Chapter 2

Financial Statements & Cash Flow Analysis

Net Worth

A firm has $8 million in total assets. It has $3 million in current liabilities, $2 million in long-term debt, and $1 million in preferred stock. What is the reported net worth (i.e., the reported common equity)?

• Total assets	$8,000,000
• Current liabilities	$3,000,000
• Long-term debt	$2,000,000
• Preferred stock	$1,000,000

Net worth = common equity = $2,000,000

EBITDA

A firm has $2,000,000 million in earnings before taxes. The firm has an interest expense of $300,000 and depreciation of $200,000; it has no amortization. What is its EBITDA?

Earnings before taxes	**$2,000,000**
Interest	**$300,000**
Depreciation	**$200,000**
Amortization	**$0**

EBITDA	**$2,500,000**

Now suppose a firm has the following information: $7 million in sales, $4 million of costs of goods sold excluding depreciation & amortization, $500,000 of other operating expenses. What is its EBITDA?

Sales	**$7,000,000**
Costs of goods sold excluding depreciation and amortization	**$4,000,000**
Other operating expenses	**$500,000**

EBITDA	**$2,500,000**

EBITDA is sometimes used as a proxy for Free Cash Flow.

It is not accurate enough to use EBITA to get an accurate valuation and to know the true cash flows of the company.

However, it is an approximation and is used widely enough as a proxy, that you should know about it.

Why is EBITDA sometimes confusing?

- This is the way it **should** look on the Income Statement

	Sales	10,000,000	
	Cost of Goods Sold	(5,000,000)	
	Gross Margin	5,000,000	
	SG&A Expenses	(1,500,000)	
(Operating Income)	Earnings BEFORE Interest Taxes Depreciation Amt	**3,500,000**	EBITDA
	Interest Expense	(300,000)	
	Depreciation	(200,000)	
	Amortization	-	
(Profit Margin)	Earnings AFTER Interest Depreciation Amt	3,000,000	
	Taxes (25% rate)	(750,000)	
(Net Income)	Earnings after Taxes	2,250,000	

Why is EBITDA sometimes confusing?

- This is the way it **usually** looks on the Income Statement

Sales	10,000,000
Cost of Goods Sold	(5,000,000)
Gross Margin	5,000,000
SG&A Expenses	(1,500,000)
Interest Expense	(300,000)
Depreciation	(200,000)
Amortization	-
Profit Margin	3,000,000
Taxes (25% rate)	(750,000)
Net Income	2,250,000
EBITDA	**3,500,000**

What is free cash flow?

- FCF is the amount of cash available from operations for distribution to all investors (including stockholders and debtholders) after making the necessary investments to support operations.

Why is it important?

- A company’s value depends on the amount of FCF it can generate.

Free Cash Flow

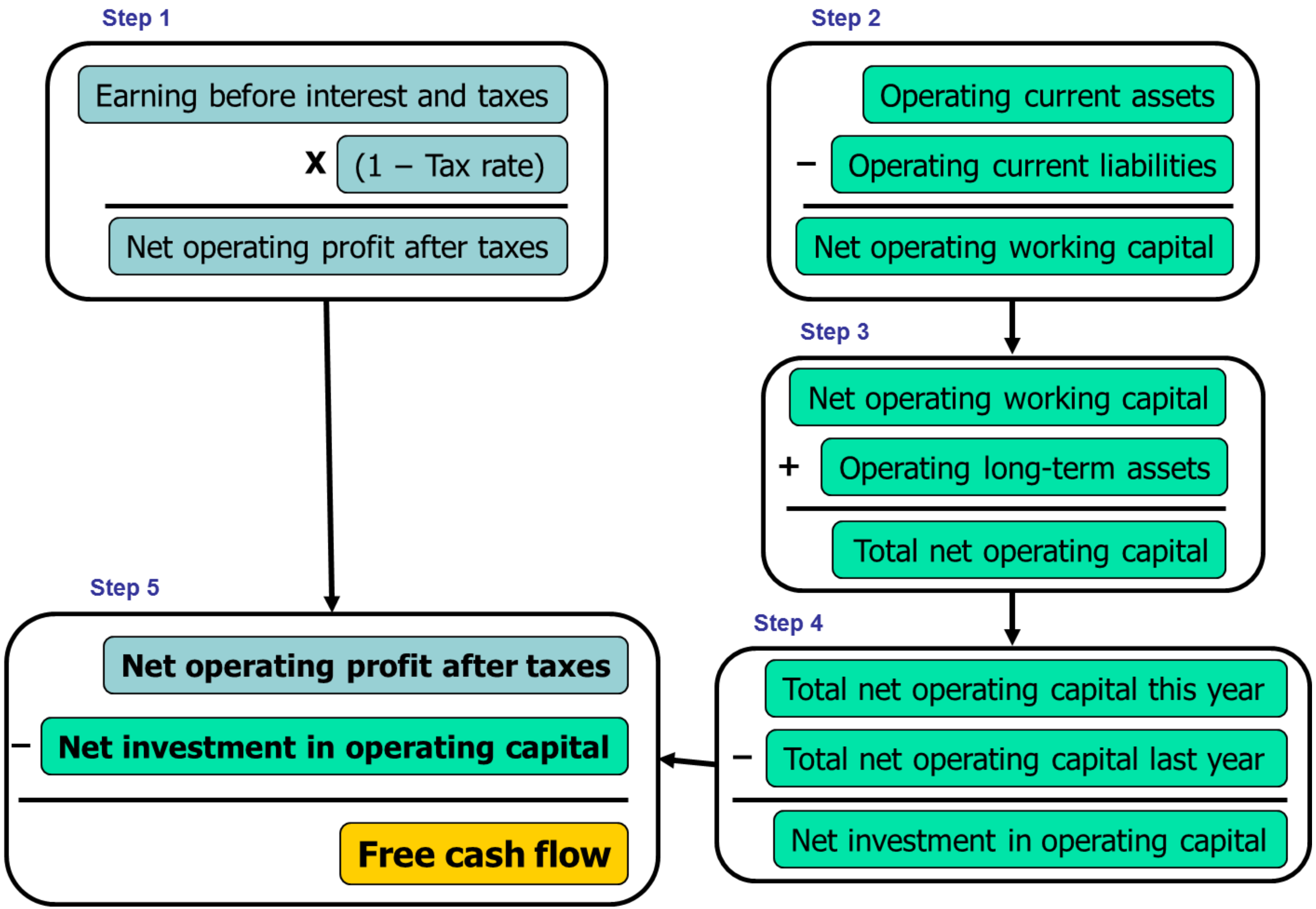
A firm has net income of $5 million. Assuming that depreciation of $1 million is its only noncash expense, what is the firm's net cash flow?							
Net income		**$5,000,000**					
Depreciation		**$1,000,000**					

Net cash flow	**$6,000,000**

What are the five uses of FCF?

1. Pay interest on debt.
2. Pay back principal on debt.
3. Pay dividends.
4. Buy back stock.
5. Buy nonoperating assets (e.g., marketable securities, investments in other companies, etc.)

Calculating Free Cash Flow in 5 Easy Steps



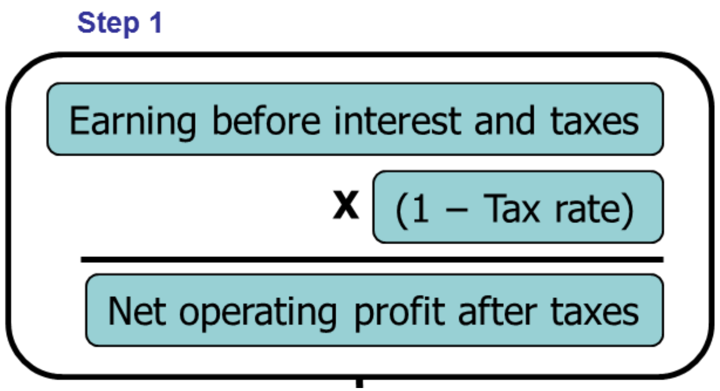
Step 1: NOPAT

What is NOPAT?

- Net operating profit after tax (NOPAT) is a company's potential cash earnings if it had no debt.
- NOPAT is a calculation that allows analysts to compare company performance without the influence of debt. In this way, it is a more accurate measure of pure operating efficiency.
- The figure doesn't include one-time losses or charges; these don't provide a true representation of a company's true profitability.
- NOPAT measures the efficiency of a leveraged company's operations.

Step 1: Net Operating Profit After Taxes: NOPAT

Sales	10,000,000
Cost of Goods Sold	5,000,000
Depreciation	1,400,000
Other Operating Expenses	2,000,000
Interest Expense	1,000,000
Tax Rate	25%



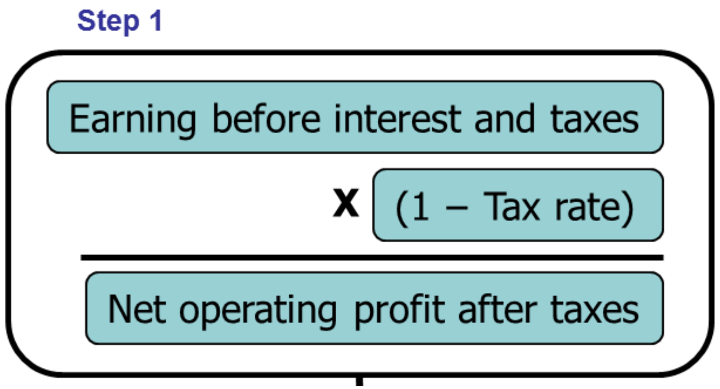
Calculation: NOPAT = EBIT * (1-Tax Rate)

Step 1: Find the EBIT

Step 2: Find the NOPAT

Net Operating Profit After Taxes: NOPAT

Sales	10,000,000
Cost of Goods Sold	5,000,000
Depreciation	1,400,000
Other Operating Expenses	2,000,000
Interest Expense	1,000,000
Tax Rate	25%



Step 1	**Find the EBIT**	
	Sales	10,000,000
	Less: COGS	(5,000,000)
	Less: Dep	(1,400,000)
	Less: OpEx	(2,000,000)
	EBIT	**1,600,000**
Step 2	**NOPAT**	**1,200,000**

Interest Rate is not deducted. Why?

Step 2: Net Operating Working Capital (NOWC)

Step 2

Operating current assets

− Operating current liabilities

Net operating working capital

What are operating current assets and current liabilities?

What are operating current assets?

- Operating current assets are the CA needed to support operations.
  - Operating Current Assets **include**: cash, inventory, receivables.
  - Operating Current Assets **exclude**: short-term investments, because these are not a part of operations.

- Operating current liabilities are the liabilities resulting as a normal part of operations.
  - Operating Current Liabilities **include**: accounts payable and accruals.
  - Operating Current Liabilities **exclude**: notes payable, because this is a source of financing, not a part of operations.

Operating Current Assets

Cash	500,000
Short-term Investments	2,500,000
Accounts Receivable	1,200,000
Inventories	1,000,000
Net Plant and Equipment	4,000,000

Current Assets	
Cash	500,000
Accounts Receivable	1,200,000
Inventories	1,000,000
Current Assets	**2,700,000**

Why not ST Investments or Plant?

Calculation: Current Assets = Cash + AR + Inventories

Operating Current Liabilities?

Accounts Payable	1,000,000
Notes Payable	1,100,000
Short-Term Debt	1,400,000
Accruals	500,000
Long-Term Bonds	3,000,000

Current Liabilities	
Accounts Payable	1,000,000
Accruals	500,000
Current Liabilities	**1,500,000**

Why not any debt?

Calculation: Current Liabilities = AP + Accruals

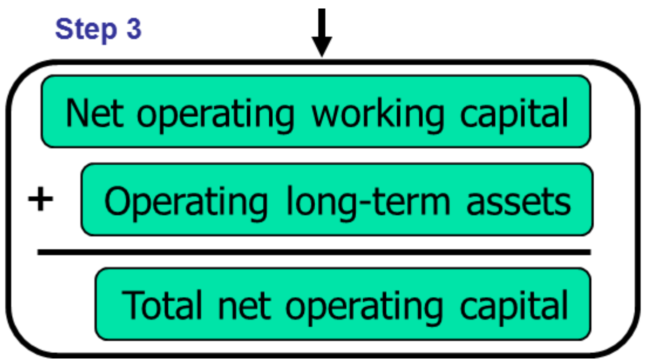
Step 2: Net Operating Working Capital (NOWC)

NOWC = Operating CA – Operating CL

Current Assets	2,700,000
Current Liabilities	1,500,000
Long-Term Bonds	3,000,000
Net Plant and Equipment	7,800,000
Other long-term Operating Assets	1,000,000

NOWC	
Current Assets	2,700,000
Current Liabilities	(1,500,000)
NOWC	**1,200,000**

Step 3: Total Operating Working Capital



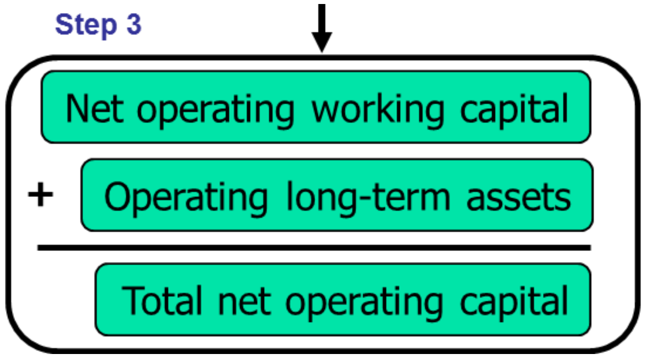
Total Operating Capital= NOWC + Net fixed assets.

Step 3: Total Net Operating Capital

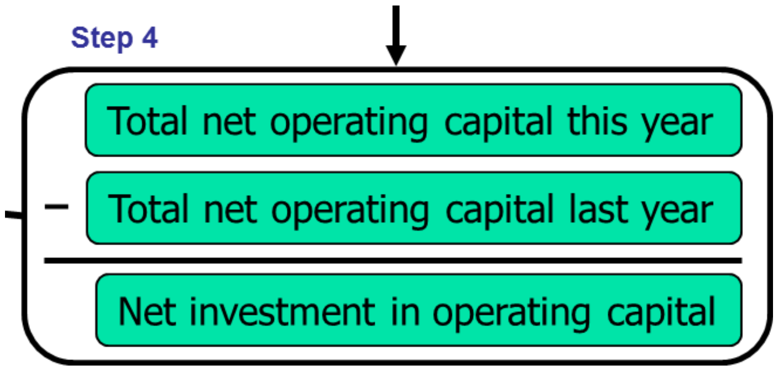
Current Assets	2,700,000
Current Liabilities	1,500,000
Long-Term Bonds	3,000,000
Net Plant and Equipment	7,800,000
Other long-term Operating Assets	1,000,000

NOWC	
Current Assets	2,700,000
Current Liabilities	(1,500,000)
NOWC	**1,200,000**

Total Operating Capital	
NOWC	1,200,000
Net Fixed Assets	7,800,000
Other long-term Operating Assets	1,000,000
Total Operating Capital	**10,000,000**



Step 4: Net Investment in Operating Capital

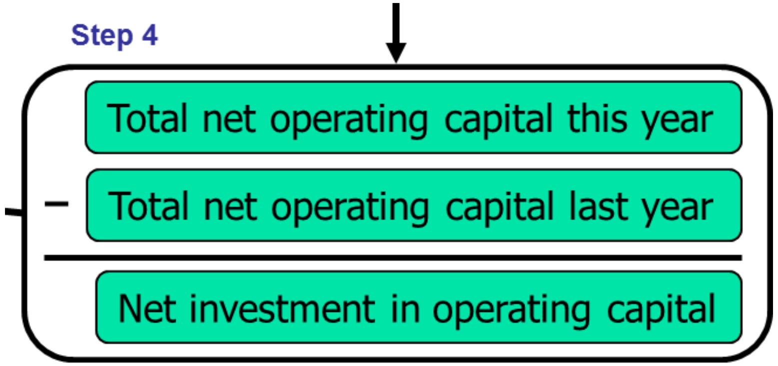


Total net operating capital this year –
Total net operating capital last year =
Net investment in operating capital

Step 4: Net Investment in Operating Capital

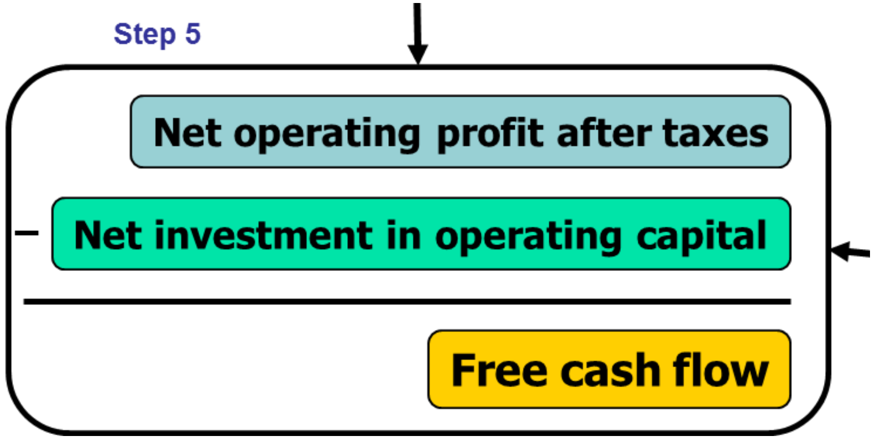
Total Operating Capital	
NOWC	1,200,000
Net Fixed Assets	7,800,000
Other long-term Operating Assets	1,000,000
Total Operating Capital (this year)	**10,000,000**
Total net operating capital (last year) =	9,000,000

Net investment in operating capital = 1,000,000



Step 5: Calculate Free Cash Flow

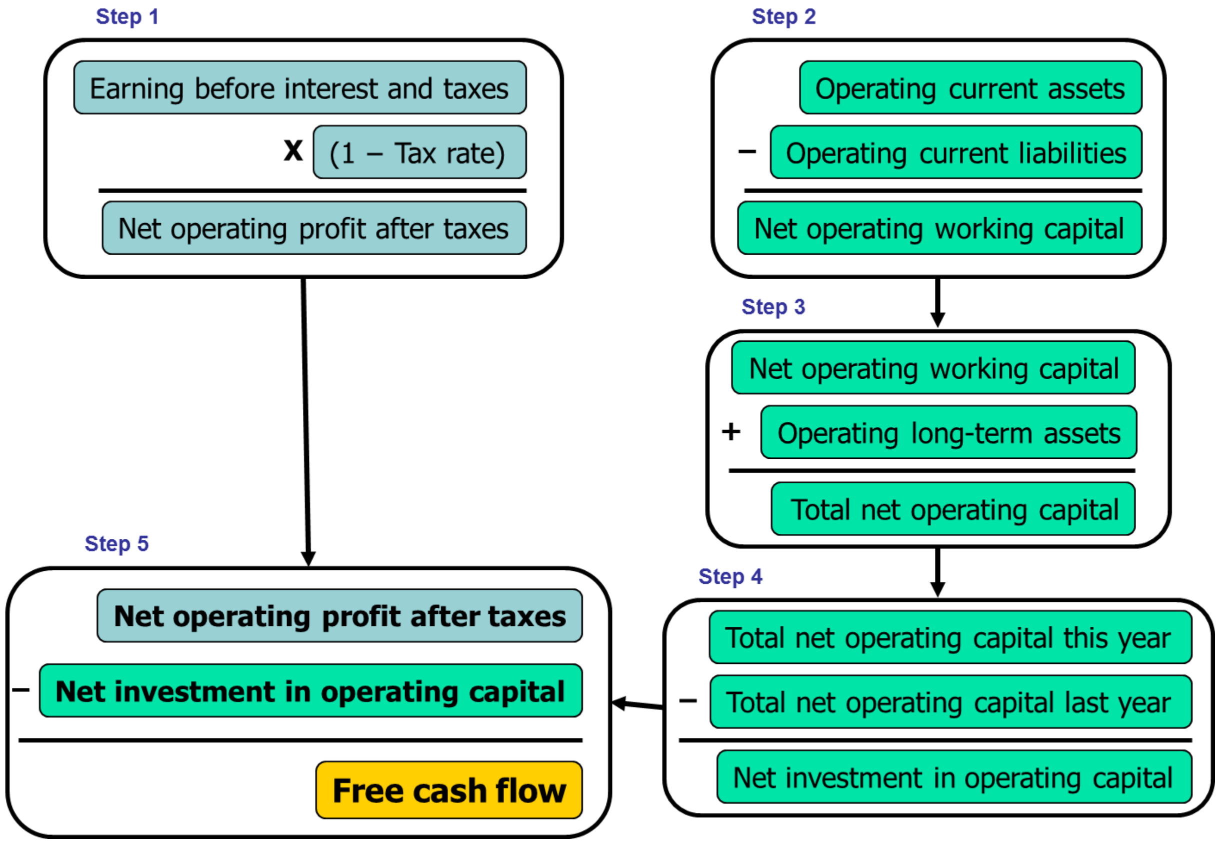
Sales	10,000,000
Less: COGS	(5,000,000)
Less: Dep	(1,400,000)
Less: OpEx	(2,000,000)
EBIT	**1,600,000**
NOPAT	**1,200,000**
Total Net Operating Capital **this** year	10,000,000
Total Net Operating Capital **last** year	(9,000,000)
Net Investment in Operating Capital	**1,000,000**
Free Cash Flow:	**200,000**



Summary of Free Cash Flow

Putting it all together: Find the Free Cash Flow

Sales	10,000,000
EBIT	1,600,000
Tax Rate	25%
Operating Current Assets	2,700,000
Operating Current Liabilities	1,500,000
Operating Long-Term Assets	8,800,000
Total Net Operating Capital **Last** Year	9,000,000



Step 1: Find the NOPAT

Sales	10,000,000
EBIT	1,600,000
Tax Rate	25%
Operating Current Assets	2,700,000
Operating Current Liabilities	1,500,000
Operating Long-Term Assets	8,800,000
Total Net Operating Capital **Last** Year	9,000,000

Step 1	**Find the NOPAT**	
	EBIT	1,600,000
	Tax Rate	25%
	NOPAT	**1,200,000**

Step 2: Find the NOWC

Sales	10,000,000
EBIT	1,600,000
Tax Rate	25%
Operating Current Assets	2,700,000
Operating Current Liabilities	1,500,000
Operating Long-Term Assets	8,800,000
Total Net Operating Capital **Last** Year	9,000,000

Step 1	**Find the NOPAT**	
	EBIT	1,600,000
	Tax Rate	25%
	NOPAT	**1,200,000**

Step 2	**Find the NOWC**	
	Operating Current Assets	2,700,000
	Operating Current Liabilities	1,500,000
	NOWC	**1,200,000**

Step 3: Find the Total Net Operating Capital

Sales	10,000,000
EBIT	1,600,000
Tax Rate	25%
Operating Current Assets	2,700,000
Operating Current Liabilities	1,500,000
Operating Long-Term Assets	8,800,000
Total Net Operating Capital **Last** Year	9,000,000

Step 1	**Find the NOPAT**	
	EBIT	1,600,000
	Tax Rate	25%
	NOPAT	**1,200,000**

Step 2	**Find the NOWC**	
	Operating Current Assets	2,700,000
	Operating Current Liabilities	1,500,000
	NOWC	**1,200,000**

Step 3	**Find the Total Net Operating Capital**	
	NOWC	1,200,000
	Operating Long-Term Assets	8,800,000
	Total Net Operating Capital (this year)	**10,000,000**

Step 4: Find the Net Investment in Operating Capital

Sales	10,000,000
EBIT	1,600,000
Tax Rate	25%
Operating Current Assets	2,700,000
Operating Current Liabilities	1,500,000
Operating Long-Term Assets	8,800,000
Total Net Operating Capital **Last** Year	9,000,000

Step 1	**Find the NOPAT**	
	EBIT	1,600,000
	Tax Rate	25%
	NOPAT	**1,200,000**

Step 2	**Find the NOWC**	
	Operating Current Assets	2,700,000
	Operating Current Liabilities	1,500,000
	NOWC	**1,200,000**

Step 3	**Find the Total Net Operating Capital**	
	NOWC	1,200,000
	Operating Long-Term Assets	8,800,000
	Total Net Operating Capital (this year)	**10,000,000**

Step 4	**Find the Net Investment in Operating Capital**	
	Total Net Operating Capital **this** year	10,000,000
	Total Net Operating Capital **last** year	(9,000,000)
	Net Investment in Operating Capital	**1,000,000**

Step 5: Calculate the Free Cash Flow

Sales	10,000,000
EBIT	1,600,000
Tax Rate	25%
Operating Current Assets	2,700,000
Operating Current Liabilities	1,500,000
Operating Long-Term Assets	8,800,000
Total Net Operating Capital **Last** Year	9,000,000

Step 1	**Find the NOPAT**	
	EBIT	1,600,000
	Tax Rate	25%
	NOPAT	**1,200,000**

Step 2	**Find the NOWC**	
	Operating Current Assets	2,700,000
	Operating Current Liabilities	1,500,000
	NOWC	**1,200,000**

Step 3	**Find the Total Net Operating Capital**	
	NOWC	1,200,000
	Operating Long-Term Assets	8,800,000
	Total Net Operating Capital (this year)	**10,000,000**

Step 4	**Find the Net Investment in Operating Capital**	
	Total Net Operating Capital **this** year	10,000,000
	Total Net Operating Capital **last** year	(9,000,000)
	Net Investment in Operating Capital	**1,000,000**

Step 5	**Free Cash Flow**	
	NOPAT (step 1)	1,200,000
	Net Investment in Operating Capital (step 4)	(1,000,000)
	Total Free Cash Flow	**200,000**

Is this a healthy Free Cash Flow?

Sales	10,000,000
EBIT	1,600,000
Tax Rate	25%
Operating Current Assets	2,700,000
Operating Current Liabilities	1,500,000
Operating Long-Term Assets	8,800,000
Total Net Operating Capital **Last** Year	9,000,000

Depends upon the industry in which this company operates

Step 5	**Free Cash Flow**		
	NOPAT (step 1)	1,200,000	17% NOPAT Margin
	Net Investment in Operating Capital (step 4)	(1,000,000)	
	Total Free Cash Flow	**200,000**	2% Net Margin

Return on Invested Capital (ROIC)

- Return on invested capital (ROIC) assesses a company's efficiency in allocating capital to profitable investments.
- ROIC gives a sense of how well a company is using its capital to generate profits.
- Comparing a company's ROIC with its weighted average cost of capital (WACC) reveals whether invested capital is being used effectively.

Return on Invested Capital (ROIC)

$$\text{ROIC} = \frac{\text{NOPAT}}{\text{Total operating capital}}$$

ROIC?

Sales	200,000,000
NOPAT	12,000,000
Net Income	8,000,000
Net Operating Working Capital	10,000,000
Total Net Operating Capital	100,000,000
Total Assets	110,000,000

ROIC	
NOPAT	12,000,000
Total Net Operating Capital	100,000,000
ROIC	**12%**

The firm's cost of capital is 10%. Did the growth add value?

- Yes. The ROIC of 12% is greater than the WACC of 10%. Investors did get the return they require.

- Note: High growth usually causes negative FCF (due to investment in capital), but that's ok if ROIC > WACC.

Mini Case

Chapter 2

Computron’s Financial Statements

Computron's Balance Sheets (Millions of Dollars)	2018	2019
Assets		
Cash and equivalents	$ 60	$ 50
Short-term investments	100	10
Accounts receivable	400	520
Inventories	620	820
Total current assets	$ 1,180	$ 1,400
Gross fixed assets	$ 3,900	$ 4,820
Less: Accumulated depreciation	1,000	1,320
Net fixed assets	$ 2,900	$ 3,500
Total assets	$ 4,080	$ 4,900
Liabilities and equity		
Accounts payable	$ 300	$ 400
Notes payable	50	250
Accruals	200	240
Total current liabilities	$ 550	$ 890
Long-term bonds	800	1,100
Total liabilities	$ 1,350	$ 1,990
Common stock	1,000	1,000
Retained earnings	1,730	1,910
Total equity	$ 2,730	$ 2,910
Total liabilities and equity	$ 4,080	$ 4,900

Computron's Income Statement (Millions of Dollars)	2018	2019
Net sales	$ 5,500	$ 6,000
Cost of goods sold (Excluding depr. & amort.)	4,300	4,800
Depreciation and amortization[a]	290	320
Other operating expenses	350	420
Total operating costs	$ 4,940	$ 5,540
Earnings before interest and taxes (EBIT)	$ 560	$ 460
Less interest	68	108
Pre-tax earnings	$ 492	$ 352
Taxes (25%)	123	88
Net Income	$ 369	$ 264

Notes:

[a] Computron has no amortization charges.

Other Data	2018	2019
Stock price	$50.00	$30.00
Shares outstanding (millions)	100	100
Common dividends (millions)	$90	$84
Tax rate	25%	25%
Weighted average cost of capital (WACC)	10.00%	10.00%

Net Operating Profit After Taxes

Net Operating Profit After Taxes

NOPAT is the amount of profit Computron would generate if it had no debt and held no financial assets.

2019	**NOPAT =**	**EBIT**	**x**	**(1 - T)**
	=	**$460**	**x**	**75%**
	=	**$345**		
2018	**NOPAT =**	**EBIT**	**x**	**(1 - T)**
	=	**$560**	**x**	**75%**
	=	**$420**		

Net Operating Working Capital

Those current assets used in operations are called operating current assets, and the current liabilities that result from operations are called operating current liabilities. Net operating working capital is equal to operating current assets minus operating current liabilities.

2019	**NOWC =**	**Operating current assets**	**–**	**Operating current liabilities**
	=	**$1,390**	**–**	**$640**
	=	**$750**		
2018	**NOWC =**	**Operating current assets**	**–**	**Operating current liabilities**
	=	**$1,080**	**–**	**$500**
	=	**$580**		

Total Net Operating Capital (TNOC)

TNOC = NOWC + net operating long-term assets

2019	**TNOC =**	**NOWC**	**+**	**Fixed assets**
	=	**$750**	+	**$3,500**
	=	**$4,250**		
2018	**TNOC =**	**NOWC**	**+**	**Fixed assets**
	=	**$580**	+	**$2,900**
	=	**$3,480**		

Free Cash Flow

Computron's Free Cash Flow calculation is the cash flow actually availabe for distribution to investors after the company has made all necessary investments in fixed assets and working capital to sustain ongoing operations.

2019	**FCF =**	**NOPAT**	**–**	**Net Investment in Operating Capital**
	=	**$345.0**	**–**	**$770**
	=	**-$425**		

Uses of FCF	**2019**
After-tax interest payment =	**$81**
Reduction (increase) in debt =	**-$500**
Payment of dividends =	**$84**
Repurchase (Issue) stock =	**$0**
Purchase (Sale) of short-term investments =	**-$90**
Total uses of FCF =	**-$425**

Return on Invested Capital

The Return on Invested Capital tells us the amount of NOPAT per dollar of operating capital.

2019	**ROIC =**	**NOPAT**	**÷**	**Operating Capital**
	=	**$345.0**		**$4,250**
	=	**8.1%**		
2018	**ROIC =**	**NOPAT**	**÷**	**Operating Capital**
	=	**$420.0**		**$3,480**
	=	**12.1%**		

Operating Profitability

The operating profitability (OP) ratio shows how many dollars of operating profit are generated by each dollar of sales.

2019	**OP =**	**NOPAT**	**÷**	**Sales**
	=	**$345.0**		**$6,000**
	=	**5.8%**		
2018	**OP =**	**NOPAT**	**÷**	**Sales**
	=	**$420.0**		**$6,000**
	=	**7.0%**		

Capital Utilization

The capital utilization (CR) ratio shows how many dollars of operating assets are needed to generated a dollar of sales.

2019	**CR =**	**Total Op. Cap.**	**÷**	**Sales**
	=	**\$4,250.0**		**\$6,000**
	=	**70.8%**		
2018	**CR =**	**Total Op. Cap.**	**÷**	**Sales**
	=	**\$3,480.0**		**\$6,000**
	=	**58.0%**		

Operating profitability declined and the capital utlization worsened, each contributing to the big decrease in ROIC.

Economic Value Added

Economic Value Added represents Computron's residual income that remains after the cost of all capital, including equity capital, has been deducted.

2019	**EVA =**	**NOPAT**	**–**	**Operating Capital**	**x**	**WACC**
	=	**\$345**	**–**	**\$4,250**	x	**10%**
	=	**\$345**	**–**		**\$425.0**	
	=	**-\$80**				
2018	**EVA =**	**NOPAT**	**–**	**Operating Capital**	**x**	**WACC**
	=	**\$420**	**–**	**\$3,480**	x	**10%**
	=	**\$420**	**–**		**\$348.0**	
	=	**\$72**				

Analysis of Financial Statements

Chapter 3

FIN 6150

Topics in Chapter

- Ratio analysis
  - Ratios
  - Common size statements
  - Percent change statement
- DuPont equation
- Limitations of ratio analysis
- Qualitative factors

These are the ratios covered in FIN 6150

Liquidity Ratios

$$\text{Current Ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

$$\text{Quick Ratio} = \frac{\text{Current assets} - \text{Inventories}}{\text{Current liabilities}}$$

Asset Management Ratios

$$\text{Inventory Turnover Ratio} = \frac{\text{Cost of goods sold}}{\text{Inventories}}$$

$$\text{Days Sales Outstanding (DSO) Ratio} = \frac{\text{Receivables}}{\text{Annual sales/365}}$$

$$\text{Total Assets Turnover Ratio} = \frac{\text{Sales}}{\text{Total assets}}$$

Debt Management Ratios

$$\text{Total Debt to Total Capital} = \frac{\text{Total debt}}{\text{Total capital}}$$

$$\text{Times Interest Earned (TIE) Ratio} = \frac{\text{EBIT}}{\text{Interest charges}}$$

Profitability Ratios

$$\text{Operating Margin} = \frac{\text{EBIT}}{\text{Sales}}$$

$$\text{Profit Margin} = \frac{\text{Net Income}}{\text{Sales}}$$

$$\text{Return on Total Assets (ROA)} = \frac{\text{Net income}}{\text{Total assets}}$$

$$\text{Return on Common Equity (ROE)} = \frac{\text{Net income}}{\text{Common equity}}$$

Market Value Ratios

$$\text{Price/Earnings (P/E)Ratio} = \frac{\text{Price per share}}{\text{Earnings per share}}$$

$$\text{Market/Book (M/B)Ratio} = \frac{\text{Price per share}}{\text{Book value per share}}$$

DuPont Equation

$$\text{ROE} = \frac{\text{Net income}}{\text{Sales}} \text{ x } \frac{\text{Sales}}{\text{Total assets}} \text{ x } \frac{\text{Total assets}}{\text{Total common equity}}$$

Overview

- Ratios facilitate comparison of:
  - One company over time
  - One company versus other companies
- Ratios are used by:
  - Lenders to determine creditworthiness
  - Stockholders to estimate future cash flows and risk
  - Managers to identify areas of weakness and strength

Potential Problems and Limitations of Ratio Analysis

- Comparison with industry averages is difficult if the firm operates many different divisions.
- Seasonal factors can distort ratios.
- Window dressing techniques can make statements and ratios look better.
- Different accounting and operating practices can distort comparisons.

Qualitative Factors that ratios do not account for

- There is greater risk if:
  - revenues tied to a single customer
  - revenues tied to a single product
  - reliance on a single supplier?
  - High percentage of business is generated overseas?
- What is the competitive situation?
- What products are in the pipeline?
- What are the legal and regulatory issues?

