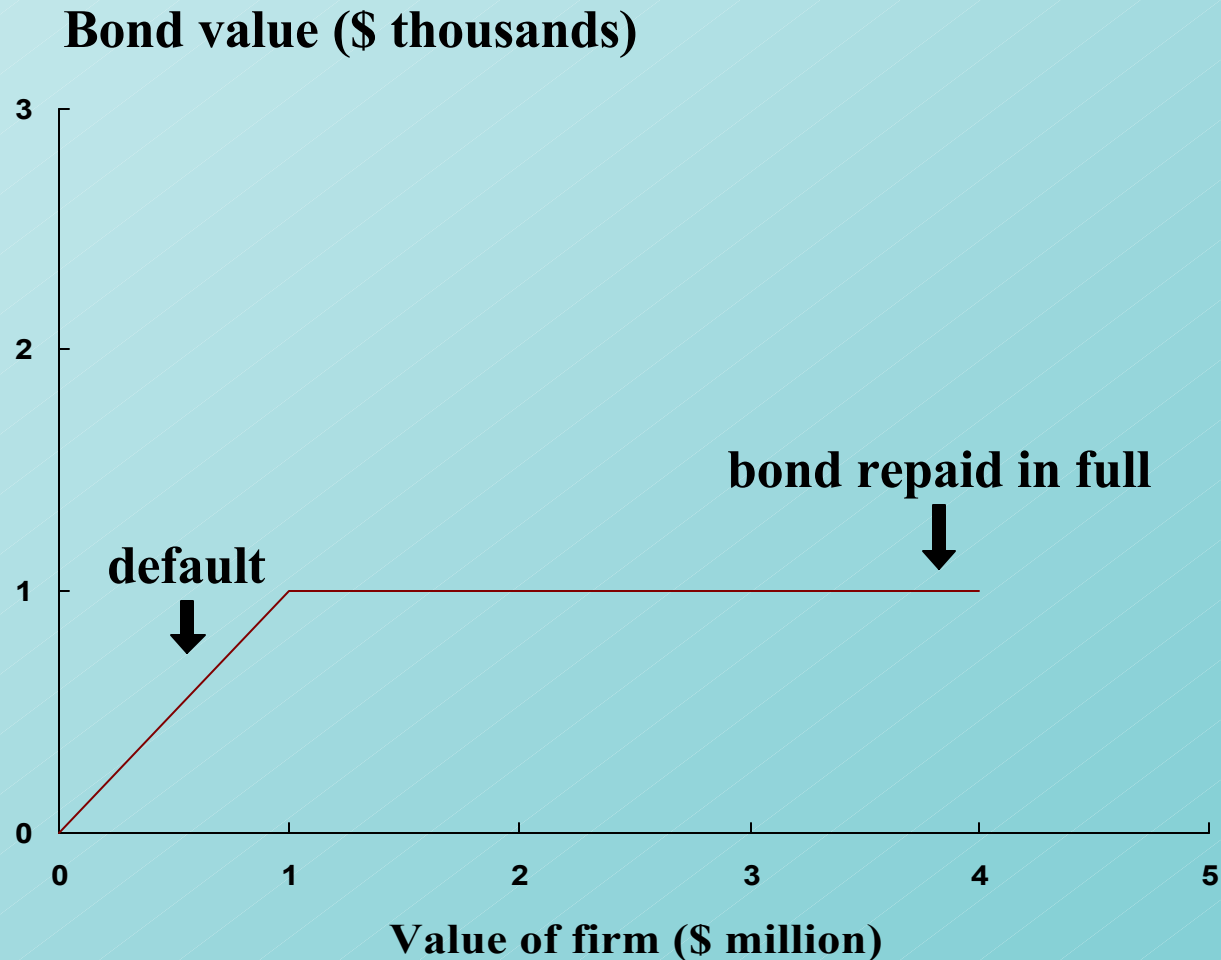
- 5% Convertible 2006
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- Conversion ratio 26.2
- Conversion price =  $1000/26.2 = \$38.17$
- Market price of shares = \$28

## ♦ Lower bound of value

- Bond value
- Conversion value =  $26.2 \times 28 = 733.60$

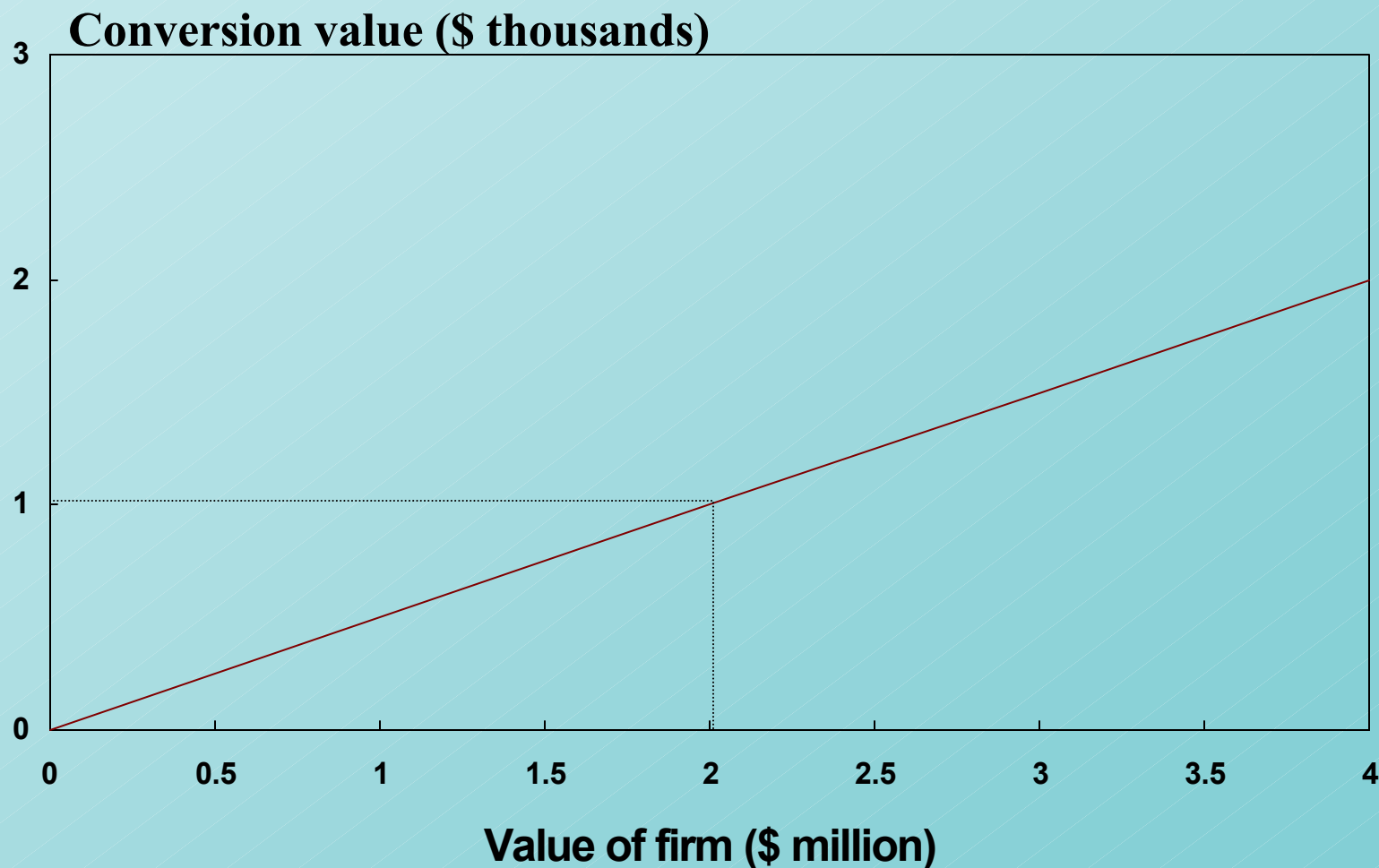
# What is a Convertible Bond?

- ♦ How bond value varies with firm value at maturity.



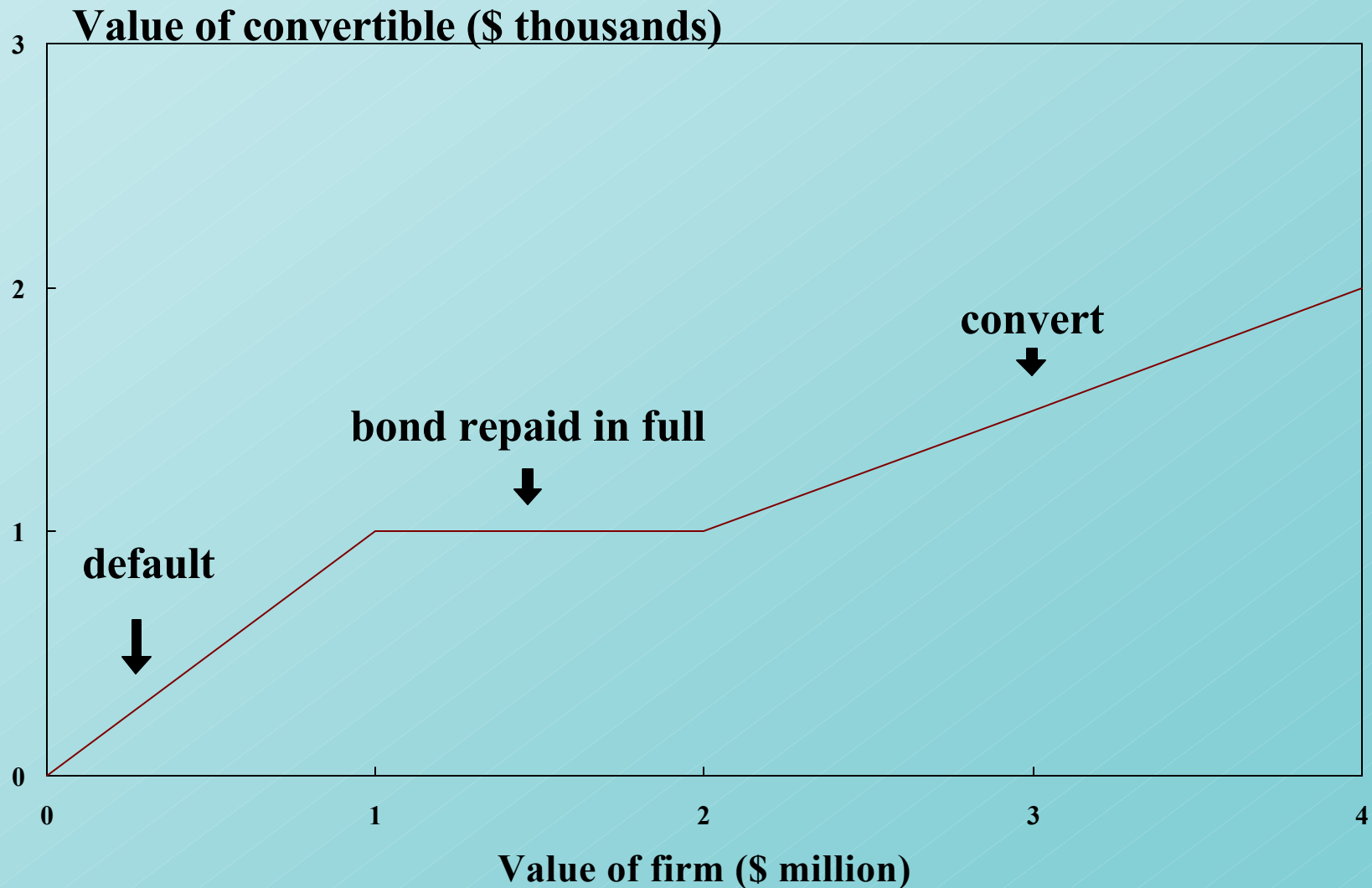
# What is a Convertible Bond?

- ♦ **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)

- ◆ developed by Irving Fisher

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

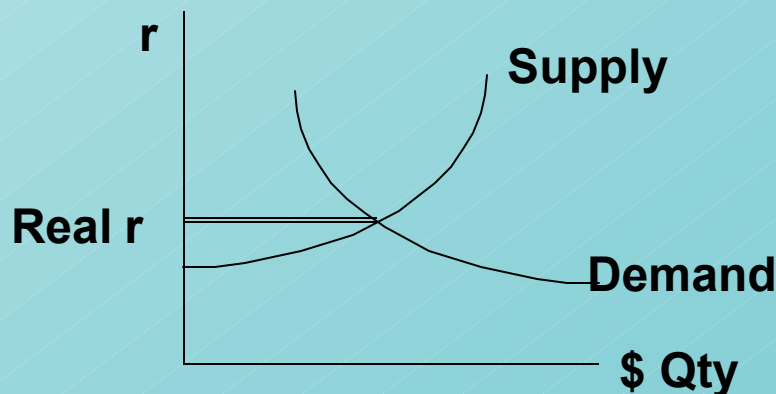
# Debt & Interest Rates

## 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

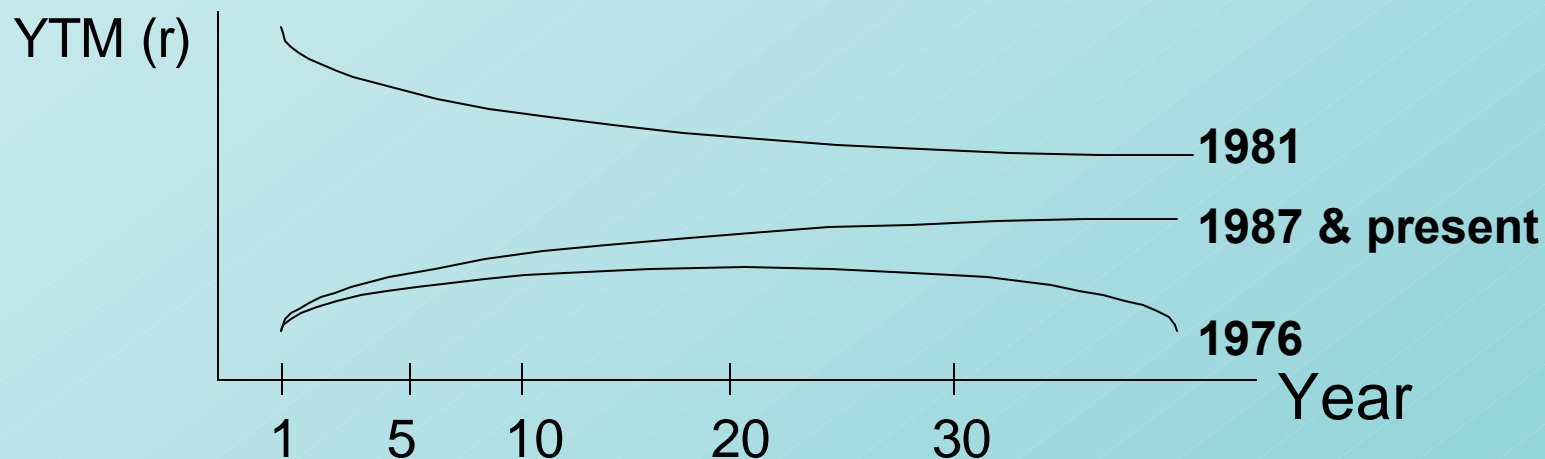
Q: Why do we care?

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

<u>Year</u>	<u>CF</u>	<u>PV@YTM</u>	<u>% of Total PV</u>	<u>% x Year</u>
-------------	-----------	---------------	----------------------	-----------------

# Debt & Risk

Example (Bond 1)

Calculate the duration of our 10.5% bond @ 8.5% YTM

<u>Year</u>	<u>CF</u>	<u>PV@YTM</u>	<u>% of Total PV</u>	<u>% x Year</u>
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

<u>Year</u>	<u>CF</u>	<u>PV@YTM</u>	<u>% of Total PV</u>	<u>% x Year</u>
1	105	96.77		
2	105	89.19		
3	105	82.21		
4	105	75.77		
5	1105	<u>734.88</u>		
		<u>1078.82</u>		

# Debt & Risk

Example (Bond 1)

Calculate the duration of our 10.5% bond @ 8.5% YTM

<u>Year</u>	<u>CF</u>	<u>PV@YTM</u>	<u>% of Total PV</u>	<u>% x Year</u>
1	105	96.77	.090	
2	105	89.19	.083	
3	105	82.21	.076	
4	105	75.77	.070	
5	1105	<u>734.88</u>	<u>.681</u>	
		<u>1078.82</u>	<u>1.00</u>	



# Debt & Risk

Example (Bond 1)

Calculate the duration of our 10.5% bond @ 8.5% YTM

<u>Year</u>	<u>CF</u>	<u>PV@YTM</u>	<u>% of Total PV</u>	<u>% x Year</u>
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	<u>734.88</u>	<u>.681</u>	<u>3.406</u>
		<u>1078.82</u>	<u>1.00</u>	<b><u>4.166 Duration</u></b>

# Debt & Risk

## Example (Bond 2)

Given a 5 year, 9.0%, \$1000 bond, with a 8.5% YTM, what is this bond's duration?