Industry Specific Ratios

Hotels: Occupancy Ratio $= \frac{\text{Occupied Rooms}}{\text{Total Rooms}}$

Retail: Sales Per Square Foot $= \frac{\text{Total Sales}}{\text{Square Footage of Selling Space}}$

Manufacturing: Contribution Margin $= \frac{\text{Sales Per Unit} - \text{Variable Cost Per Unit}}{\text{Sales Per Unit}}$

Hospital: Nursing Hours Per Patient Day $= \frac{\text{Nursing Hours Worked}}{\text{Total Number of Patients}}$

Key Performance Indicator (KPI)

Ratios Explained

Income Statement

Income Statement		
	2019	**2020E**
Sales	6,000	6,600
COGS except depr.	(4,800)	(5,210)
Gross Margin	**1,200**	**1,390**
Other expenses	(320)	(370)
Deprec.	(420)	(400)
EBIT	**460**	**620**
Int. expense	(108)	(100)
EBT	**352**	**520**
Taxes (25%)	(88)	(130)
Net Income	**264**	**390**

Balance Sheet

Assets	2,019	2020E
Cash	50	60
ST Invest	10	50
AR	520	530
Inventories	820	660
Total Current Assets	**1,400**	**1,300**
Net Fixed Assets	3,500	3,700
Total assets	**4,900**	**5,000**

Liabilities and Equity	2,019	2020E
Accts. payable	400	330
Notes payable	250	100
Accruals	240	270
Total Current Liabilities	**890**	**700**
Long-term debt	1,100	1,100
Total liabilities	**1,990**	**1,800**
Common stock	1,000	1,000
Ret. earnings	1,910	2,200
Total equity	**2,910**	**3,200**
Total L&E	**4,900**	**5,000**

Other Data

	2019	2020E
EPS	$2.64	$3.90
DPS	$0.84	$1.00
Book value per share	$29.10	$32.00
Dividends	$84	$100
Number of shares	100	100
Year-end stock price	$30	$49
Lease payments	$20	$20
Tax rate	25%	25%

Profitability Ratios

- What is the company's rate of return on sales?
  - Profit margin
  - Operating profit margin
- What is the company's rate of return on assets?
  - Basic earning power
  - Return on assets
  - Return on equity

Net Profit Margin

What is the Net Profit Margin 2019 and 2020E?

	2019	2020E
Sales	6,000	6,600
COGS except depr.	(4,800)	(5,210)
Gross Margin	**1,200**	**1,390**
Other expenses	(320)	(370)
Deprec.	(420)	(400)
EBIT	**460**	**620**
Int. expense	(108)	(100)
EBT	**352**	**520**
Taxes (25%)	(88)	(130)
Net Income	**264**	**390**

Profit Margin

Net profit margin (PM):

$$\text{PM} = \frac{\text{NI}}{\text{Sales}} = \frac{\$390}{\$6,600} = 5.9\%.$$

	2018	2019	2020E	Ind.
Profit Margin	6.7%	4.4%	5.9%	7.2%

Operating Profit Margin

What is the Operating Profit Margin 2019 and 2020E?

	2019	2020E
Sales	6,000	6,600
COGS except depr.	(4,800)	(5,210)
Gross Margin	**1,200**	**1,390**
Other expenses	(320)	(370)
Deprec.	(420)	(400)
EBIT	**460**	**620**
Int. expense	(108)	(100)
EBT	**352**	**520**
Taxes (25%)	(88)	(130)
Net Income	**264**	**390**

Operating Profit Margin

Operating profit margin:

$$\text{PM} = \frac{\text{EBIT}}{\text{Sales}} = \frac{\$620}{\$6,600} = 9.4\%.$$

	2018	2019	2020E	Ind.
Profit Margin	10.2%	7.7%	9.4%	10.4%

Basic Earning Power (BEP)

$$\text{BEP} = \frac{\text{EBIT}}{\text{Total assets}}$$

$$= \frac{\$620}{\$5,000} = 12.4\%.$$

Basic Earning Power vs. Industry Average

- BEP removes effect of taxes and financial leverage.
- BEP is a figure that transmits a business's ability to generate profits over the long haul, assuming all current operational conditions generally remain constant.
- The higher the BEP ratio, the more effective a company is at generating income from its assets.

	2018	2019	2020E	Ind.
Basic Earning Power	13.7%	9.4%	12.4%	15.6%

Return on Assets (ROA)

$$\text{ROA} = \frac{\text{NI}}{\text{Total assets}}$$

$$= \frac{\$390}{\$5,000} = 7.8\%.$$

- ROA indicates how profitable a company is in relation to its total assets (similar to BEP).
- Corporate management, analysts, and investors can use ROA to determine how efficiently a company uses its assets to generate a profit.

Return on Equity (ROE)

$$\text{ROE} = \frac{\text{NI}}{\text{Common Equity}}$$

$$= \frac{\$390}{\$3,200} = 12.2\%.$$

ROE is a gauge of a corporation's profitability and depicts how well the company makes profits from equity capital.

If the company's ROE is low, it indicates that the company did not use the shareholder capital efficiently.

ROA and ROE vs. Industry Averages

	2018	2019	2020	Industry
ROA	9.0%	5.4%	7.8%	10.8%
ROE	13.5%	9.1%	12.2%	15.4%

Effects of Debt on ROA and ROE

- ROA is lowered by debt – interest expense lowers net income, which then lowers ROA.
- ROE is increased by debt – but other risks are introduced when the debt levels rise.

Why would a firm take on debt if it does not need to?

Asset Management Ratios

- How efficiently does the firm use its assets?
- How much does the firm have tied up in assets for each dollar of sales?

Inventory Turnover Ratio

$$\text{Inv. Turnover} = \frac{\text{COGS}}{\text{Inventories}}$$

$$= \frac{\$5,210 + \$370}{\$660} = 8.5$$

- Inventory includes all the goods a company has in its stock that will ultimately be sold.
- Inventory turnover indicates the rate at which a company sells and replaces its stock of goods during a particular period.

Inventory Turnover Ratio vs. Industry Average

	2018	2019	2020E	Ind.
Inventory turnover	**7.4**	**6.2**	**8.5**	**9.0**

Days Sales Outstanding

$$\text{DSO} = \frac{\text{Receivables}}{\text{Average sales per day}}$$

$$= \frac{\text{Receivables}}{\text{Sales}/365} = \frac{\$530}{\$6,600/365}$$

$$= 29.3 \text{ days.}$$

- Days sales outstanding (DSO) is the average number of days it takes a company to receive payment for a sale.
- A high DSO number suggests that a company is experiencing delays in receiving payments. That can cause a cash flow problem.
- A low DSO indicates that the company is getting its payments quickly. That money can be put back into the business to good effect.
- Generally speaking, a DSO under 45 days is considered low.

Appraisal of DSO

	2018	2019	2020E	Ind.
Days Sales Outstanding	**26.5**	**31.6**	**29.3**	**28.0**

Fixed Assets and Total Assets Turnover Ratios

$$\text{Fixed assets turnover} = \frac{\text{Sales}}{\text{Net fixed assets}}$$

$$= \frac{\$6,600}{\$3,700} = 1.8$$

$$\text{Total assets turnover} = \frac{\text{Sales}}{\text{Total assets}}$$

$$= \frac{\$6,600}{\$5,000} = 1.320.$$

- The Fixed Asset Turnover ratio reveals how efficient a company is at generating sales from its existing fixed assets.
- A higher ratio implies that management is using its fixed assets more effectively.
- A high Fixed Asset Turnover ratio does not tell anything about a company's ability to generate solid profits or cash flows.
- The Asset Turnover ratio helps investors understand how effectively companies are using their assets to generate sales.

Fixed Assets and Total Assets Turnover Ratios

	2018	2019	2020E	Ind.
Fixed Asset Turnover	1.9	1.7	1.8	3.0
Total Asset Turnover	1.348	1.224	1.320	1.5

Liquidity Ratios

- Can the company meet its short-term obligations using the resources it currently has on hand?

Forecasted Current and Quick Ratios

$$\text{CR} = \frac{\text{CA}}{\text{CL}} = \frac{\$1,200}{\$700} = 1.9.$$

$$\text{QR} = \frac{\text{CA} - \text{Inv.}}{\text{CL}}$$

$$= \frac{\$1,200 - \$660}{\$700} = 0.9.$$

Current Ratio

- The current ratio compares all of a company’s current assets to its current liabilities.
- These are usually defined as assets that are cash or will be turned into cash in a year or less and liabilities that will be paid in a year or less.
- The current ratio helps investors understand more about a company’s ability to cover its short-term debt with its current assets and make apples-to-apples comparisons with its competitors and peers.
- Weaknesses of the current ratio include the difficulty of comparing the measure across industry groups, the overgeneralization of the specific asset and liability balances, and the lack of trending information.

Quick Ratio

- The quick ratio measures a company's capacity to pay its current liabilities without needing to sell its inventory or obtain additional financing.
- The quick ratio is considered a more conservative measure than the current ratio, which includes all current assets as coverage for current liabilities.
- The higher the ratio result, the better a company's liquidity and financial health; the lower the ratio, the more likely the company will struggle with paying debts.

Comments on Current and Quick Ratios

	2018	2019	2020E	Ind.
Current	2.1	1.6	1.9	2.5
Quick	1.0	0.7	0.9	1.9

Debt Management Ratios

- Does the company have too much debt?
- Can the company’s earnings meet its debt servicing requirements?

Leverage Ratios: Debt Ratio

$$\text{Debt ratio} = \frac{\text{Total debt}}{\text{Total assets}}$$

$$= \frac{\$100 + \$1{,}100}{\$5{,}000} = 24.0\%.$$

- Proportion of a company’s assets that are financed by debt.
- A ratio greater than 1 shows that a considerable portion of debt is funded by assets. In other words, the company has more liabilities than assets.
- A high ratio also indicates that a company may be putting itself at risk of default on its loans if interest rates were to rise suddenly.
- A ratio below 1 translates to the fact that a greater portion of a company's assets is funded by equity.

Leverage Ratios: Debt-to-Equity Ratio

$$\text{Debt-equity} = \frac{\text{Total debt}}{\text{Equity}}$$

$$= \frac{\$100 + \$1{,}100}{\$3{,}200} = 37.5\%.$$

- The Debt-to-Equity Ratio is a measure of the degree to which a company is financing its operations through debt versus wholly owned funds.
- More specifically, it reflects the ability of shareholder equity to cover all outstanding debts in the event of a business downturn.

Leverage Ratios: Liabilities-to-Assets Ratio

$$\text{Liabilities/TA ratio} = \frac{\text{Total liabilities}}{\text{Total assets}}$$

$$= \frac{\$1{,}800}{\$5{,}000}$$

$$= 36.0\%.$$

- Used to compare one company's leverage with that of other companies in the same industry.
- This information can reflect how financially stable a company is.
- The higher the ratio, the higher the degree of leverage and, consequently, the higher the risk of investing in that company.

Leverage Ratios: Equity Multiplier

$$\text{Equity multiplier} = \frac{\text{Total Assets}}{\text{Common Equity}}$$

$$= \frac{\$5{,}000}{\$3{,}200} = 1.5625$$

- A high equity multiplier indicates that a company is using a high amount of debt to finance assets.

- A low equity multiplier means that the company has less reliance on debt.

EBITDA Coverage (EC)

$$\frac{\text{EBIT} + \text{Depr. \&Amort.} + \text{Lease payments}}{\text{Interest expense} + \text{Lease pmt.} + \text{Loan pmt.}}$$

$$= \frac{\$620 + \$370 + \$20}{\$100 + \$20 + \$0} = 8.4$$

- EBITDA coverage is used to see how easily a firm can pay the interest on its outstanding debt.

- A higher coverage ratio is better.

Debt Management Ratios vs. Industry Averages

	2018	2019	2020E	Industry
Debt Ratio	20.8%	27.6%	24.0%	15.0%
Debt-to-equity	0.31	0.46	0.38	0.22
Liabilities-to-assets	33.1%	40.6%	36.0%	32.0%
Equity Multiplier	1.49	1.68	1.56	1.47
Times Interest Earned	8.2	4.3	6.2	13.0
EBITDA Coverage Ratio	9.9	6.3	8.4	17.2

Market Value Ratios

Market value ratios incorporate the:

- High current levels of earnings and cash flow *increase* market value ratios
- High expected growth in earnings and cash flow *increases* market value ratios
- High risk of expected growth in earnings and cash flow *decreases* market value ratios

Calculate the P/E Ratio

	2019	2020E
EPS	$2.64	$3.90
DPS	$0.84	$1.00
Book value per share	$29.10	$32.00
Dividends	$84	$100
Number of shares	100	100
Year-end stock price	$30	$49
Lease payments	$20	$20
Tax rate	25%	25%

Calculate and appraise the Price/Earnings (P/E) ratio.

Price per share (P) = \$49.00

Earnings per share (EPS) = \$3.90

P/E Ratio = Price Per Share / EPS

\$49.00/\$3.90 = 16.8

- The price-to-earnings (P/E) ratio relates a company's share price to its earnings per share.
- A high P/E ratio could mean that a company's stock is overvalued, or else that investors are expecting high growth rates in the future.
- Companies that have no earnings or that are losing money do not have a P/E ratio because there is nothing to put in the denominator.

Calculate the Market to Book Ratio

	2019	2020E
EPS	$2.64	$3.90
DPS	$0.84	$1.00
Book value per share	$29.10	$32.00
Dividends	$84	$100
Number of shares	100	100
Year-end stock price	$30	$49
Lease payments	$20	$20
Tax rate	25%	25%

Appraise the Market to Book Ratio

(1) BVPS = Equity/ # Shares

= $3,200/100 = $32.00.

(2) M/B = P/BVPS

M/B = $49.00/$32.00 = 1.53

- The ratio compares a firm's book value to its market value.
- M/B: How much paid for $1 of book value. Higher is better.

Comparison with Industry Averages

	2018	2019	2020E	Ind.
Price-to Earnings	13.6	11.4	12.6	16.8
Market-to-Book	1.8	1.0	1.5	2.7

Mini case studies

Ratio Analysis

The below table shows selected financial information from a company.

	2017	2018	2019	2020
Sales	15,250	16,775	18,453	20,298
COGS	11,800	12,036	12,277	12,522
Purchases	11,889	12,106	12,368	12,600
Inventory	3,845	3,915	4,006	4,084
Accounts receivable	4,125	4,538	4,991	5,490
Accounts payable	3,927	4,003	4,082	4,162

Based on the above data, what strategy has the company *most likely* undertaken to improve its operations?

A. Change its collections policy with its customers
B. Differentiation into high margin premium products
C. Improve its inventory management

Integrated Financial Ratios

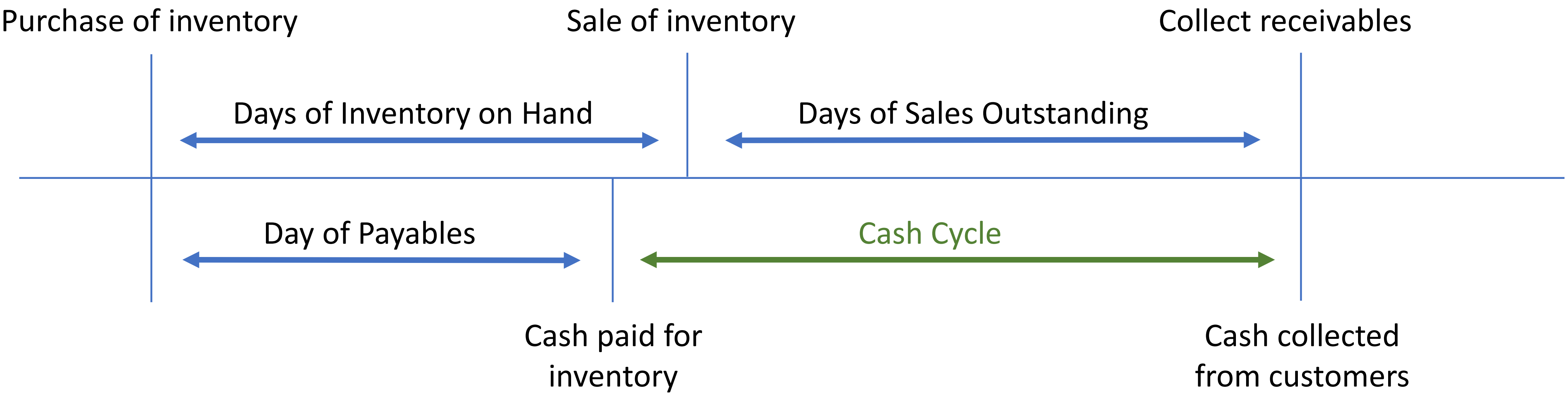
	2022	2023	2024
Current Ratio	1.2	1.5	2.0
Quick Ratio	1.0	0.8	0.5
Days Inventory on Hand	30	50	60
Days Sales Outstanding	40	30	20

What can you conclude about this firm's performance?
Current and Quick Ratios? Inventory management?
AR management? Cash collections?

Integrated Financial Ratios

1. How can Current be up and Quick down?
2. DOH has increased – indicates rising inventory
3. DSO decreasing – collecting cash from customers sooner
4. Current and quick ratios indicate the collected cash is being spent on inventory accumulation
5. It appears collections have been accelerated to compensate for poor inventory management

Net Operating Cycle or Cash Conversion Cycle



Net operating cycle = Days Inventory + Days AR – Days Payable

Common Size Balance Sheets: Divide all items by Total Assets

Assets	2,019	2020E	2,019	2020E	Industry
Cash	50	60	1.02%	1.20%	1.50%
ST Invest	10	50	0.20%	1.00%	7.60%
AR	520	530	10.61%	10.60%	13.20%
Inventories	820	660	16.73%	13.20%	17.80%
Total Current Assets	**1,400**	**1,300**	28.57%	26.00%	40.00%
Net Fixed Assets	3,500	3,700	71.43%	74.00%	60.00%
Total assets	**4,900**	**5,000**			

Divide all items by Total Liabilities & Equity

Liabilities and Equity	2,019	2020E	2,019	2020E	Industry
Accts. payable	400	330	8.16%	6.60%	6.80%
Notes payable	250	100	5.10%	2.00%	3.00%
Accruals	240	270	4.90%	5.40%	10.20%
Total Current Liabilities	**890**	**700**	18.16%	14.00%	20.00%
Long-term debt	1,100	1,100	22.45%	22.00%	12.00%
Total liabilities	**1,990**	**1,800**	40.61%	36.00%	32.00%
Common stock	1,000	1,000	20.41%	20.00%	
Ret. earnings	1,910	2,200	38.98%	44.00%	
Total equity	**2,910**	**3,200**	59.39%	64.00%	68.00%
Total L&E	**4,900**	**5,000**			

Analysis of Common Size Balance Sheets

- Computron has higher proportion of net fixed assets than the industry.
- Computron’s total debt is 24% (the combined percentages of notes payable and long-term bonds) of its assets, which is higher than the industry’s combined debt percentage of 20%.
- **What else?**

Common Size Income Statement: Divide all items by Sales

Income Statement	2019	2020E	2,019	2020E	Industry
Sales	6,000	6,600			
COGS except depr.	(4,800)	(5,210)	80.00%	78.94%	69.00%
Gross Margin	**1,200**	**1,390**	20.00%	21.06%	31.00%
Other expenses	(320)	(370)	5.33%	5.61%	3.30%
Deprec.	(420)	(400)	7.00%	6.06%	17.30%
EBIT	**460**	**620**	7.67%	9.39%	10.40%
Int. expense	(108)	(100)	1.80%	1.52%	0.80%
EBT	**352**	**520**	5.87%	7.88%	9.60%
Taxes (25%)	(88)	(130)	1.47%	1.97%	2.40%
Net Income	**264**	**390**	4.40%	5.91%	7.20%

Analysis of Common Size Income Statements

- Computron’s profit margin is less than the industry ratio
  - Computron has lower Other Costs.
  - But… it has much higher costs of goods sold

Percentage Change Analysis: Cumulative Change from First Year (2018)

Income St.	2018	2019	2020E
Sales	0.0%	9.1%	20.0%
COGS	0.0%	11.6%	21.2%
Depr.	0.0%	10.3%	27.6%
Other exp.	0.0%	20.0%	14.3%
EBIT	0.0%	-17.9%	10.7%
Int. Exp.	0.0%	58.8%	47.1%
EBT	0.0%	-28.5%	5.7%
Taxes	0.0%	-28.5%	5.7%
NI	0.0%	-28.5%	5.7%

Analysis of Percent Change Income Statement

- For 2019:
  - Sales grew by 9% in 2019.
  - Net income fell by 28.5%!
- For 2020 projections:
  - Cumulative sales growth is 20%.
  - Cumulative net income growth is 5.7%
    - Improvement, but more work is needed

Cumulative Percentage Change: Assets

Assets	2018	2019	2020E
Cash	0.0%	-16.7%	0.0%
ST Invest.	0.0%	-90.0%	-50.0%
AR	0.0%	30.0%	32.5%
Invent.	0.0%	32.3%	6.5%
Total CA	0.0%	18.6%	10.2%
Net FA	0.0%	20.7%	27.6%
TA	0.0%	20.1%	22.5%

Cumulative Percentage Change: Liabilities & Equity

Liab. & Eq.	2018	2019	2020E
AP	0.0%	33.3%	10.0%
Notes pay.	0.0%	400.0%	100.0%
Accruals	0.0%	20.0%	35.0%
Total CL	0.0%	61.8%	27.3%
LT Debt	0.0%	37.5%	37.5%
Total eq.	0.0%	6.6%	17.2%
Total L&E	0.0%	20.1%	22.5%

Analysis of Percent Change Balance Sheets: 2019

- Assets grew by 20.1% even though net income fell.
- Much of the asset growth was in accounts receivable and inventories.
  - Not collecting on credit sales
  - Unsold product is piling up.
- Growth was funded with big increase in debt.

Analysis of Percent Change Balance Sheets: Projections Compared with 2019

- Small cumulative increase in 2020E total assets (22.5%) compared with 2019 change in total assets (20.1%)
  - But big reduction in cumulative inventory growth (6.5% in 2020E vs. 32.3% in 2019)
- Big drop in cumulative notes payable growth in 2020E relative to notes payable growth in 2019.

Explain the Extended DuPont Equation

- The DuPont equation focuses on:
  - Expense control (Profit margin, PM)
  - Asset utilization (Total asset turnover, TAT)
  - Debt utilization (Equity multiplier, EM)
- It shows how these factors combine to determine the return on equity (ROE).
- Return on equity (ROE) is a closely-watched number among knowledgeable investors. It is a strong measure of how well a company's management creates value for its shareholders.
- The number can be misleading, however, as it is vulnerable to measures that increase its value while also making the stock riskier.
- Without a way of breaking down ROE components, investors could be duped into believing a company is a good investment when it's not.

The Simple Version of the DuPont Equation

$$\text{ROE} = \frac{\text{Net income}}{\text{Equity}}$$

$$= \frac{\text{Net income}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Equity}}$$

$$\text{ROE} = \text{ROA} \times \text{EM}$$

The Extended DuPont Equation

$$\text{ROE} = \frac{\text{Net income}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Equity}}$$

$$\text{ROE} = \frac{\text{Net income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Equity}}$$

$$\text{ROE} = \text{Profit margin} \times \text{Total asset turnover} \times \text{Equity multiplier}$$

ROE: (Profit margin)(TA turnover)(EM)

ROE_{2018} = (6.7%)(1.348)(1.495) = 13.5%

ROE_{2019} = (4.4%)(1.224)(1.684) = 9.1%

ROE_{2020E} = (5.9%)(1.320)(1.563) = 12.2%

ROE_{Ind} = (7.2%)(1.5)(1.47) = 15.9%

The Retention Ratio

- The retention ratio is the proportion of earnings kept back in the business as retained earnings.
- The retention ratio refers to the percentage of net income that is retained to grow the business, rather than being paid out as dividends.
- It is the opposite of the payout ratio, which measures the percentage of profit paid out to shareholders as dividends.
- The retention ratio is also called the plowback ratio.

ROE and a sustainable growth rate

Assume that there are two companies with identical ROEs and net income, but different retention ratios.

- Company A has an ROE of 15% and returns 30% of its net income to shareholders in a dividend, which means company A retains 70% of its net income.
- Business B also has an ROE of 15% but returns only 10% of its net income to shareholders for a retention ratio of 90%.

Compare Company A and Company B Growth Rates

- **Growth Rate = ROE x Retention Ratio**

ROE and a sustainable growth rate

- Assume that there are two companies with identical ROEs and net income, but different retention ratios. Company A has an ROE of 15% and returns 30% of its net income to shareholders in a dividend, which means company A retains 70% of its net income. Business B also has an ROE of 15% but returns only 10% of its net income to shareholders for a retention ratio of 90%.

  - **For company A, the growth rate is 10.5% (15% x 70% = 10.5%)**
  - **B's growth rate is 13.5% (15% x 90% = 13.5%)**

Analysis on Growth Rate

- **A’s growth rate: 10.5% (15% x 70% = 10.5%)**
- **B's growth rate: 13.5% (15% x 90% = 13.5%)**

- Investors can use this model to make estimates about the future and to identify stocks that may be risky because they are running ahead of their sustainable growth ability.
- A stock that is growing at a slower rate than its sustainable rate could be undervalued, or the market may be discounting risky signs from the company.
- In either case, a growth rate that is far above or below the sustainable rate warrants additional investigation.
- This comparison seems to make business B more attractive than company A, but it ignores the advantages of a higher dividend rate that may be favored by some investors.

Time Value of Money
&
The Cost of Debt

Chapters 4 & 5

FIN 6150

Time Value of Money

1. Investing in stocks: Invest early and earn compounding money over time.
2. Valuing companies: Discounted Cash Flow model is the basis of creating a valuation.
3. Retirement planning: Saving today for a comfortable life in the future.
4. Homeownership: The financial benefits of buying a home versus renting, as well as the long-term impact of a mortgage and property appreciation on net worth.
5. Consumer loan: The impact of interest rates, repayment terms, and the total cost of borrowing for consumer loans.

The Cost of Debt:

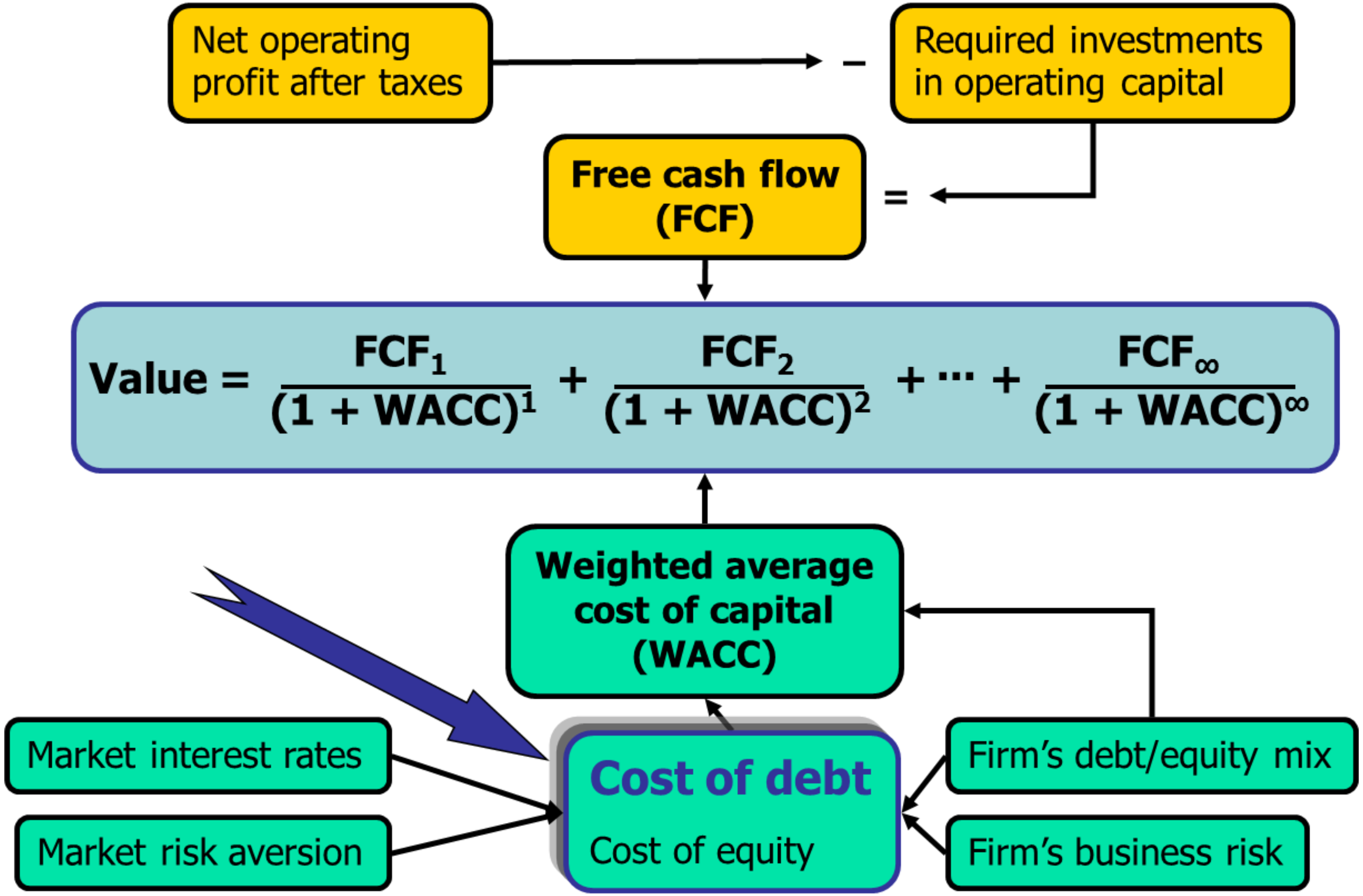
Bonds, Bond Valuation, and Interest Rates

Chapter 5

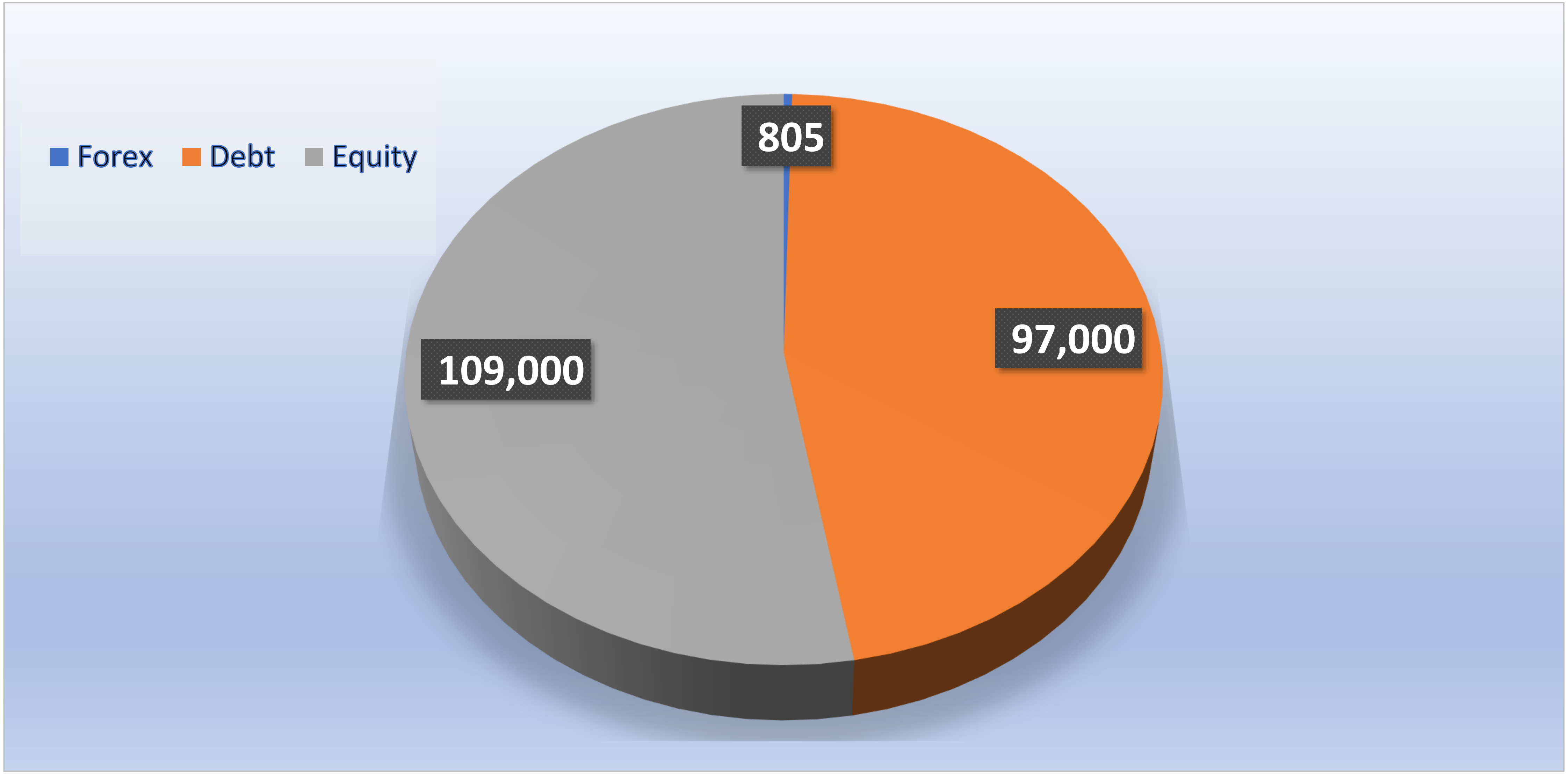
Topics in Chapter

- Key features of bonds
- Bond valuation
- Measuring yield
- Assessing risk

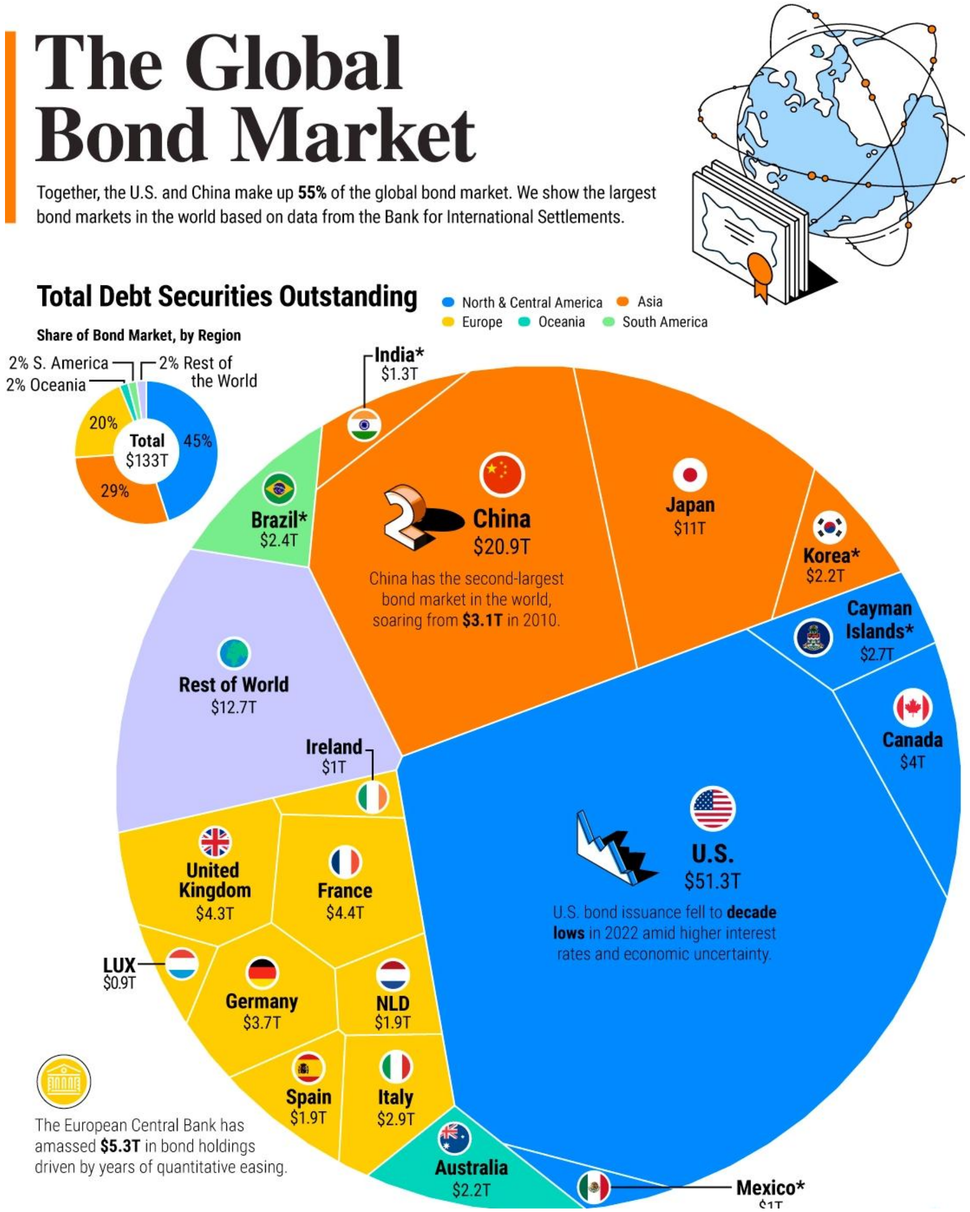
Determinants of Intrinsic Value: The Cost of Debt



Global Capital Markets




The $109T Global Stock Market IN 2023
STOCKS
Here's how global equity markets break down in 2023, according to analysis from SIFMA.
Global Equity Market Share as of Q2 2023
North America
Asia
Europe
Oceania
Developed & Emerging Markets
In 2024, corporate earnings growth across emerging markets is projected to outpace other major regions:
2024 Earnings Growth
EM*
U.S.
DM**
Europe
Japan
U.S.
42.5%
The U.S. is home to 39 of the 100 largest companies in the world.
Canada
2.7%
Japan
5.4%
Hong Kong
4.0%
Singapore
0.6%
China
10.6%
The Shanghai Stock Exchange is the third largest globally, with a $7.1T market cap.
EU
11.1%
Luxury conglomerate, LVMH, is Europe's most valuable firm.
Australia
1.5%
UK
2.9%
Other Developed Markets
9.4%
Other Emerging Markets
9.2%


The Global Bond Market
Together, the U.S. and China make up 55% of the global bond market. We show the largest bond markets in the world based on data from the Bank for International Settlements.
Total Debt Securities Outstanding
North & Central America
Asia
Europe
Oceania
South America
Share of Bond Market, by Region
2% S. America
2% Oceania
2% Rest of the World
20%
45%
29%
Total
$133T
India*
$1.3T
Brazil*
$2.4T
China
$20.9T
China has the second-largest bond market in the world, soaring from $3.1T in 2010.
Japan
$11T
Korea*
$2.2T
Cayman Islands*
$2.7T
Rest of World
$12.7T
Canada
$4T
Ireland
$1T
U.S.
$51.3T
U.S. bond issuance fell to decade lows in 2022 amid higher interest rates and economic uncertainty.
United Kingdom
$4.3T
France
$4.4T
LUX
$0.9T
Germany
$3.7T
NLD
$1.9T
Spain
$1.9T
Italy
$2.9T
Australia
$2.2T
Mexico*
The European Central Bank has amassed $5.3T in bond holdings driven by years of quantitative easing.