<u>Year</u>	<u>CF</u>	<u>PV@YTM</u>	<u>% of Total PV</u>	<u>% x Year</u>
-------------	-----------	---------------	----------------------	-----------------

# Debt & Risk

## Example (Bond 2)

Given a 5 year, 9.0%, \$1000 bond, with a 8.5% YTM, what is this bond's duration?

<u>Year</u>	<u>CF</u>	<u>PV@YTM</u>	<u>% of Total PV</u>	<u>% x Year</u>
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?

<u>Year</u>	<u>CF</u>	<u>PV@YTM</u>	<u>% of Total PV</u>	<u>% x Year</u>
1	90	82.95		
2	90	76.45		
3	90	70.46		
4	90	64.94		
5	1090	<u>724.90</u>		
		<u>1019.70</u>		

# Debt & Risk

## Example (Bond 2)

Given a 5 year, 9.0%, \$1000 bond, with a 8.5% YTM, what is this bond's duration?

<u>Year</u>	<u>CF</u>	<u>PV@YTM</u>	<u>% of Total PV</u>	<u>% x Year</u>
1	90	82.95	.081	
2	90	76.45	.075	
3	90	70.46	.069	
4	90	64.94	.064	
5	1090	<u>724.90</u>	<u>.711</u>	
		<u>1019.70</u>	<u>1.00</u>	

# Debt & Risk

## Example (Bond 2)

Given a 5 year, 9.0%, \$1000 bond, with a 8.5% YTM, what is this bond's duration?

<u>Year</u>	<u>CF</u>	<u>PV@YTM</u>	<u>% of Total PV</u>	<u>% x Year</u>
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	<u>724.90</u>	<u>.711</u>	<u>3.555</u>
		<u>1019.70</u>	<u>1.00</u>	<b><u>4.249 Duration</u></b>

# Term Structure

## What Determines the Shape of the TS?

- 1 - Unbiased Expectations Theory
- 2 - Liquidity Premium Theory
- 3 - Market Segmentation Hypothesis

## Term Structure & Capital Budgeting

- ◆ 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 in other 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?

<u>C0</u>	<u>C1</u>	<u>C2</u>	<u>C3</u>	<u>C4</u>	<u>C5</u>
-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.**

## **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:**

# 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

Brealey and Myers

Sixth Edition

## ◆ 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.

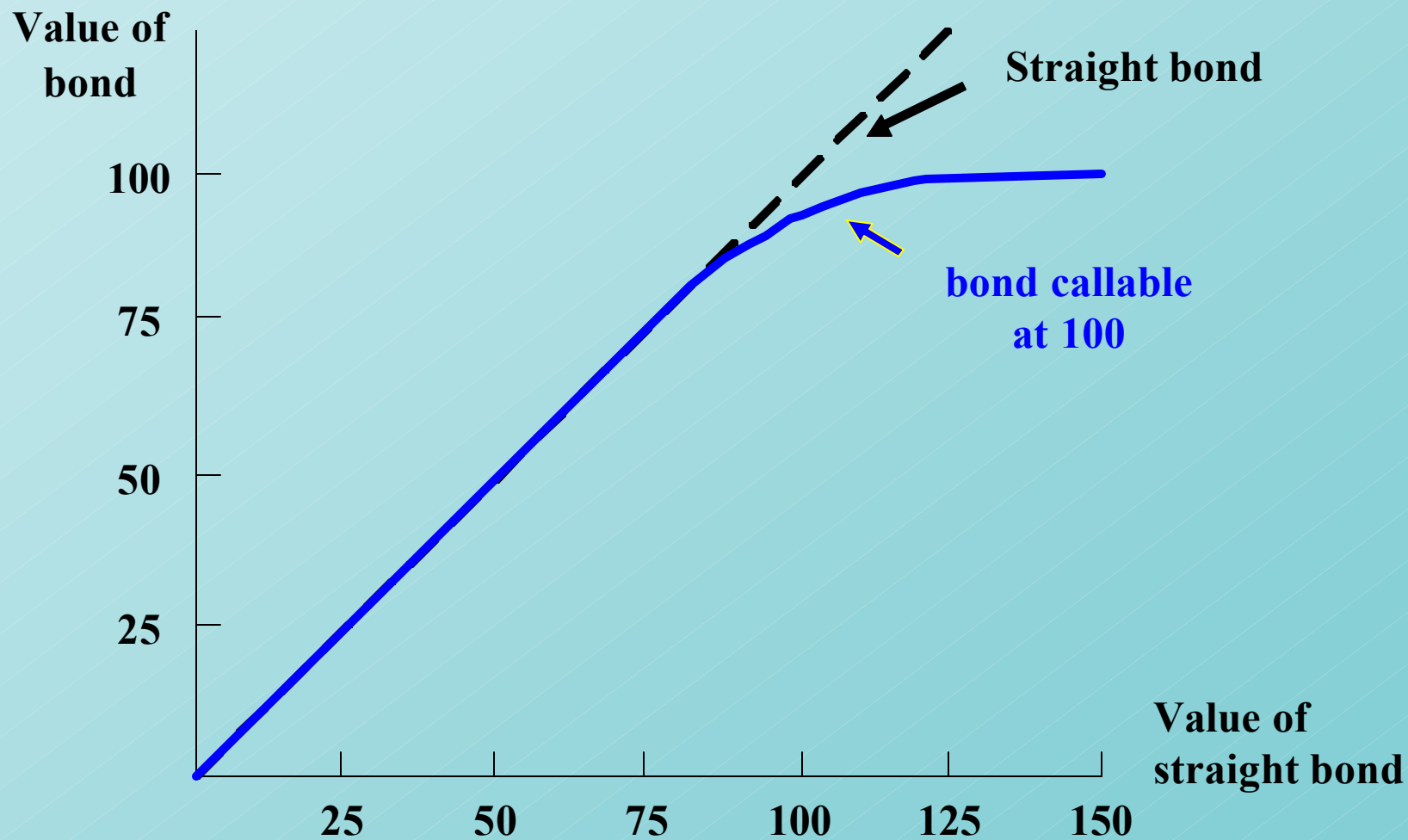
# Bond Terminology

- ◆ 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%.**

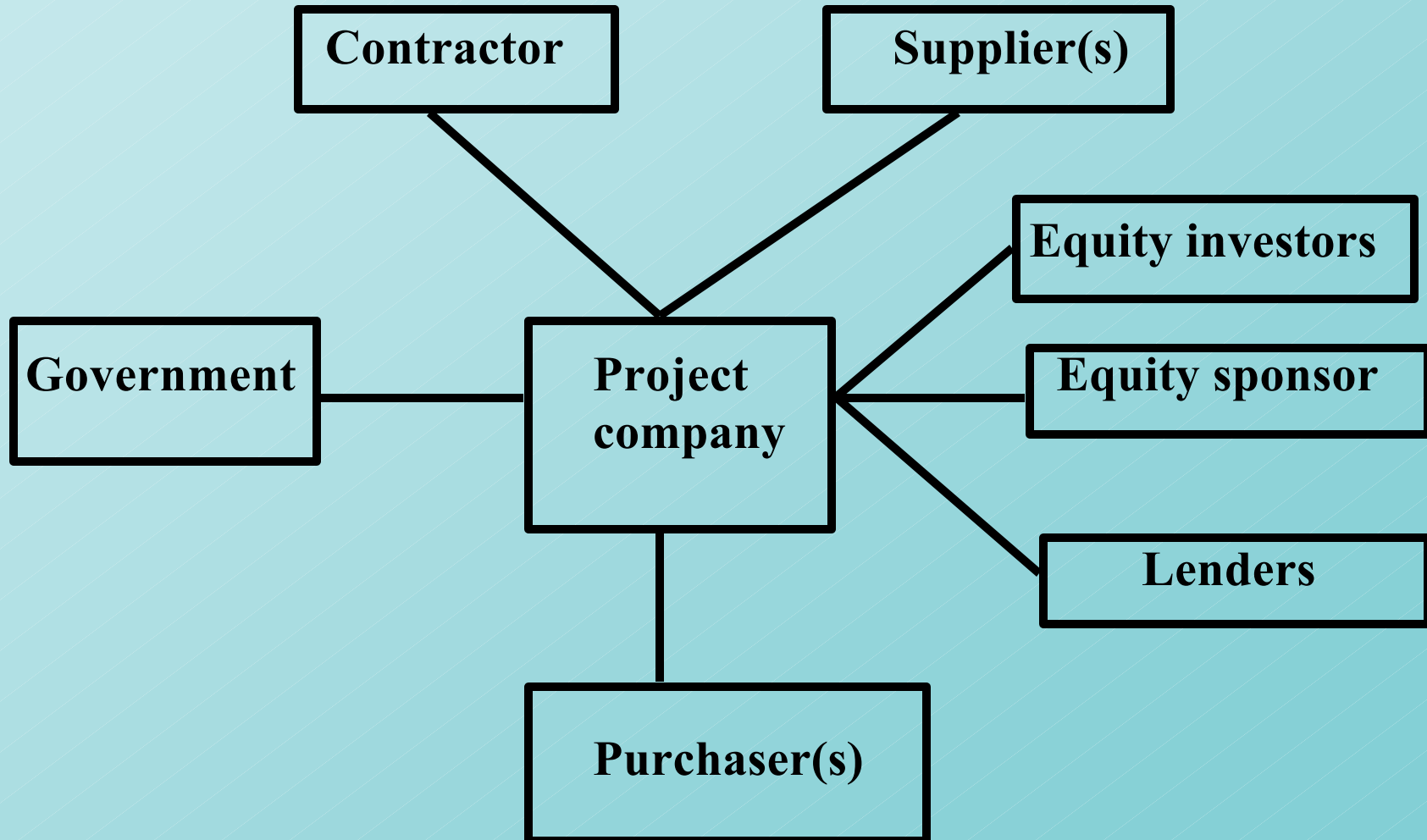
**Bondholders sued and Marriott modified its spinoff plan.**



# 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

<b>Risk</b>	<b>Shifted to:</b>	<b>Contract</b>
<b>Completion/ continuing management</b>	<b>Sponsor</b>	<b>Management contract/ completion gtees / working capital maintenance</b>
<b>Construction cost</b>	<b>Contractor</b>	<b>Turnkey contract/ fixed price/ delay penalties</b>
<b>Raw materials</b>	<b>Supplier(s)</b>	<b>Long-term contract/ indexed prices/ supply or pay</b>
<b>Revenues</b>	<b>Purchaser(s)</b>	<b>Long-term contract/ indexed to costs/ take or pay/ throughput agreements/ tolling contract</b>
<b>Concession/regulation</b>	<b>Government</b>	<b>Concession agreement/ provision of supporting infrastructure</b>
<b>Currency convertibility</b>	<b>Government</b>	<b>Gtees or comfort letters/ hard currency paid to offshore escrow account</b>



# 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?

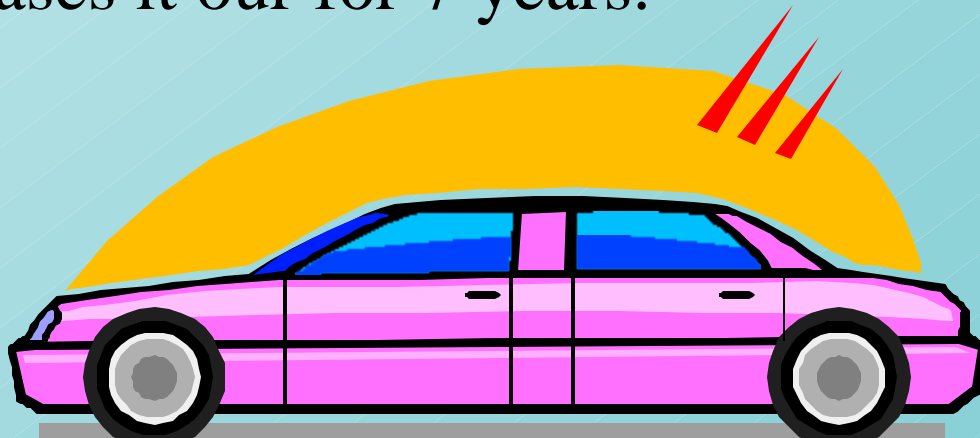
- ◆ Dubious Reasons for Leasing
  - Leasing avoids capital expenditure controls
  - Leasing preserves capital
  - Leases may be off balance sheet financing
  - Leasing effects book income



# 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 out for 7 years.



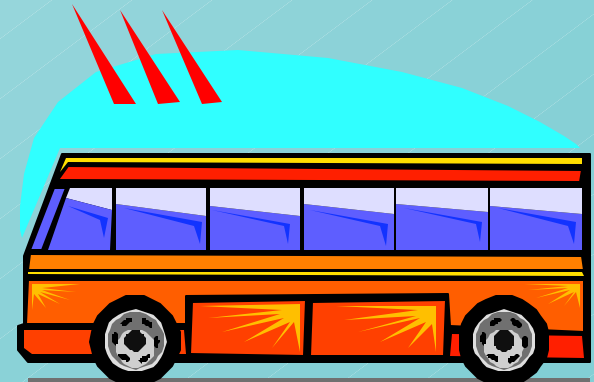
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# Financial Leases

## *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.

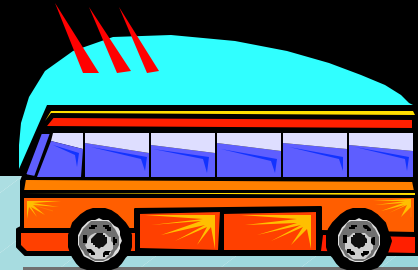
Should Greymore buy or lease the bus?



## 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:

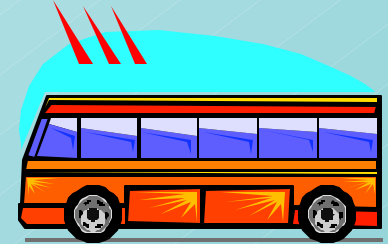
- Greymore saves the \$100,000 cost of the bus.
- Loss of depreciation benefit of owning the bus.
- \$16,900 lease payment is due at the start of each year.
- Lease payments are tax deductible.

# 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



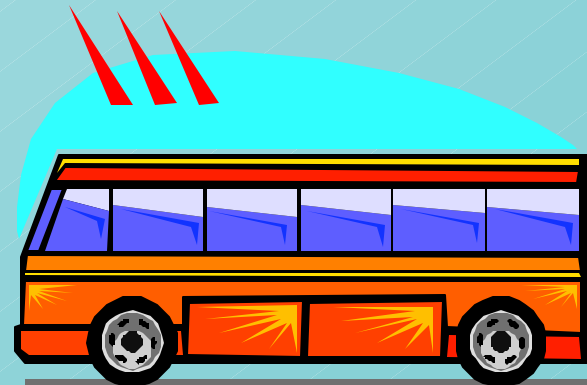
### Equivalent lease balance sheet

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  $.10 \times (1-.35)$ . The result will tell us if Greymore should lease or buy the bus.