New Issuances

Global new Issues (in billions)	2023	
Bonds	939	76%
Stocks	296	24%
Total	1,235	

Key Features of a Bond

1. Par value: Face amount; paid at maturity. Assume $1,000.
2. Coupon interest rate: Stated interest rate. Multiply by par value to get dollars of interest. Generally fixed.
3. Maturity: Years until bond must be repaid. Declines.
4. Issue date: Date when bond was issued.
5. Default risk: Risk that issuer will not make interest or principal payments.

Call Provision

- Issuer can refund if rates decline. That helps the issuer but hurts the investor.
- Therefore, borrowers are willing to pay more, and lenders require more, on callable bonds.
- Most bonds have a deferred call and a declining call premium.

What's a sinking fund?

- Provision to pay off a loan over its life rather than all at maturity.
- Similar to amortization on a term loan.
- Reduces risk to investor, shortens average maturity.
- But not good for investors if rates decline after issuance.

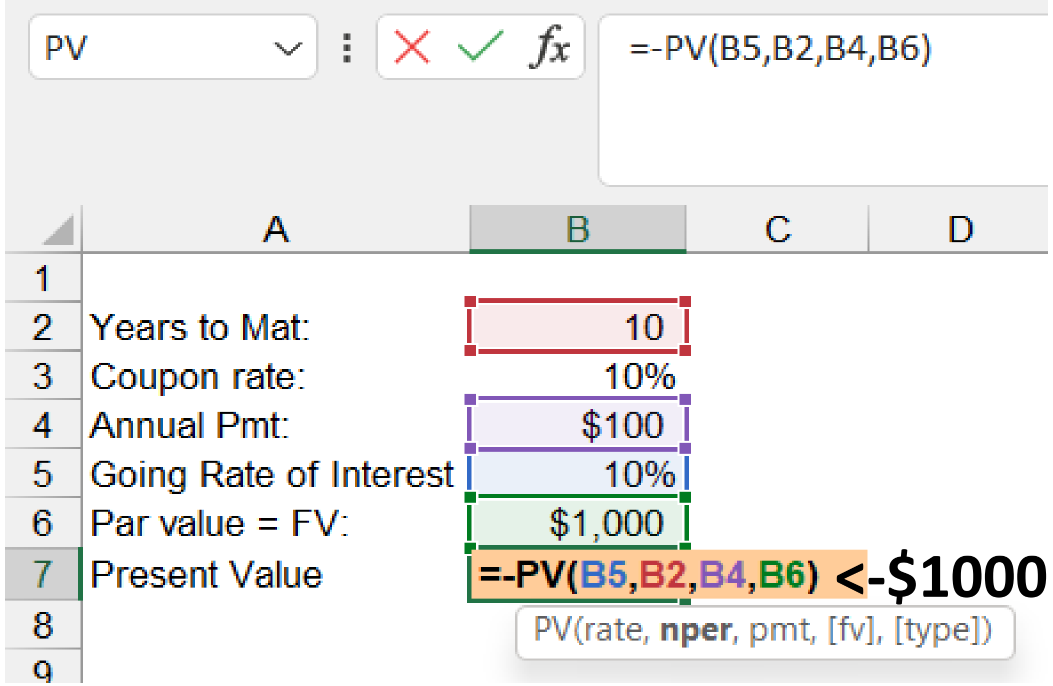
- How does the company do this?
  - through periodic payments to a trustee who retires part of the issue by purchasing the bonds in the open market.

Sinking funds are generally handled in 2 ways

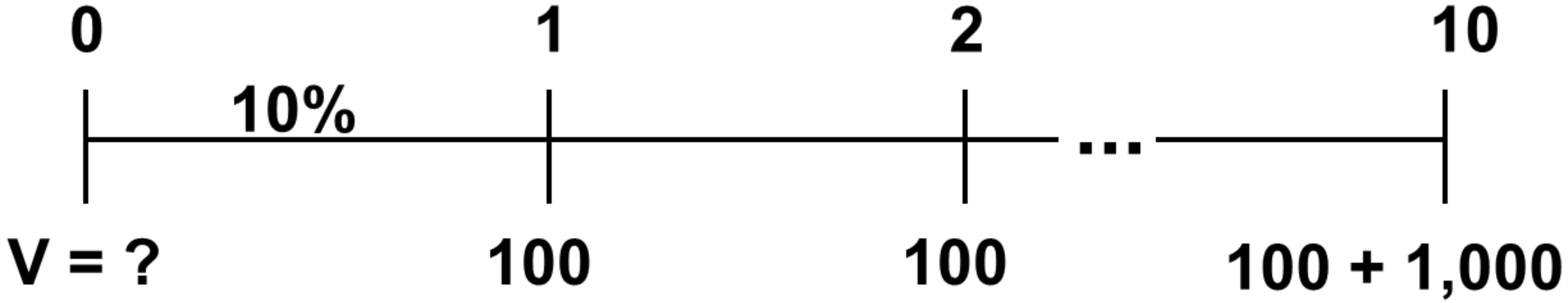
- Call x% at par per year for sinking fund purposes.
  - Call if r_d is below the coupon rate and bond sells at a premium.
- Buy bonds on open market.
  - Use open market purchase if r_d is above coupon rate and bond sells at a discount.

What is the Value of a 10-year, 10% coupon bond if $r_d = 10\%$

Years to Mat:	10
Coupon rate:	10%
Annual Pmt:	$100
Going Rate of Interest	10%
Par value = FV:	$1,000
Present Value	



Value of a 10-year, 10% coupon bond if r_d = 10%



$$V_B = \frac{\$100}{(1+r_d)^1} + \ldots + \frac{\$100}{(1+r_d)^N} + \frac{\$1,000}{(1+r_d)^N}$$

$$= \$90.91 + \ldots + \$38.55 + \$385.54$$

$$= \$1,000.$$

The bond consists of a 10-year, 10% annuity of $100/year plus a $1,000 lump sum at t = 10:

PV annuity	=	$614.46
PV maturity value	=	385.54
Value of bond	=	$1,000.00

	N	I/YR	PV	PMT	FV
INPUTS	10	10		100	1000
OUTPUT			-1,000		

What would happen if expected inflation rose by 3%, causing r = 13%?

Years to Mat:	10
Coupon rate:	10%
Annual Pmt:	$100
Going Rate of Interest	13%
Par value = FV:	$1,000
Present Value	**$837**

When r_d rises above the coupon rate, the bond's value falls below par, so it sells at a **discount**.

INPUTS	**10**	**13**		**100**	**1000**
	N	**I/YR**	**PV**	**PMT**	**FV**
OUTPUT			**-837.21**		

What would happen if inflation fell, and r_d declined to 7%?

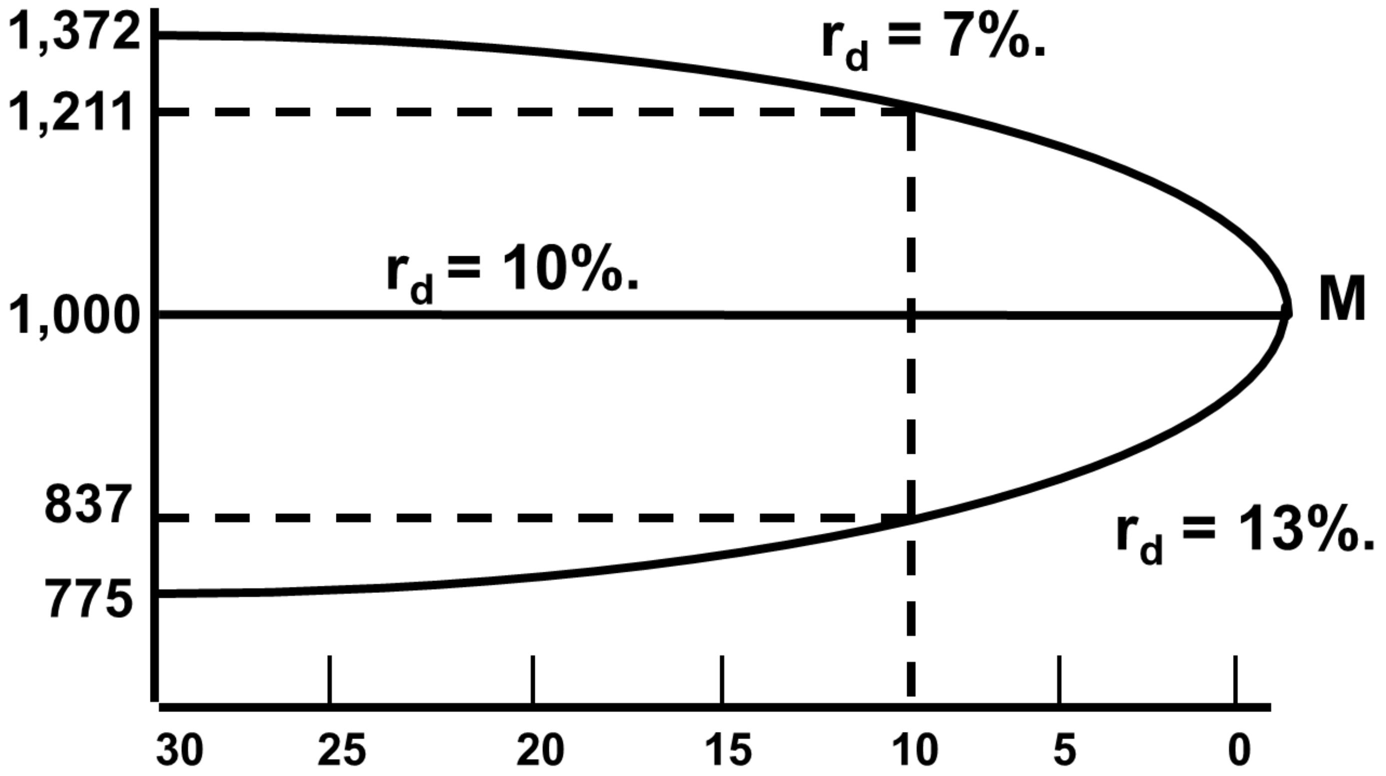
Years to Mat:	10
Coupon rate:	10%
Annual Pmt:	$100
Going Rate of Interest	7%
Par value = FV:	$1,000
Present Value	**$1,211**

If coupon rate > r_d, price rises above par, and bond sells at a **premium**.

	N	I/YR	PV	PMT	FV
INPUTS	10	7		100	1000
OUTPUT			-1,210.71		

Bond Value ($) vs. Years remaining to Maturity

Suppose the bond was issued 20 years ago and now has 10 years to maturity. What would happen to its value over time if the required rate of return remained at 10%, or at 13%, or at 7%?



- At maturity, the value of any bond must equal its par value.
- The value of a premium bond would decrease to $1,000.
- The value of a discount bond would increase to $1,000.
- A par bond stays at $1,000 if r_d remains constant.

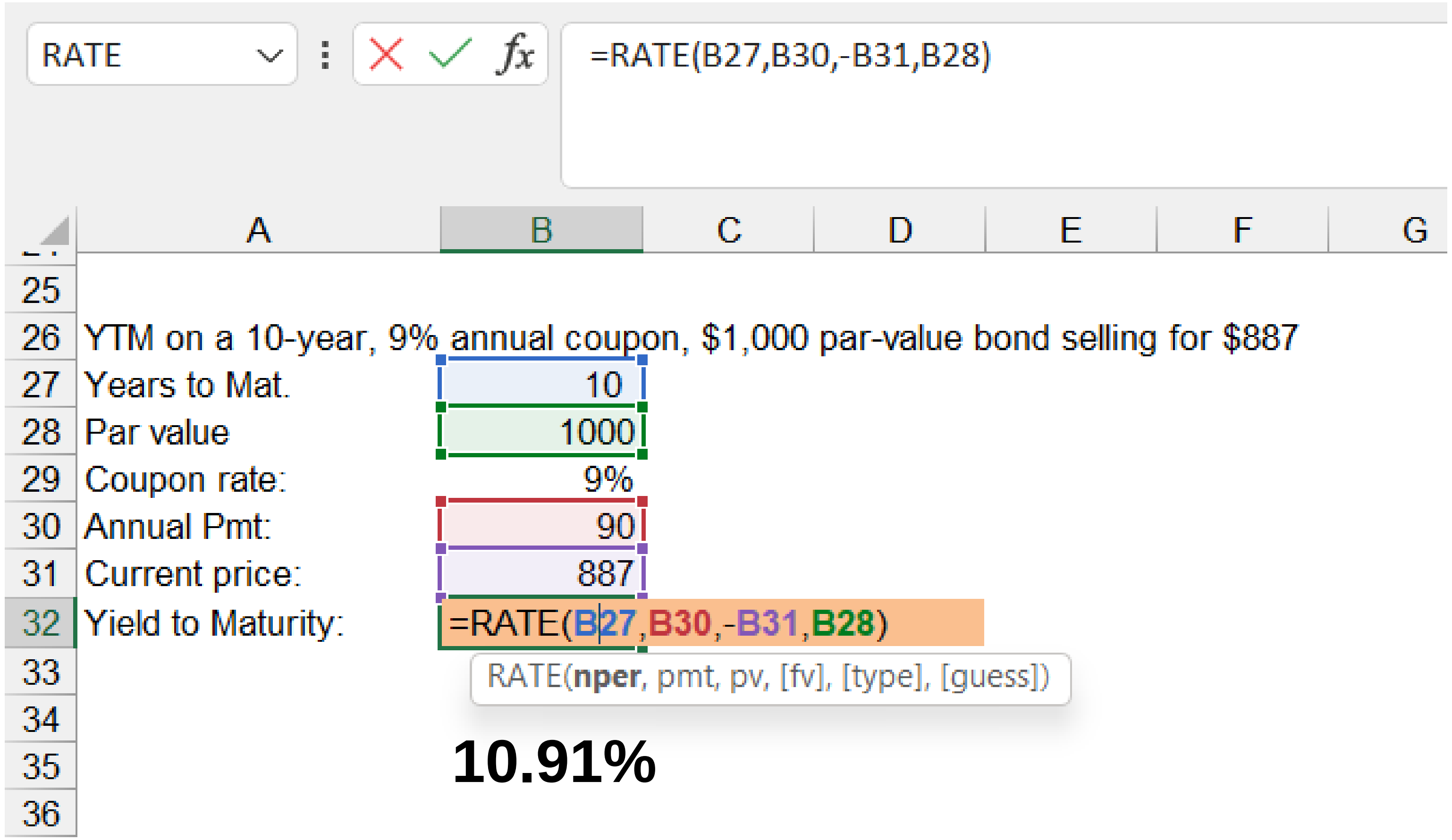
What’s “yield to maturity”?

- YTM is the rate of return earned on a bond held to maturity. Also called “promised yield.”
- It assumes the bond will not default.
- You will reinvest the interest payments at a similar rate

YTM on a 10-year, 9% annual coupon, $1,000 par-value bond selling for $887

Years to Mat.	10
Par value	1000
Coupon rate:	9%
Annual Pmt:	90
Current price:	887
Yield to Maturity:	

YTM on a 10-year, 9% annual coupon, $1,000 par-value bond selling for $887


RATE =RATE(B27,B30,-B31,B28)

	A	B
25		
26	YTM on a 10-year, 9% annual coupon, $1,000 par-value bond selling for $887	
27	Years to Mat.	10
28	Par value	1000
29	Coupon rate:	9%
30	Annual Pmt:	90
31	Current price:	887
32	Yield to Maturity:	=RATE(B27,B30,-B31,B28)

RATE(**nper**, pmt, pv, [fv], [type], [guess])

10.91%

Or, with math or the calculator, Find r_d

$$V_B = \frac{INT}{(1+r_d)^1} + \ldots + \frac{INT}{(1+r_d)^N} + \frac{M}{(1+r_d)^N}$$

$$887 = \frac{90}{(1+r_d)^1} + \ldots + \frac{90}{(1+r_d)^N} + \frac{1{,}000}{(1+r_d)^N}$$

INPUTS	**10**		**-887**	**90**	**1000**
	N	**I/YR**	**PV**	**PMT**	**FV**
OUTPUT		**10.91**			

- If coupon rate < r_d, bond sells at a discount.
- If coupon rate = r_d, bond sells at its par value.
- If coupon rate > r_d, bond sells at a premium.
- If r_d rises, price falls.
- Price = par at maturity.

Pricing a Bond

- Bonds can be priced at a discount, at par, or at a premium.
- When the bond is priced at par, the bond's interest rate is equal to its coupon rate.
- A bond priced above par, called a premium bond, has a coupon rate higher than the realized interest rate
- A bond priced below par, called a discount bond, has a coupon rate lower than the realized interest rate.

Find YTM if price were $1,134.20.

Years to Mat.	10
Par value	1000
Coupon rate:	9%
Annual Pmt:	90
Current price:	1134.2
Yield to Maturity:	

Find YTM if price were $1,134.20.

RATE | =RATE(B35,B38,-B39,B36)

	A	B	C	D
34	Find YTM if price were $1,134.20.			
35	Years to Mat.	10		
36	Par value	1000		
37	Coupon rate:	9%		
38	Annual Pmt:	90		
39	Current price:	1134.2		
40	Yield to Maturity:	=RATE(B35,B38,-B39,B36) <-7.08%		

Sells at a premium
- coupon = 9% > r_d = 7.08%
- bond's value > par

	N	I/YR	PV	PMT	FV
INPUTS	10		-1134.2	90	1000
OUTPUT		7.08			

Expected Total Return of a Bond

Definitions:

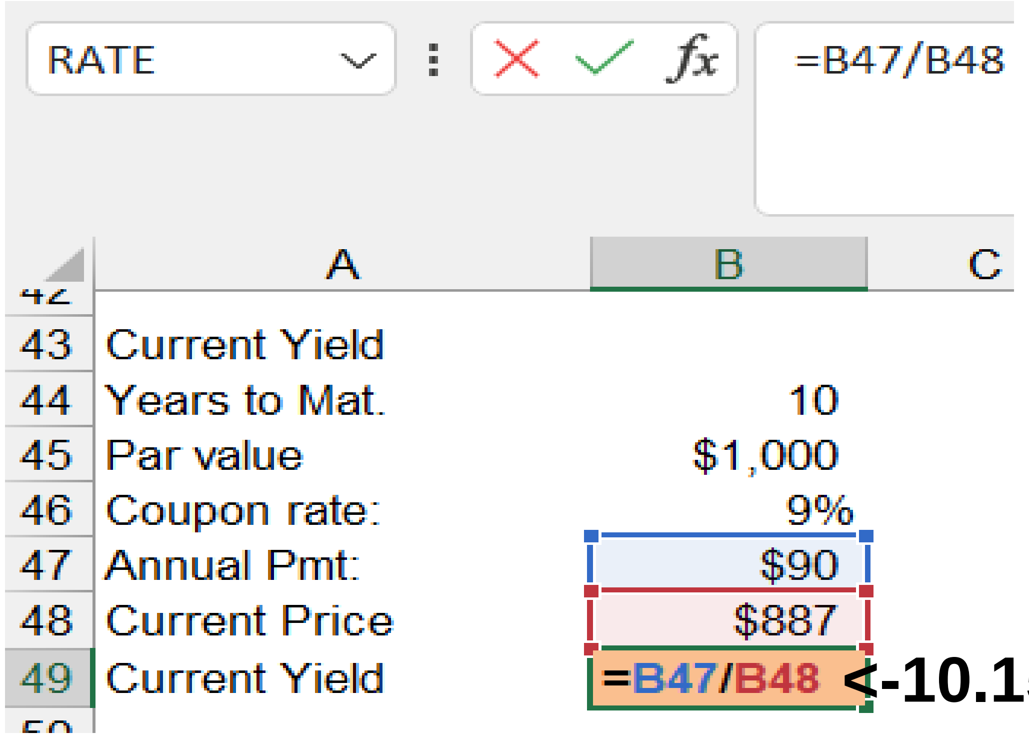
$$\text{Current yield} = \frac{\text{Annual coupon pmt}}{\text{Current price}}$$

$$\text{Capital gains yield} = \frac{\text{Change in price}}{\text{Beginning price}}$$

$$\text{Exp total return} = \text{YTM} = \text{Exp Curr yld} + \text{Exp cap gains yld}$$

What is the Current Yield of a 9% coupon, 10-year bond, P = $887

Years to Mat.	10
Par value	$1,000
Coupon rate:	9%
Annual Pmt:	$90
Current Price	$887
Current Yield	



<-10.15%

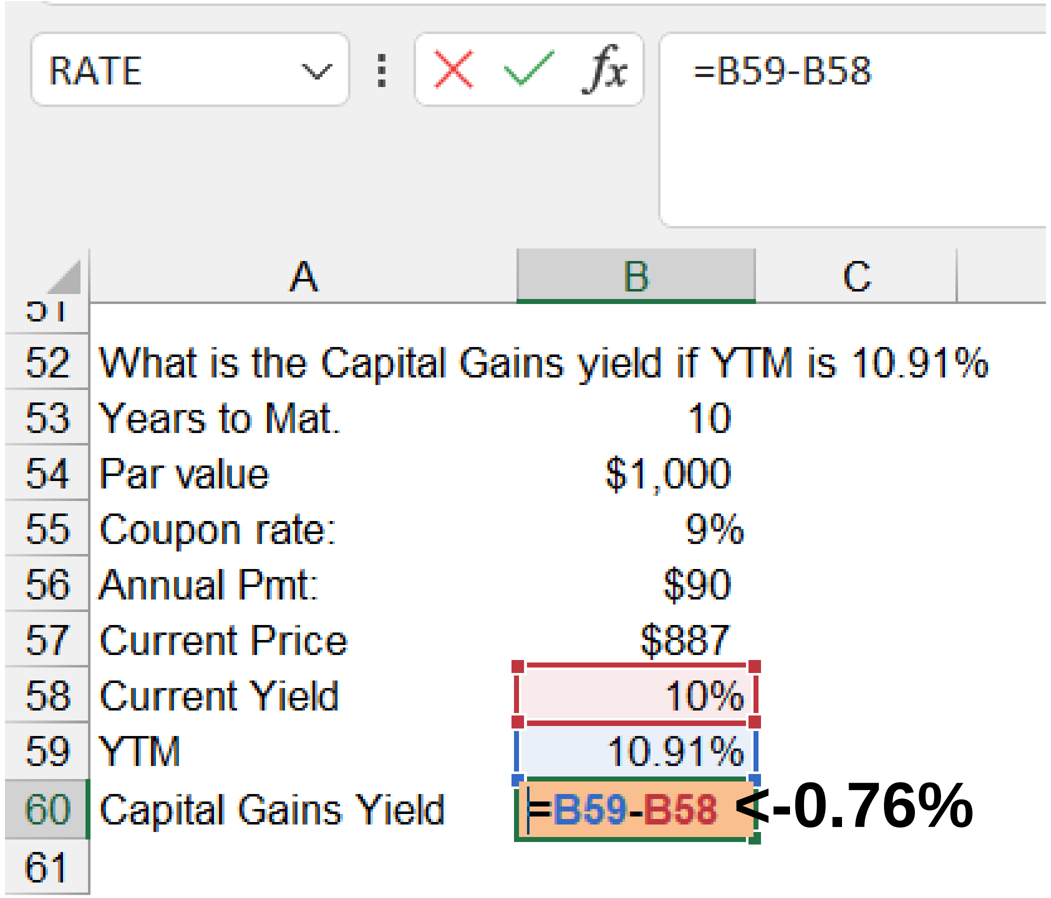
What is the Current Yield of a 9% coupon, 10-year bond, P = \$887, and YTM = 10.91%

$$\text{Current yield} = \frac{\$90}{\$887}$$

$$= 0.1015 = 10.15\%.$$

What is the Capital Gains yield if YTM is 10.91%

Years to Mat.	10
Par value	$1,000
Coupon rate:	9%
Annual Pmt:	$90
Current Price	$887
Current Yield	10%
YTM	10.91%
Capital Gains Yield	



What is the Capital Gains yield if YTM is 10.91%

$$\begin{aligned} \text{Cap gains yield} &= \text{YTM} - \text{Current yield} \\ &= 10.91\% - 10.15\% \\ &= 0.76\%. \end{aligned}$$

- Could also find values in Years 1 and 2, get difference, and divide by value in Year 1. Same answer.

Understanding Yield to Maturity

- Yield to maturity is similar to current yield, which divides annual cash inflows from a bond by the market price of that bond to determine how much money one would make by buying a bond and holding it for one year.
- Yet, unlike current yield, YTM accounts for the present value of a bond's future coupon payments.
- In other words, YTM factors in the time value of money, whereas a simple current yield calculation does not. As such, it is often considered a more thorough means of calculating the return from a bond.

Semiannual Bonds

1. Multiply years by 2 to get periods = 2N.
2. Divide nominal rate by 2 to get periodic: rate = $r_d/2$.
3. Divide annual INT by 2 to get PMT = INT/2.

INPUTS	**2N**	**$r_d/2$**	**OK**	**INT/2**	**OK**
	N	**I/YR**	**PV**	**PMT**	**FV**
OUTPUT					

Value of 10-year, 10% coupon, **semiannual** bond if r_d = 13%.

Years to Mat.	10
Par value	$1,000
Coupon rate:	10%
Annual Pmt:	$100
Current Interest Rate	13%
Present Value	

PV =-PV(B68/2,B64*2,B67/2,B65)

	A	B	C	D	E
61					
62					
63	Value of 10-year, 10% coupon, **semiannual** bond if rd = 13%.				
64	Years to Mat.	10			
65	Par value	$1,000			
66	Coupon rate:	10%			
67	Annual Pmt:	$100			
68	Current Interest Rate	13%			
69	Present Value	=-PV(B68/2,B64*2,B67/2,B65)			
70					

<-$834.72

	N	I/YR	PV	PMT	FV
INPUTS	2(10) 20	13/2 6.5		100/2 50	1000
OUTPUT			-834.72		

What is the nominal Yield to Call on a Callable Bond?

- A 10-year, 10% semiannual coupon, $1,000 par value bond is selling for $1,135.90. **What is the yield to maturity?** It can be called after 5 years at $1,050. **What is the Yield to call?**

Years to Mat.	10
Par value	$1,000
Coupon rate:	10%
Annual Pmt:	$100
Current Price	$1,135.90
YTM	
Called after 5 years for	$1,050
Nominal Yield to Call	

What is the YTM on this Callable Bond?

B78 =(RATE(B73*2,B76/2,-B77,B74))*2

	A	B	C	D	E
71					
72					
73	Years to Mat.	10			
74	Par value	$1,000			
75	Coupon rate:	10%			
76	Annual Pmt:	$100			
77	Current Price	$1,135.90			
78	YTM	**8.00%**			
79	Called after 5 years for	$1,050			
80	Nominal Yield to Call				
81					

What is the nominal Yield to Call on a Callable Bond?

B80 =(RATE(B73,B76/2,-B77,B79))*2

	A	B	C	D	E
71					
72					
73	Years to Mat.	10			
74	Par value	$1,000			
75	Coupon rate:	10%			
76	Annual Pmt:	$100			
77	Current Price	$1,135.90			
78	YTM	**8.00%**			
79	Called after 5 years for	$1,050			
80	Nominal Yield to Call	**7.53%**			
81					

Nominal Yield to Call (YTC)

INPUTS	**10**		**-1135.9**	**50**	**1050**
	N	**I/YR**	**PV**	**PMT**	**FV**
OUTPUT		**3.765 x 2 = 7.53%**			

Years to Mat.	10
Par value	$1,000
Coupon rate:	10%
Annual Pmt:	$100
Current Price	$1,135.90
YTM	8%
Called after 5 years for	$1,050
Nominal Yield to Call	

If you bought these bonds, would you be more likely to earn YTM or YTC?

- Coupon rate = 10% vs. YTC = r_d = 7.53%. Could raise money by selling new bonds which pay 7.53%.
- Could thus replace bonds which pay $100/year with bonds that pay only $75.30/year.
- Investors should expect a call, hence YTC = 7.5%, not YTM = 8%.

- In general, if a bond sells at a premium, then coupon > r_d, so a call is likely.
- So, expect to earn:
  - YTC on premium bonds.
  - YTM on par & discount bonds.

Determinants of Market Interest Rates

$r_d = r^* + IP + MRP + DRP + LP$

$$
\begin{aligned}
&\text{Here:}\\
rd &= \text{Required rate of return on a debt security.}\\
r^* &= \text{Real risk} - \text{free rate.}\\
IP &= \text{Inflation premium.}\\
MRP &= \text{Maturity risk premium.}\\
DRP &= \text{Default risk premium.}\\
LP &= \text{Liquidity premium.}
\end{aligned}
$$

What is the real risk-free rate (r*)?

- Rate that a hypothetical riskless security pays each moment if zero inflation were expected.
- r* changes over time depending on economic conditions.
- r* can be approximated by rate on short-term Treasury Inflation-Protected Securities (TIPS).

What is the nominal risk-free rate (r_{RF})?

- The rate on a U.S. Treasury security
  - Short-term security: T-bill
  - Long-term security: T-bond

Estimating the Inflation Premium (IP)

- Treasury Inflation-Protected Securities (TIPS) are indexed to inflation.
- The IP for a particular length maturity can be approximated as the difference between the yield on a non-indexed Treasury security of that maturity minus the yield on a TIPS of that maturity.

Bond Spreads, the Default Risk Premium (DRP), and the Liquidity Premium (LP)

- A “bond spread” is often calculated as the difference between a corporate bond’s yield and a Treasury security’s yield of the same maturity. Therefore:
  - Spread = DRP + LP.
- Bond’s of large, strong companies often have very small LPs. Bond’s of small companies often have LPs as high as 2%.

What factors affect default risk and bond ratings?

- Financial ratios
  - Debt ratio
  - Coverage ratios, such as interest coverage ratio or EBITDA coverage ratio
  - Profitability ratios
  - Current ratios

Bond Ratings		% defaulting within:	
S&P and Fitch	Moody’s	1 yr.	5 yrs.
Investment grade bonds:			
AAA	Aaa	0.13	0.68
AA	Aa	0.00	0.00
A	A	0.09	0.96
BBB	Baa	0.07	1.72
Junk bonds:			
BB	Ba	0.62	6.35
B	B	2.06	11.68
CCC	Caa	21.36	35.38

Bond Ratings

	Return on capital	Debt to capital
AAA	27.6%	12.4%
AA	27.0%	28.3%
A	17.5%	37.5%
BBB	13.4%	42.5%
BB	11.3%	53.7%
B	8.7%	75.9%
CCC	3.2%	113.5%

Long-term Bonds	Yield (%)	Spread (%)
10-Year T-bond	1.72	
AAA	2.21	0.49
AA	2.27	0.55
A	2.42	0.70
BBB	3.46	1.74
BB	5.16	3.44
B	6.58	4.86
CCC	8.37	6.65

Factors that Affect Bond Ratings

- Provisions in the bond contract
  - Secured versus unsecured debt
  - Senior versus subordinated debt
  - Guarantee provisions
  - Sinking fund provisions
  - Debt maturity
- Other factors
  - Earnings stability
  - Regulatory environment
  - Potential product liability
  - Accounting policies

What is reinvestment rate risk?

- The risk that cash flows will have to be reinvested in the future at lower rates, reducing income.
- Illustration: Suppose you just won $500,000 playing the lottery. You'll invest the money and live off the interest. You buy a 1-year bond with a YTM of 10%.

What is the Year 1 income?

What happens if rates fall to 3%

What is reinvestment rate risk?

- Year 1 income = $50,000. At year-end get back $500,000 to reinvest.
- If rates fall to 3%, income will drop from $50,000 to $15,000.
- Had you bought 30-year bonds, income would have remained constant.

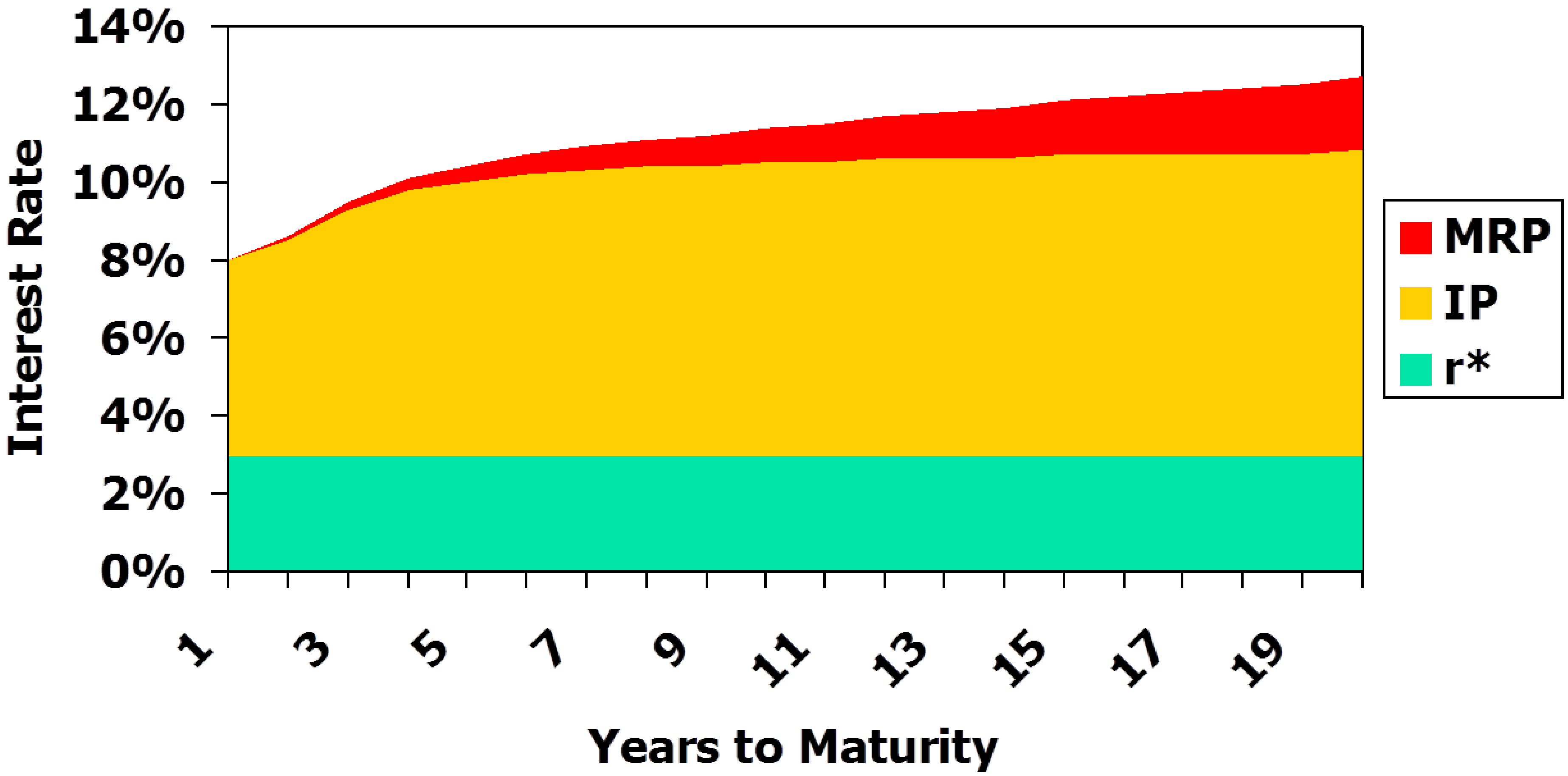
The Maturity Risk Premium (MRP)

- Long-term bonds: High interest rate risk, low reinvestment rate risk.
- Short-term bonds: Low interest rate risk, high reinvestment rate risk.
- Nothing is riskless!
- Yields on longer term bonds usually are greater than on shorter term bonds, so the MRP is more affected by interest rate risk than by reinvestment rate risk.

Term Structure Yield Curve

- Term structure of interest rates: the relationship between interest rates (or yields) and maturities.
- A graph of the term structure is called the yield curve.

Hypothetical Treasury Yield Curve



Bankruptcy

- Two main chapters of Federal Bankruptcy Act:
  - Chapter 11, Reorganization
  - Chapter 7, Liquidation
- Typically, company wants Chapter 11, creditors may prefer Chapter 7.
- If company can't meet its obligations, it files under Chapter 11. That stops creditors from foreclosing, taking assets, and shutting down the business.
- Company has 120 days to file a reorganization plan.
  - Court appoints a "trustee" to supervise reorganization.
  - Management usually stays in control.

Bankruptcy

- Company must demonstrate in its reorganization plan that it is "worth more alive than dead."
- Otherwise, judge will order liquidation under Chapter 7.
- In a liquidation, unsecured creditors generally get zero. This makes them more willing to participate in reorganization even though their claims are greatly scaled back.
- Various groups of creditors vote on the reorganization plan. If both the majority of the creditors and the judge approve, company "emerges" from bankruptcy with lower debts, reduced interest charges, and a chance for success.

If the company is liquidated, here's the payment priority:

- Past due property taxes
- Secured creditors from sales of secured assets.
- Trustee's costs
- Expenses incurred after bankruptcy filing
- Wages and unpaid benefit contributions, subject to limits
- Unsecured customer deposits, subject to limits
- Taxes
- Unfunded pension liabilities
- Unsecured creditors
- Preferred stock
- Common stock

Time Value of Money

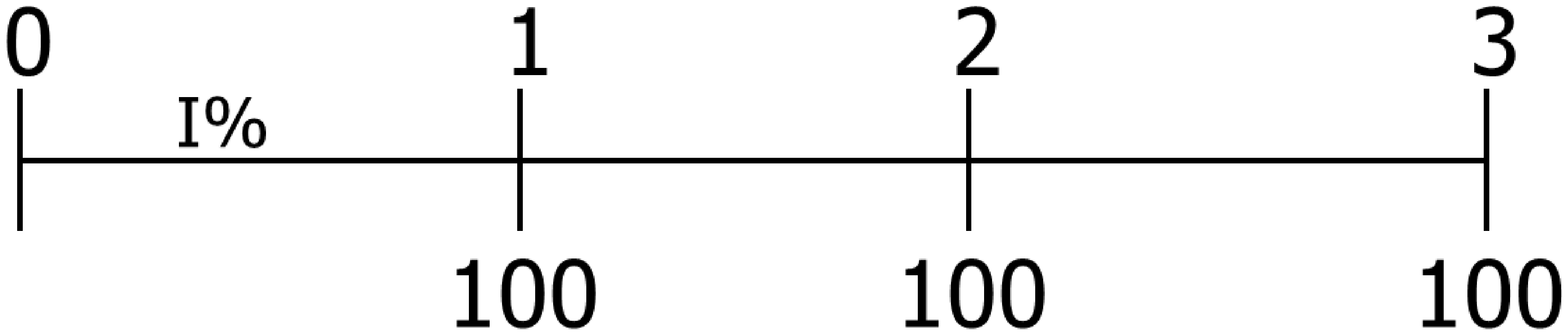
Time Value Topics

- Future value
- Present value
- Rates of return
- Amortization

Future Value

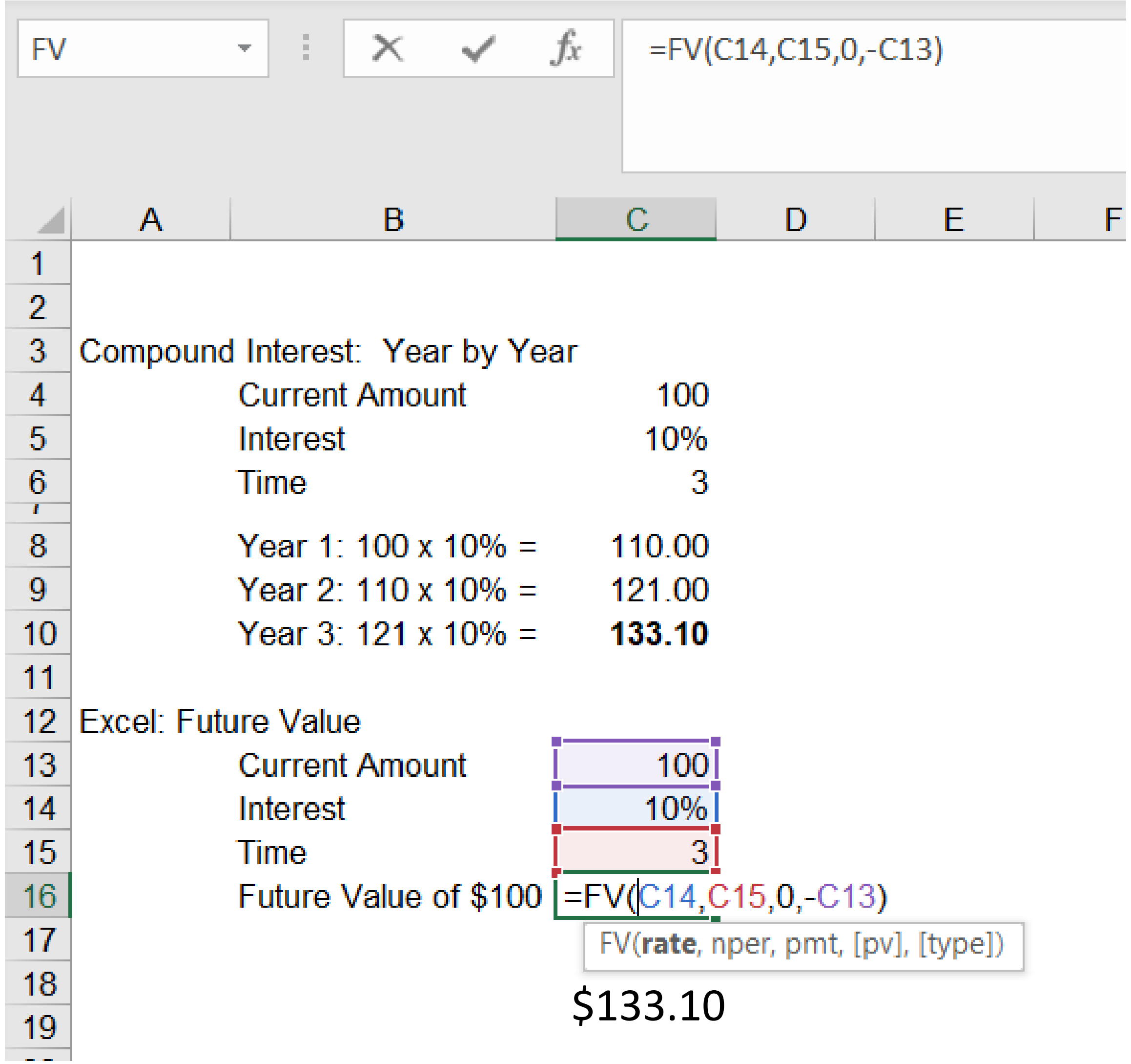
- Future value (FV) is the value of a current asset at a future date based on an assumed rate of growth.
- The future value is important to anyone who needs to **estimate how much an investment made today will be worth in the future**.
- Finding FVs (moving to the right on a timeline) is called compounding.

Timeline for an ordinary annuity of $100 for 3 years



What is the $100 worth in 3 years from now compounding at 10% interest per year?

Future Value of $100 in 3 years at 10% p.a.



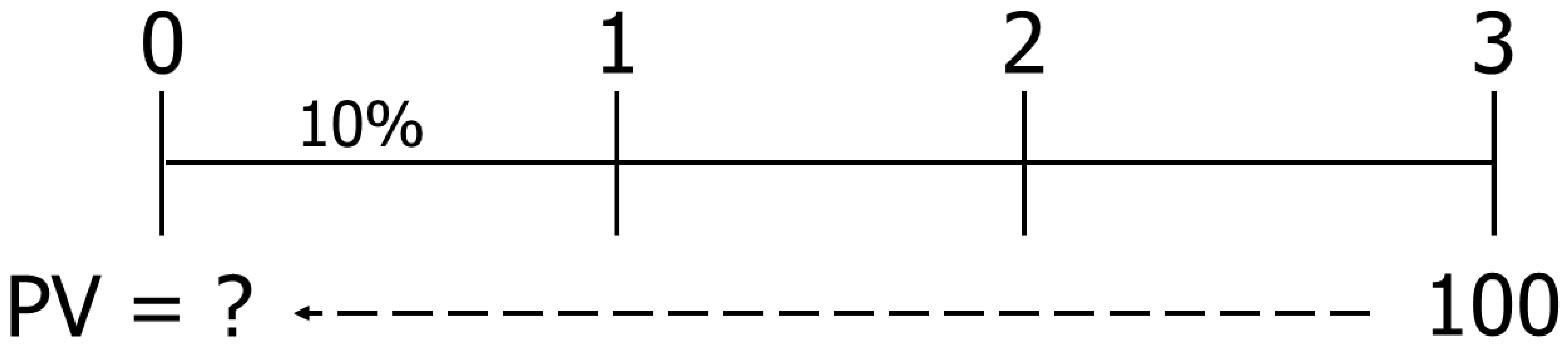
$133.10

If I invest $100 today at 10% per year, in three years, that $100 grows to $133.10

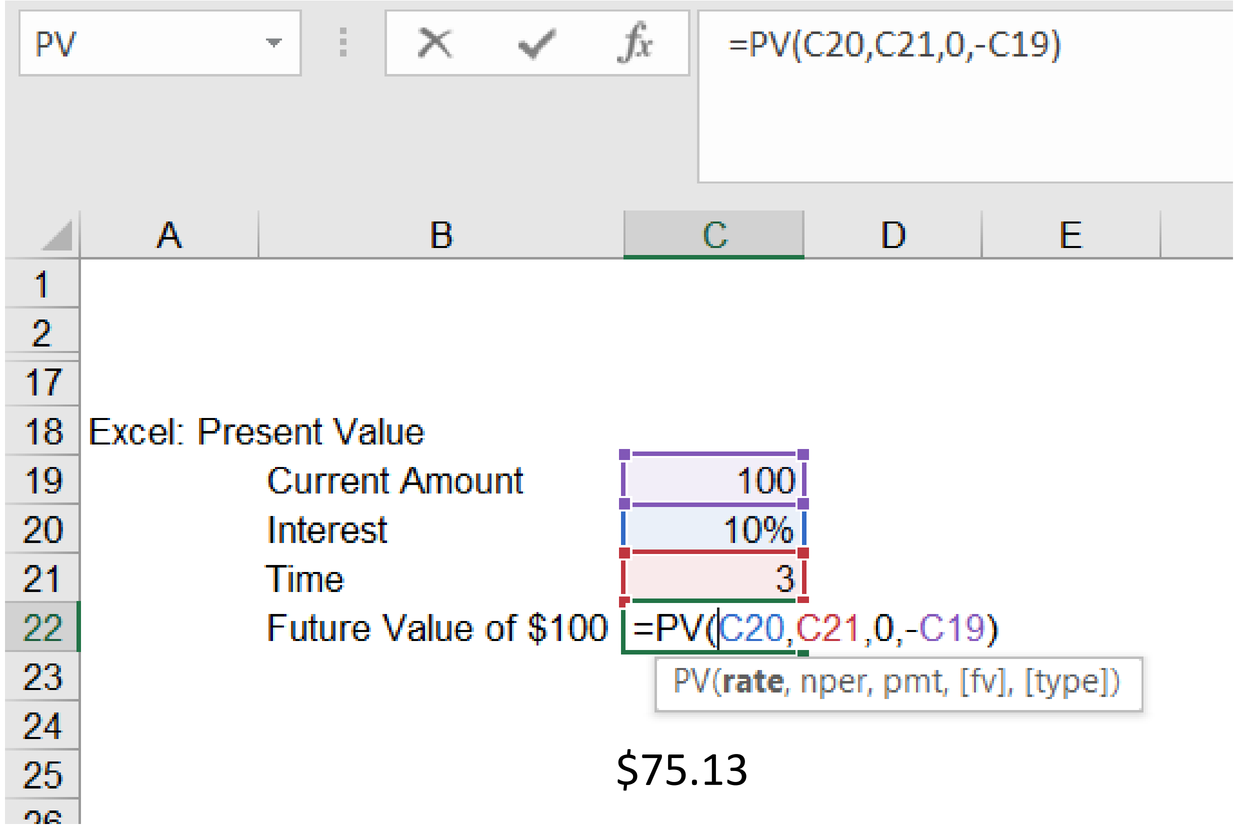
Present Value

- Present value (PV) is the current value of a future sum of money or stream of cash flows given a specified rate of return.
- Future cash flows are discounted at **the discount rate.**
- The higher the discount rate, the lower the present value of the future cash flows.
- Determining the appropriate discount rate is the key to properly valuing future cash flows, whether they be earnings or debt obligations.
- Finding PVs is discounting, and it’s the reverse of compounding.

In 3 years, you will be given $100. You can invest at 10%, per year. What is that worth today?



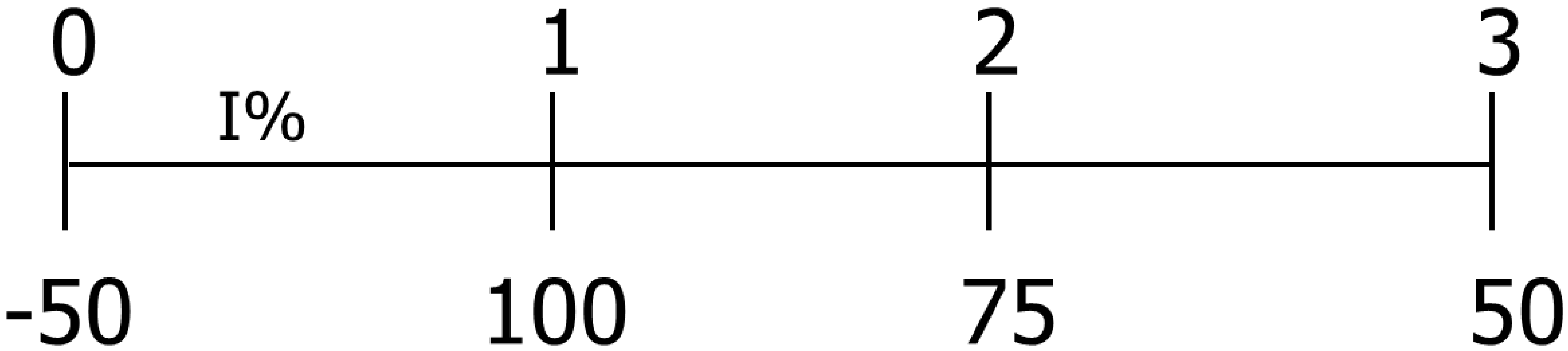
Present Value of $100 over 3 years at 10% p.a.



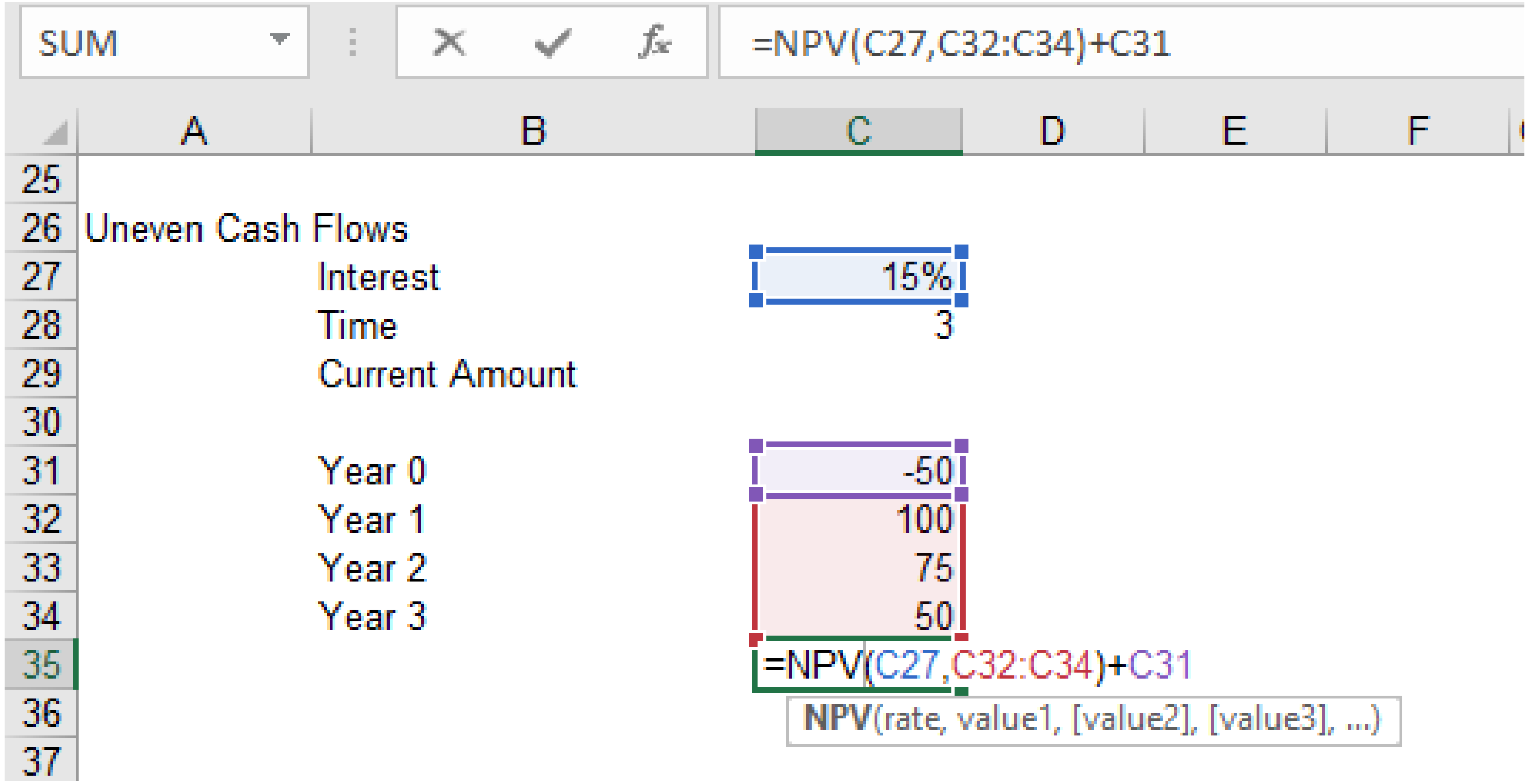
$75.13

$100 in three years from now is worth $75.13 today – if I invest at 10% per year.

Timeline for uneven Cash Flows

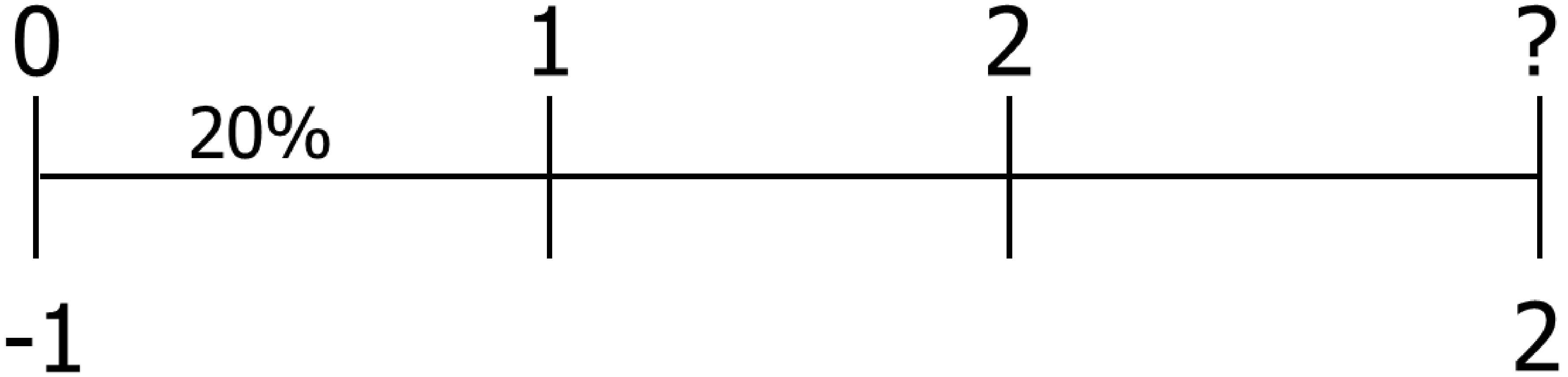


Timeline for uneven Cash Flows



$126.54

Finding the Time to Double



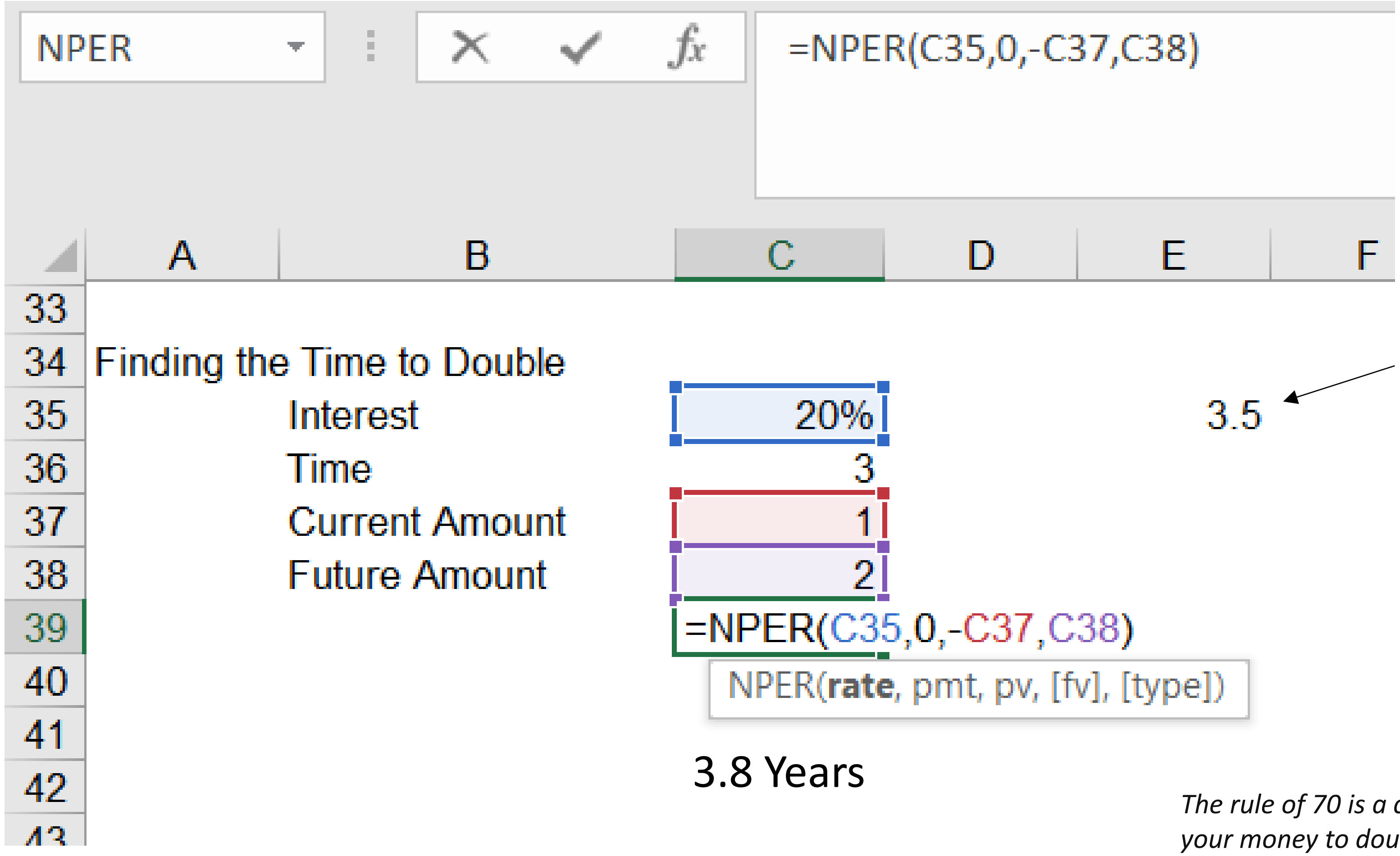
$$FV_N = PV(1 + I)^N$$

Financial Calculator Solution

INPUTS		20	-1	0	2
	N	I/YR	PV	PMT	FV
OUTPUT	3.8				

If you know 4 of the 5 inputs, you can easily solve for the 5th

Time to Double



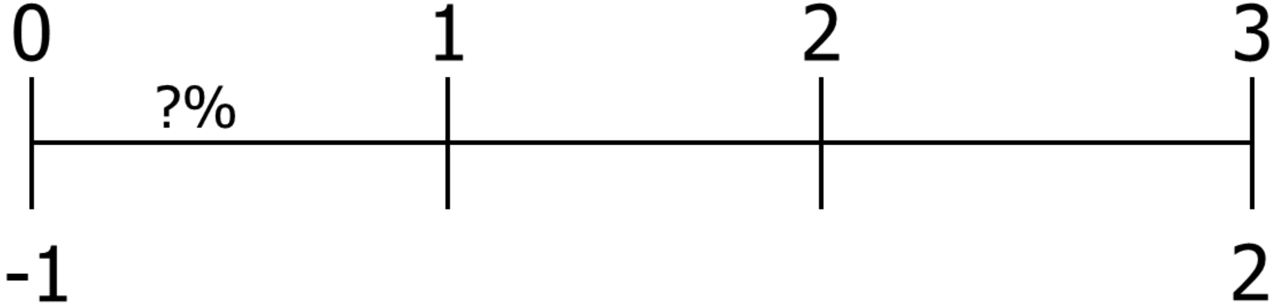
3.5

Rule of 70

3.8 Years

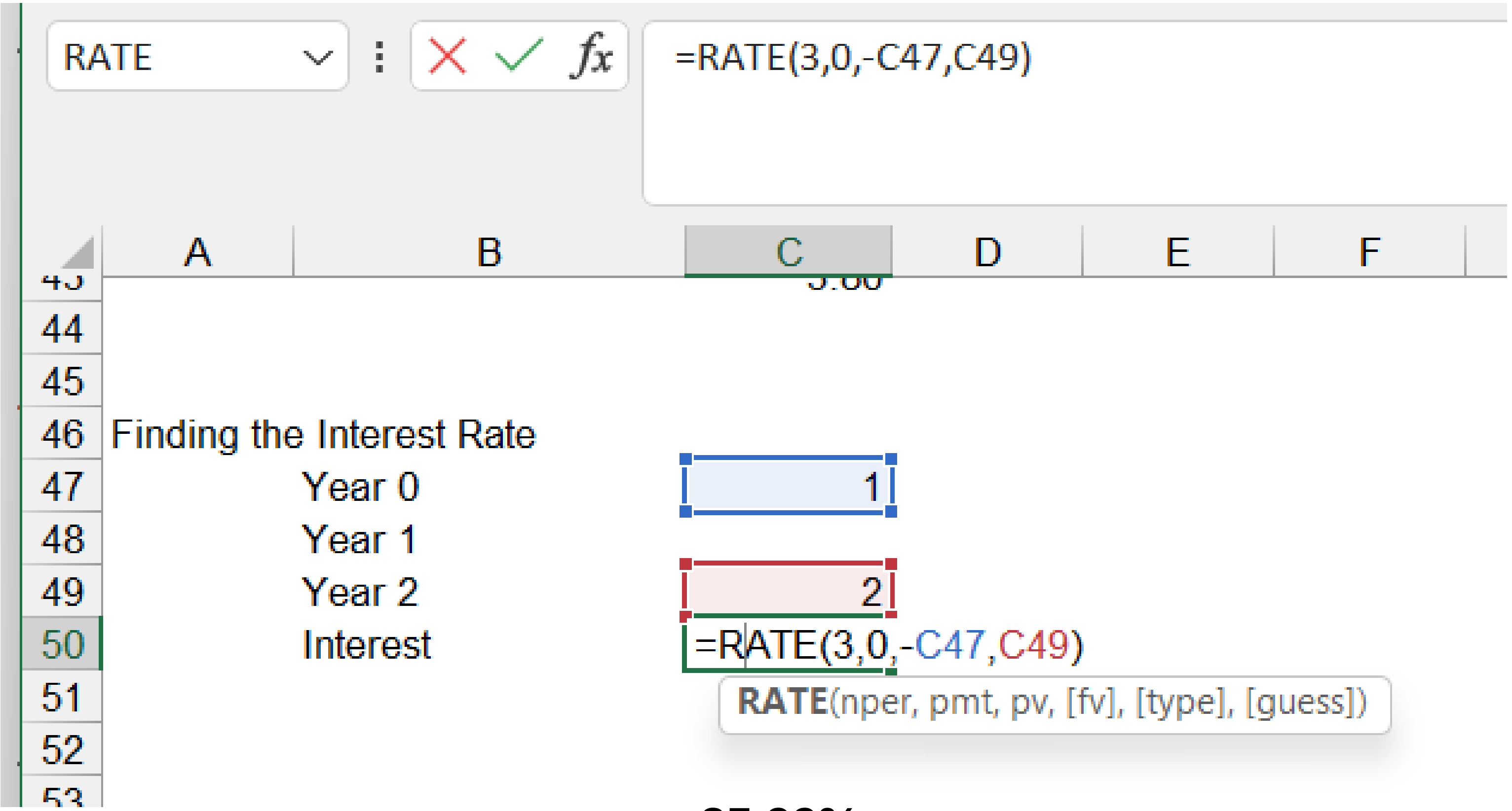
The rule of 70 is a calculation to determine how many years it'll take for your money to double given a specified rate of return. The rule is commonly used to compare investments with different annual compound interest rates to quickly determine how long it would take for an investment to grow. The rule of 70 is also referred to as doubling time.