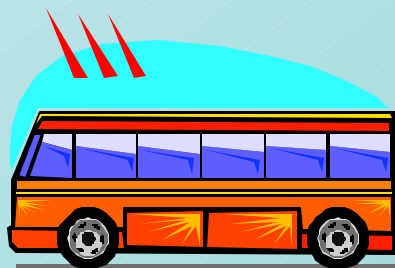


# Financial Leases

## *Example - cont*

Greymore Bus Lines can borrow at 10%, thus the value of the lease should be discounted at 6.5% or  $.10 \times (1-.35)$ . The result will tell us if Greymore should lease or buy the bus.

$$\begin{aligned}
 \text{NPV lease} &= 89.02 - \frac{17.99}{1.065} - \frac{22.19}{(1.065)^2} - \frac{17.71}{(1.065)^3} - \frac{15.02}{(1.065)^4} \\
 &\quad - \frac{15.02}{(1.065)^5} - \frac{13.00}{(1.065)^6} - \frac{10.98}{(1.065)^7} \\
 &= -.70 \text{ or } -\$700
 \end{aligned}$$

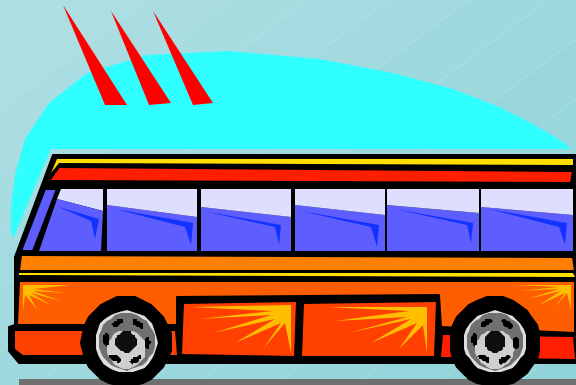




# Financial Leases

## *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.

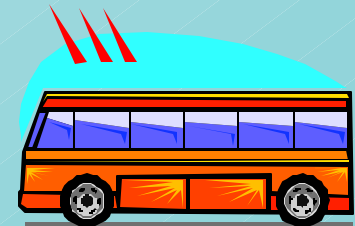
	Year							
	0	1	2	3	4	5	6	7
Amount borrowed								
at year end	89.72	77.56	60.42	46.64	34.66	21.89	10.31	0.00
Interest paid @ 10%		-8.97	-7.76	-6.04	-4.66	-3.47	-2.19	-1.03
Tax shield @ 35%		3.14	2.71	2.11	1.63	1.21	0.77	0.36
Interest paid after tax		-5.83	-5.04	-3.93	-3.03	-2.25	-1.42	-0.67
Principal 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.



$$APV = NPV \text{ of project} - NPV \text{ of lease}$$

$$APV = -5,000 + 8,000 = \$3,000$$



# Principles of Corporate Finance

Brealey and Myers

Sixth Edition

## ◆ Managing Risk

## Chapter 26

# Topics Covered

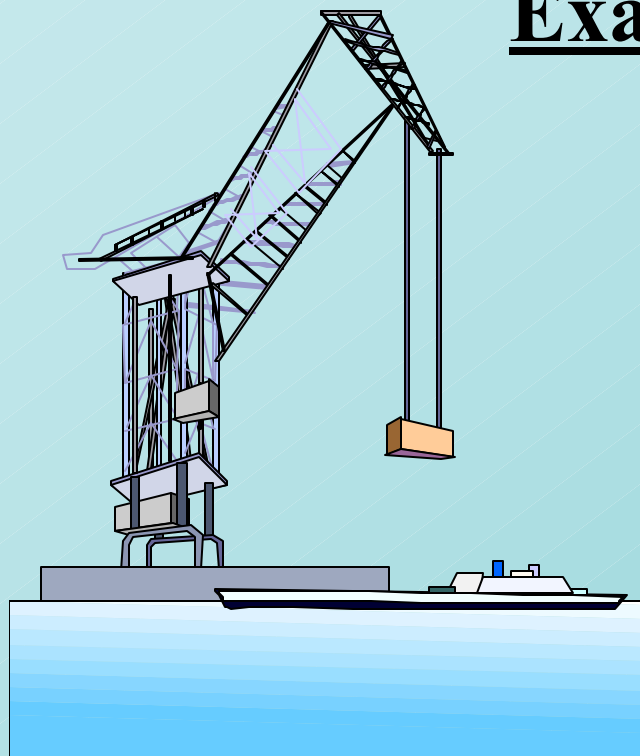
- ◆ Insurance
- ◆ Hedging With Futures
- ◆ Speculating and Margin
- ◆ SWAPS

# 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

## Example - cont.



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

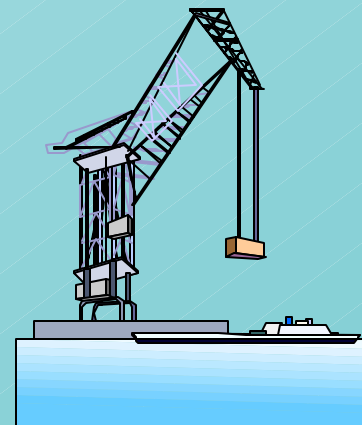
## Example - cont.

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:

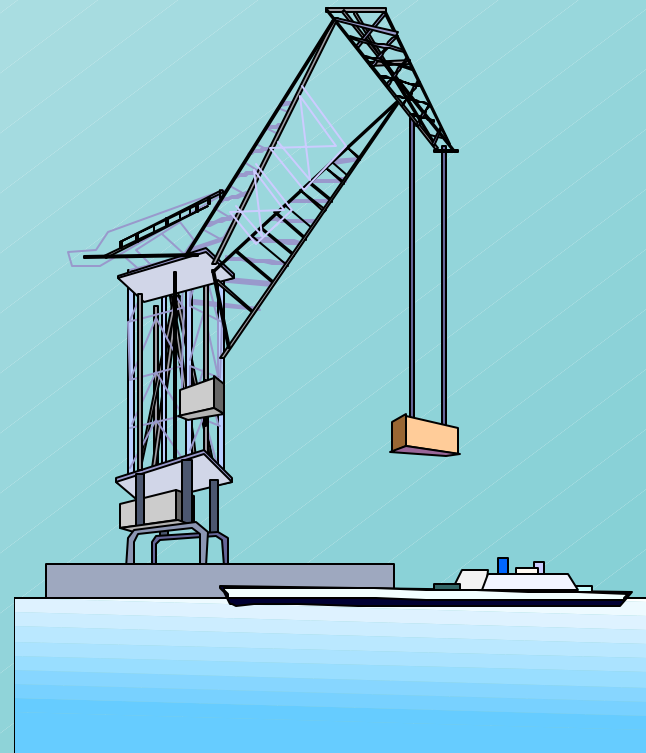
$$\frac{1,000,000,000}{10,000} = \$100,000$$



# 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

## Commodity Futures

- Sugar -Corn -OJ
- Wheat-Soy beans -Pork bellies



## Financial Futures

- Tbills -Yen -GNMA
- Stocks -Eurodollars

## Index Futures

- 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

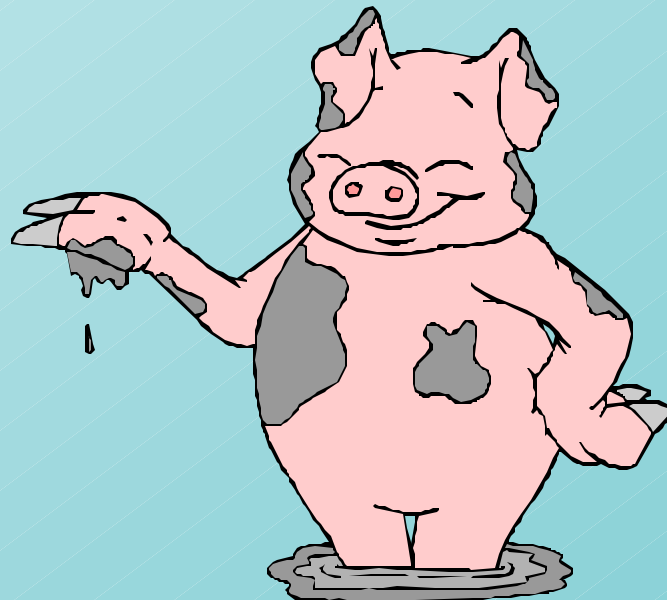
Value line Index K = \$index x 500



# 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?

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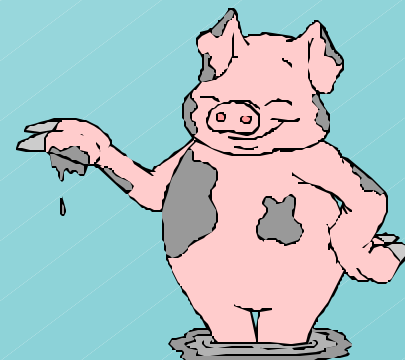
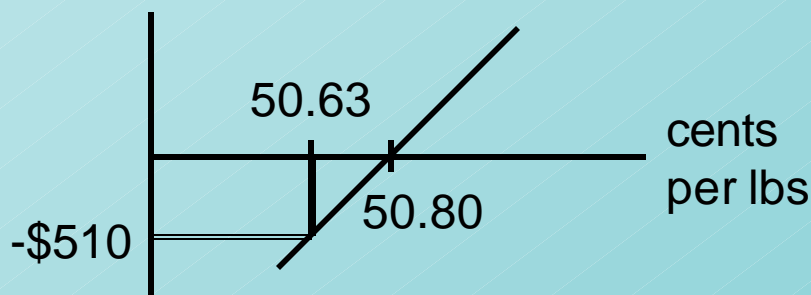


# Ex - Settlement & Speculate

**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?

---

$$30,000 \text{ lbs} \times \$0.0017 \text{ loss} \times 10 \text{ Ks} = \$510.00 \text{ loss}$$



---

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

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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 = <u>28,000</u>	
--------------------------------------	--

Gain on Position-----	1,400
-----------------------	-------

<b><u>Total Revenue</u></b>	<b><u>\$ 29,400</u></b>
-----------------------------	-------------------------

# 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 = <u>30,500</u>	
Loss on Position-----	( 1,100 )
<b><u>Total Revenue</u></b>	<b><u>\$ 29,400</u></b>

# 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 (uncured 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?**

---

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---

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 open a position = margin.
- ◆ CME margin requirements are 15%
- ◆ Thus, you can control \$100,000 of assets with only \$15,000.

# Commodity Speculation with margin

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# Commodity Speculation with margin

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**Feb: Long 3 May K (.4850 x 38,000 x 3 ) = - 55,290**

**Loss = - 5,130**

**Loss**  
-----  
**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

## Key points

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
- 
- ◆  $\text{Swap Gain} = \text{fixed spread} - \text{floating spread}$

# 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

## example - cont.

Benefit to XYZ

floating +7.25 -7.25

fixed +10.50 -10.00

Net gain

Net position

0

+.50

+.50%

Benefit ABC

floating +7.25 - 7.50

fixed -10.50 + 11.50

net gain

Net Position

-.25

+1.00

+.75%



# SWAPS

## example - cont.

### Settlement date

ABC pmt  $10.50 \times 1\text{mil}$  = 105,000

XYZ pmt  $7.25 \times 1\text{mil}$  = 72,500

net cash pmt by ABC = 32,500



if libor rises to 9%

### settlement date

ABC pmt  $10.50 \times 1\text{mil}$  = 105,000

XYZ pmt  $9.25 \times 1\text{mil}$  = 92,500

net cash pmt by ABC = 12,500



# SWAPS

- ♦ transactions
- ♦ rarely done direct
- ♦ banks = middleman
- ♦ bank profit = part of “swap gain”

example - same continued

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  $10.50 \times 1\text{mil}$  = 105,000

XYZ pmt  $7.25 \times 1\text{mil}$  = 72,500

net Bank pmt to XYZ = 32,500

settlement date - ABC

Bank pmt  $7.25 \times 1\text{mil}$  = 72,500

ABC pmt  $10.75 \times 1\text{mil}$  = 107,500

net ABC pmt to bank = 35,000

bank “swap gain” =  $+35,000 - 32,500 = +2,500$



# SWAPS

## example - cont.

### benefit to XYZ

floating  $7.25 - 7.25 = 0$

fixed  $10.50 - 10.00 = +.50$

net gain .50

### benefit to ABC

floating  $7.25 - 7.50 = - .25$

fixed  $-10.75 + 11.50 = + .75$

net gain .50

### benefit to bank

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

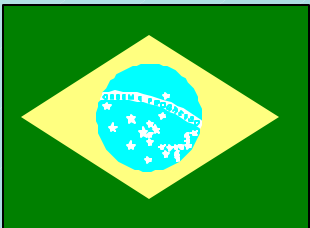
- ◆ Foreign Exchange Markets
- ◆ Some Basic Relationships
- ◆ Hedging Currency Risk
- ◆ Exchange Risk and International Investment Decisions

# Foreign Exchange Markets

**Exchange Rate** - Amount of one currency needed to purchase one unit of another.

**Spot Rate of Exchange** - Exchange rate for an immediate transaction.

**Forward Exchange Rate** - 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?

$$\frac{\text{Forward Price} - \text{Spot Price}}{\text{Spot Price}} = \text{Premium or (-Discount)}$$

$$4 \times \frac{112.645 - 111.300}{111.300} \times 100 = 4.8\%$$





# 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

$$\frac{1 + r_{\text{foreign}}}{1 + r_{\$}}$$

equals

$$\frac{f_{\text{foreign} / \$}}{S_{\text{foreign} / \$}}$$

equals

$$\frac{1 + i_{\text{foreign}}}{1 + i_{\$}}$$

equals

$$\frac{E(s_{\text{foreign} / \$})}{S_{\text{foreign} / \$}}$$

# Exchange Rate Relationships

## 1) Interest Rate Parity Theory

$$\frac{1 + r_{\text{foreign}}}{1 + r_{\$}} = \frac{f_{\text{foreign} / \$}}{S_{\text{foreign} / \$}}$$

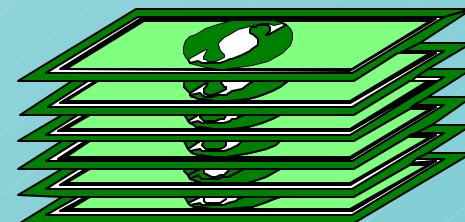
- ◆ The ratio between the risk free interest rates in two different countries is equal to the ratio between the forward and spot exchange rates.

# 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.



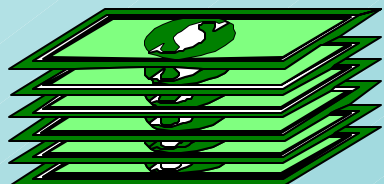
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---

Value of US bond = \$1,000,000 x 1.05 = **\$1,050,000**



# Exchange Rate Relationships

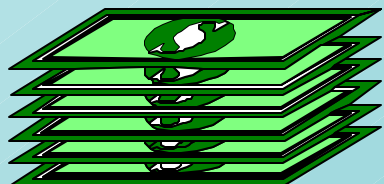
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---

Value of US bond = \$1,000,000 x 1.05 = **\$1,050,000**

Value of Japan bond = \$1,000,000 x 112.645 = 112,645,000 yen      exchange



# Exchange Rate Relationships

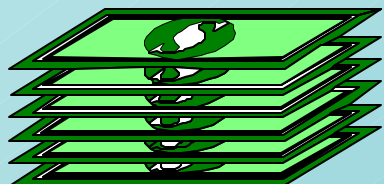
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Which bond will you prefer and why? Ignore transaction costs

---

Value of US bond = \$1,000,000 x 1.05 = **\$1,050,000**

Value of Japan bond = \$1,000,000 x 112.645 = 112,645,000 yen      exchange  
112,645,000 yen x 1.08 = 121,656,600 yen      bond pmt



# 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

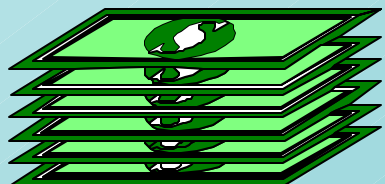
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Value of US bond = \$1,000,000 x 1.05 = **\$1,050,000**

Value of Japan bond = \$1,000,000 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

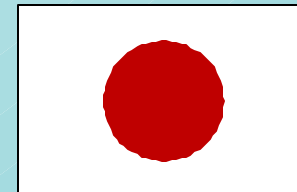
## 3) Purchasing Power Parity

$$\frac{1 + i_{\text{foreign}}}{1 + i_{\$}} = \frac{E(s_{\text{foreign} / \$})}{S_{\text{foreign} / \$}}$$

**The expected change in the spot rate equals the expected difference in inflation between the two countries.**

# Exchange Rate Relationships

## Example



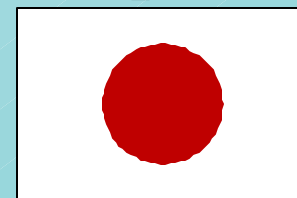
If inflation in the US is forecasted at 2.0% this year and Japan is forecasted to fall 2.5%, what do we know about the expected spot rate?