Finding the Interest Rate



$$FV = PV\left(1+I\right)^{N}$$

Finding the Interest Rate

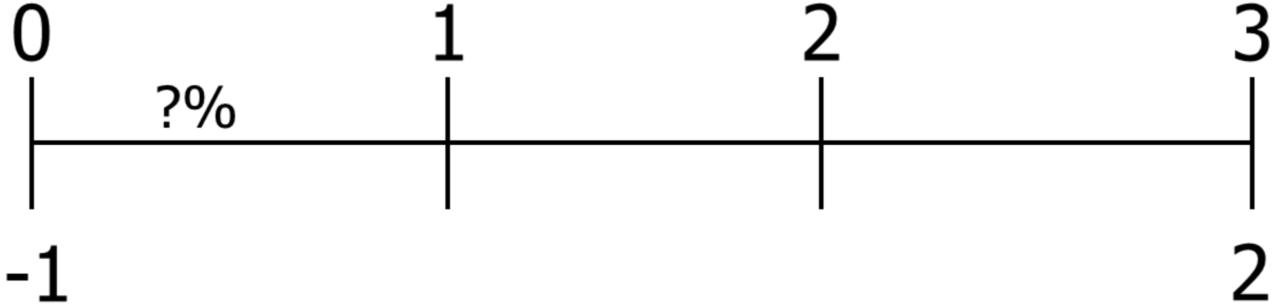


25.99%

Financial Calculator

	N	I/YR	PV	PMT	FV
INPUTS	3		-1	0	2
OUTPUT		25.99			

Finding the Interest Rate



$$FV = PV\left(1+I\right)^{N}$$

$$\$2 = \$1\left(1+I\right)^{3}$$

$$\left(2\right)^{(1/3)} = \left(1+I\right)$$

$$1.2599 = \left(1+I\right)$$

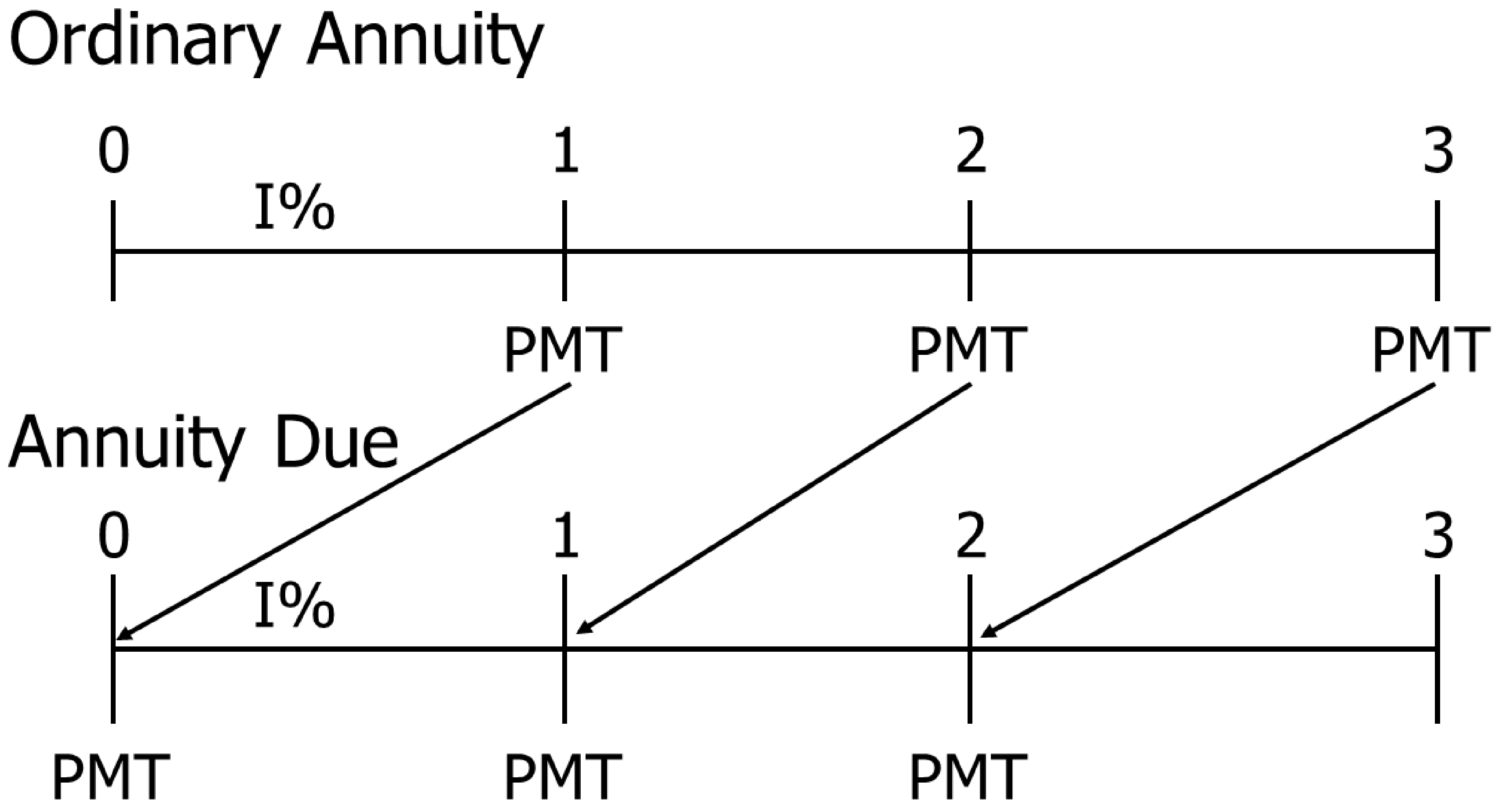
$$I = 0.2599 = 25.99\%$$

Ordinary Annuity vs. Annuity Due

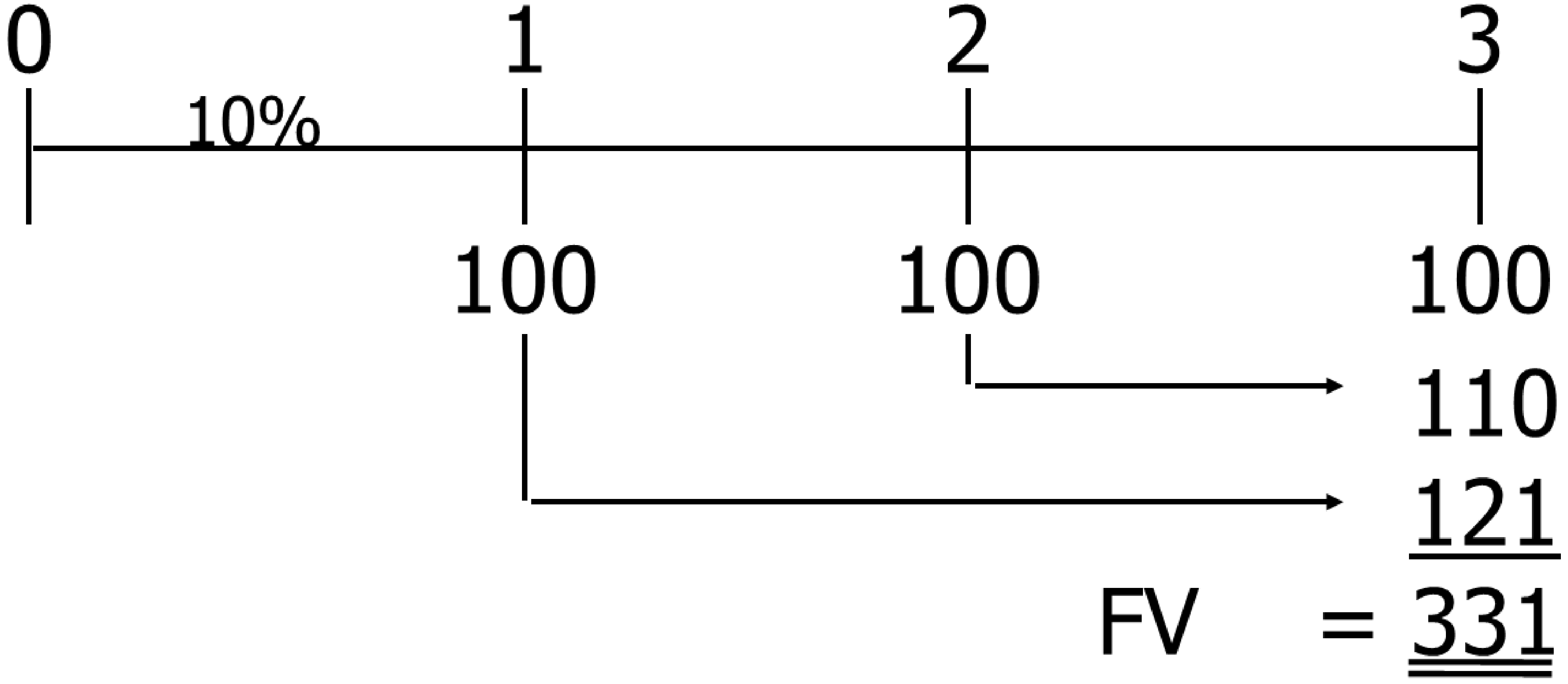
What is the difference?

When is each applied?

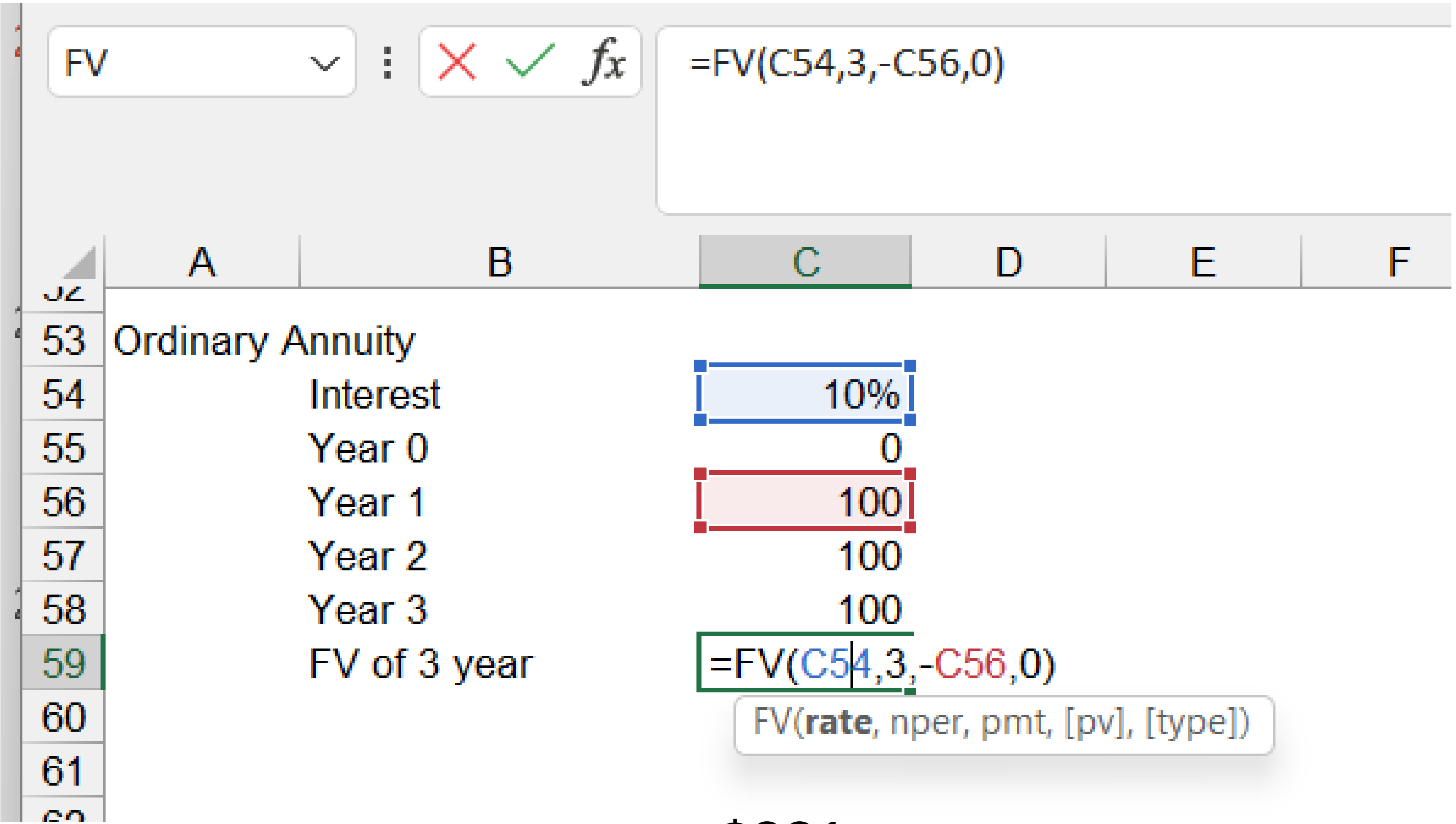
Ordinary Annuity vs. Annuity Due



What's the FV of a 3-year ordinary annuity of $100 at 10%?



What’s the FV of a 3-year ordinary annuity of $100 at 10%?



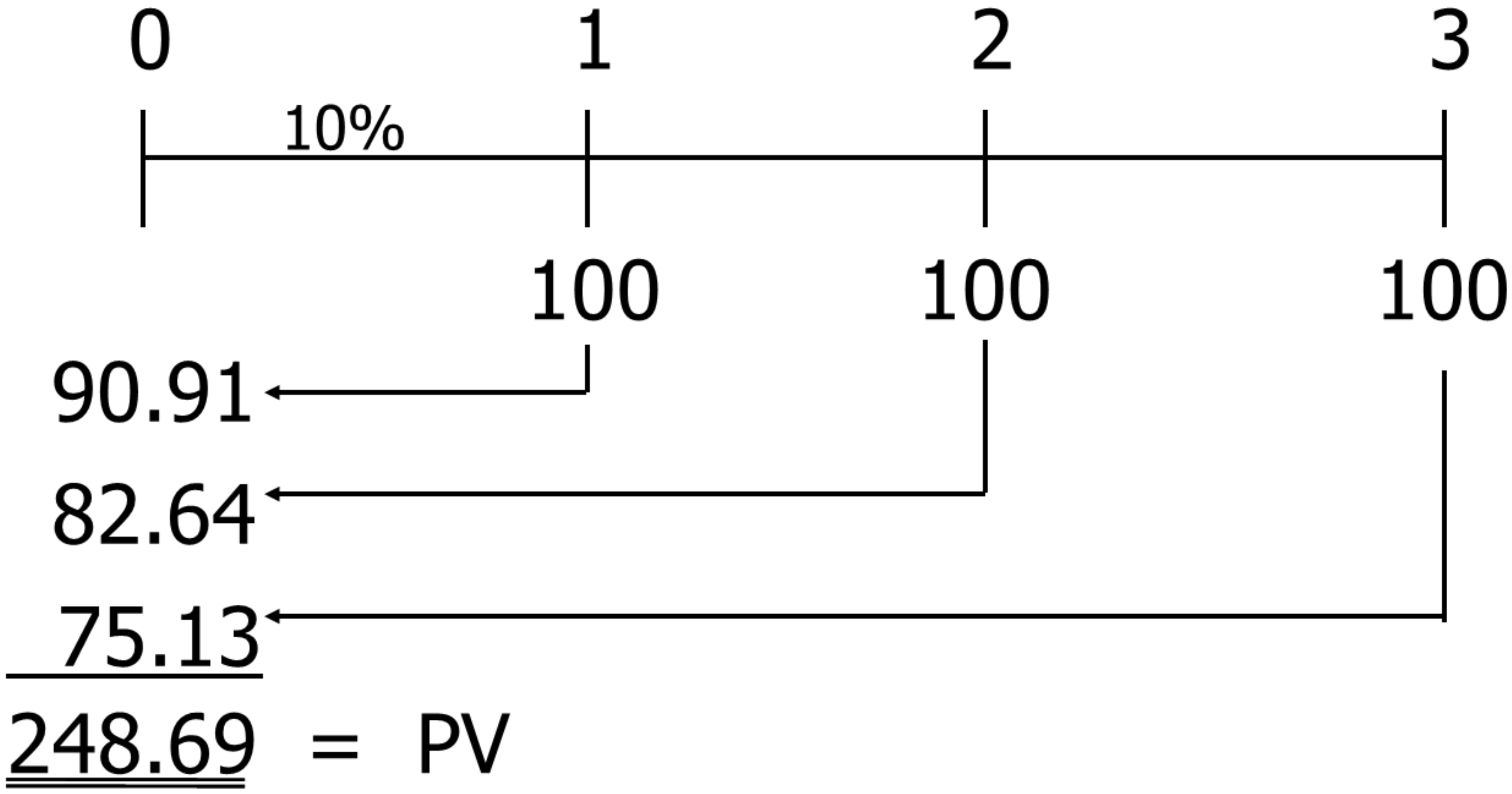
$331

Financial Calculator Solution

INPUTS	3	10	0	-100	
	N	I/YR	PV	PMT	FV
OUTPUT					331.00

Have payments but no lump sum PV, so enter 0 for present value.

What's the PV of this ordinary annuity?



What’s the PV of this ordinary annuity?

PV

=PV(C63,3,-C65)

	A	B	C	D	E
62	PV Ordinary Annuity				
63		Interest	10%		
64		Year 0	0		
65		Year 1	100		
66		Year 2	100		
67		Year 3	100		
68		PV for 3 years	=PV(C63,3,-C65)		
69					
70					

PV(rate, nper, pmt, [fv], [type])

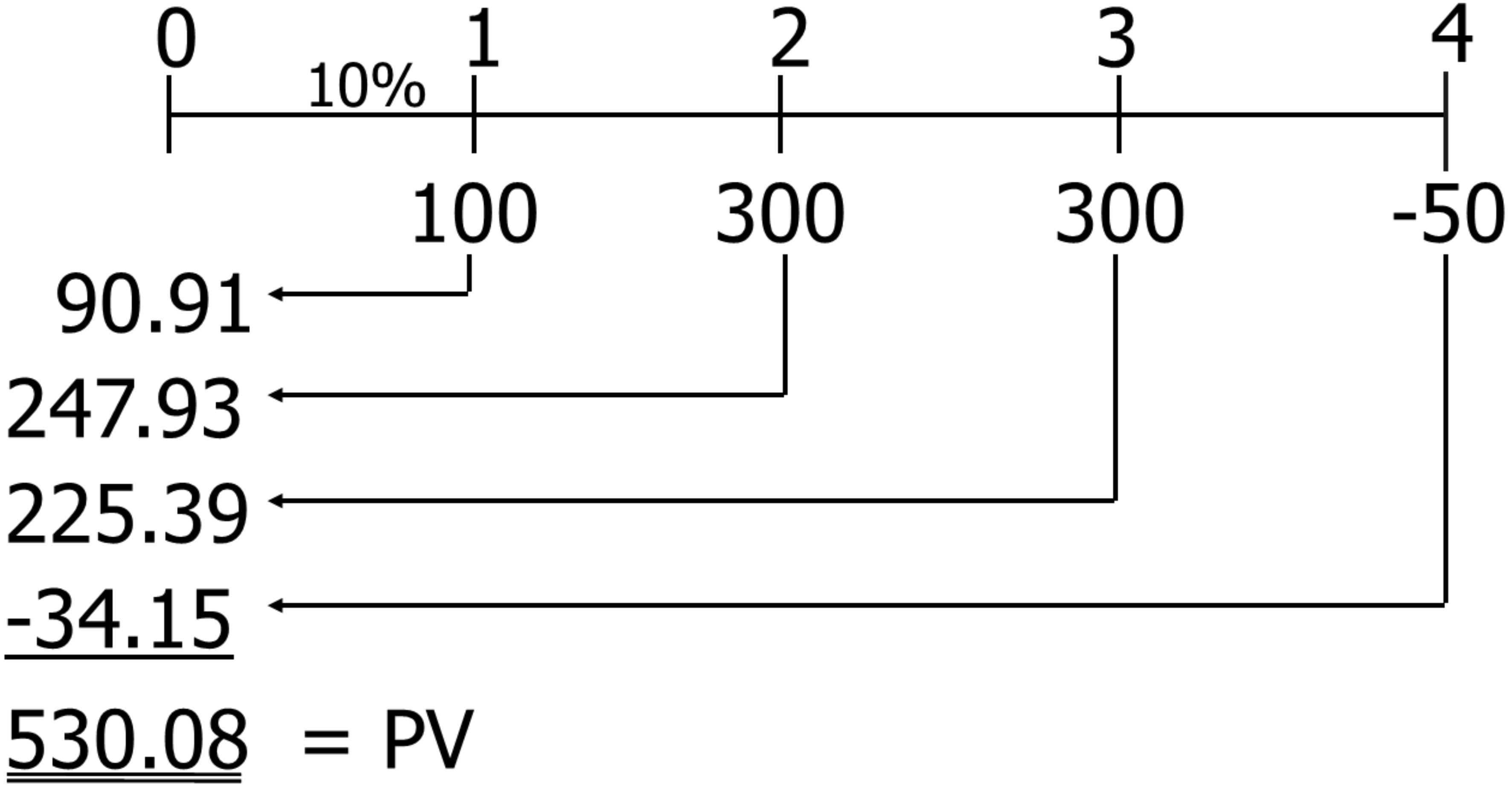
$248.69

Financial Calculator Solution (3 of 3)

INPUTS	3	10		100	0
	N	**I/YR**	**PV**	**PMT**	**FV**
OUTPUT			-248.69		

Have payments but no lump sum FV, so enter 0 for future value.

What is the PV of this uneven cash flow stream?



Excel Formula in cell A3: = NPV(10%,B2:E2)

	A	B	C	D	E
1	**0**	**1**	**2**	**3**	**4**
2		**100**	**300**	**300**	**-50**
3	**$530.09**				
4					
5					

Interest Rates

Nominal rate (I_{NOM})

- Stated in contracts and quoted by banks and brokers.
- Not used in calculations or shown on timelines
- Periods per year (M) must be given.
- Examples:
  - 8%; Quarterly
  - 8%, Daily interest (365 days)

Periodic rate (I_{PER})

- $I_{PER} = I_{NOM}/M$, where M is number of compounding periods per year.

- M = 4 for quarterly, 12 for monthly, and 360 or 365 for daily compounding.

- Used in calculations, shown on timelines.
- Examples:
  - 8% quarterly: I_{PER} = 8%/4 = 2%.
  - 8% daily (365): I_{PER} = 8%/365 = 0.021918%.

The Impact of Compounding

- Will the FV of a lump sum be larger or smaller if we compound more often, holding the stated I% constant?
- Why?

The Impact of Compounding (Answer)

- LARGER!

- If compounding is more frequent than once a year--for example, semiannually, quarterly, or daily--interest is earned on interest more often.

FV of $100 at a 12% nominal rate for 5 years with different compounding

FV(Ann.)	$= \$100(1.12)^5$	= $176.23
FV(Semi.)	$= \$100(1.06)^{10}$	= $179.08
FV(Quar.)	$= \$100(1.03)^{20}$	= $180.61
FV(Mon.)	$= \$100(1.01)^{60}$	= $181.67
FV(Daily)	$= \$100(1+(0.12/365))^{(5x365)}$	= $182.19

Effective Annual Rate

- The effective annual interest rate (EAR or EFF%) is the real return paid on savings or the real cost of a loan as it takes into account the effects of compounding and any fees charged.

- The more frequent the compounding periods, the greater the return.

- The nominal interest rate does not reflect the effects of compounding interest or even the fees that come with these financial products. The effective annual interest rate is the real return.

Effective Annual Rate Example

- Example: Invest $1 for one year at 12%, semiannual:

$$FV = PV\left(1 + I_{NOM}/M\right)^{M}$$

$$FV = \$1\left(1.06\right)^{2} = \$1.1236.$$

Because $1 invested for one year at 12% semiannual compounding would grow to the same value as $1 invested for one year at 12.36% annual compounding.

Comparing Rates

- An investment with monthly payments is different from one with quarterly payments. Must put on EFF% basis to compare rates of return. Use EFF% only for comparisons.
- Banks say “interest paid daily.” Same as compounded daily.

EAR (or EFF%) for a Nominal Rate of of 12%

$$\text{EAR}_{\text{Annual}} = 12\%.$$

$$\text{EAR}_{\text{Q}} = \left(1 + 0.12/4\right)^{4} - 1 = 12.55\%.$$

$$\text{EAR}_{\text{M}} = \left(1 + 0.12/12\right)^{12} - 1 = 12.68\%.$$

$$\text{EAR}_{\text{D}(365)} = \left(1 + 0.12/365\right)^{365} - 1 = 12.75\%.$$

Can the effective rate ever be equal to the nominal rate?

- Yes, but only if annual compounding is used, i.e., if M = 1.
- If M > 1, EFF% will always be greater than the nominal rate.

When is each rate used? (1 of 3)

I_{NOM}: Written into contracts, quoted by banks and brokers.

<u>Not</u> used in calculations or shown on timelines.

When is each rate used? (2 of 3)

I_{PER}: Used in calculations, shown on timelines.

If I_{NOM} has annual compounding,
then $I_{PER} = I_{NOM}/1 = I_{NOM}$.

When is each rate used? (3 of 3)

- EAR (or EFF%): Used to compare returns on investments with different payments per year.
- Used for calculations if and only if dealing with annuities where payments don’t match interest compounding periods.

Amortization (1 of 2)

- Amortization refers to the process of paying off debt over time in regular installments of interest and principal sufficient to repay the loan in full by its maturity date.

- A higher percentage of the flat monthly payment goes toward interest early in the loan, but with each subsequent payment, a greater percentage of it goes toward the loan's principal.

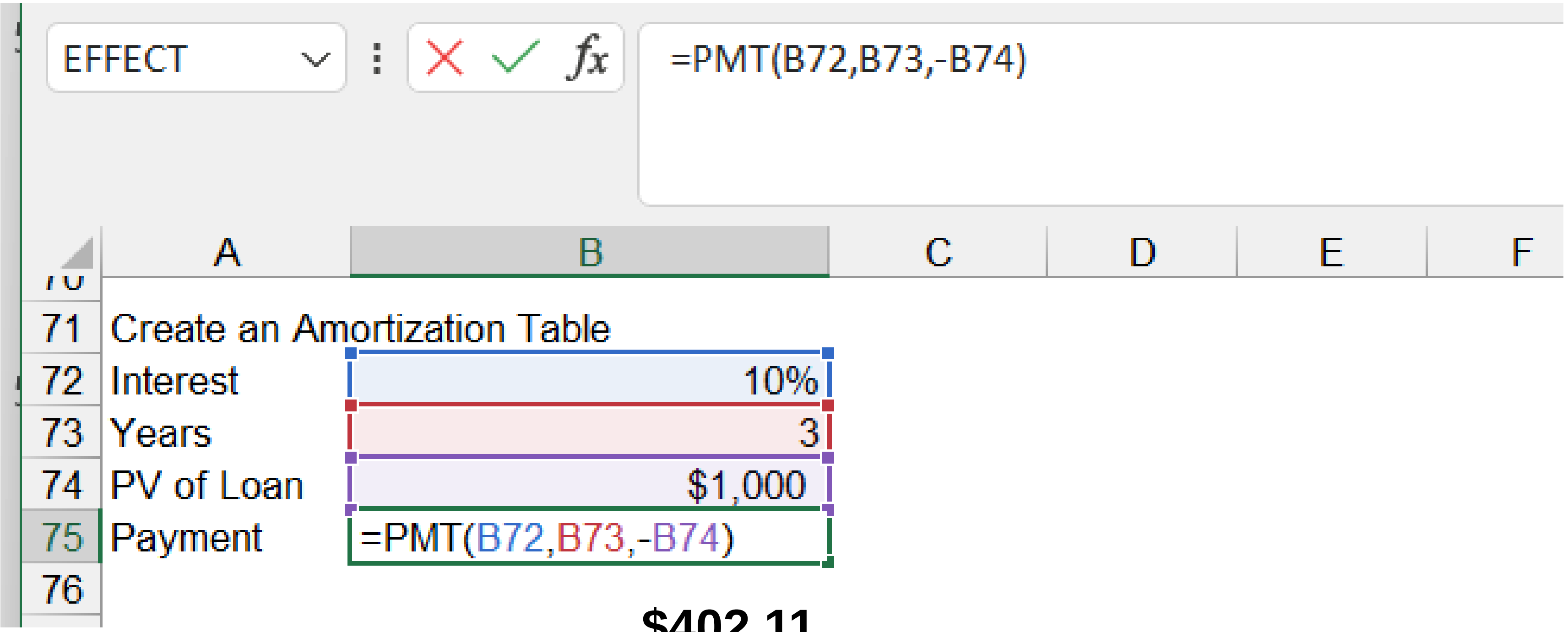
- Amortization tables are widely used--for home mortgages, auto loans, business loans, retirement plans, and more. They are very important!

- Construct an amortization schedule for a $1,000, 10% annual rate loan with 3 equal payments.

Step 1: Find the required payments

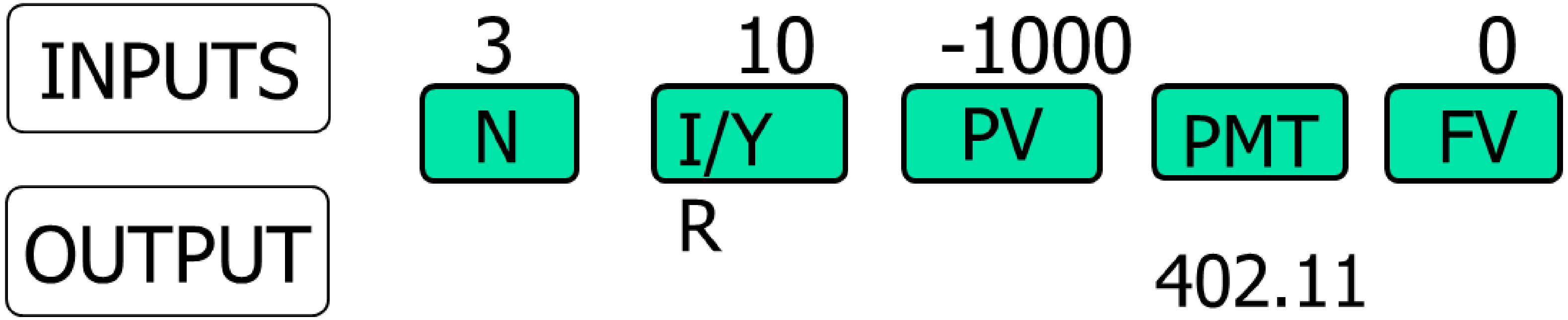
Interest	10%
Years	3
PV of Loan	$1,000

Step 1: Find the required payments.



$402.11

Step 1: Find the required payments.

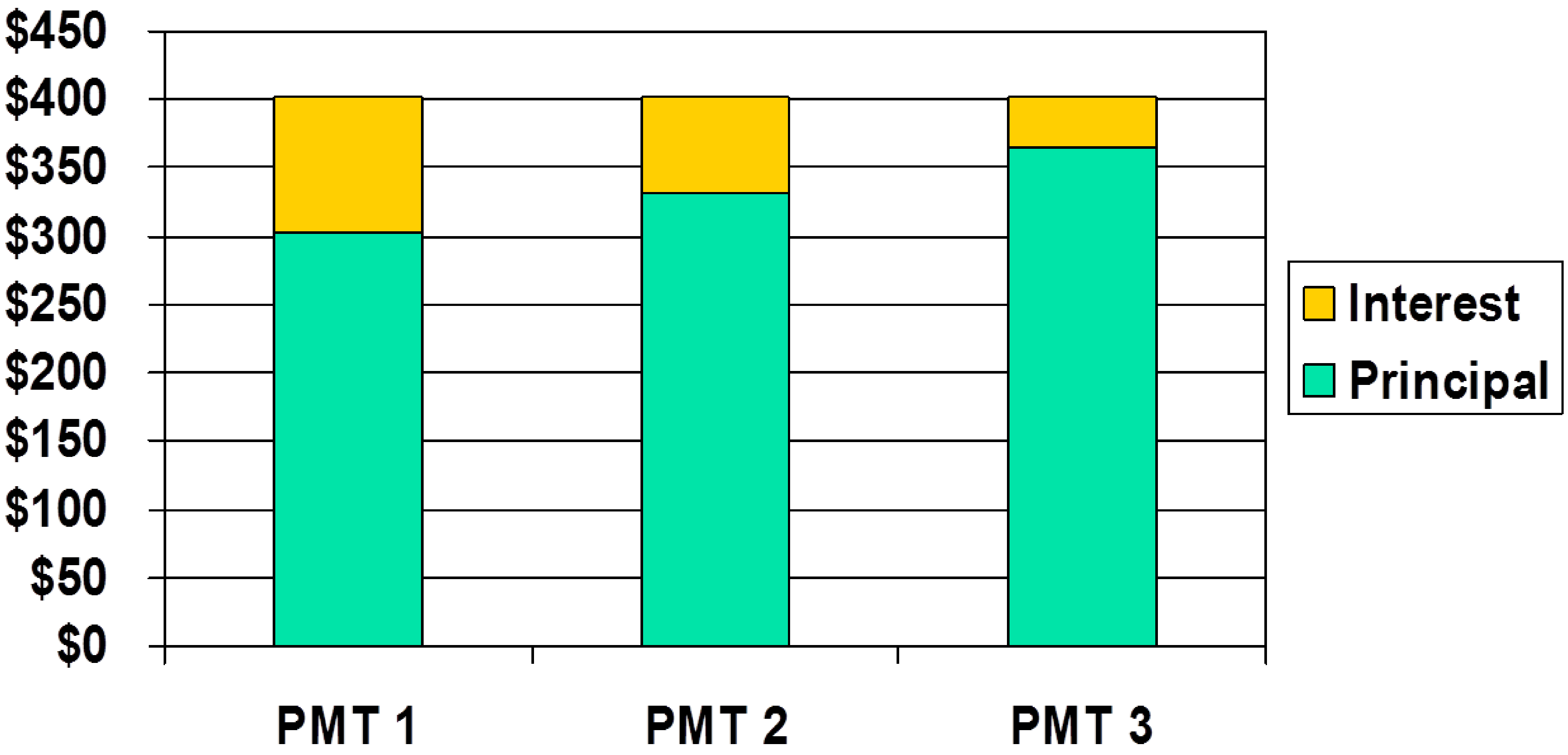


Step 2: Create the Amortization Table

Interest	10%
Years	3
PV of Loan	$1,000
Payment	$402.11

N	Beg. Amt.	Payment	Interest	Principal	End. Amt.
1	$1,000.00	$402.11	$100.00	$302.11	$697.89
2	$697.89	$402.11	$69.79	$332.33	$365.56
3	$365.56	$402.11	$36.56	$365.56	$0.00

Interest declines because outstanding balance declines.

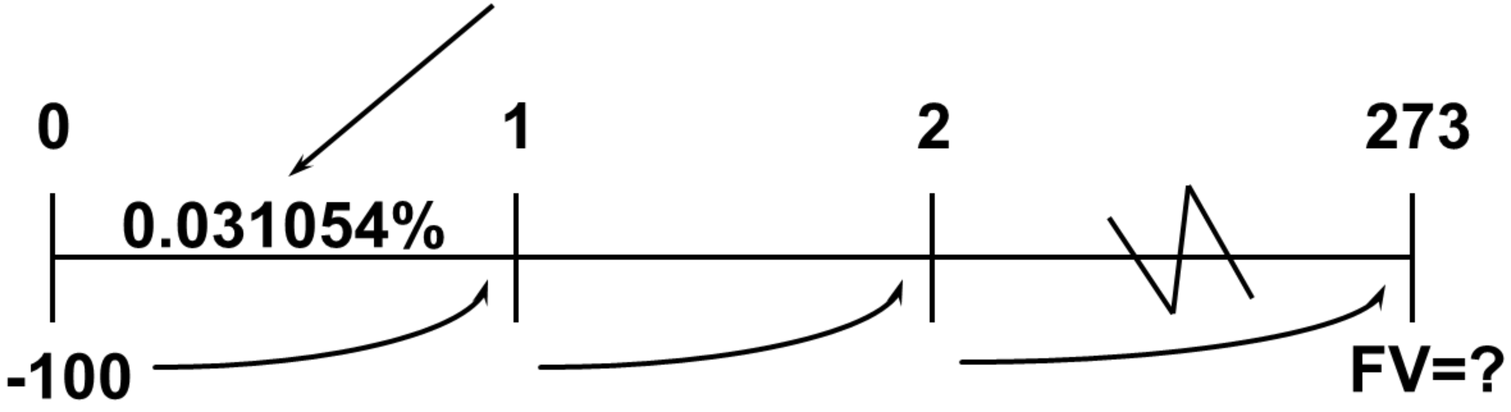


Fractional Time Periods

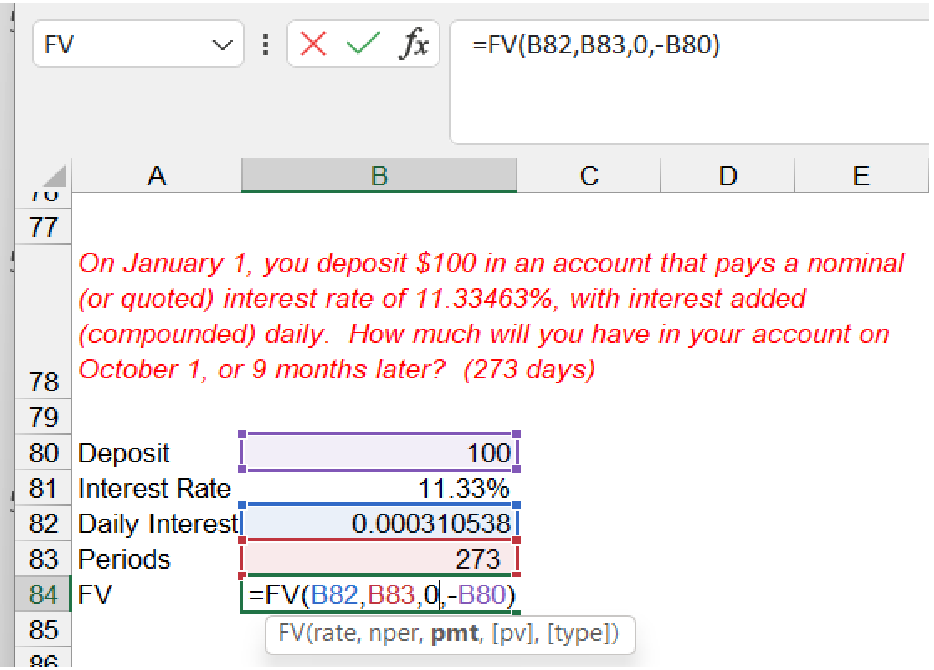
- On January 1 you deposit $100 in an account that pays a nominal interest rate of 11.33463%, with daily compounding (365 days).
- How much will you have on October 1, or after 9 months (273 days)? (Days given.)

Convert interest to daily rate

$$I_{PER} = 11.33463\%/365$$
$$= 0.031054\% \text{ per day}$$



Find FV



$$FV_{273} = \$100(1.00031054)^{273}$$

$$= \$100(1.08846) = \$108.85$$

INPUTS

273		-100	0	
N	**I/YR**	**PV**	**PMT**	**FV**
				108.85

OUTPUT

Risk and Return
&
Weighted Average Cost of Capital

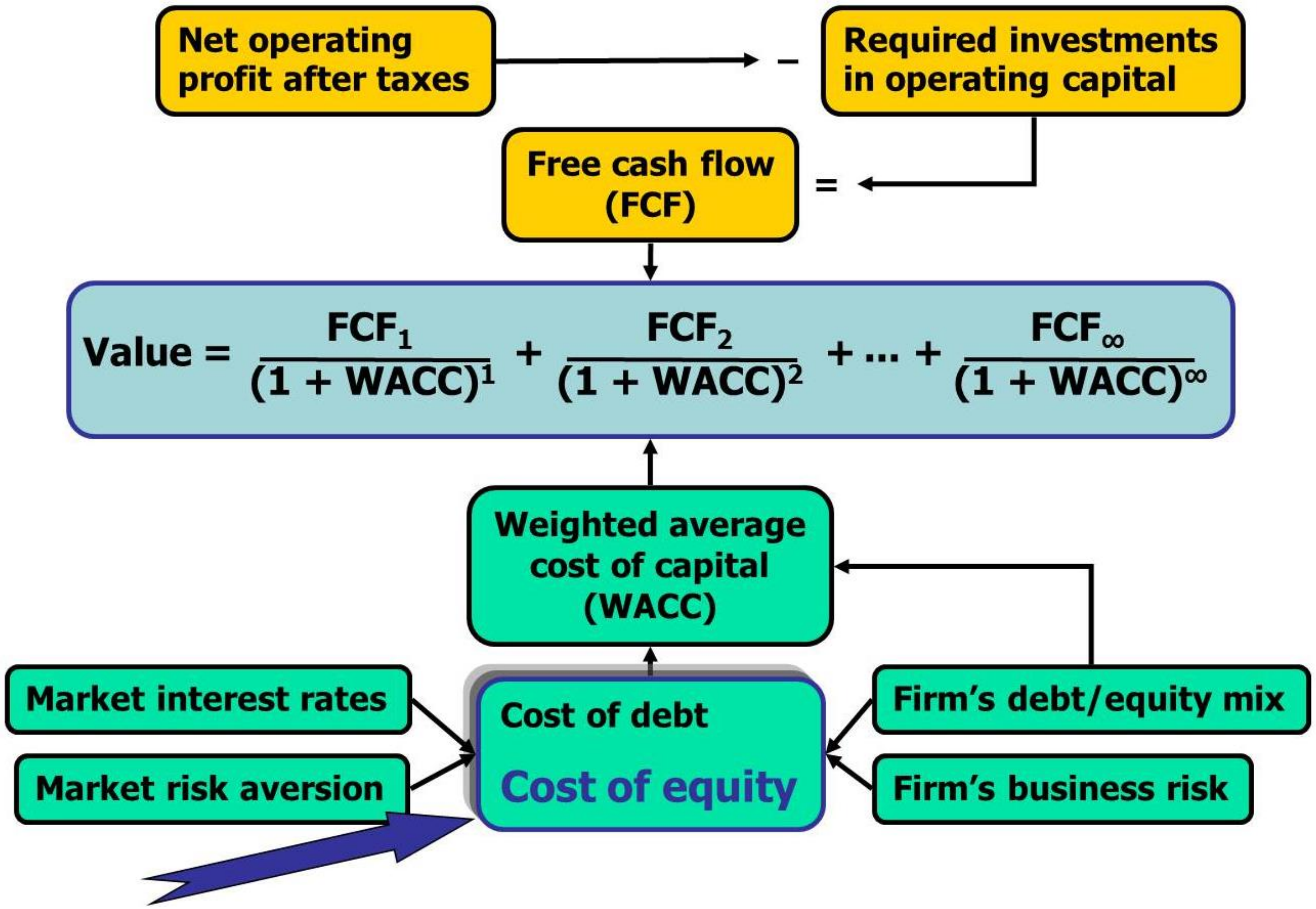
Chapters 6 & 9

FIN 6150

Topics in Chapter

- Basic return and risk concepts
- Stand-alone risk
- Portfolio (market) risk
- Risk and return: CAPM/SML
- Market equilibrium and market efficiency

Determinants of Intrinsic Value: The Cost of Equity



An investment costs \$1,000 and is sold after 1 year for \$1,060.

Dollar return:

$\$$ Received $-$ $\$$ Invested

$\$1{,}060 - \$1{,}000 = \$60.$

Percentage return:

$\$$ Return/$\$$ Invested

$\$60/\$1{,}000 = 0.06 = 6\%.$

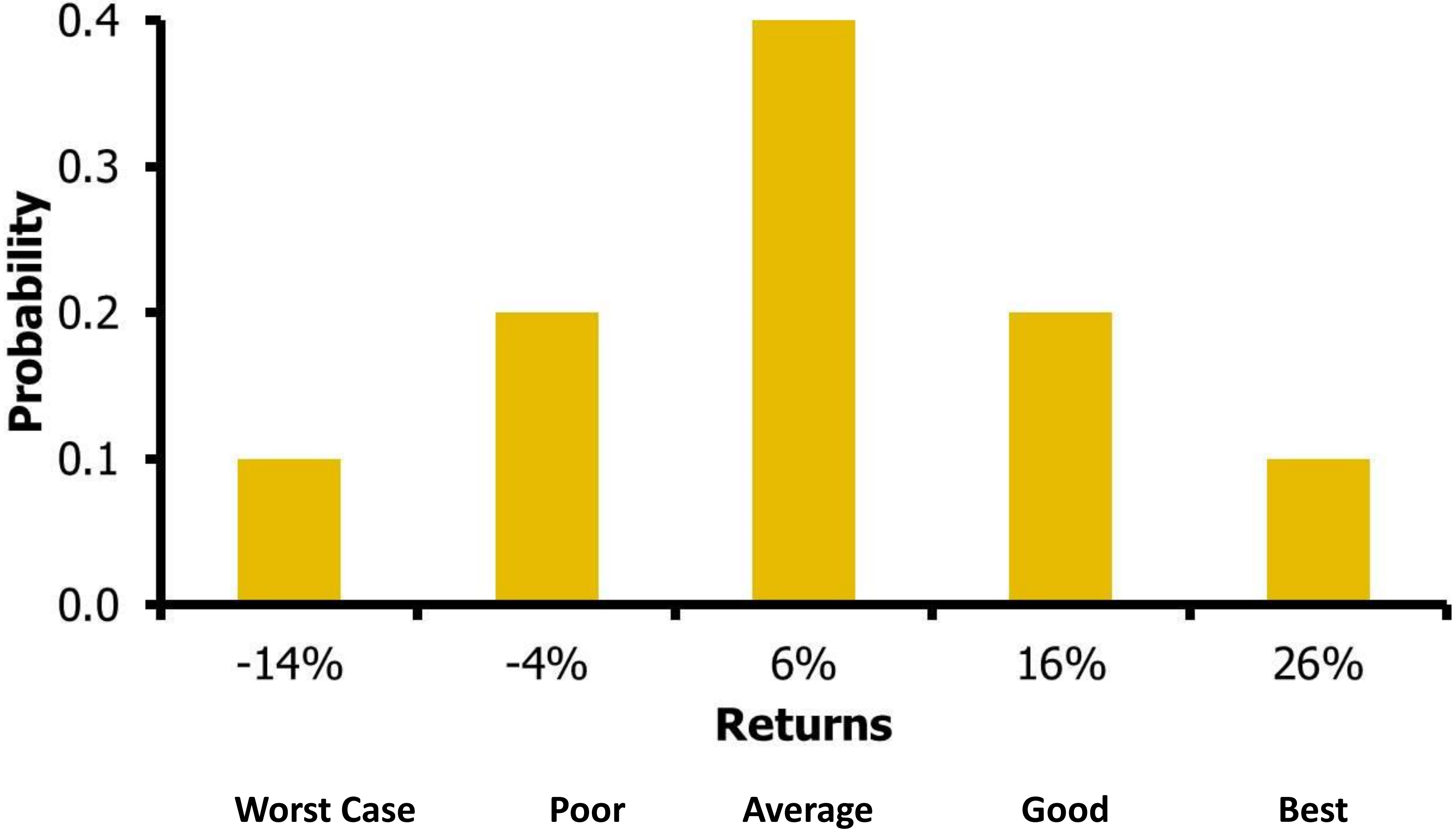
What is investment risk?

- Investment risk is exposure to the chance of earning less than expected.
- The greater the chance of a return far below the expected return, the greater the risk.

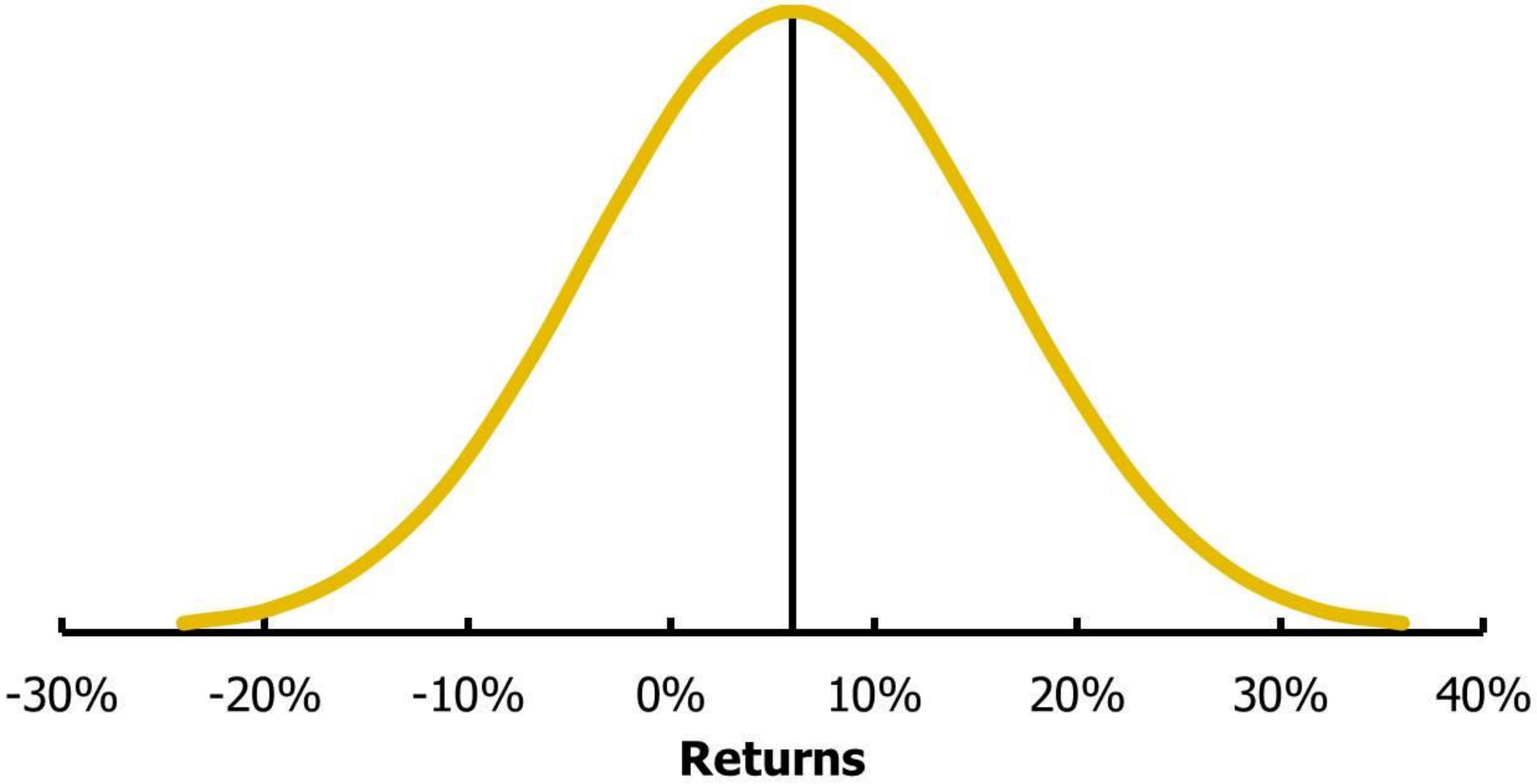
Scenarios and returns for a 10-Year corporate bond over the next year

Scenario	**Probability**	**Return**
Worst Case	0.10	–14%
Poor Case	0.20	–4%
Most Likely	0.40	6%
Good Case	0.20	16%
Best Case	0.10	26%
	1.00	

Discrete Probability Distribution for Scenarios



Example of a Continuous Probability Distribution



Calculate the **expected** rate of return ($\hat{r}$) on the bond for the next year.

$$\hat{r} = \sum_{i=1}^{n} [p_i r_i]$$

$\hat{r}$ = 0.10(-14%) + 0.20(-4%) + 0.40(6%)

+ 0.20(16%) + 0.10(26%)

$\hat{r}$ = 6%

Calculate the **expected** rate of return ($\hat{r}$) on the bond for the next year.

Inputs:			**Expected Return**
Scenario	**Probability of Scenario (1)**	**Rate of Return (2)**	**Product of Probability and Return (1) x (2) = (3)**
Worst Case	0.10	−14%	−1.4%
Poor Case	0.20	−4%	−0.8%
Most Likely	0.40	6%	2.4%
Good Case	0.20	16%	3.2%
Best Case	0.10	26%	2.6%
	1.00	Exp. ret. =	Sum = 6.0%

Use Excel to Calculate the Expected Value of a Discrete Distribution

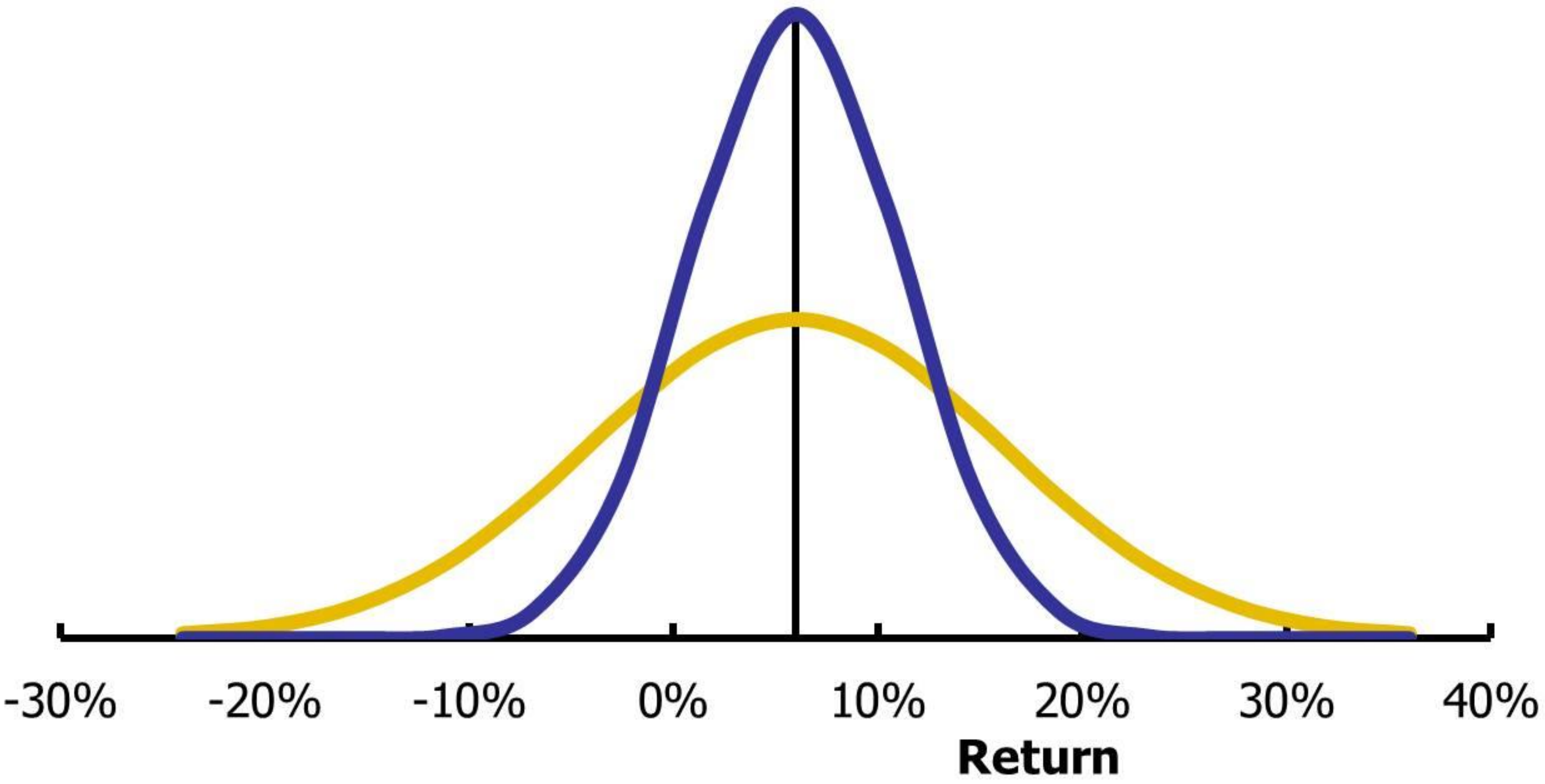
- $\hat{\mathbf{r}}$ = SUMPRODUCT(Probabilities,Returns)
- SUMPRODUCT:
  - Multiplies each value in the first array (the range of cells with probabilities) by its corresponding value in the second array (the range of cells with returns).
  - Sums the products.
  - This is identical to the formula on the previous slide.

Use Excel to Calculate the Expected Value of a Discrete Distribution

F114 =SUMPRODUCT(B105:B109,C105:C109)

	A	B	C	D	E	F
102	Calculating Expected Returns					
103	Inputs:			Expected Return		
104	Scenario	Probability of Scenario (1)	Rate of Return (2)	Product of Probability and Return (1) x (2) = (3)		
105	Worst Case	0.10	−14%	−1.4%		
106	Poor Case	0.20	−4%	−0.8%		
107	Most Likely	0.40	6%	2.4%		
108	Good Case	0.20	16%	3.2%		
109	Best Case	0.10	26%	2.6%		
110		1.00	Exp. ret. =	Sum = 6.0%		
111						
112						
113	Excel function for finding expected return of discrete events:					
114	Use SUMPRODUCT to find expected return by putting probabilities in first argument array					6%
115	and rates of return in the second argument array.					
116						

Consider these probability distributions for two investments. Which riskier? Why?



Stand-Alone Risk: Standard Deviation

- Stand-alone risk is the risk of each asset held by itself.
- Standard deviation measures the dispersion of possible outcomes.
- For a single asset:
  - Stand-alone risk = Standard deviation

- Standard deviation is a measure of how much the actual return of a stock (or an asset) deviates from its expected return.

Standard Deviation of the Bond's Return During the Next Year

- $\sigma^2 = 0.10\,(-0.14 - 0.06)^2$
- $\quad + 0.20\,(-0.04 - 0.06)^2$
- $\quad + 0.40\,(0.06 - 0.06)^2$
- $\quad + 0.20\,(0.16 - 0.06)^2$
- $\quad + 0.10\,(0.26 - 0.06)^2$
- $\boldsymbol{\sigma^2 = 0.0120}$
- $\sigma = \sqrt{\sigma^2} = \sqrt{.0120}$
- $\boldsymbol{\sigma = 0.1095 = 10.95\%}$

Use Excel to Calculate the Variance and Standard Deviation of a Discrete Distribution

$\boldsymbol{\sigma^2}$ = SUMPRODUCT(Probabilities,Returns− $\hat{\mathbf{r}}$,Returns−$\hat{\mathbf{r}}$)

- SUMPRODUCT:
  - Multiplies each value in the first array (the range of cells with probabilities) by its corresponding value in the second array (the range of cells with returns less the expected return) and by the third array (which is identical to the second array).
  - Sums the products; the result is variance.
- Take the square root of the variance to get the standard deviation.

Standard Deviation of the Bond's Return During the Next Year

F137 | fx | =SQRT(F134)

	A	B	C	D	E	F	G
120	Calculating Expected Returns and Standard Deviations: Discrete Probabilities						
121	Inputs:			Expected Return	Standard Deviation		
122	Scenario	Probability of Scenario (1)	Rate of Return (2)	Product of Probability and Return (1) x (2) = (3)	Deviation from Expected Return (2) – Exp. r = (4)	Squared Deviation $(4)^2 = (5)$	Sq. Dev. × Prob. (1) x (5) = (6)
123	Worst Case	0.10	−14%	−1.4%	−20%	4.0%	0.4%
124	Poor Case	0.20	−4%	−0.8%	−10%	1.0%	0.2%
125	Most Likely	0.40	6%	2.4%	0%	0.0%	0.0%
126	Good Case	0.20	16%	3.2%	10%	1.0%	0.2%
127	Best Case	0.10	26%	2.6%	20%	4.0%	0.4%
128		1.00	Exp. ret. =	Sum = 6.0%		Sum = Variance =	1.20%
129						Std. Dev. = Square root of var. =	10.95%
130							
131	Excel functions for finding expected return and standard deviation of discrete events						
132	Use SUMPRODUCT to find expected return by putting probabilities in first argument array					6%	
133	and rates of return in the second argument array.						
134	Use SUMPRODUCT to find variance by putting probabilities in first argument array and the					1.20%	
135	outcomes minus the expected value in the second and third arrays.						
136							
137	Take the square root of the variance to get the standard deviation.					10.95%	
138							

Understanding the Standard Deviation

- If the returns are normally distributed:
  - Outcome will be ***more than 1 σ away*** from $\hat{r}$ about 34% of the time:
    - 34% of the time below $\hat{r} - \sigma$
    - 34% of the time above $\hat{r} + \sigma$.

  - **If $\hat{r}$ = 6% and σ =10.95% ≈ 11%, what would you expect to see, most of the time, in terms of a return on this investment?**

Understanding the Standard Deviation

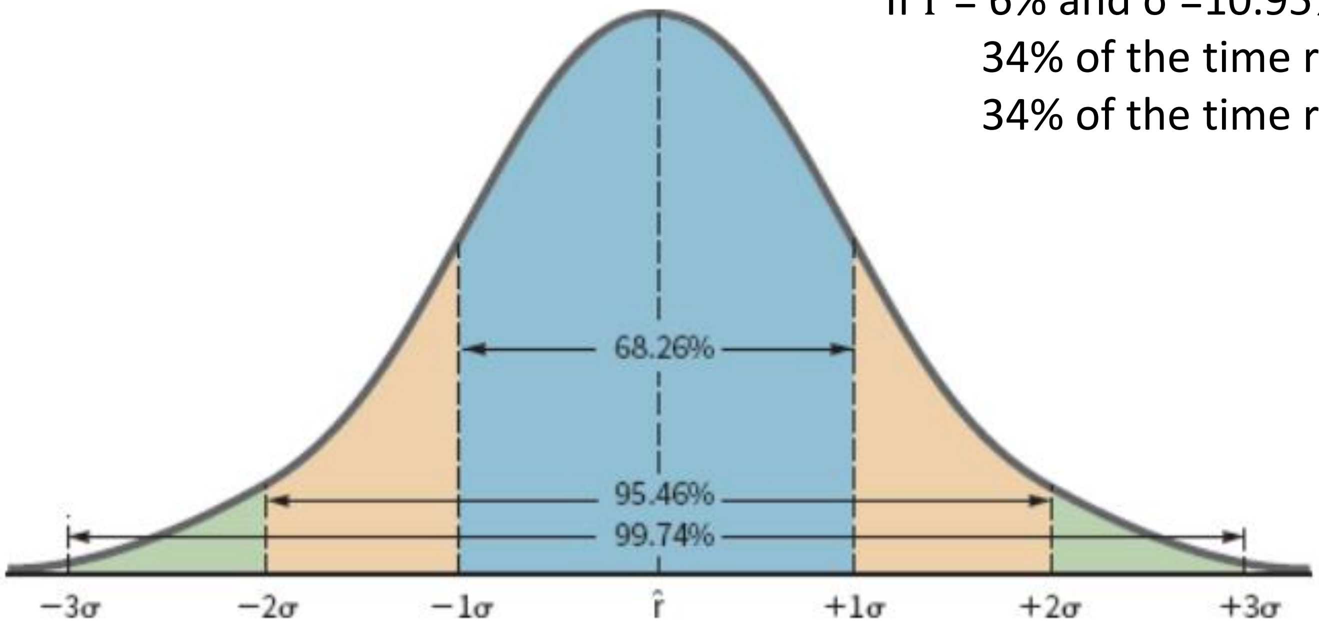
- If the returns are normally distributed:
  - Outcome will be ***more than 1 σ away*** from $\hat{r}$ about 34% of the time:
    - 34% of the time below $\hat{r}-\sigma$
    - 34% of the time above $\hat{r}+\sigma$.
  - **If $\hat{r}$ = 6% and σ =10.95% ≈ 11%:**
    - **34% of the time return <−5% (6% – 11%)**
    - **34% of the time return > 17% (6% + 11%)**

Probability Ranges for a Normal Distribution

If r̂ = 6% and σ =10.95% ≈ 11%:

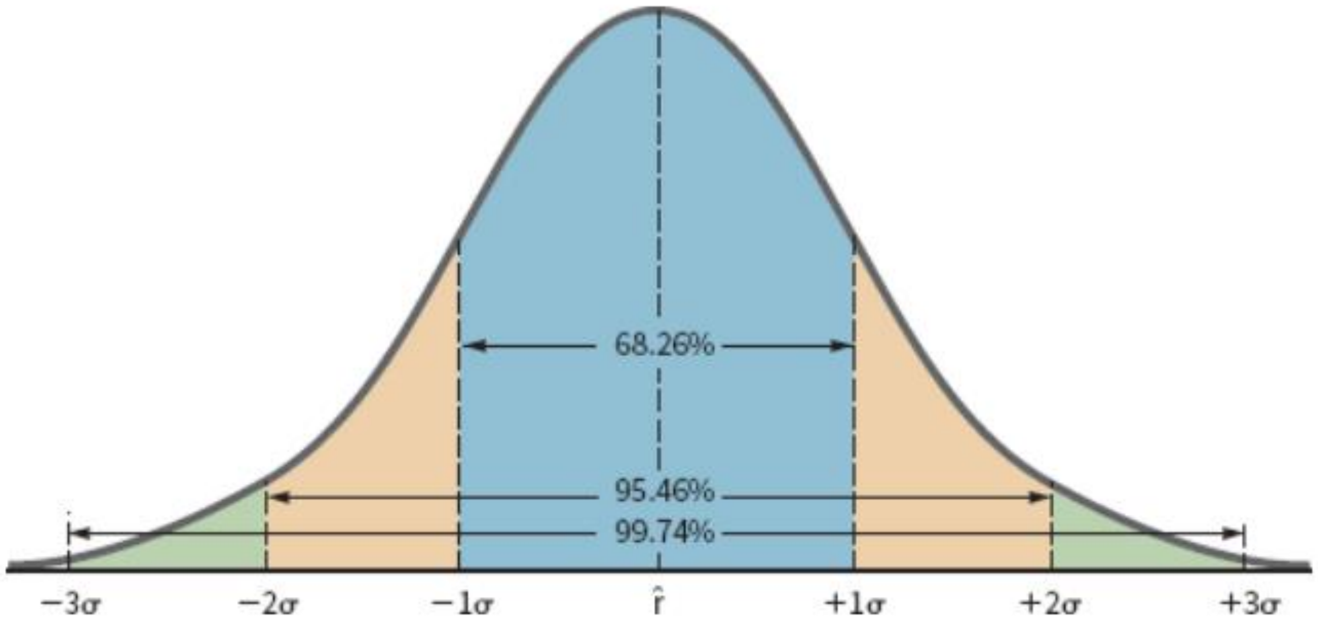
34% of the time return <**−5%** *(6% - 11%)*

34% of the time return > **17%** *(6% + 11%)*



Outcome will be ***more than 1 σ away*** from r̂ about ≈ 34% of the time

Probability Ranges for a Normal Distribution



-27% -16% -5% 6% 17% 28% 39%

You have a 34% chance you will be more than 1 σ away from the expected return

You have a 4.5% chance you will be more than 2 σ away from the expected return

You have a .4% chance you will be more than 3 σ away from the expected return

Useful in Comparing Investments

- Investments with bigger standard deviations have more risk.
- High risk doesn’t mean you should reject the investment, but:
  - You should know the risk before investing
  - You should expect a higher return as compensation for bearing the risk.

Using Historical Data to Estimate Risk

- Analysts often use discrete outcomes to analyze risk for projects; see Chapter 11.
- But for investments, most analysts normally use historical data rather than discrete forecasts to estimate an investment's risk unless it is a very special situation.
- Most analysts use:
  - 48 to 60 months of monthly data, or
  - 52 weeks of weekly data, or
  - Shorter period using daily data.
- Use annual returns here for sake of simplicity.

Average and Standard Deviations for Stand-Alone Investments

- What is Blandy’s stand-alone risk?
- Note: analysts often use past risk as a predictor of future risk, **but past returns are not a good prediction of future returns**.

	Market	Blandy	Gourmange
Average return	8.0%	6.4%	9.2%
Standard deviation	20.1%	25.2%	38.6%

How risky is Blandy stock?

- Assumptions:
  - Returns are normally distributed.
  - σ is 25.2%
  - Expected return is about 6.4%.
- 34% of the time (approximately), return will be:
  - < **−18.8%** *(6.4% − 25.2% = −18.8)*
  - > **32.6%** *(6.4% + 25.2% = 32.6)*

- **What do you think of the risk of this stock?**
- **Now, do the same for Gourmange.**

Portfolios

2-Stock Portfolio

- Form a portfolio by selling 25% of the Blandy stock and investing it in the higher-risk Gourmange stock.
- The portfolio return each year will be weighted as follows:
  - Portfolio Return = .75 (Return on Blandy) + .25 (Return on Groumange)

  or

  - $\bar{r}_{P,t} = 0.75\left(\bar{r}_{Blandy,t}\right) + 0.25\left(\bar{r}_{Gour.,t}\right)$

Historical Data for Stocks and Portfolio Returns

	Blandy	Gourmange
Weight in :	75%	25%

	Stock Returns		
Year	Blandy	Gourmange	Portfolio
1	26%	47%	31.3%
2	15%	-54%	-2.3%
3	-14%	15%	-6.8%
4	-15%	7%	-9.5%
5	2%	-28%	-5.5%
6	-18%	40%	-3.5%
7	42%	17%	35.8%
8	30%	-23%	16.8%
9	-32%	-4%	-25.0%
10	28%	75%	39.8%
Average return:			
Standard deviation of returns:			

Historical Data for Stocks and Portfolio Returns

	Blandy	Gourmange
Weight in :	75%	25%

	Stock Returns		
Year	Blandy	Gourmange	Portfolio
1	26%	47%	31.3%
2	15%	-54%	-2.3%
3	-14%	15%	-6.8%
4	-15%	7%	-9.5%
5	2%	-28%	-5.5%
6	-18%	40%	-3.5%
7	42%	17%	35.8%
8	30%	-23%	16.8%
9	-32%	-4%	-25.0%
10	28%	75%	39.8%
Average return:	6.4%	9.2%	7.1%
Standard deviation of returns:	25.2%	38.6%	22.2%

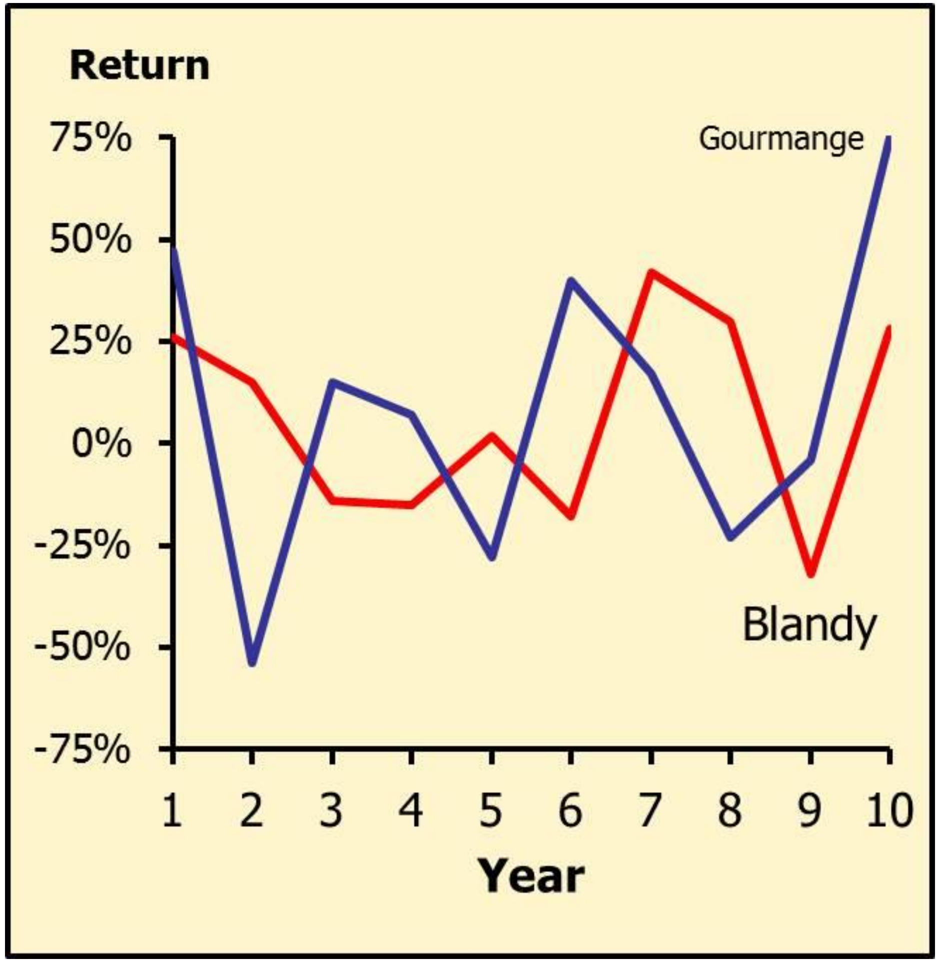
Portfolio Historical Average and Standard Deviation

- The portfolio's average return is the weighted average of the stocks' average returns.
- The portfolio's standard deviation is *less* than either stock's σ!
- **What explains this reduction in risk?**

	Blandy	Gourmange	Portfolio
Average return	6.4%	9.2%	7.1%
Standard deviation	25.2%	38.6%	22.2%

Correlation

How closely do the returns follow one another?