Given a spot rate of  $112.645 \text{ yen} : \$1$

# 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

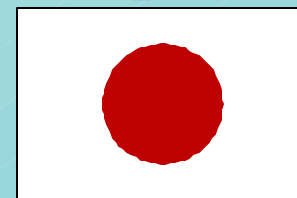


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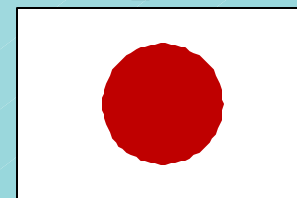
$$\frac{1 + i_{\text{foreign}}}{1 + i_{\$}} = \frac{E(s_{\text{foreign}/\$})}{S_{\text{foreign}/\$}}$$

$$\frac{1 - .025}{1 + .02} = \frac{E(s_{\text{foreign}/\$})}{112.645}$$

# 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



$$\frac{1 + i_{\text{foreign}}}{1 + i_{\$}} = \frac{E(s_{\text{foreign}/\$})}{S_{\text{foreign}/\$}}$$

$$\frac{1 - .025}{1 + .02} = \frac{E(s_{\text{foreign}/\$})}{112.645}$$

**solve for  $E_s$**

$$E_s = 107.68$$

# Exchange Rate Relationships

## 4) International Fisher effect

$$\frac{1 + r_{\text{foreign}}}{1 + r_{\$}} = \frac{1 + i_{\text{foreign}}}{1 + i_{\$}}$$

**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.

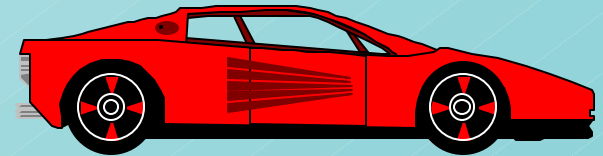
$$r(real) = \frac{1 + r_{\text{foreign}}}{1 + i_{\text{foreign}}} = \frac{1.0025}{.975} = .028$$

$$r(real) = \frac{1 + r_{\$}}{1 + i_{\$}} = \frac{1.05}{1.02} = .029$$



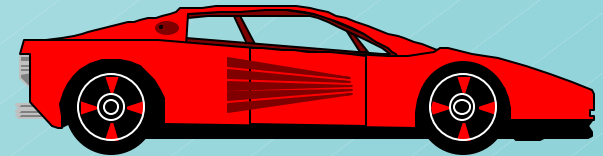
# Exchange Rate Risk

**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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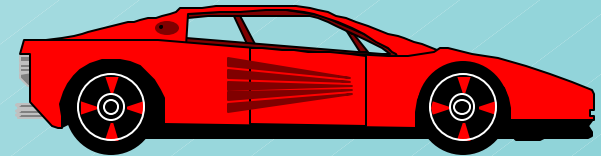


$$\underline{1,715,000} = \$16,333$$

105

# Exchange Rate Risk

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$$\underline{1,715,000} = \$16,333$$

105

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?

$$\text{\$12,000} \times 105 = 1,260,000 \text{ yen} \quad (3.78\% \text{ rise})$$



# 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

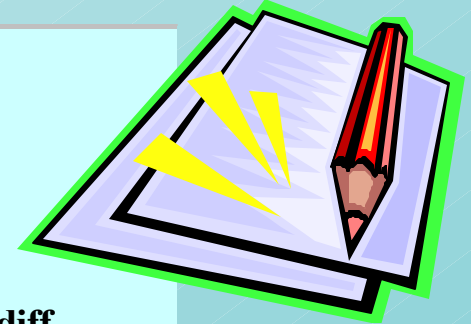
## Chapter 28



# Topics Covered

- ◆ Executive Paper Corporation
- ◆ Financial Ratios
- ◆ The DuPont System
- ◆ Financial Planning
- ◆ Growth and External Financing

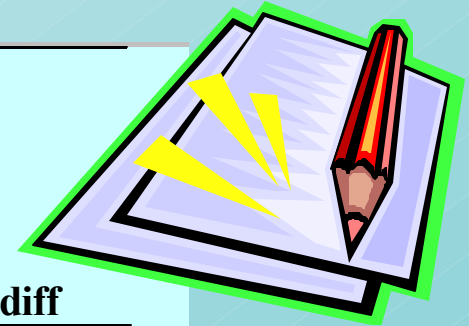
# Executive Paper



## Executive Paper Balance Sheet

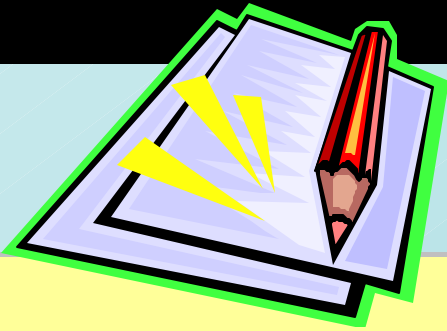
	Dec 1998	Dec 1999	diff
<i>Assets</i>			
Current Assets			
Cash & Securities	100.0	110.0	10.0
Receivables	433.1	440.0	6.9
Inventory	339.9	350.0	10.1
Total	873.0	900.0	27.0
Fixed Assets			
P, P, E	929.8	100.0	-829.8
accum Depr	396.7	450.0	53.3
Net Fixed Assets	533.1	550.0	16.9
<i>Total Assets</i>	1,406.1	1,450.0	43.9

# Executive Paper



	Dec 1998	Dec 1999	diff
<b><i>Liabilities and Equity</i></b>			
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
<b><i>Total liabilities and equity</i></b>	1,406.1	1,450.0	43.9

# Executive Paper



## *Executive Paper - Other Data*

	<i>1998</i>	<i>1999</i>
Estimated replacement 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
<b><i>Net income</i></b>	<b><i>76.00</i></b>
Dividend	45.60
Retained earnings	30.40
Earnings per share, dollars	5.37
Dividend per share, dollars	3.22

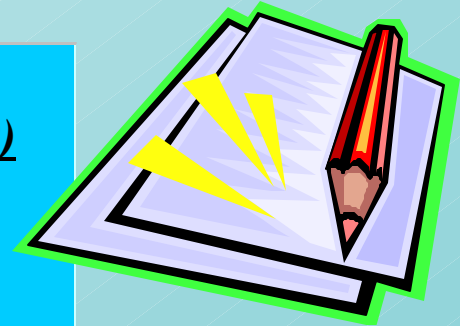


# Executive Paper

## *Executive Paper Sources and Uses of Funds (1999)*

<b>Sources:</b>	<b>\$ millions</b>
Net Income	76.00
Depreciation	53.30
Operating cash flow	129.30
Borrowing	-
Stock issues	-
<b>Total sources</b>	<b>129.30</b>

<b>Uses:</b>	
Increase in net working capital	13.50
Investment	70.20
Dividends	45.60
<b>Total uses</b>	<b>129.30</b>



# 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

$$\text{Payout ratio} = \frac{\text{dividends}}{\text{earnings}}$$

$$\begin{aligned}\text{Plowback ratio} &= \frac{\text{earnings} - \text{dividends}}{\text{earnings}} \\ &= 1 - \text{payout ratio}\end{aligned}$$

$$\text{Growth in equity from plowback} = \frac{\text{earnings} - \text{dividends}}{\text{earnings}}$$

# 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

$$\text{Price per share} = P_0 = \frac{\text{Div}_1}{r - g}$$

$$\text{Market to book ratio} = \frac{\text{stock price}}{\text{book value per share}}$$

$$\text{Tobins } Q = \frac{\text{market value of assets}}{\text{estimated replacement cost}}$$



# 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

$$\text{ROA} = \frac{\text{sales}}{\text{assets}} \times \frac{\text{EBIT} - \text{taxes}}{\text{sales}}$$

# 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

$$\text{ROE} = \frac{\text{assets}}{\text{equity}} \times \frac{\text{sales}}{\text{assets}} \times \frac{\text{EBIT} - \text{taxes}}{\text{sales}} \times \frac{\text{EBIT} - \text{taxes} - \text{interest}}{\text{EBIT} - \text{taxes}}$$

The diagram illustrates the DuPont System by breaking down Return on Equity (ROE) into four components. Each component is represented by a label in red text at the bottom, with a black arrow pointing upwards to a specific part of the ROE formula above. The components are: leverage ratio (points to assets/equity), asset turnover (points to sales/assets), profit margin (points to (EBIT - taxes)/sales), and debt burden (points to (EBIT - taxes - interest)/(EBIT - 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

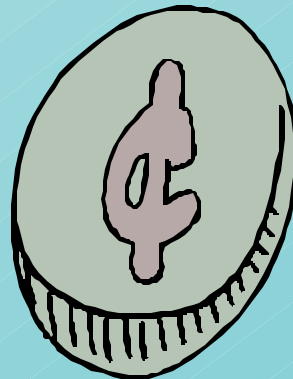
# Working Capital

**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.

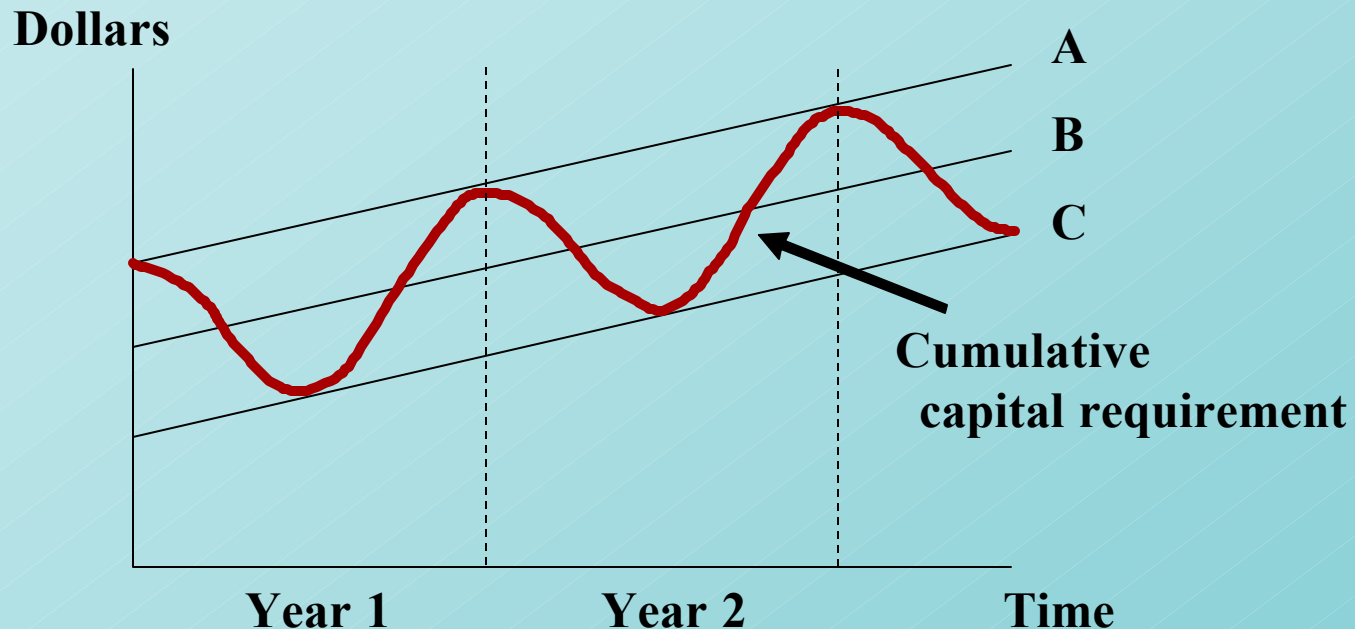
**Carrying Costs** - Costs of maintaining current assets, including opportunity cost of capital.

**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

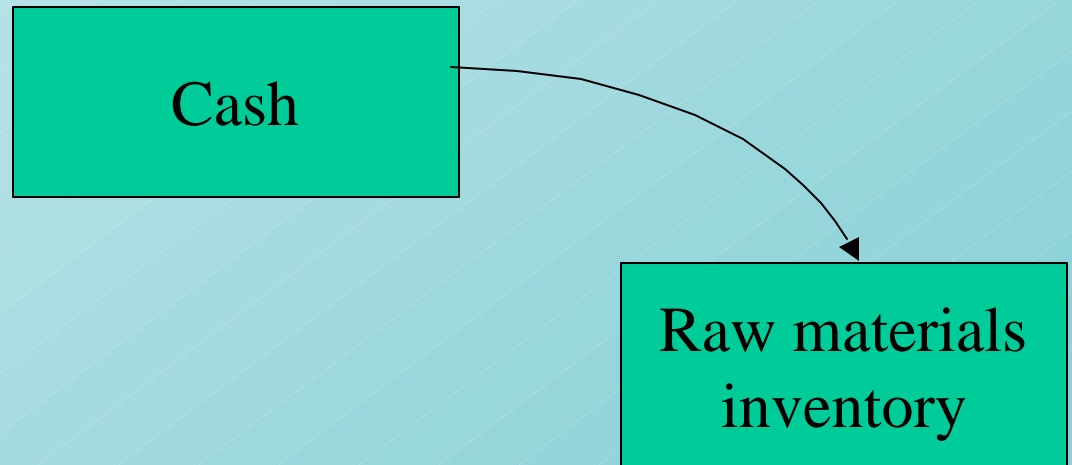
Simple Cycle of operations



Cash

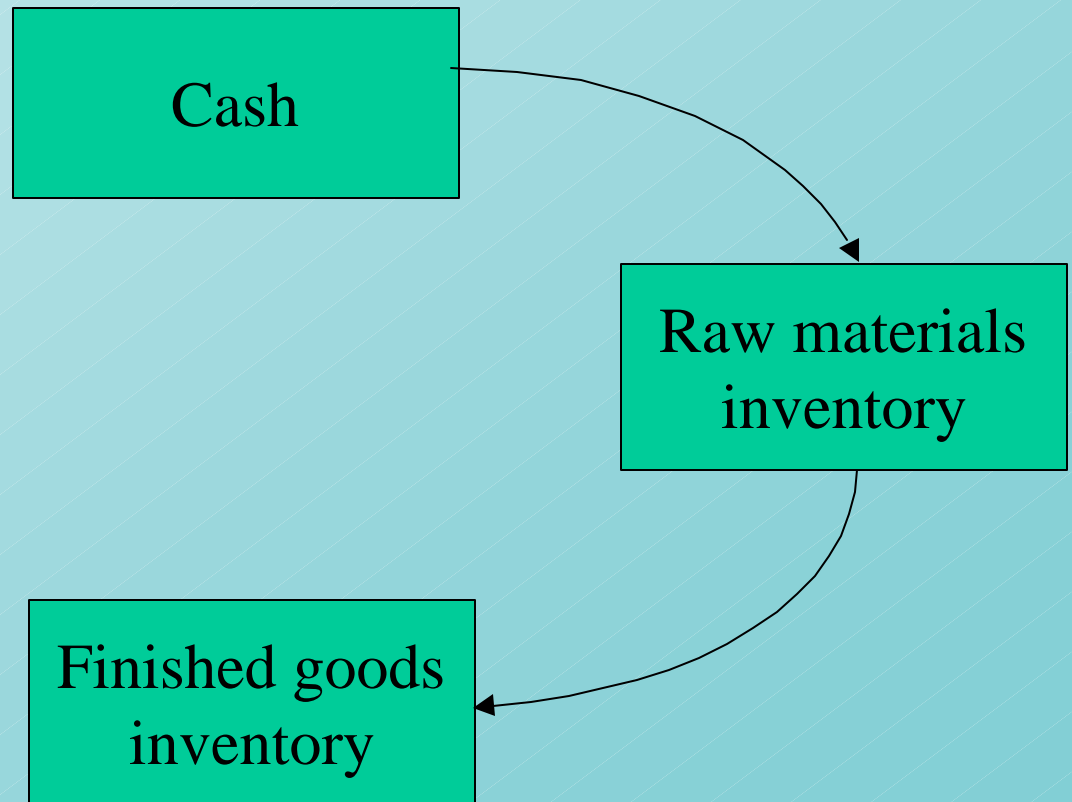
# Working Capital

Simple Cycle of operations



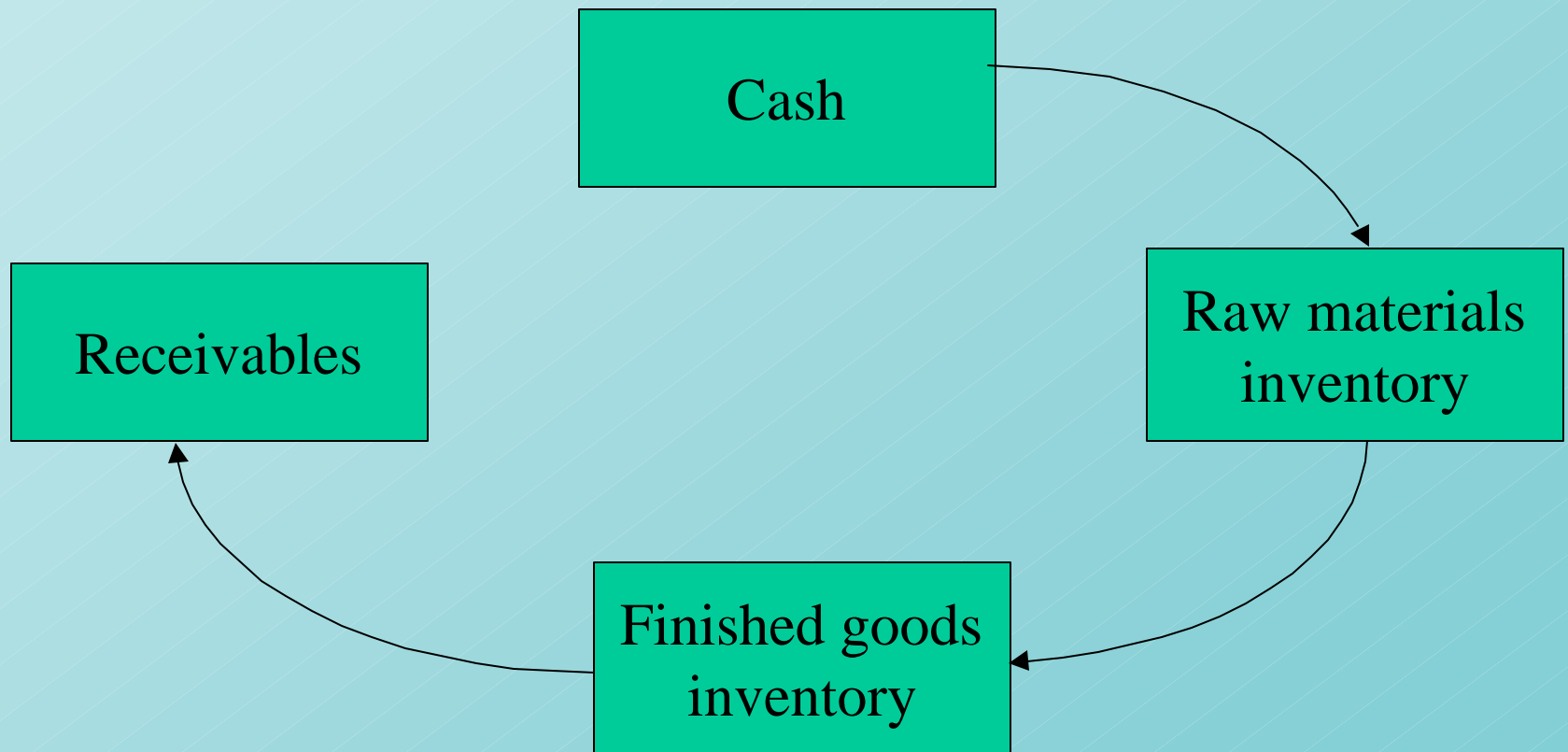
# Working Capital

Simple Cycle of operations



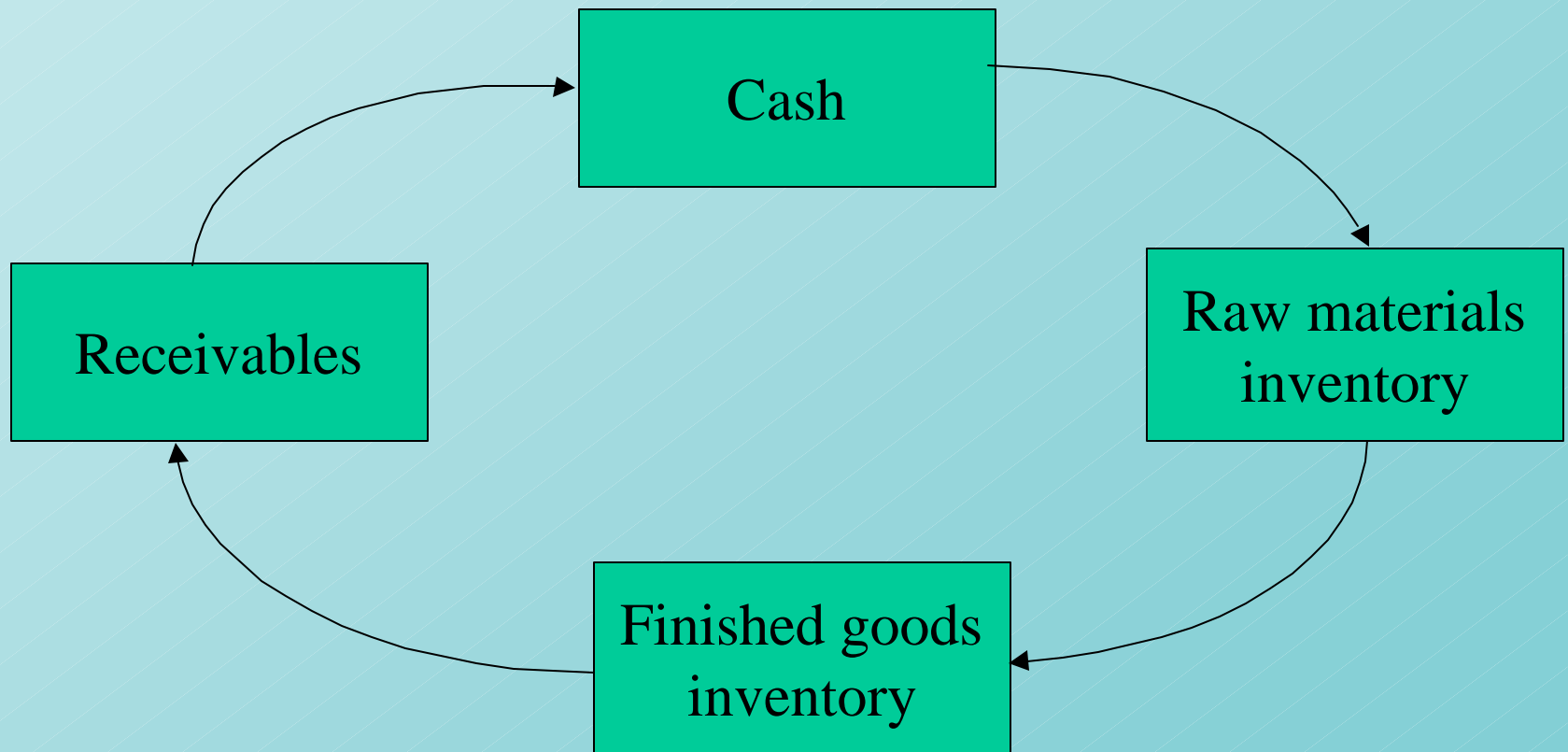
# Working Capital

Simple Cycle of operations



# Working Capital

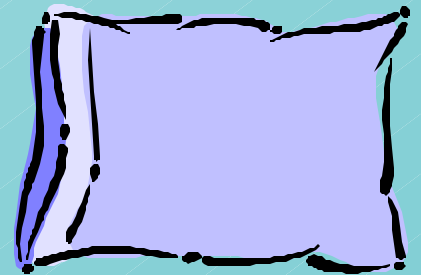
Simple Cycle of operations



# 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 Assets	95	115	Total Liab and owner's equity	95	115



# Changes in Cash & W.C.

## Example - Dynamic Mattress Company

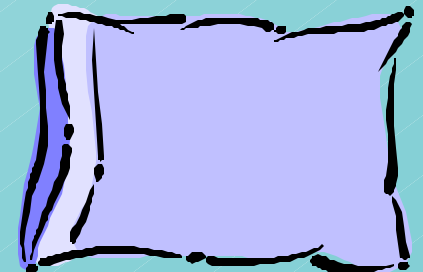
### Income Statement

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

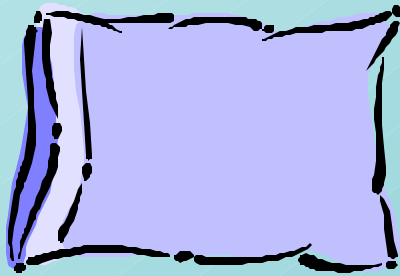
R.E.=\$11 mil





# 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
<b>Total Sources</b>	<b>\$31</b>

## Uses

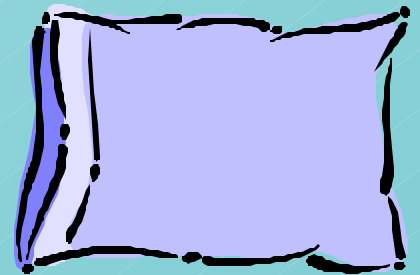
Repaid short term bank loan	5
Invested in fixed assets	14
Purchased marketable securities	5
Increased accounts receivable	5
Dividend	1
<b>Total Uses</b>	<b>\$30</b>
<b>Increase in cash balance</b>	<b>\$1</b>

# 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
<u>Total Sources</u>	<u>85.0</u>	<u>80.3</u>	<u>121.0</u>	<u>128.0</u>
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 expenditures	32.5	1.3	5.5	8.0
taxes, interest, & dividends	4.0	4.0	4.5	5.0
<u>Total uses of cash</u>	<u>131.5</u>	<u>95.3</u>	<u>95.0</u>	<u>93.0</u>
Net cash inflow	\$46.5	\$15.0	\$26.0	\$35.0
(sources minus uses)				

# Cash Budgeting

## Example - Dynamic Mattress Company



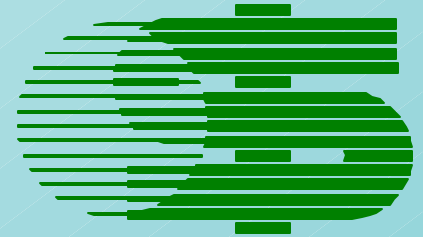
### Dynamic short term financing requirements

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*



	<u>1st</u>	<u>2nd</u>	<u>3rd</u>	<u>4th</u>
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

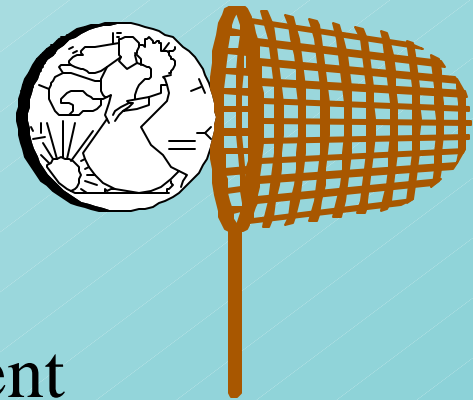
# Topics Covered

- ◆ Terms of Sale
- ◆ Commercial Credit Instruments
- ◆ Credit Analysis
- ◆ The Credit Decision
- ◆ Collection Policy
- ◆ Bankruptcy

# Terms of Sale

**Terms of Sale** - Credit, discount, and payment terms offered on a sale.

**Example -** *5/10 net 30*



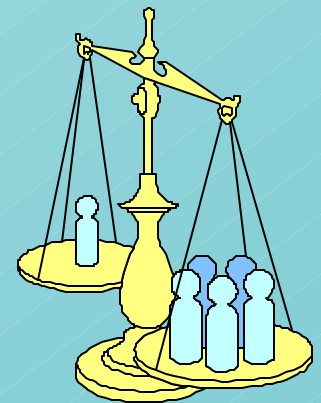
*5* - percent discount for early payment

*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.

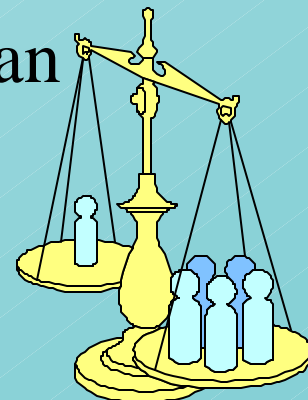


# Terms of Sale

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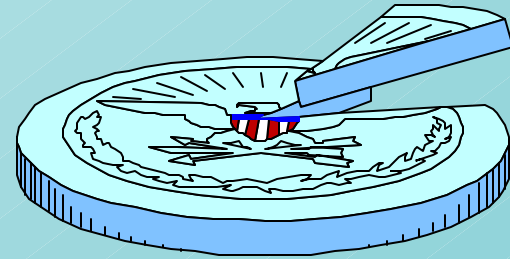
Effective annual rate

$$= \left( 1 + \frac{\text{discount}}{\text{discounted price}} \right)^{365 / \text{extra days credit}} - 1$$



# Terms of Sale

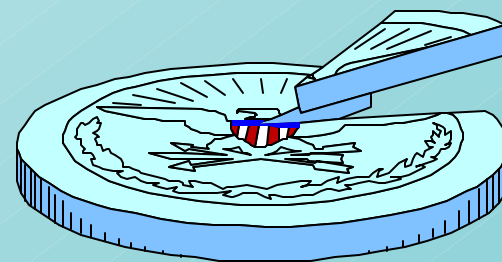
**Example** - On a \$100 sale, with terms 5/10 net 60, what is the implied interest rate on the credit given?





# 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

**Credit Analysis** - 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

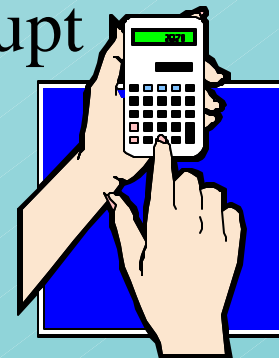
## Numerical Credit Scoring categories

- 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



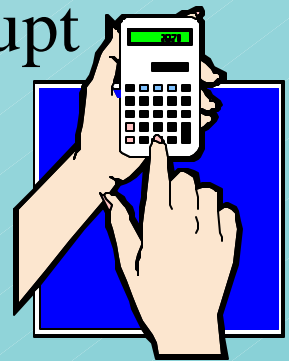
# Credit Analysis

**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

**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.



Altman Z Score formula

$$\begin{aligned}
 Z = & 3.3 \frac{\text{EBIT}}{\text{total assets}} + 1.0 \frac{\text{sales}}{\text{total assets}} + .6 \frac{\text{market value of equity}}{\text{total book debt}} \\
 & + 1.4 \frac{\text{retained earnings}}{\text{total assets}} + 1.2 \frac{\text{working capital}}{\text{total assets}}
 \end{aligned}$$

# 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?

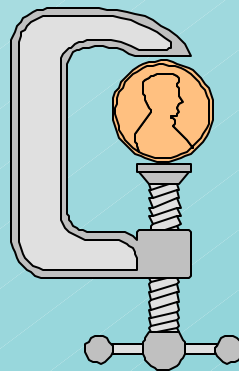
Firm' s Z Score

$$(3.3 \times .12) + (1.0 \times 1.4) + (.6 \times .9) + (1.4 \times .4) + (1.2 \times .12) = 3.04$$

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.