Notice that the returns don't move in perfect lock-step: Sometimes one is up and the other is down.

Correlation Coefficient (ρ)

- Loosely speaking, the correlation (ρ) coefficient measures the tendency of two variables to move together.
- A correlation coefficient of +1 means that the stocks always move together
- A correlation coefficient of −1 means that the stocks always move oppositely to one another.
- A correlation coefficient of 0 means that there is no relationship between the stocks' movements.

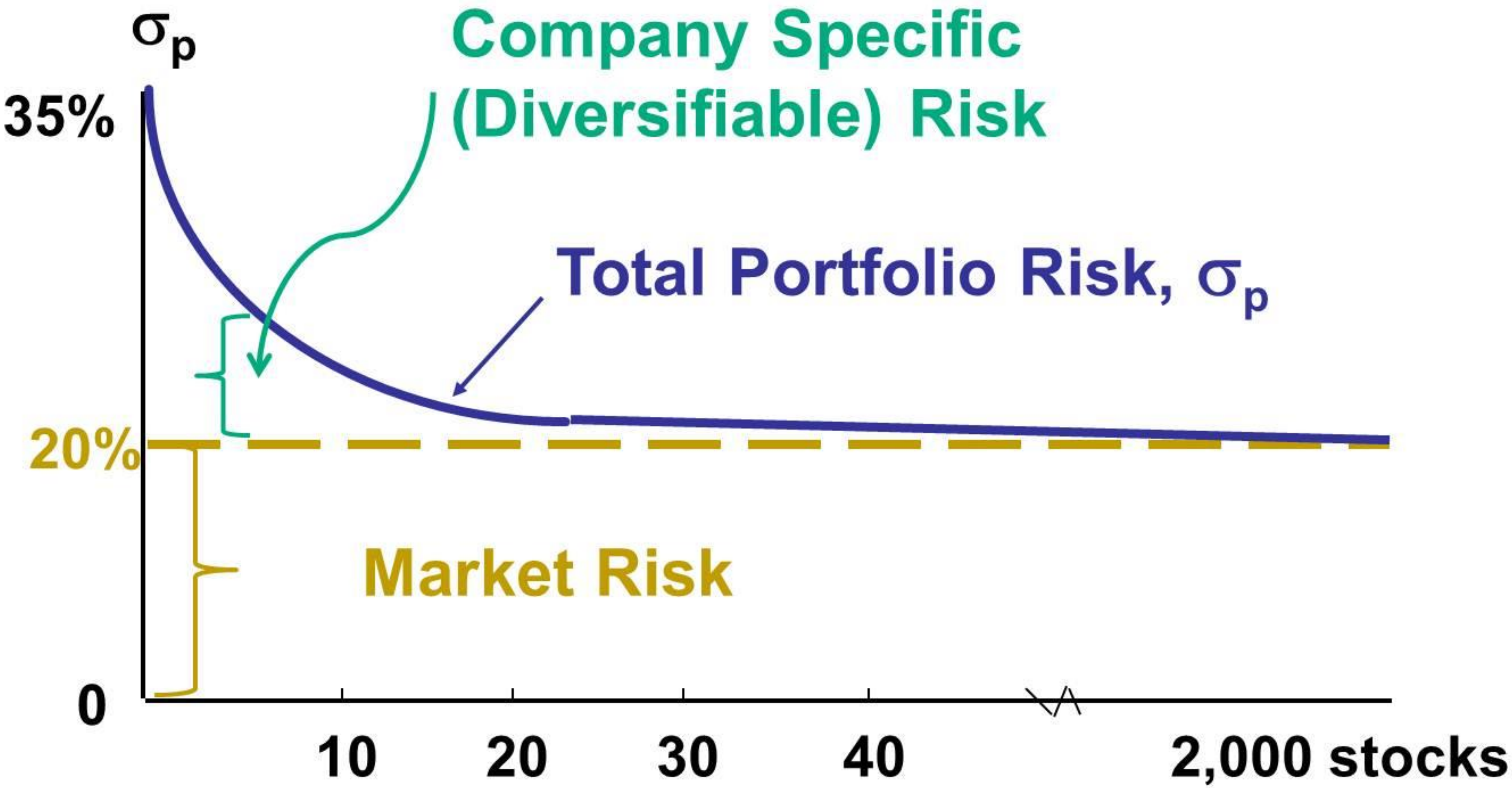
Adding Stocks to a Portfolio

What would happen to the risk of an average 1-stock portfolio as more randomly selected stocks were added?

Adding Stocks to a Portfolio

- What would happen to the risk of an average 1-stock portfolio as more randomly selected stocks were added?
- σ_p would decrease because the added stocks would not be perfectly correlated.

Risk vs. Number of Stocks in Portfolio



Market risk & Diversifiable risk

- Market risk is that part of a security's stand-alone risk that cannot be eliminated by diversification.
- Firm-specific, or diversifiable, risk is that part of a security's stand-alone risk that can be eliminated by diversification.

Conclusions

- As more stocks are added, each new stock has a smaller risk-reducing impact on the portfolio.
- σ_p falls very slowly after about 40 stocks are included. The lower limit for σ_p is about 20% = σ_M .
- By forming well-diversified portfolios, investors can eliminate about half the risk of owning a single stock.

The Capital Asset Pricing Model or CAPM

Can an investor holding one stock earn a return commensurate with its risk?

- The capital market theory is an incomplete explanation for the relationship that exists between risk and return.
- This is because the Capital Market Line (CML) defined the risk an investor bears by the total volatility of the investment.
- However, since investors cannot expect to be compensated for any portion of risk that they could have diversified away (unsystematic risk), the CML is based on the assumption that investors only hold fully diversified portfolios, for which total risk and systematic risk are the same thing.
- So, the CML cannot provide an explanation for the risk–return trade-off for individual risky assets because the standard deviation for these securities will contain a substantial amount of unique risk.
- The capital asset pricing model (CAPM) extends capital market theory in a way that allows investors to evaluate the risk–return trade-off for **both** diversified portfolios **and** individual securities.

Market Risk due to an Individual Stock

- How do you measure the amount of market risk that an individual stock brings to a well-diversified portfolio?
- William Sharpe developed the Capital Asset Pricing Model (CAPM) to answer this question.

But first, a word about Standard Deviation and Beta…

- Standard deviation is a measure of how much the actual return of a stock (or any asset) deviates from its expected return.

- Beta is a measure of how sensitive a stock is to the movements of the market.

- Beta shows how much the expected return of an asset changes when the market changes.

- A beta of one means that the asset moves in sync with the market, a beta of more than one means that the asset is more volatile than the market, and a beta of less than one means that the asset is less volatile than the market.

- Beta shows the extent the stock moves relative to the direction of the market. Standard deviation shows how the stock return varies from expected value, which can result from both market and non-market reasons.

Stated differently…

Investor Expectation

>10%

Reality

>20%

Reaction

=

σ

Standard Deviation

Market Moves

>10%

Reality

>10%

Reaction

=

β

Beta

Web Sites for Beta

- http://finance.yahoo.com
  - Enter the ticker symbol for a “Stock Quote”, such as IBM or Dell, then click GO.
  - When the quote comes up, select Key Statistics from panel on left.

- www.valueline.com
  - Enter a ticker symbol at the top of the page (registration is free).

- Most stocks have betas in the range of 0.5 to 1.5.

A basic guide to beta levels:

- **Negative beta**: A beta less than 0, which would indicate an inverse relation to the market, is possible but highly unlikely. Some investors argue that gold and gold stocks should have negative betas because they tend to do better when the stock market declines.
- **Beta of 0**: Basically, cash has a beta of 0. In other words, regardless of which way the market moves, the value of cash remains unchanged (given no inflation).
- **Beta between 0 and 1**: Companies that are less volatile than the market have a beta of less than 1 but more than 0. Many utility companies fall in this range.
- **Beta of 1:** A beta of 1 means a stock mirrors the volatility of whatever index is used to represent the overall market. If a stock has a beta of 1, it will move in the same direction as the index, by about the same amount. An index fund that mirrors the S&P 500 will have a beta close to 1.
- **Beta greater than 1**: This denotes a volatility that is greater than the broad-based index. Many new technology companies have a beta higher than 1.
- **Beta greater than 100**: This is impossible, as it indicates volatility that is 100 times greater than the market. If a stock had a beta of 100, it would go to 0 on any decline in the stock market. If you see a beta of over 100 on a research site it is usually a statistical error or the stock has experienced a wild and probably fatal price swing. For the most part, stocks of established companies rarely have a beta higher than 4.

Warnings About Beta

- The biggest drawback to using beta to make an investment decision is that beta is a historical measure of a stock's volatility. It can show you the pattern so far, but it can't tell you what's going to happen in the future.

- The second caveat for using beta is that it is a measure of systematic risk, which is the risk that the market faces as a whole. The market index to which a stock is being compared is affected by market-wide risks. So, beta can only take into account the effects of market-wide risks on the stock. The other risks the company faces are specific to the company.

Required Return and Risk: General Concept

Investors require a return:

1. **For time** (for tying their funds up in the investment).
   - $\mathbf{r_{RF}}$, the risk-free rate

2. **For risk**, which is the extra return above the risk-free rate that investors require to induce them to invest in Stock i.
   - $\mathbf{RP_i}$, the risk premium of Stock i.

Required Return and Risk: The CAPM

- RP_M is the **market risk premium**. It is the extra return **above** the risk-free rate that that investors require to invest in the overall stock market:
  - $RP_M = r_M - r_{RF}$.
  - Market Risk Premium = Market Risk – Risk Free Rate

But, if you want to know the risk that a particular stock adds to a portfolio, then you must include the Beta.

- The CAPM defines the risk premium for Stock i as:
  - $RP_i = b_i (RP_M)$

2025 Equity Risk Premium Table
The Extra Reward for Owning Equities has Disappeared

The Security Market Line: Relating Risk and Required Return

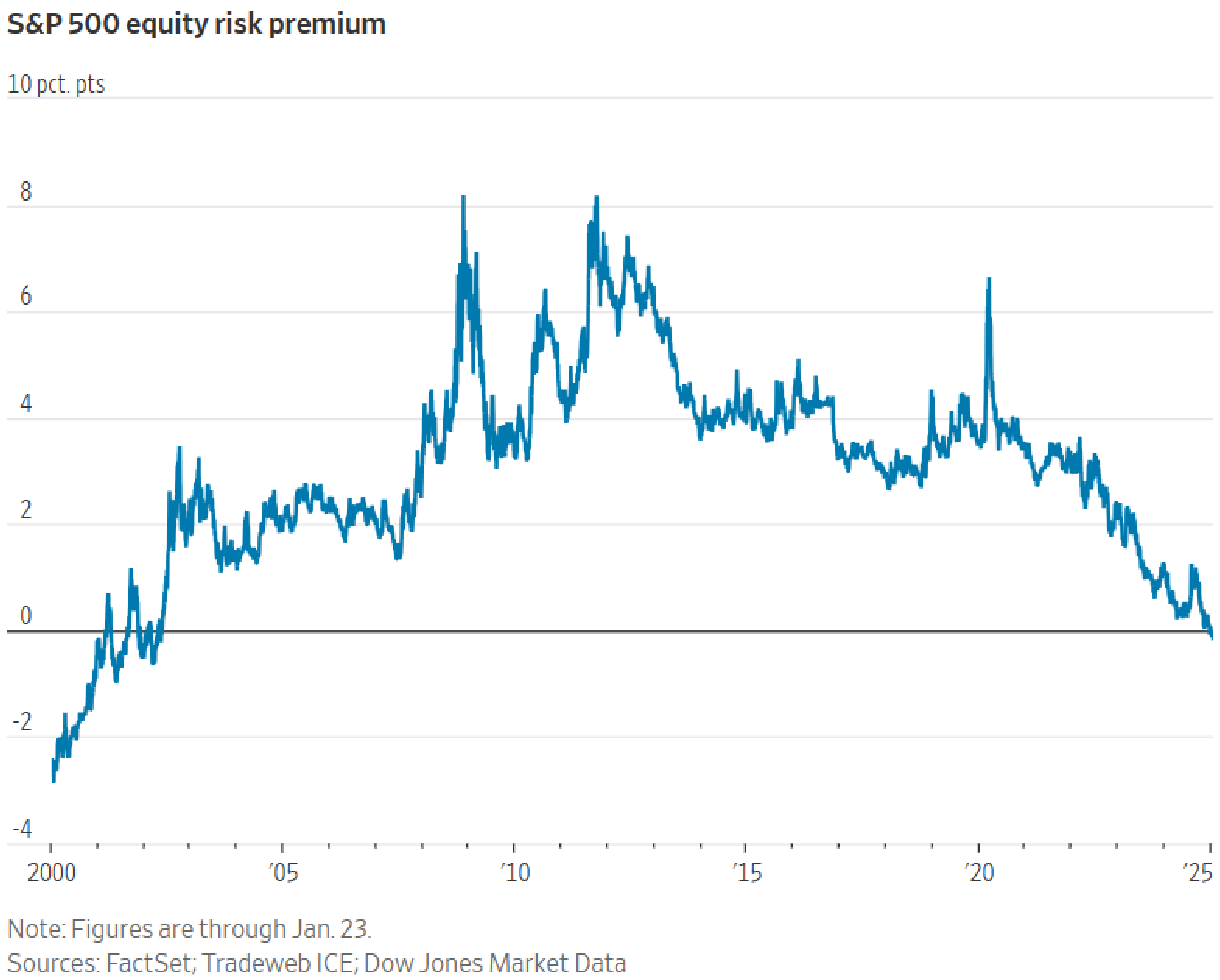
The Security Market Line (SML) puts the pieces together, showing how to determine the return required for bearing a stock's risk:

SML: $\mathbf{r_i = r_{RF} + (RP_M)b_i}$

or

SML: Risk of a stock = Risk Free Rate + (Market Risk Premium)*Beta

Equity Risk Premium



Required Return for Blandy

- Inputs:
  - r_{RF} = 4% (given)
  - R_{PM} = 5% (given)
  - b = 0.60 (estimated)

- $r_i = r_{RF} + b_i\,(RP_M)$

Required Return for Blandy

- Inputs:
  - r_{RF} = 4% (given)
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  - b = 0.60 (estimated)

- $r_i = r_{RF} + b_i\,(RP_M)$

$r_i = 4\% + 0.60(5\%) = 7\%$

Comparing Risk and Return for Different Stocks

- The beta of an average stock is 1.0
- Gourmange's beta is 1.3
- How do their required returns compare with Blandy's?
    - (Blandy's beta was .6)

Comparing Risk and Return for Different Stocks

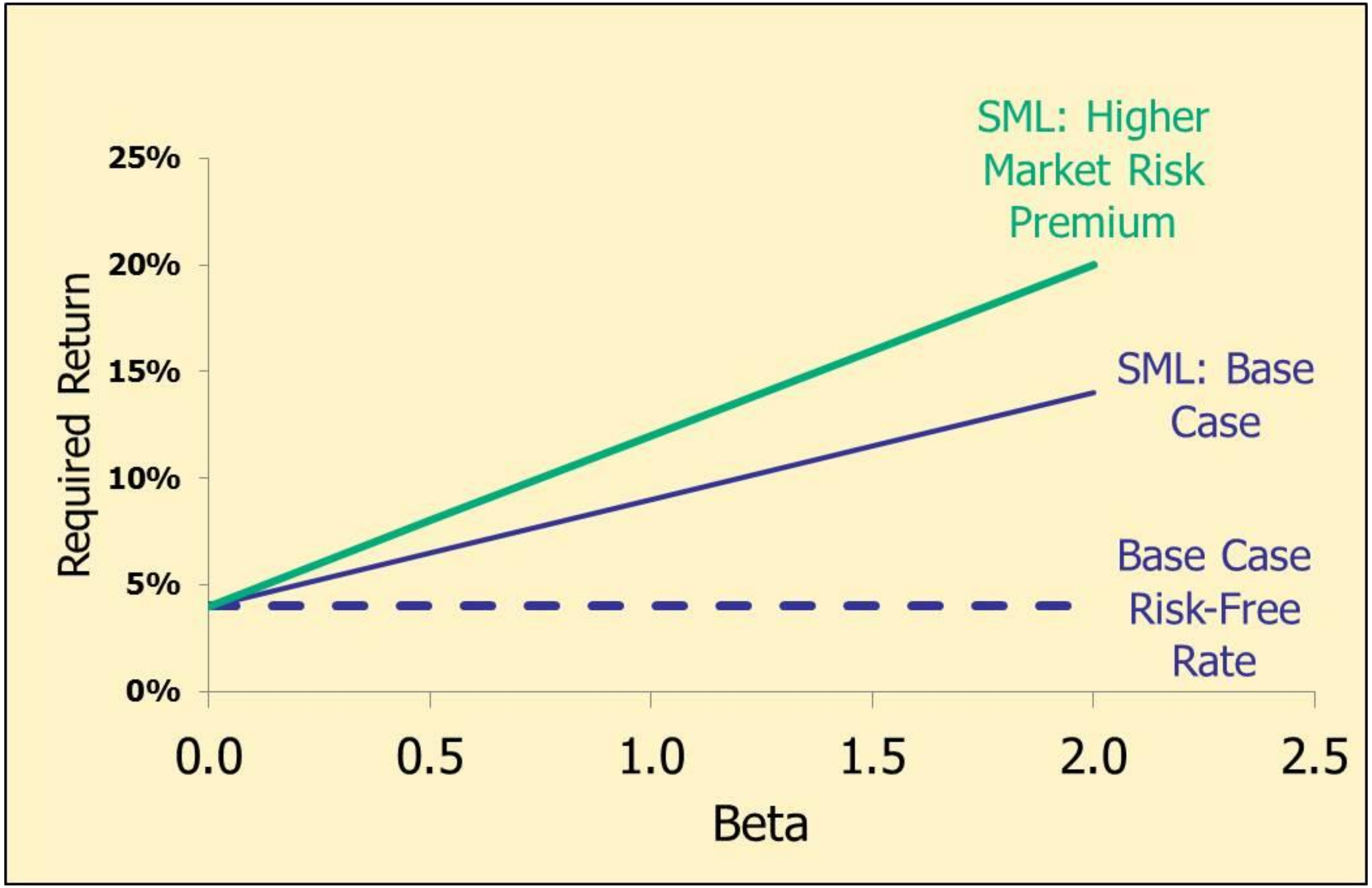
$r_{Avg\_company} = 4\% + 1.0\,(5\%) = 9\%$

$r_G = 4\% + 1.3\,(5\%) = 10.5\%$

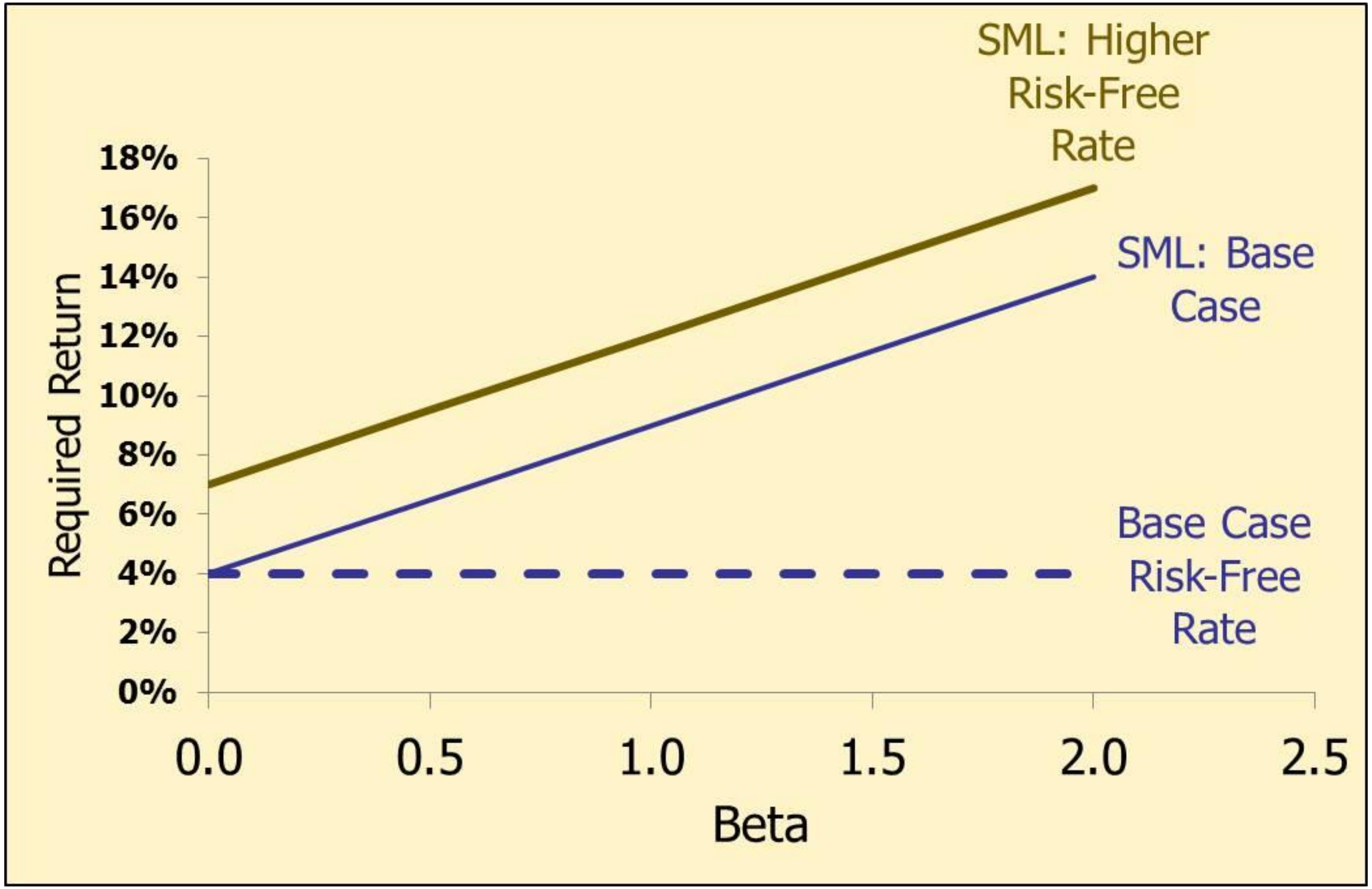
$r_B = 4\% + 0.6\,(5\%) = 7\%$

- Blandy’s stock contributes less risk to a well-diversified portfolio than do Gourmange or the average stock, so Blandy’s investors require a lower rate of return.

Impact on SML of Increase in Risk-Free Rate



Impact on SML of Increase in Risk Aversion



Calculate the weights for a portfolio with $1.4 million in Blandy and $0.6 million in Gourmange.

- Find the weights:

- The portfolio beta is the weighted average of the stocks’ betas:

Calculate the weights for a portfolio with $1.4 million in Blandy and $0.6 million in Gourmange.

- Find the weights:

Blandy	1,400,000	70%	or 1.4 mil / 2 mil
Gourmange	600,000	30%	or .6 mil / 2 mil
Total Portfolio	2,000,000	100%	

- The portfolio beta is the weighted average of the stocks' betas:

$$b_p = \sum_{i=1}^{n} w_i b_i$$

Calculate the portfolio beta

$b_p = 0.7(b_{Blandy}) + 0.3(b_{Gour.})$

$= 0.7(0.60) + 0.3(1.30)$

$= 0.81$

What is the Required Return on the Portfolio?

Inputs:

r_{RF} = 4% (given)

R_{PM} = 5% (given)

B_{p} = .81

(1) Use SML:

$r_p = r_{RF} + b_p\,(RP_M)$

$= 4.0\% + 0.81*(5\%)$

= **8.05%**.

(2)Use fact that $r_p = \sum_{i=1}^{n} \mathbf{w_i r_i}$

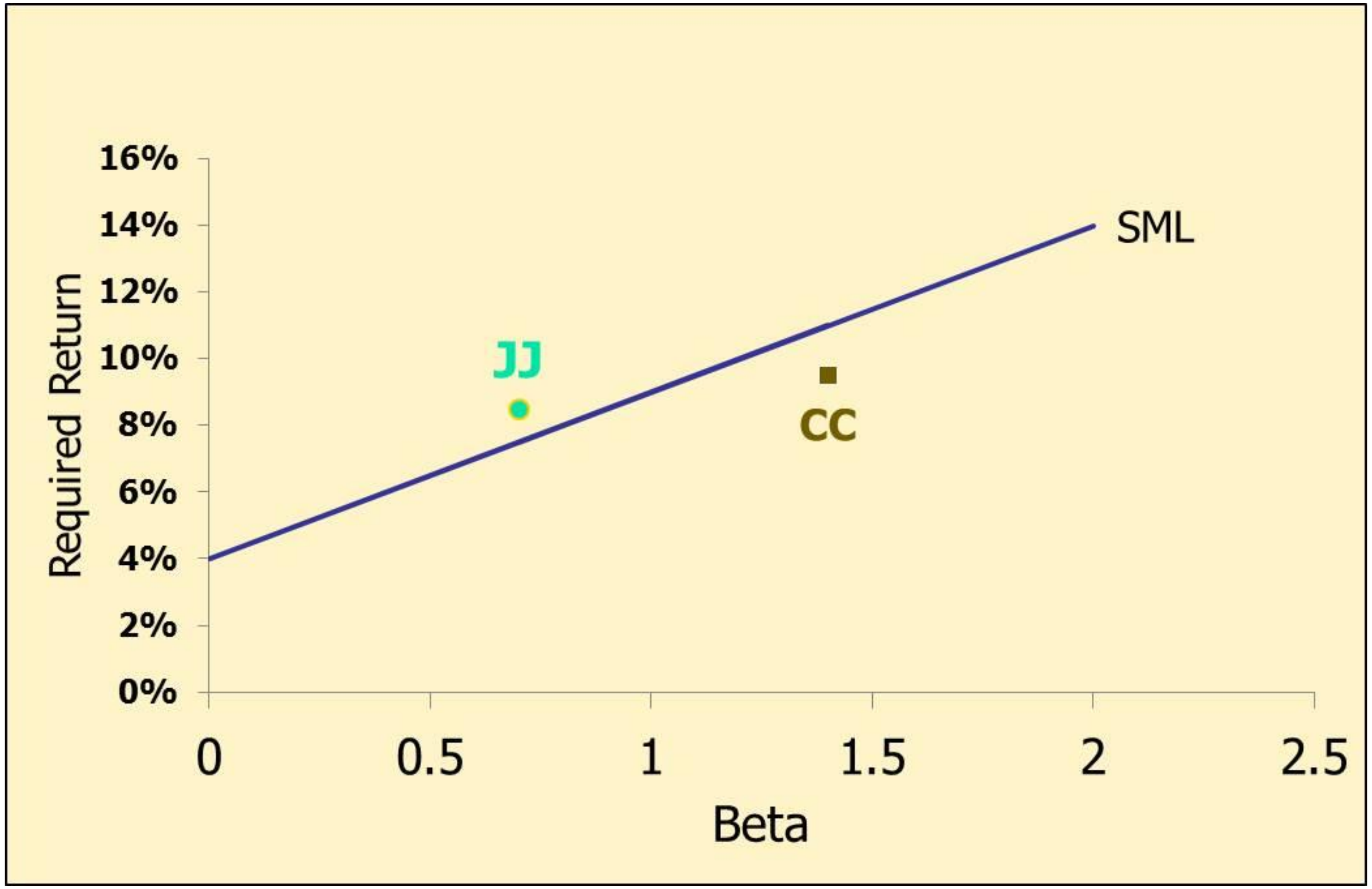
$r_p = 0.7(7.0\%) + 0.3(10.5\%)$

= **8.05%**.

Portfolio Performance Evaluation

	Portfolio Manager	**Portfolio Manager**
	JJ	CC
Portfolio beta	0.7	1.4
Risk-free rate	4%	4%
Market risk premium	5%	5%
Portfolio required return	7.5%	11.0%
Portfolio actual return	8.5%	9.5%
Over/under performance	**+1.0%**	**-1.5%**

Portfolio Performance Evaluation Relative to SML



What is required for the market to be in equilibrium?

- The market price of a security must equal the security's intrinsic value (intrinsic value reflects the size, timing, and risk of the future cash flows).

Market price = Intrinsic value

- The expected return a security must equal its required return (which reflects the security's risk).

$$\hat{r} = r$$

How is equilibrium established?

- If the market price is below the intrinsic value (or if the expected return is above the required return), then the security is a “bargain.”
- Buy orders will exceed sell orders, bidding up the market price (which also drives down the expected return, given no change in the asset’s cash flows).
- “Profitable” trading (i.e., earning a return greater than justified by risk) will continue until the market price is equal to the intrinsic value.
- The opposite occurs if the market price is above the intrinsic value.

Efficient Market Hypothesis (EMH): It's all about the info.

- The EMH asserts that when new information arrives, prices move to the new equilibrium price very, very quickly because:
  - There are many really smart analysts looking for mispriced securities.
  - New information is available to most professional traders almost instantly.
  - When mispricing occurs (due to new info or inefficient markets), analysts have billions of dollars to use in taking advantage of the mispricing– which then quickly eliminates the mispricing.

Implications of Efficient Market Hypothesis (EMH)

- Stocks are normally in equilibrium.
- One cannot "beat the market" by consistently earning a return higher than is justified by a stock's risk.

Testing the EMH

- Choose a trading strategy and implement it over a large sample.
- Pick an asset pricing model, like the CAPM, and measure the required return of the strategy's investments.
- Measure the actual return.
  - Actual > required? Reject EMH.
- Notice that this is a "joint" test of the EMH and the particular asset model– if the test rejects the EMH, it could be that the asset pricing model is wrong.

Weak-form EMH

- Current prices already reflect all the information "contained" in past prices, so you cannot earn excess returns with strategies based on past prices.
- Example strategy: Invest in stocks that have declined below their previous 52-week low.
- This is a type of "technical" analysis.

Weak-form EMH: Empirical Evidence

- Most empirical evidence supports weak-form EMH because very few trading strategies consistently earn in excess of the CAPM prediction.
- Two exceptions with small excess returns:
  - Short-term momentum
  - Long-term reversals

Semistrong-form EMH

- Current prices already reflect all publicly available information, so you cannot earn excess returns with strategies based on information from financial statements or other public sources.
- Example strategy: Invest in stocks with past 3-year annual earnings growth greater than 10% and a ratio of R&D to sales greater than 10%.
- This is a type of “fundamental” analysis.

Semistrong-form EMH: Empirical Evidence

- Most empirical evidence supports the semistrong-form EMH.
  - In fact, the vast majority of portfolio managers do not consistently have returns in excess of CAPM predictions.
- Two exceptions that earn excess returns:
  - Small companies
  - Companies with high book-to-market ratios

Strong-form EMH

- All information, even inside information, is embedded in stock prices so you cannot earn excess returns ever.
- Not true—excess returns can be gained by trading on the basis of insider information.
  - Illegal! Go to jail now!

Market Bubbles and Market Efficiency

- Market bubbles:
  - Prices climb rapidly to heights that would have been considered extremely unlikely before the run-up.
  - Trading volume is unusually high.
  - Many new investors (or speculators?) eagerly enter the market.
  - Prices suddenly fall precipitously.
  - Everyone rushes in, even the sophisticated investors.
- What does this imply about the EMH?

Bubbles are hard to puncture.

- If there is a bubble, why don't traders take positions that make big profits when the bubble bursts?
  - It is hard to recognize a bubble until after it bursts—then it seems obvious!
  - Trading strategies expose traders to possible big negative cash flows if the bubble is slow to burst.

Market Efficiency: The Bottom Line

- For most stocks, for most of the time, it is generally safe to assume that the market is reasonably efficient.
- Many investors have given up trying to beat the market, which helps explain the popularity of index funds.
- However, bubbles do occur infrequently.

The CAPM: The Bottom Line

- Empirical tests of CAPM have statistical problems that make empirical verification or rejection virtually impossible.
- Most corporations use the CAPM to determine their stock's required return.
- Most researchers use multi-factor models to identify the portion of a stock's return that remains unexplained after accounting for the model's factors.

Has the CAPM been completely confirmed or refuted?

- No. The statistical tests have problems that make empirical verification or rejection virtually impossible.
  - Investors' required returns are based on future risk, but betas are calculated with historical data.
  - Investors may be concerned about both stand-alone and market risk.