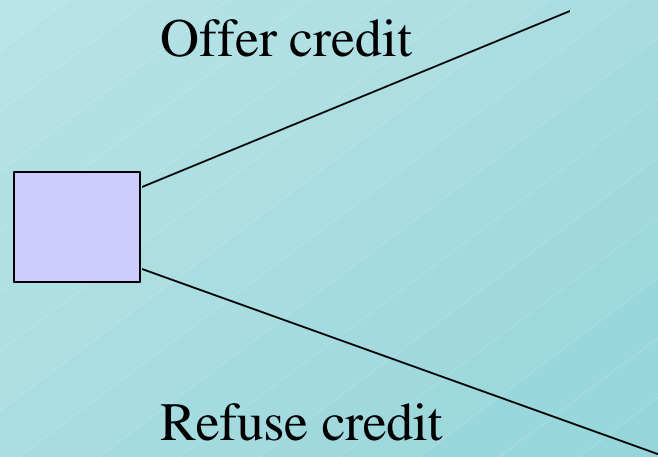
# The Credit Decision

**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.

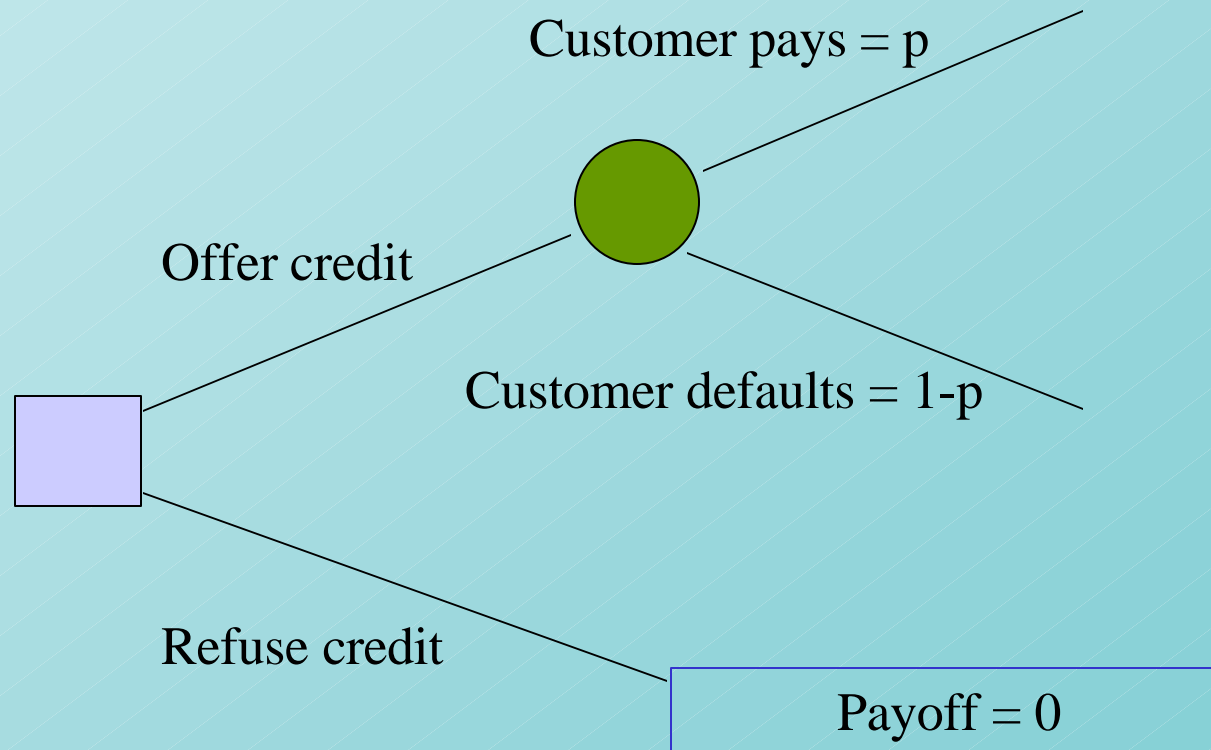
# The Credit Decision

**The credit decision and its probable payoffs**



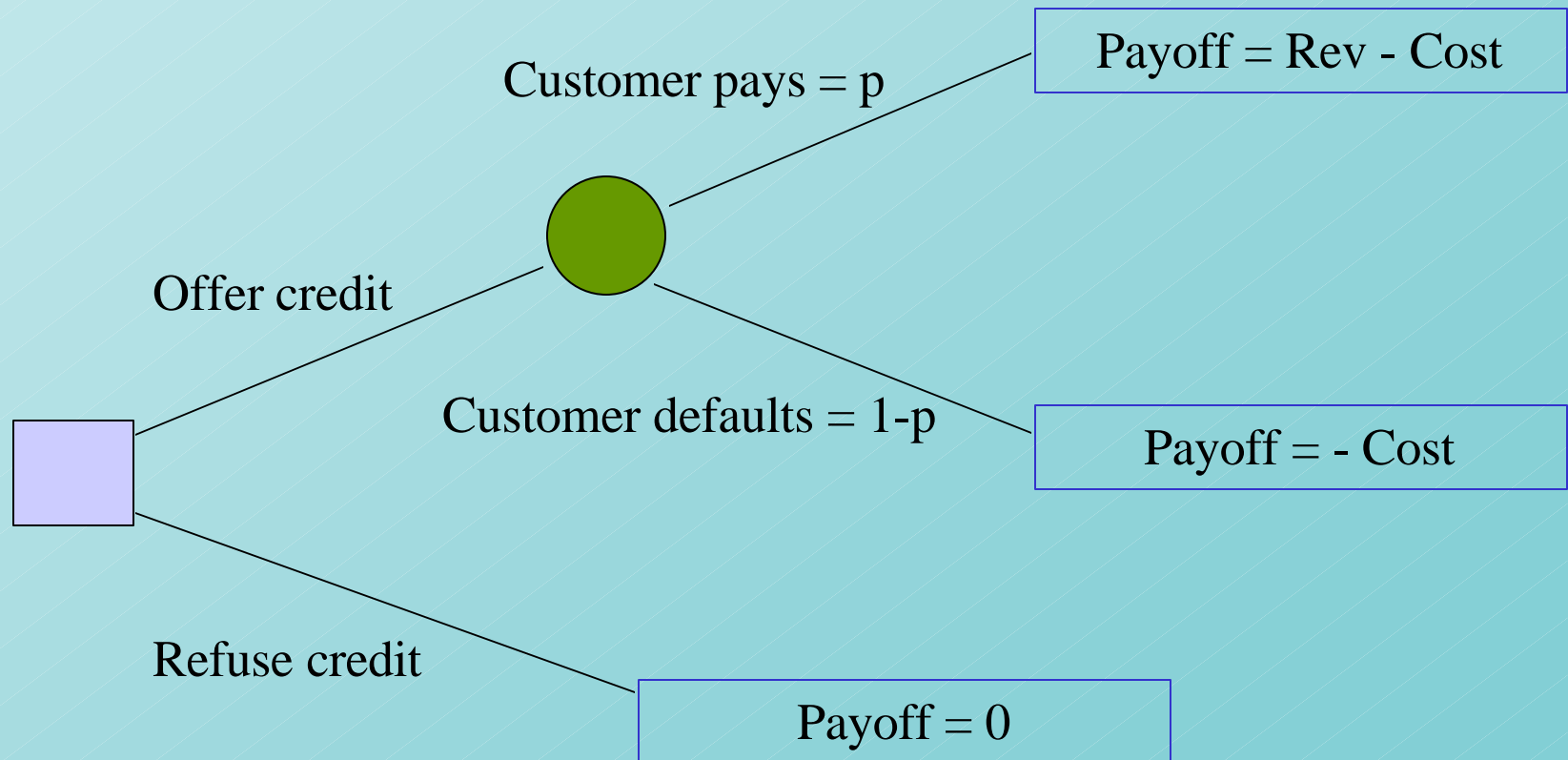
# The Credit Decision

The credit decision and its probable payoffs



# 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:

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$$p \times PV(\text{Rev} - \text{Cost}) - (1 - p) \times (PV(\text{cost}))$$



# The Credit Decision

- ◆ Based on the probability of payoffs, the expected profit can be expressed as:

$$p \times PV(\text{Rev} - \text{Cost}) - (1 - p) \times (PV(\text{cost}))$$

- ◆ The break even probability of collection is:

$$p = \frac{PV(\text{Cost})}{PV(\text{Rev})}$$

# 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

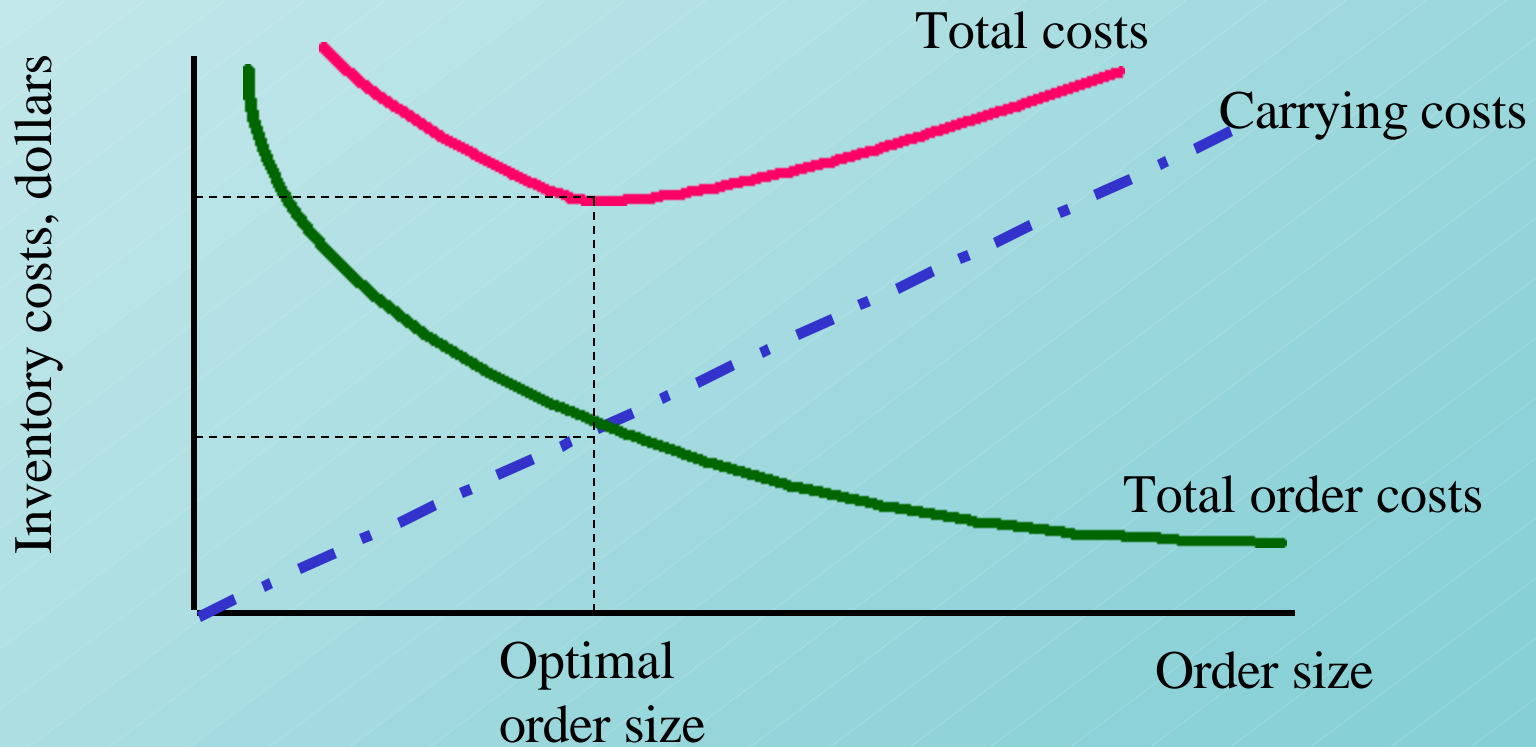
# Inventories & Cash Balances

**Economic Order Quantity** - Order size that minimizes total inventory costs.

$$\text{Economic Order Quantity} = \sqrt{\frac{2 \times \text{annual sales} \times \text{cost per order}}{\text{carrying cost}}}$$

# 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.

$$\text{Initial cash balance} = \sqrt{\frac{2 \times \text{annual cash outflows} \times \text{cost per sale of securities}}{\text{interest rate}}}$$



# Inventories & Cash Balances

- ◆ Money Market - market for short term financial assets.
  - commercial paper
  - certificates of deposit
  - repurchase agreements

# Inventories & Cash Balances



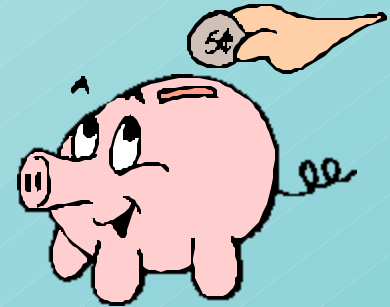
Value of bills sold =  $Q =$

$$\sqrt{\frac{2 \times \text{annual cash disbursement} \times \text{cost per sale}}{\text{interest rate}}} =$$

$$\sqrt{\frac{2 \times 1260 \times 20}{.08}} = 25$$

# 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*.

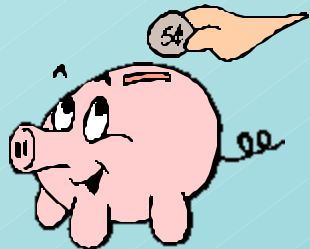


**Payment Float** - Checks written by a company that have not yet cleared.

**Availability Float** - Checks already deposited that have not yet cleared.

# Float

**Payment Float illustration** - The company issues a \$200,000 check that has not yet cleared.



# Float

**Payment Float illustration** - The company issues a \$200,000 check that has not yet cleared.

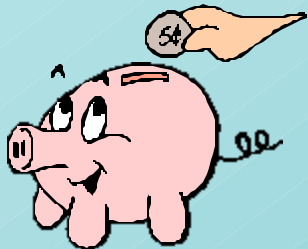
Company's ledger balance

\$800,000

+

Payment float

\$200,000



# Float

**Payment Float illustration** - The company issues a \$200,000 check that has not yet cleared.

Company's ledger balance

\$800,000

+

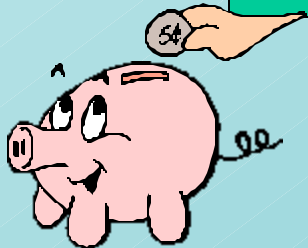
Payment float

\$200,000

equals

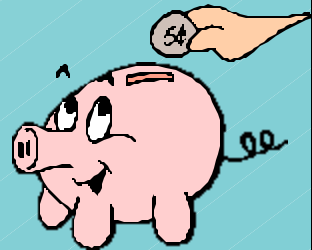
Bank's ledger balance

\$1,000,000



# Float

**Availability Float illustration** - The company deposits a \$100,000 check that has not yet cleared.



# Float

**Availability Float illustration** - The company deposits a \$100,000 check that has not yet cleared.

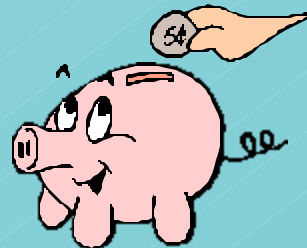
Company's ledger balance

\$900,000

+

Payment float

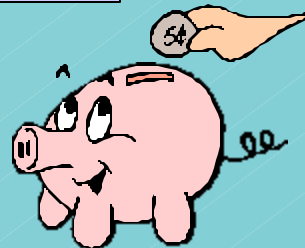
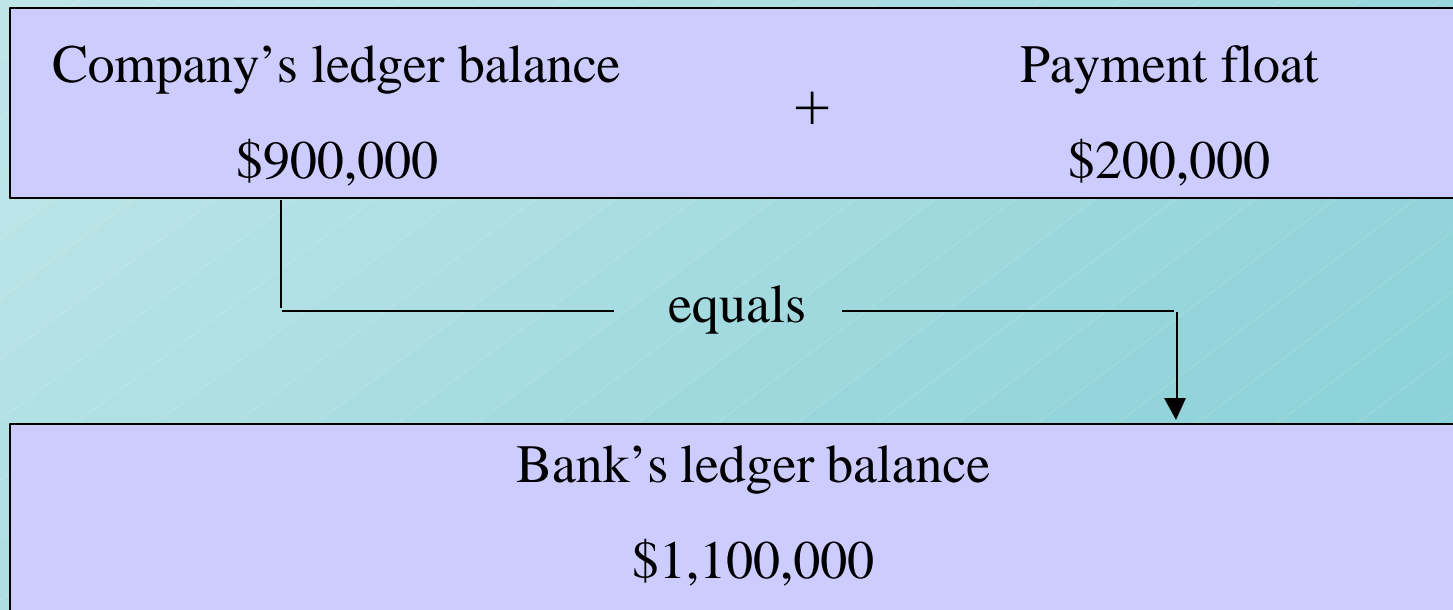
\$200,000





# Float

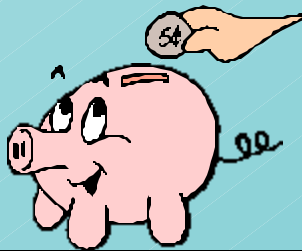
**Availability Float illustration** - The company deposits a \$100,000 check that has not yet cleared.



# Float

## Net Float illustration

Net float = payment float - availability float



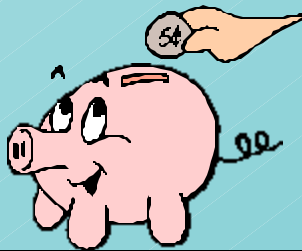
# Float

## Net Float illustration

Net float = payment float - availability float

Bank's ledger balance

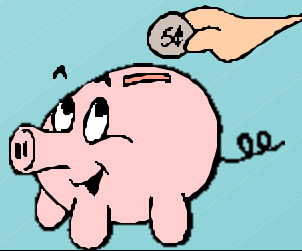
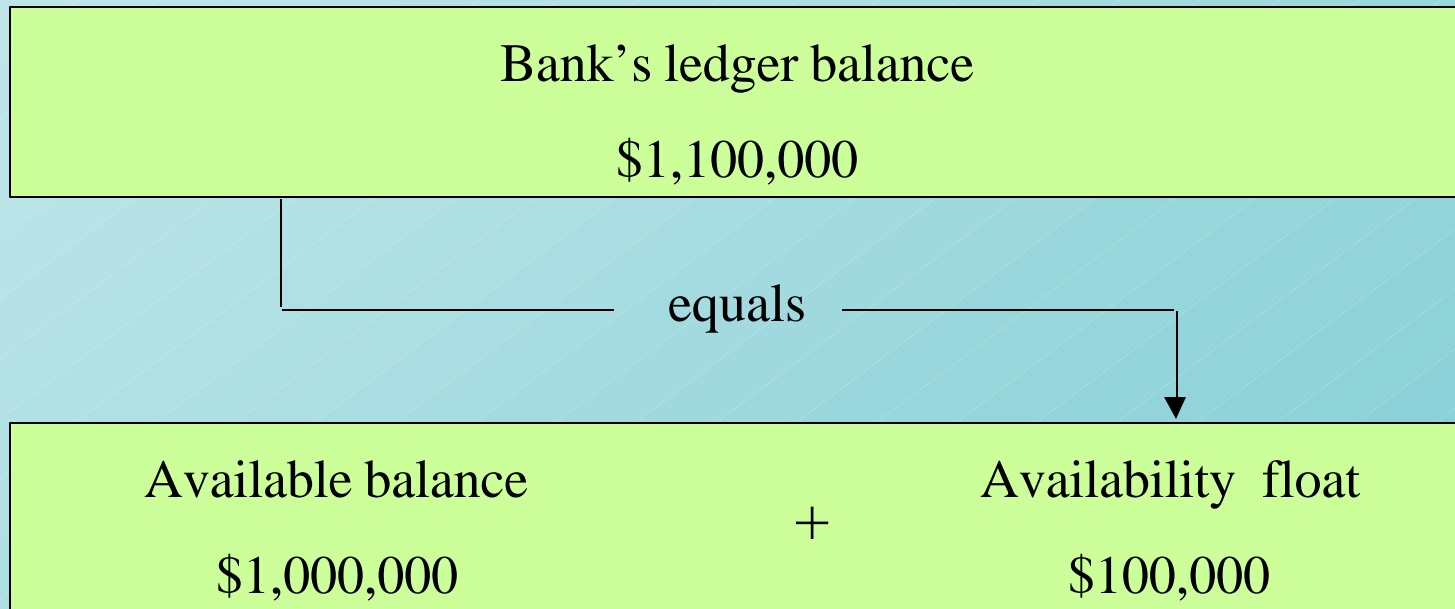
\$1,100,000



# Float

## Net Float illustration

Net float = payment float - availability float



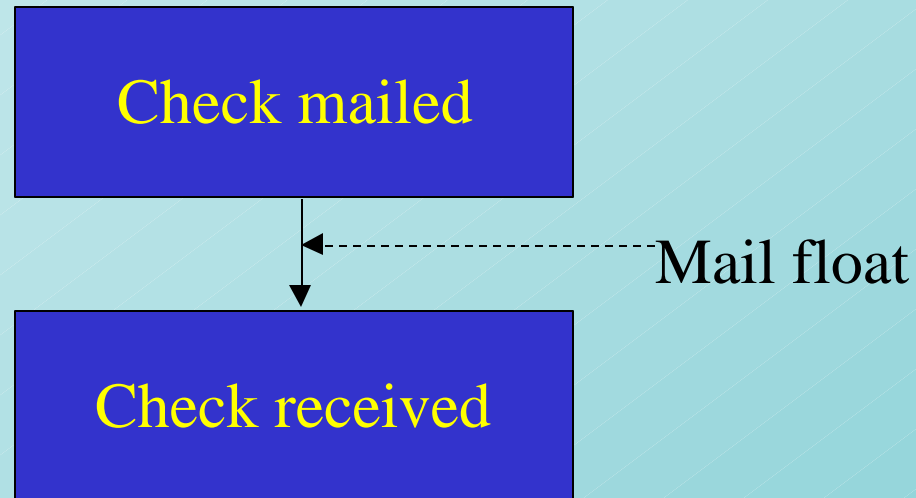
# Managing Float

- ◆ 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

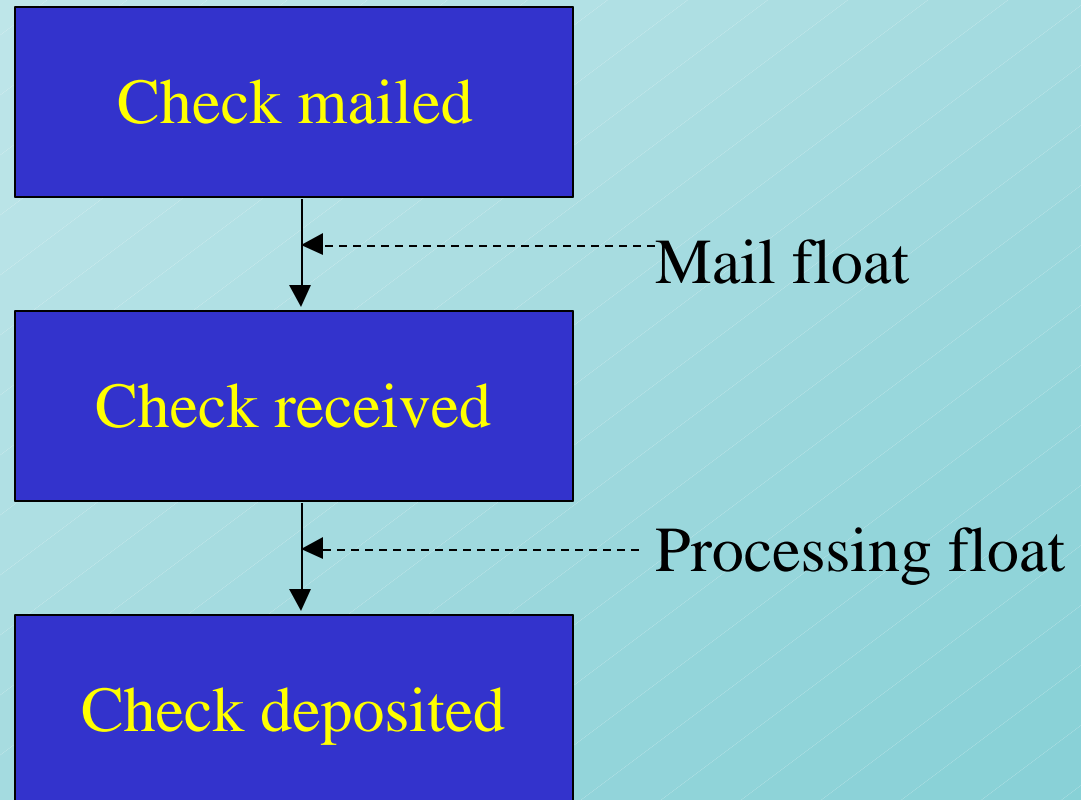
# Managing Float

Check mailed

# Managing Float

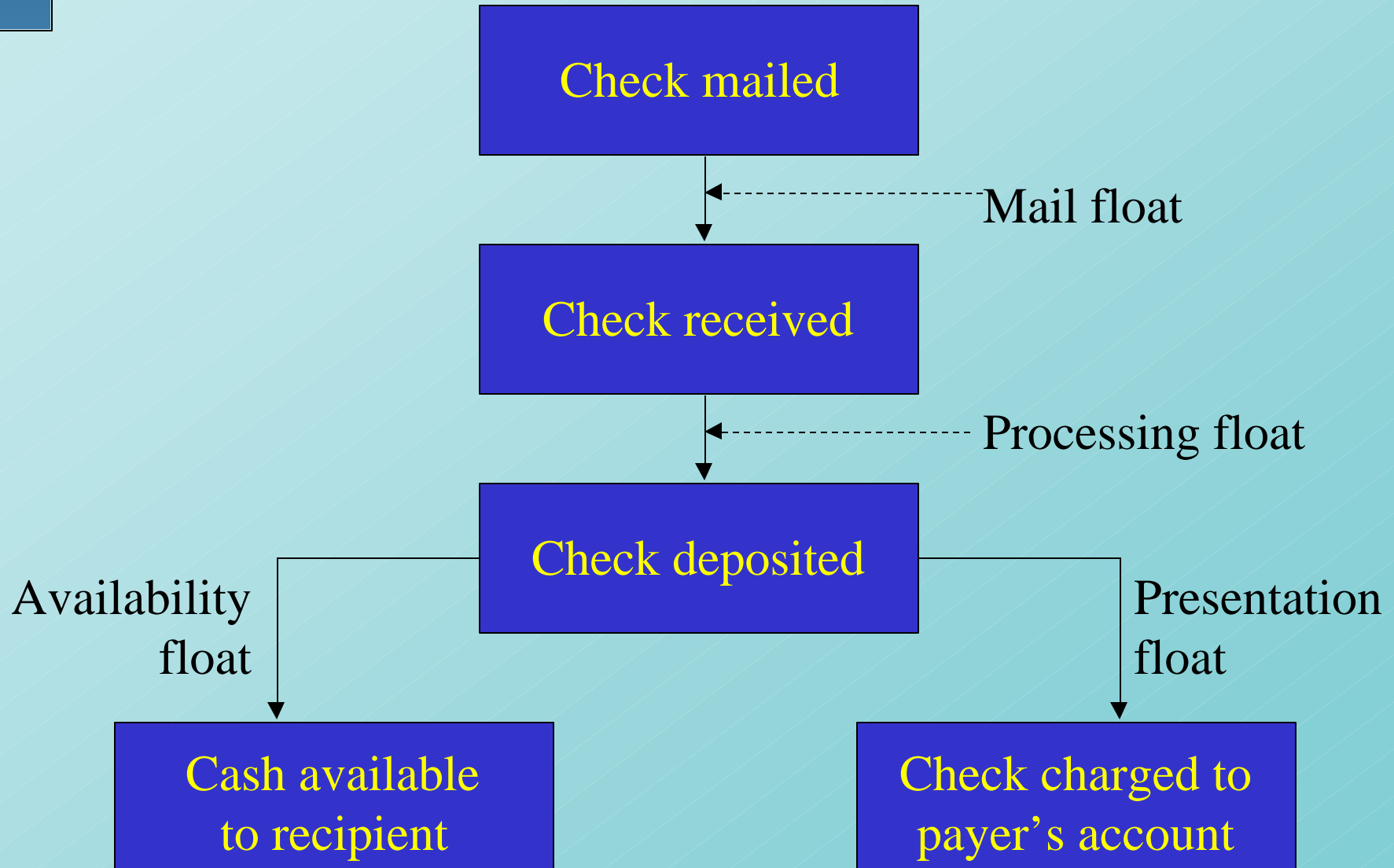


# Managing Float





# Managing Float

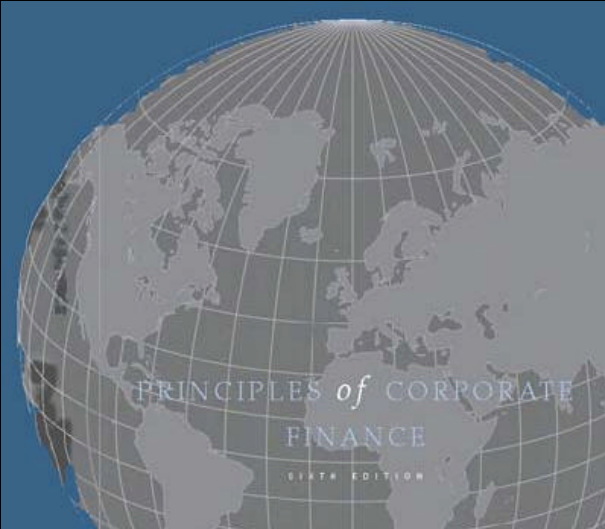


# Managing Float

**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.



# Principles of Corporate Finance

Brealey and Myers

Sixth Edition

## ◆ 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

$$\text{Amount of loan } X \times \frac{\text{annual interest rate}}{\text{number of periods in the year}}$$

# Cost of Short-Term Loans

## Simple Interest

$$\text{Amount of loan } X \times \frac{\text{annual interest rate}}{\text{number of periods in the year}}$$

## Effective annual rate

$$\left( 1 + \frac{\text{quoted annual interest rate}}{n} \right)^n - 1$$

# Cost of Short-Term Loans

## Discount Interest

$$\text{Face value of loan} \times \left( 1 - \frac{\text{quoted annual interest rate}}{\text{number of periods in the year}} \right)$$



# Calculating Yields

## Example

In January of 1999, 91-day T-bills were issued at a discount of 4.36%.

1. Price of bill =  $100 - 91/360 \times 4.36 = 98.898$
2. 91-day return =  $(100 - 98.898) / 98.898 = 1.11\%$
3. Annual return =  $1.11 \times 365/91 = 4.47\%$  simple interest

*or*

$$(1.0111)^{365/91} - 1 = 4.55\% \text{ compound interest}$$

# Money Market Investments

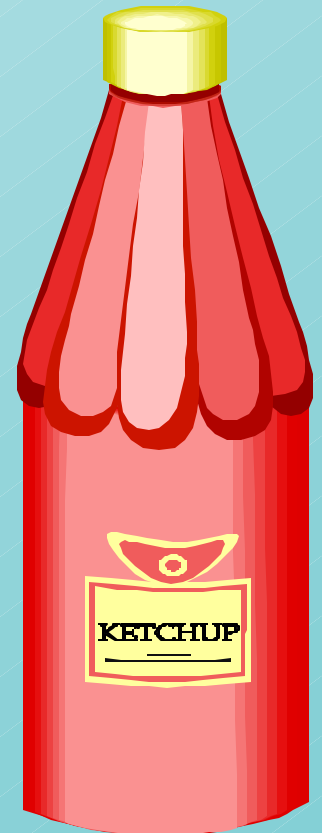
- ◆ US Treasury Bills
- ◆ Federal Agency Securities
- ◆ Short-Term Tax-Exempts
- ◆ Bank Time Deposits and CDs
- ◆ Commercial Paper
- ◆ Medium Term Notes
- ◆ Bankers' Acceptances
- ◆ Repos



# Credit Rationing

*Example* - Henrietta Ketchup

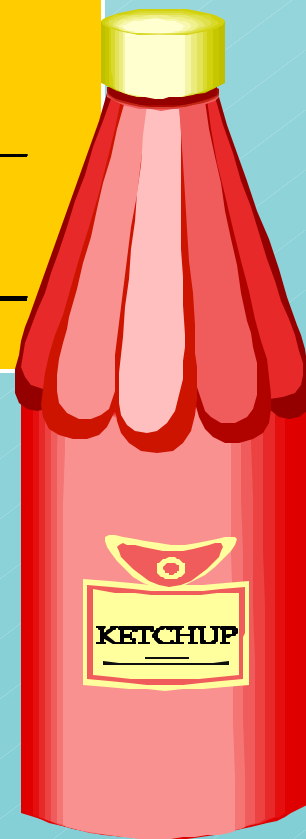
	Investments	Payoff	Prob. of Payoff
<b>Project 1</b>	-12	15	1
<b>Project 2</b>	-12	24 or 0	.5 or .5



# Credit Rationing

*Example* - Henrietta Ketchup

	Expected Payoff to Bank	Expected Payoff to Ms. Ketchup
<b>Project 1</b>	110	15
<b>Project 2</b>	$(.5 \times 10) + (.5 \times 0) = +5$	$.5 \times (24 - 10) = +7$



# Credit Rationing

## *Example* - Henrietta Ketchup

	Expected Payoff to Bank	Expected Payoff to Ms. Ketchup
<b>Project 1</b>	5	10
<b>Project 2</b>	$(.5 \times 5) + (.5 \times 0) = +2.5$	$.5 \times (24 - 5) = +9.5$





# Principles of Corporate Finance

Brealey and Myers

Sixth Edition

## ◆ 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

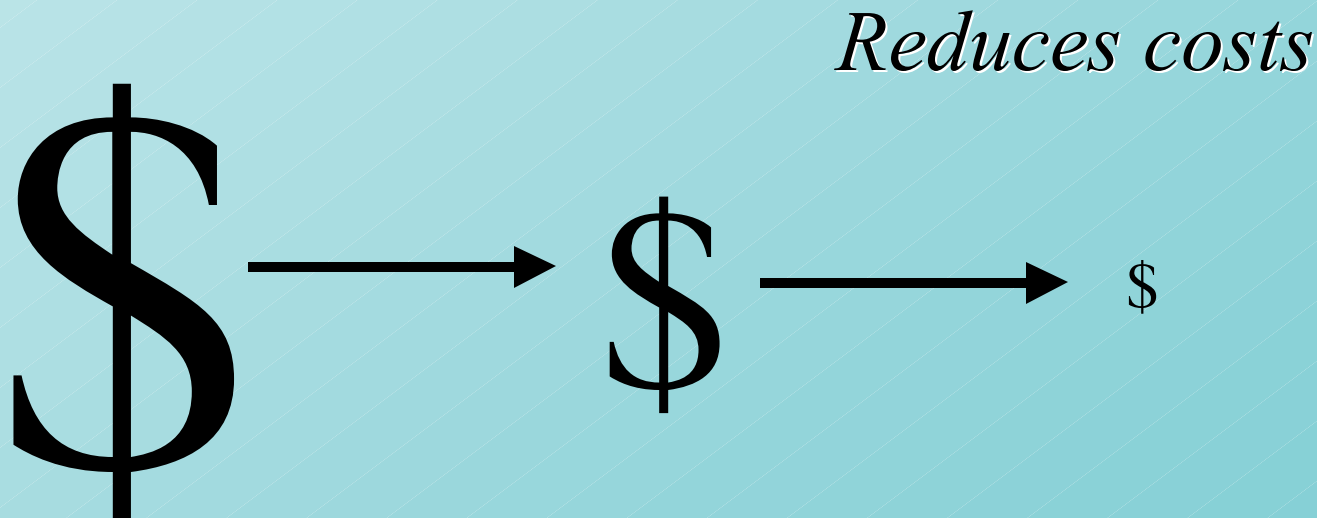
<u>Selling Company</u>	<u>Acquiring Company</u>	<u>Payment, billions of dollars</u>
NYNEX	Bell Atlantic	21.0
McDonnell Douglas	Boeing	13.4
Digital Equipment	Compaq Computer	9.1
Schweizerischer	Union Bank of Swiz.	23.0
Energy Group PCC	Texas Utilities	11.0
Amoco Corp.	British Petroleum	48.2
Sun America	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.



# Sensible Reasons for Mergers

## Economies of Vertical Integration

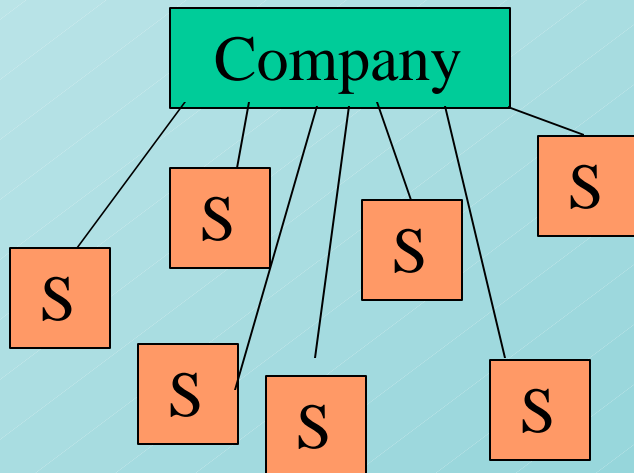
- Control over suppliers “may” reduce costs.
- Over integration can cause the opposite effect.

# Sensible Reasons for Mergers

## Economies of Vertical Integration

- Control over suppliers “may” reduce costs.
- Over integration can cause the opposite effect.

Pre-integration  
(less efficient)

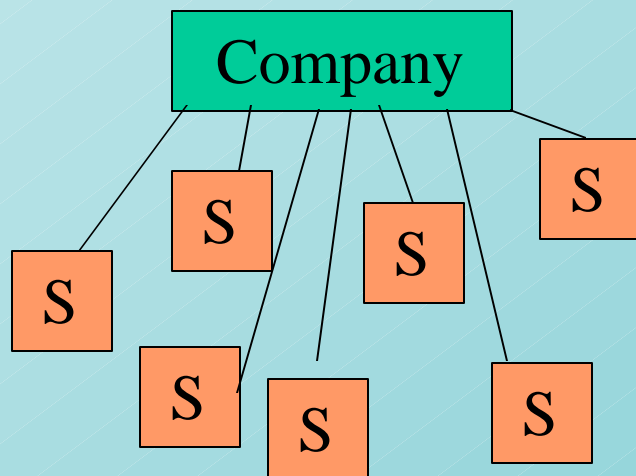


# Sensible Reasons for Mergers

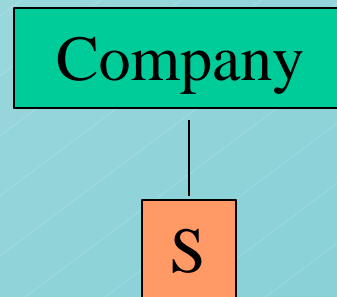
## Economies of Vertical Integration

- Control over suppliers “may” reduce costs.
- Over integration can cause the opposite effect.

### Pre-integration (less efficient)



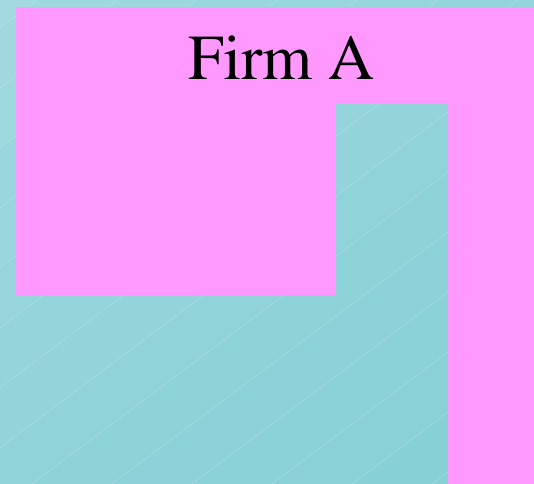
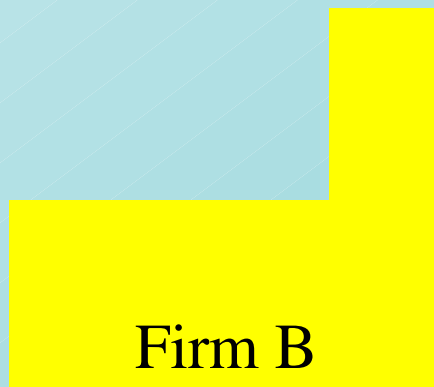
### Post-integration (more efficient)



# Sensible Reasons for Mergers

## Combining Complementary Resources

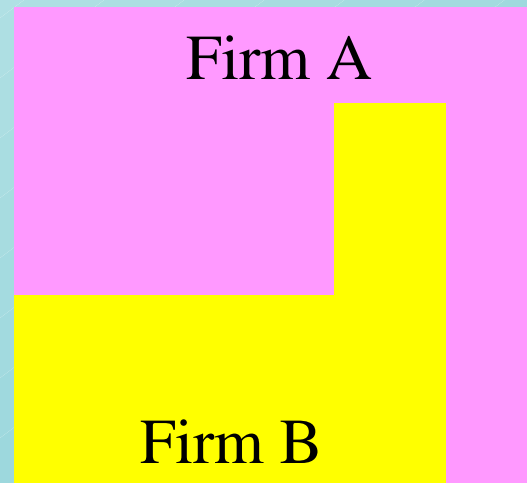
Merging may result in each firm filling in the “missing pieces” of their firm with pieces from the other firm.



# 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.



# 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

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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)

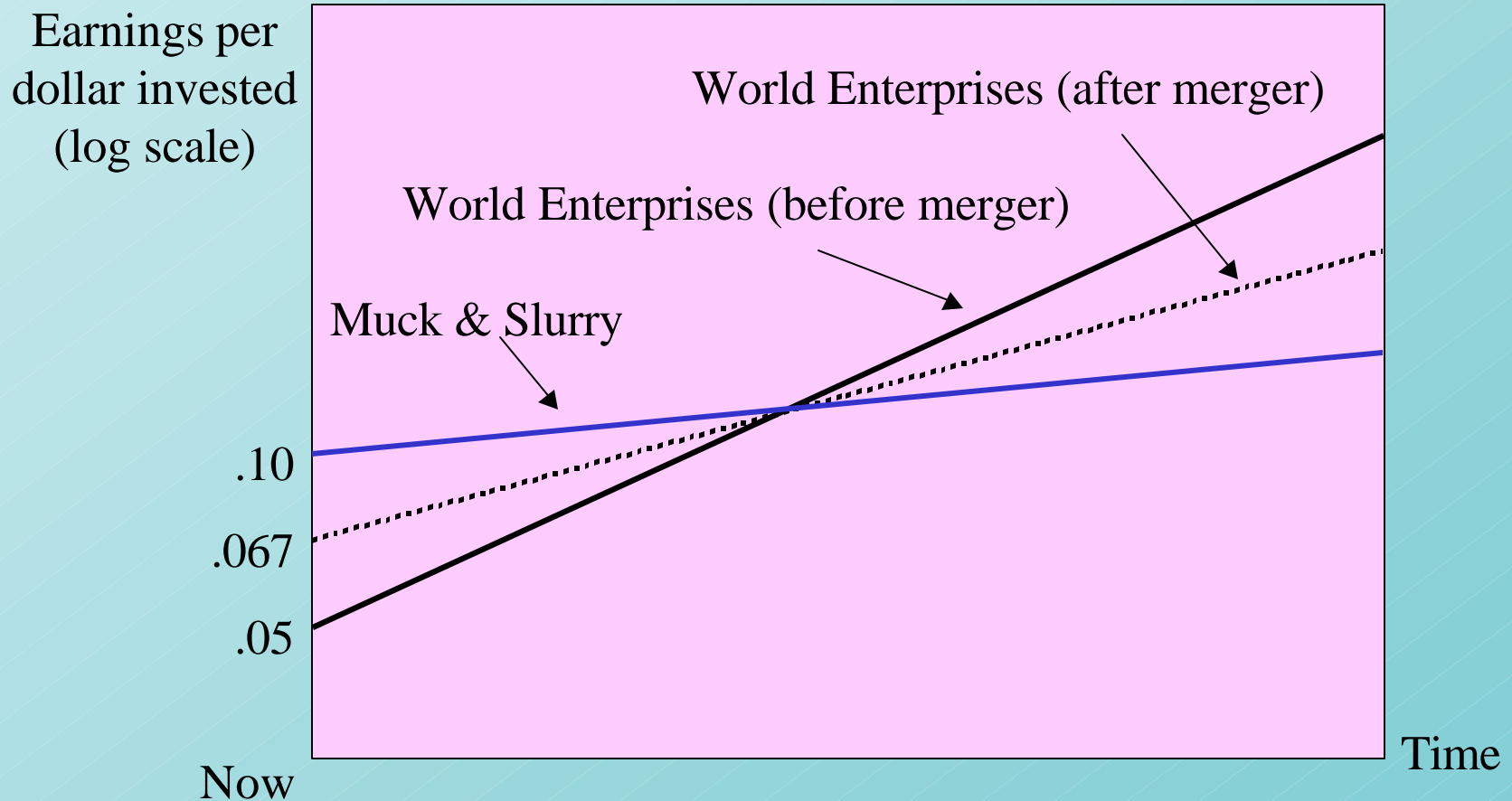


After merger, acquiring firm has short term EPS rise



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

Economic Gain = 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.

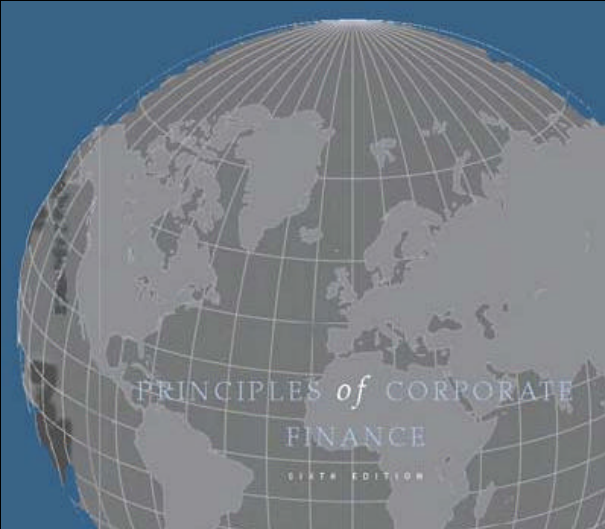


**Shark Repellent** - Amendments to a company charter made to forestall takeover attempts.

**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.







# Principles of Corporate Finance

Brealey and Myers

Sixth Edition

## ◆ 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

<i>Acquirer</i>	<i>Target</i>	<i>Year</i>	<i>Price (\$bil)</i>
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

## Investment Phase

General Partner put up  
1% of capital



Mgmt fees

Limited  
partners put in  
99% of capital



Partnership

Investment in  
diversified  
portfolio of  
companies



Company 1

Company 2

Company N

## Payout Phase

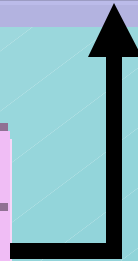
General Partner get carried  
interest in 20% of profits

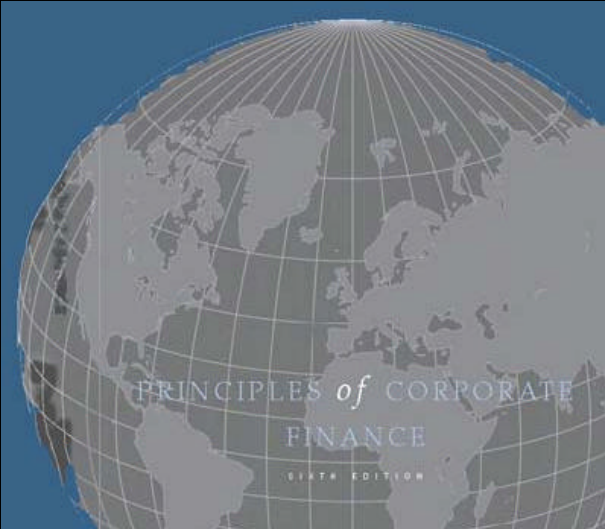
Limited  
partners get  
investment  
back, then 80%  
of profits



Partnership

Sale or IPO of  
companies





# Principles of Corporate Finance

Brealey and Myers

Sixth Edition

## ◆ 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?