The Cost of Capital

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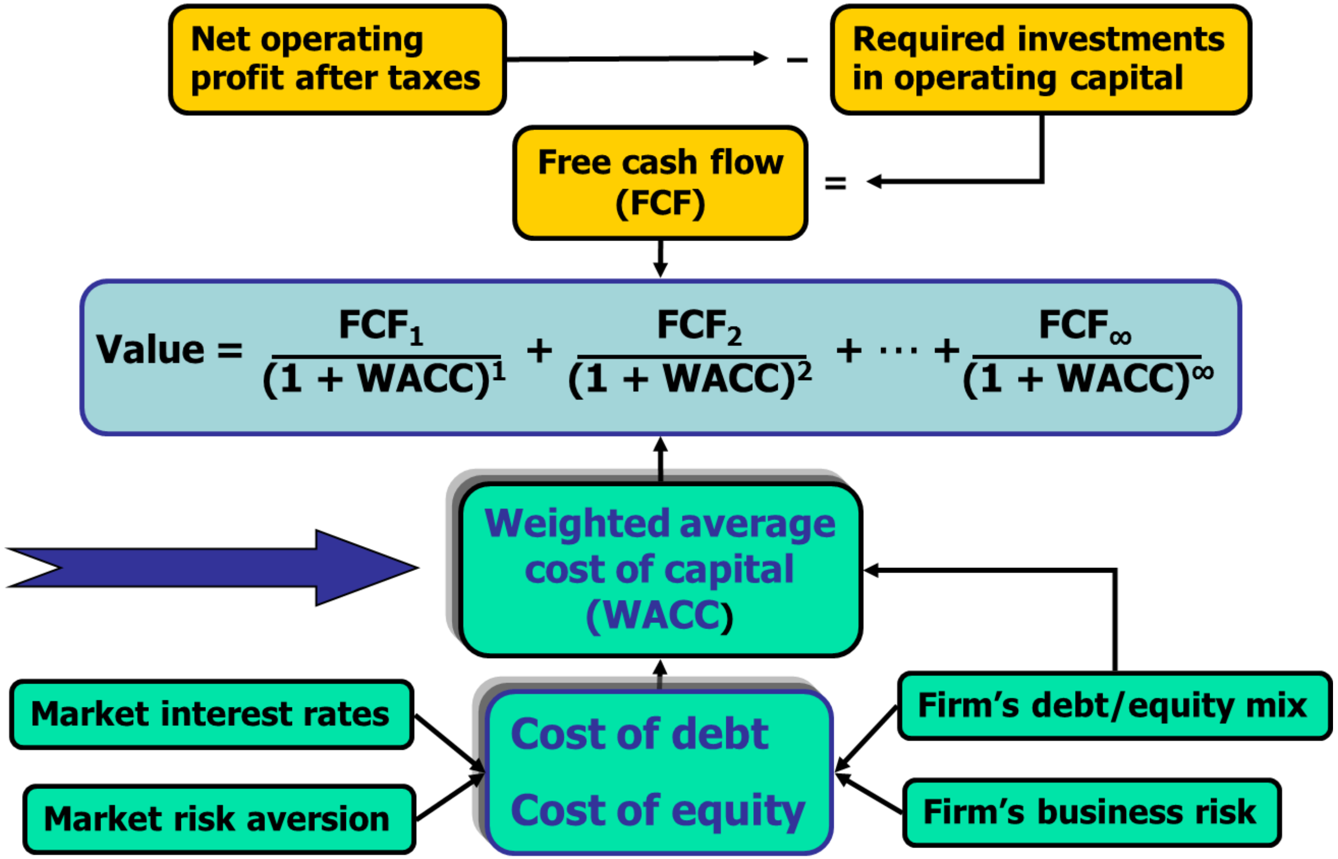
Chapter 9

Topics in Chapter 9

- Cost of capital components
  - Debt
  - Preferred stock
  - Common equity
- WACC
- Factors that affect WACC
- Adjusting cost of capital for risk

Determinants of Intrinsic Value: The Weighted Average Cost of Capital



What types of long-term capital do firms use?

- Long-term debt
  - Some firms also use permanent short-term debt
  - Other firms have temporary short-term debt for seasonal fluctuations in inventory, but this is usually not part of the capital structure
- Preferred stock
- Common equity

Capital Components

- Capital components are sources of funding that come from investors.
- Accounts payable, accruals, and deferred taxes **are not sources of funding** that come from investors, so they are not included in the calculation of the cost of capital.
- We do adjust for these items when calculating the cash flows of a project, but not when calculating the cost of capital.

Before-tax vs. After-tax Capital Costs

- Tax effects associated with financing can be incorporated either in capital budgeting cash flows or in cost of capital.
- Most firms incorporate tax effects in the cost of capital. Therefore, focus on after-tax costs.
- Only cost of debt is affected.

New (Marginal) Costs

- The cost of capital is used primarily to make decisions which involve raising and investing new capital. So, we should focus on marginal costs.

Importance of an accurate WACC

WACC Sensitivity: What if the WACC goes from 11% to 10%?

31% difference in stock price with a 1% change in WACC

11% WACC

Estimating the Value of R&R's Stock Price (Millions, Except for Per Share Data)	
INPUTS:	
Value of operations =	$420.00
Value of nonoperating assets =	$100.00
All debt =	$200.00
Preferred stock =	$50.00
Number of shares of common stock =	10.00
ESTIMATING PRICE PER SHARE	
Value of operations	$420.00
+ Value of nonoperating assets	100.00
Total estimated value of firm	$520.00
− Debt	200.00
− Preferred stock	50.00
Estimated value of equity	$270.00
÷ Number of shares	10.00
WACC 11%: Estimated stock price per share =	$27.00

10% WACC

Estimating the Value of R&R's Stock Price (Millions, Except for Per Share Data)	
INPUTS:	
Value of operations =	$504.00
Value of nonoperating assets =	$100.00
All debt =	$200.00
Preferred stock =	$50.00
Number of shares of common stock =	10.00
ESTIMATING PRICE PER SHARE	
Value of operations	$504.00
+ Value of nonoperating assets	100.00
Total estimated value of firm	$604.00
− Debt	200.00
− Preferred stock	50.00
Estimated value of equity	$354.00
÷ Number of shares	10.00
WACC 10% Estimated stock price per share =	$35.40

Simple Example of a WACC

What **rate of return** must the company earn on existing assets to meet the expectations of creditors and owners?

	XYZ Firm's Liabilities and Equity	Opportunity Cost of Capital	Weights
Debt	100	10%	33%
Equity	200	20%	67%
Tax	25%		

1. Calculate the cost of Debt

(1-.25) * 10% = **7.5%**

2. Calculate the cost of Equity

(for now, it is given at **20%**)

3. Apply the weights for a WACC

(33% * **7.5%**) + (67% * **20%**) = **16%**

Summary of WACC

1. Calculate the cost of Debt
2. Calculate the cost of Equity
3. Calculate the cost of Preferred Stock *(if any)*
4. Apply the weights

= Weighted Average Cost of Capital

or

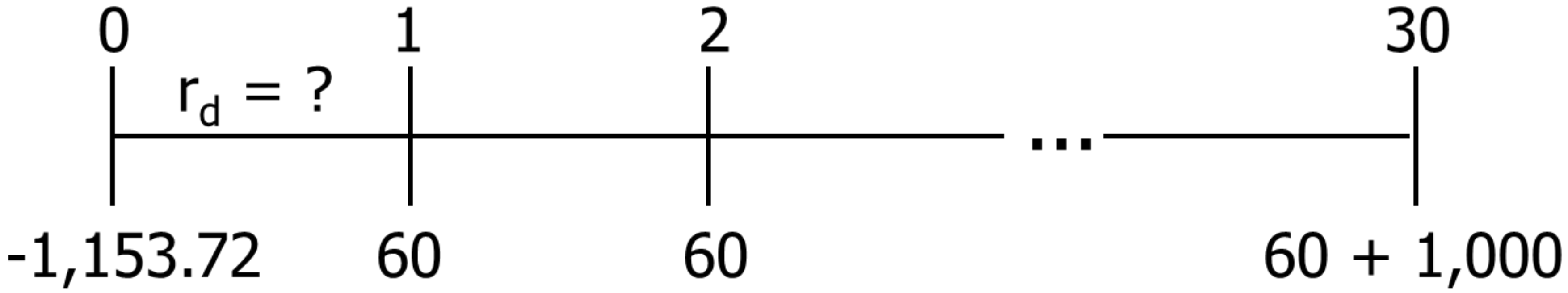
WACC

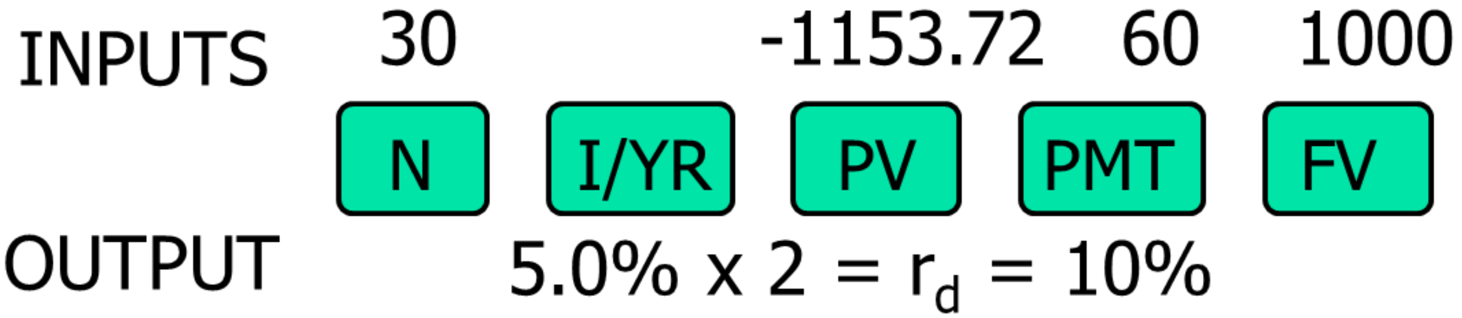
Cost of Debt

- Method 1: Ask an investment banker what the coupon rate would be on new debt.
- Method 2: Find the bond rating for the company and use the yield on other bonds with a similar rating.
- Method 3: Find the yield on the company’s debt, if it has any.

A 15-year, 12% semiannual bond sells for $1,153.72. What's r_d?

A 15-year, 12% semiannual bond sells for \$1,153.72. What's r_d?





Component Cost of Debt

- Interest is tax deductible, so the after tax (AT) cost of debt is:

  r_d AT = r_d BT(1 – T)

  r_d AT = 10%(1 – 0.25) = 7.5%.

- Use Marginal rate.
- Flotation costs small, so ignore.

What is the Cost of preferred stock?

P_{ps} = \$116.95
Dividend = 10%
Par = \$100
Flotation = 5%

$$r_{ps} = \frac{D_{ps}}{P_{ps}\left(1 - F\right)} =$$

The cost of preferred stock is simply the preferred dividend divided by the price the company will receive if it issues new preferred stock.

No tax adjustment is necessary, as preferred dividends are not tax deductible.

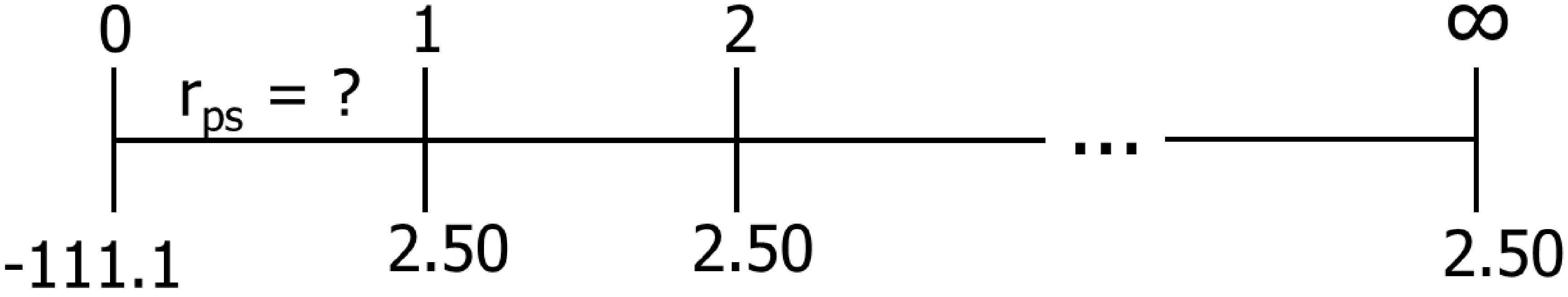
What is the Cost of preferred stock?

P_{ps} = \$116.95
10%*Q
Par = \$100
F = 5%

$$r_{ps} = \frac{D_{ps}}{P_{ps}(1-F)} = \frac{0.1(\$100)}{\$116.95(1-0.05)}$$

$$= \frac{\$10}{\$111.10} = 0.090 = 9.0\%$$

Timeline of Preferred



$$\$111.10 = \frac{D_Q}{r_{Per}} = \frac{\$2.50}{r_{Per}}$$

$$r_{Per} = \frac{\$2.50}{\$111.10} = 2.25\%;\ r_{ps(Nom)} = 2.25\%(4) = 9\%$$

Note:

- Flotation costs for preferred are significant, so are reflected. Use net price.
- Preferred dividends are not deductible, so no tax adjustment. Just r_{ps}.
- Nominal r_{ps} is used.

Is preferred stock more or less risky to investors than debt?

- More risky; company not required to pay preferred dividend.
- However, firms want to pay preferred dividend. Otherwise, (1) cannot pay common dividend, (2) difficult to raise additional funds, and (3) preferred stockholders may gain control of firm.

What are the two ways that companies can raise common equity?

1. Directly, by issuing new shares of common stock.
2. Indirectly, by reinvesting earnings that are not paid out as dividends (i.e., retaining earnings).

Why is there a cost for reinvested earnings?

- Earnings can be reinvested or paid out as dividends.
- Investors could buy other securities, earning a return.
- Thus, there is an ***opportunity cost*** if earnings are reinvested.

Three ways to determine the cost of equity, r_S:

1. CAPM: $r_s = r_{RF} + (r_M - r_{RF})b$
$= r_{RF} + (RP_M)b.$

2. DCF: $r_s = D_1/P_0 + g$ (using a dividend method of return)

3. Own-Bond-Yield-Plus-Judgmental-Risk Premium: $r_s = r_d +$ Bond RP.

1. CAPM Cost of Equity

r_{RF} = 5.6%

R_{PM} = 6%

b = 1.2

$r_s = r_{RF} + (RP_M)b$

$= 5.6\% + (6.0\%)1.2 =$ **12.8%.**

1a. CAPM Considerations

- Most analysts use the rate on a long-term (10 to 20 years) government bond as an estimate of r_{RF}.
- Most analysts use a rate of 3.5% to 6% for the market risk premium (RP_M)
- Estimates of beta vary, and estimates are “noisy” (they have a wide confidence interval).

2. What is the Dividend Growth Cost of Equity?

r_s:
$D_0 = \$3.12$
$D_1 = \$3.30$
$P_0 = \$50$
$g = 5.8\%$

Step 1: Start with the Growth Rate: 5.8%

Step 2: Calculate year 1 Dividend Yield

$3.30 / $50 = 6.6%

Step 3: Add Growth and Dividend Yield

5.8% + 6.6% = 12.4%

2. What is the Dividend Growth Cost of Equity?

(If year 1 is not given)

r_s:
D_0 = \$3.12
P_0 = \$50
g = 5.8%

$$r_s = \frac{D_1}{P_0} + g = \frac{D_0(1+g)}{p_0} + g$$

$$= \frac{\$3.12(1.058)}{\$50} + 0.058$$

$$= 6.6\% + 5.8\%$$

$$= 12.4\%$$

Estimating the Growth Rate

- Use the historical growth rate if you believe the future will be like the past.
- Obtain analysts’ estimates: Value Line, Zacks, Yahoo!Finance.
- Use the earnings retention model, illustrated on next slide.

Earnings Retention Model

- Suppose the company has been earning 15% on equity (ROE = 15%) and has been paying out 62% of its earnings.
- **If this situation is expected to continue, what's the expected future g?**

Earnings Retention Model

- Growth from earnings retention model:
  g = (Retention rate)(ROE)
  g = (1 – Payout rate)(ROE)

  g = (1 – 0.62)(15%) = 5.7%.

  This is close to g = 5.8% given earlier.

Cautions to applying the Earnings Retention Model

This approach requires four major assumptions:

1. The payout rate and therefore the retention rate remain constant.
2. The ROE on new investments remains constant and equal to the ROE on existing assets.
3. The firm is not expected to repurchase or issue new common stock, or, if it does, this new stock will be sold at a price equal to its book value.
4. Future projects are expected to have the same degree of risk as the firm's existing assets.

Unfortunately, these assumptions apply in very few situations, limiting the usefulness of the retention growth model.

3. The Own-Bond-Yield-Plus-Judgmental-Risk-Premium Method:

$r_d = 10\%$

$R_P = 3.2\%$

- r_s = r_d + Judgmental risk premium
- r_s = 10.0% + 3.2% = 13.2%

- This judgmental-risk premium $\neq$ CAPM equity risk premium, RP_M.
- Produces ballpark estimate of r_s

What's a reasonable final estimate of r_s?

Method	Estimate
CAPM	12.8%
Dividend growth	12.4%
r_d + judgment	13.2%
Average	12.8%

Determining the Weights for the WACC

- The weights are the percentages of the firm that will be financed by each component.
- If possible, always use the target weights for the percentages of the firm that will be financed with the various types of capital.

Target Weights

- $w_d = 30\%$
- $w_{ps} = 10\%$
- $w_s = 60\%$

Estimating Weights for the Capital Structure (1 of 6)

- If you don't know the targets, it is better to estimate the weights using current market values than current book values.
- Calculate the market value of debt if you have the information.
- If you don't know the market value of debt, then it is usually reasonable to use the book values of debt, especially if the debt is short-term.

Estimating Weights for the Capital Structure (2 of 6)

- Debt
  - Price = $1,153.72
  - 70,000 bonds
- Market value of debt:
  - $1,153.72*(70,000) = $80,760,400.
  - Approximately equal to $80.76 million.

Estimating Weights for the Capital Structure (3 of 6)

- Preferred stock
  - Price = $116.95
  - 200,000 shares
- Market value of preferred stock:
  - $116.95*(200,000) = $23,390,000.
  - Equal to $23.90 million.

Estimating Weights for the Capital Structure (4 of 6)

- Common stock
  - Price = $50.00
  - 3 million shares
- Market value of preferred stock:
  - $50.00*(3) = $150 million.

Estimating Weights for the Capital Structure (5 of 6)

- Market value:
  - Debt = $80.76 million
  - Preferred = $23.30 million
  - Common = $150 million
- Total value = $254.60 million

Estimating Weights for the Capital Structure (6 of 6)

- Market value weights:
  - Debt = \$80.76/\$254.60 = 31.79%
  - Pref. = \$23.30/\$254.60 = 9.17%
  - Common = \$150/\$254.60 = 59.04%
- The market value weights are very close to the target weights.

What's the WACC using the target weights?

WACC $= w_d r_d(1 – T) + w_{ps} r_{ps} + w_s r_s$

WACC $= 0.3(10\%)(1 − 0.25) + 0.1(9\%)$

$+ 0.6(12.8\%)$

WACC $= 10.83\%$

What factors influence a company’s WACC?

- Uncontrollable factors:
  - Market conditions, especially interest rates.
  - The market risk premium.
  - Tax rates.
- Controllable factors:
  - Capital structure policy.
  - Dividend policy.
  - Investment policy. Firms with riskier projects generally have a higher cost of equity.

Is the firm’s WACC correct for each of its divisions?

- NO! The composite WACC reflects the risk of an average project undertaken by the firm.
- Different divisions may have different risks. The division’s WACC should be adjusted to reflect the division’s risk and capital structure.

Project Risk

What are the three types of project risk?

- Stand-alone risk
- Corporate risk
- Market risk

How is each type of risk used?

- Stand-alone risk is easiest to calculate.
- Market risk is theoretically best in most situations.
- However, creditors, customers, suppliers, and employees are more affected by corporate risk.
- Therefore, corporate risk is also relevant.

A Project-Specific, Risk-Adjusted Cost of Capital

- Start by calculating a *divisional* cost of capital.
- Use judgment to scale up or down the cost of capital for an individual project relative to the divisional cost of capital.

Costs of Issuing New Common Stock

- When a company issues new common stock they also have to pay flotation costs to the underwriter.
- Issuing new common stock may send a negative signal to the capital markets, which may depress stock price.

Four Mistakes to Avoid

1. Current vs. historical cost of debt
2. Mixing current and historical measures to estimate the market risk premium
3. Book weights vs. Market Weights
4. Incorrect cost of capital components

1. Current vs. Historical Cost of Debt

- When estimating the cost of debt, don’t use the coupon rate on existing debt, which represents the cost of past debt.
- The cost of debt must be based on the interest rate the firm would pay if it issued new debt today.

2. Estimating the Market Risk Premium

- When estimating the risk premium for the CAPM approach, don’t subtract the current long-term T-bond rate from the historical average return on common stocks.
- For example, if the historical r_M has been about 12.2% and inflation drives the current r_{RF} up to 10%, the current market risk premium is not 12.2% – 10% = 2.2%!

3. Estimating Weights

- Use the target capital structure to determine the weights.
- If you don’t know the target weights, then use the current market value of equity.
- If you don’t know the market value of debt, then the book value of debt often is a reasonable approximation, especially for short-term debt.

4. Capital components are sources of funding that come from investors.

- Accounts payable, accruals, and deferred taxes are not sources of funding that come from investors, so they are not included in the calculation of the WACC.
- We do adjust for these items when calculating project cash flows, but not when calculating the WACC.

Corporate Valuation *and* Stock Valuation

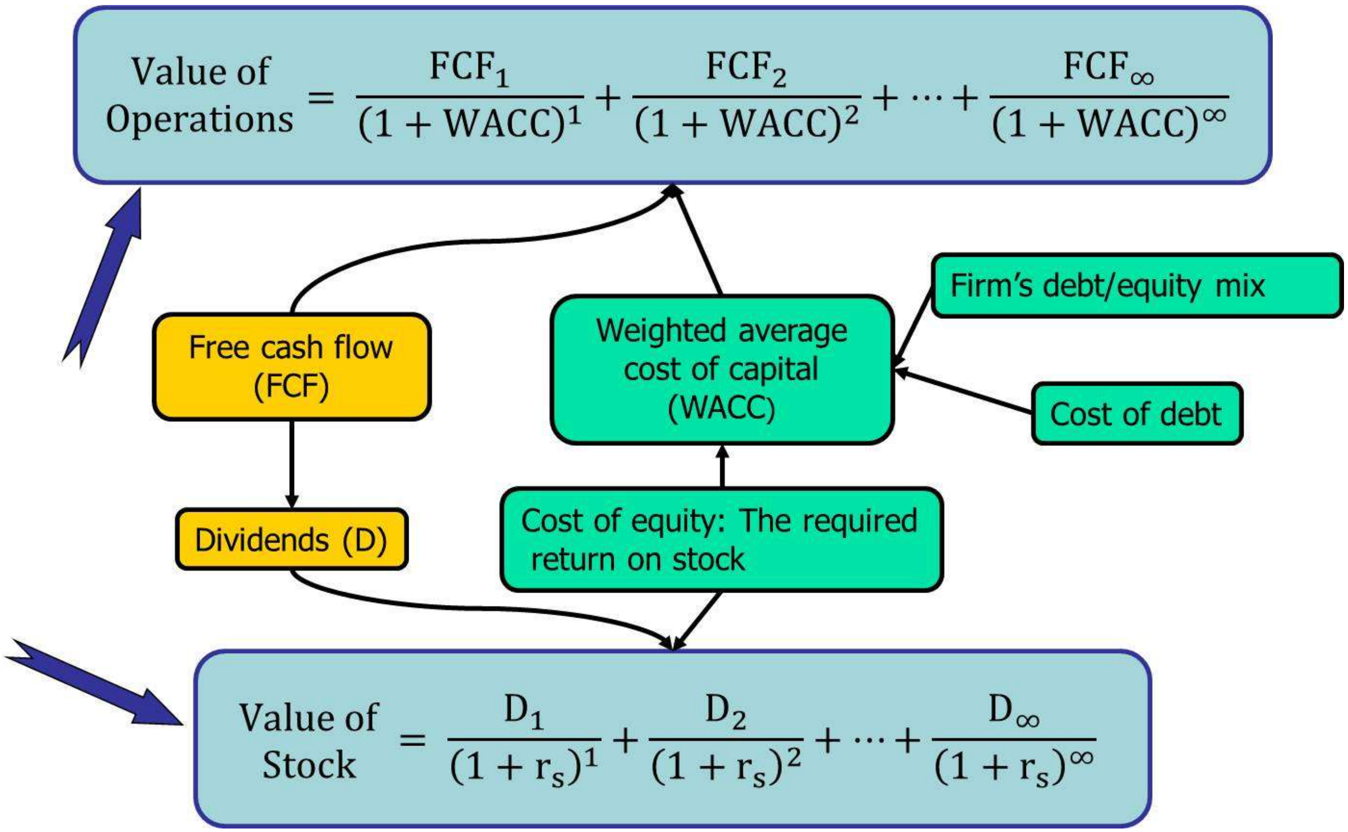
Chapter 7

FIN 6150

Topics in Chapter

- Features of common stock
- Valuing common stock
    - Dividend growth model
    - Free cash flow valuation model
    - Market multiples
- Preferred stock

Corporate Valuation and Stock Valuation



Common Stock: What is the responsibility of the Owners, Directors, and Managers?

1. Represents ownership.
2. Ownership implies control.
3. Stockholders elect directors.
4. Directors hire management.
5. Since managers are "agents" of shareholders, their goal should be: Maximize stock price.*

* But I don't agree with #5

Classified Stock

- Classified stock has special provisions for each class, usually involving voting rights and dividend rights.
- Usually named Class A, Class B, etc.
- New shares in IPO sometimes have voting restrictions but full dividend rights.
- Founders’ shares usually have voting rights but dividend restrictions.
- Standard & Poor’s no longer allows new additions to its indices to have classified stock.

Tracking Stock

- The dividends of tracking stock are tied to a particular division, rather than the company as a whole.
  - Investors can separately value the divisions.
  - Its easier to compensate division managers with the tracking stock.
- But tracking stock usually has no voting rights, and the financial disclosure for the division is not as regulated as for the company.
- Very few companies have tracking stock.

- *Liberty Media, the parent company, issues the tracking stock under the ticker symbol LSXMA, which is used to track the performance of Sirius XM, a separate publicly traded company.*

- *LSXMA is designed to allow investors to invest in the performance of Sirius XM without having to invest in the entire Liberty Media Corporation.*

Fairly Valued, Overvalued, and Undervalued

- Overvalued investments
  - Some investments are so expensive that we will not receive a fair return if we buy them
- Undervalued investments
  - Some investments are so cheap that they offer a rate of return that is a greater reward than the risk that the investor has taken

- How do we find over or under valued investments?
- Two approaches to valuation:
  1. Discounted cash flow (DCF) valuation
  2. Relative valuation or Multiples

Valuation Models

Overview

Different Approaches for Valuing Common Stock

1. Free cash flow model
   - Constant growth
   - Nonconstant growth
2. Dividend growth model
   - Constant growth
   - Nonconstant growth
3. Using the multiples of comparable firms

The Free Cash Flow Valuation Model: FCF and WACC

- Free cash flow (FCF) is:
  - The cash flow available for distribution to *all* a company's investors.
  - Generated by a company's operations.
- The weighted average cost of capital (WACC) is:
  - The overall rate of return required by *all* the company's investors.

Value of Operations (V_{op})

- The PV of expected future FCF, discounted at the WACC, is the value of a company's operations (V_{op}):

$$V_{op} = \sum_{t=1}^{\infty} \frac{FCF_t}{(1 + WACC)^t}$$

Sources of Value

- Value of operations
- Nonoperating assets
  - Short-term investments and other marketable securities
  - Ownership of non-controlling interest in another company

Value of nonoperating assets usually is very close to figure that is reported on balance sheets.

Claims on Corporate Value

- Debt holders have first claim.
- Preferred stockholders have the next claim.
- Any remaining value belongs to stockholders.

Value of operations= PV of FCF discounted at WACC

$$V_{op} = \frac{FCF_1}{(1+WACC)^1} + \frac{FCF_2}{(1+WACC)^2} + \frac{FCF_3}{(1+WACC)^3} + \ldots \frac{FCF^{\infty}}{(1+WACC)^{\infty}}$$

- **Conceptually correct, but how do you find the present value of an infinite stream?**

Valuing a Firm

Steps to value a firm

1. Find the value of the operations
2. Compute the total value of the company
3. Subtract debt and preferred stock
   - Gives the intrinsic value of the firm
4. Divide the equity by the number of shares

Data for FCF Valuation

- FCF_0 = $24 million
- WACC = 11%
- FCF is expected to grow at a constant rate of g_L = 5%
- Short-term investments = $100 million
- Debt = $200 million
- Preferred stock = $50 million
- Number of shares =n = 10 million

1. Find Value of Operations

$$V_{op} = \frac{FCF_0(1+g_L)}{(WACC - g_L)}$$

$$V_{op} = \frac{\$24(1+0.05)}{(0.11-0.05)} = \$420$$

FCF	$ 24,000,000
WACC	11%
Constant Growth Rate	5%
ST Investments	$ 100,000,000
Debt	$ 200,000,000
Pref. Stock	$ 50,000,000
Number of Shares	10,000,000

1. Find Value of Operations

C12 | =-PV(0.06,500,25200000)

	A	B		C	D
1					
2		FCF	$	24,000,000	
3		WACC		11%	
4		Years		500	
5		Constant Growth Rate		5%	
6		ST Investments	$	100,000,000	
7		Debt	$	200,000,000	
8		Pref. Stock	$	50,000,000	
9		Number of Shares	$	10,000,000	
10					
12		PV of Operations		$420,000,000	
13					

FCF	$	24,000,000
WACC		11%
Constant Growth Rate		5%
ST Investments	$	100,000,000
Debt	$	200,000,000
Pref. Stock	$	50,000,000
Number of Shares		10,000,000

2. Total Value of Company (V_{Total})

$V_{operations}$	$420.00
$+$STInv.	100.00
V_{Total}	$520.00

FCF	$	24,000,000
WACC		11%
Constant Growth Rate		5%
ST Investments	$	100,000,000
Debt	$	200,000,000
Pref. Stock	$	50,000,000
Number of Shares		10,000,000

3. Estimated Intrinsic Value of Equity (V_{Equity})

$V_{operations}$	\$420.00
+ ST Inv.	100.00
V_{Total}	\$520.00
−Debt	200.00
− Preferred Stk.	50.00
V_{Equity}	\$270.00

FCF	\$ 24,000,000
WACC	11%
Constant Growth Rate	5%
ST Investments	\$ 100,000,000
Debt	\$ 200,000,000
Pref. Stock	\$ 50,000,000
Number of Shares	10,000,000

4. Estimated Intrinsic Stock Price per Share, $\hat{P}_0$

$V_{operations}$	$420.00
+ ST Inv.	100.00
V_{Total}	$520.00
−Debt	200.00
− Preferred Stk.	50.00
V_{Equity}	$270.00
÷ n	10
$\hat{P}_0$	$27.00

FCF	$ 24,000,000
WACC	11%
Constant Growth Rate	5%
ST Investments	$ 100,000,000
Debt	$ 200,000,000
Pref. Stock	$ 50,000,000
Number of Shares	10,000,000

Steps to value a firm: Nonconstant Growth

1. Find PV of **nonconstant** cash flows
   - Hint: Do an NPV, it is much easier
2. Calculate the Horizon Value of the **constant** cash flows
   - Remember: FCF * (1+G) / WACC – G = Horizon Value
3. Discount the Horizon Value to today
   - Formula: HV / $(1+WACC)^n$
   - Hint: Do a PV using the WACC and Horizon Value
4. Add the **Nonconstant** + **Constant** = PV of the Operations
5. Compute the total value of the company
   - Add the ST Investments
6. Subtract debt and preferred stock
7. Divide the equity by the number of shares

Expansion Plan: Nonconstant Growth

- Finance expansion financed by owners.
- Projected free cash flows (FCF):
  - Year 1 FCF = −$10 million.
  - Year 2 FCF = $20 million.
  - Year 3 FCF = $35 million
  - FCF grows at constant rate of 5% after year 3.
- No change in WACC, marketable securities, debt, preferred stock, or number of shares of stock.

WACC	11%
Constant Growth Rate	5%
ST Investments	$ 100,000,000
Debt	$ 200,000,000
Pref. Stock	$ 50,000,000
Number of Shares	10,000,000

1. Find PV of nonconstant cash flows

Year	0	1	2	3	4	5	… t
FCF		−$10	$20	$35	$FCF_3(1+g_L)$	$FCF_4(1+g_L)$	$FCF_t(1+g_L)$

- Free cash flows are forecast for three years in this example, so the forecast horizon is three years.
- Growth in free cash flows is not constant during the forecast, so we can't use the constant growth formula to find the value of operations at time 0.

- PV of FCF in years 1-3 = **$32,815,138**

FCF	
Year 1	($10,000,000)
Year 2	$20,000,000
Year 3	$35,000,000

1. Find PV of nonconstant cash flows

PV | =NPV(C3,F2:F4)

	A	B	C	D	E	F
1					FCF	
2		FCF	$35,000,000		Year 1	($10,000,000)
3		WACC	11%		Year 2	$20,000,000
4		Constant Growth Rate	5%		Year 3	$35,000,000
5		ST Investments	$100,000,000			
6		Debt	$200,000,000			
7		Pref. Stock	$50,000,000			
8		Number of Shares	10,000,000			
9						
10	**Step 1**	PV of FCF in first three years				
11			**=NPV(C3,F2:F4)**			
12			NPV(rate, **value1**, [value2], [value3], ...)			
13						

$32,815,138

2. Calculate the Horizon Value of the constant cash flows

Year	0	1	2	3	4	5	… t
FCF					$FCF_3(1+g_L)$	$FCF_4(1+g_L)$	$FCF_t(1+g_L)$
				HV_3	← ↲	← ↲	← ↲

$$HV = V_{\text{op at time t}} = \frac{FCF_t(1+g)}{(WACC - g)}$$

- Horizon value is also called terminal value, or continuing value.

Horizon Value

$$HV_3 = V_{op,3} = \frac{FCF_3(1+g)}{(WACC - g)}$$

FCF	\$35,000,000
WACC	11%
Constant Growth Rate	5%

$$HV_3 = \frac{\$35(1+0.05)}{(0.11-0.05)} = \$612.50$$

- This is the value of FCF from Year 4 and beyond discounted back to Year 3.

Horizon Value

PV | =-PV(C15,500,C14)

	A	B	C	D	E	F
1					FCF	
2		FCF	$35,000,000		Year 1	($10,000,000)
3		WACC	11%		Year 2	$20,000,000
4		Constant Growth Rate	5%		Year 3	$35,000,000
5		ST Investments	$100,000,000			
6		Debt	$200,000,000			
7		Pref. Stock	$50,000,000			
8		Number of Shares	10,000,000			
9						
10	**Step 1**	PV of FCF in first three years				
11			**$32,815,138**			
12						
13						
14	**Step 2**	Growth of Constant FCF	$36,750,000.00	*$35*(1+.05)*		
15		Discount Rate	6%	*11% - 5%*		
16		PV of Horizon Cash Flows	**=-PV(C15,500,C14)**			
17			PV(rate, **nper**, pmt, [fv], [type])			
18						

$612,500,000

3. Discount the Horizon Value to today

$$\underline{\$447.855} = \frac{\$612.50}{(1+WACC)^3}$$

FCF	$35,000,000
WACC	11%
Constant Growth Rate	5%

3. Discount the Horizon Value to today

PV | =-PV(C3,3,,C16)

	A	B	C	D	E	F	G
1					FCF		
2		FCF	$35,000,000		Year 1	($10,000,000)	
3		WACC	11%		Year 2	$20,000,000	
4		Constant Growth Rate	5%		Year 3	$35,000,000	
5		ST Investments	$100,000,000				
6		Debt	$200,000,000				
7		Pref. Stock	$50,000,000				
8		Number of Shares	10,000,000				
9							
10	**Step 1**	PV of FCF in first three years					
11			**$32,815,138**				
12							
13							
14	**Step 2**	Growth of Constant FCF	$36,750,000.00	*$35*(1+.05)*			
15		Discount Rate	6%	*11% - 5%*			
16		PV of Horizon Cash Flows	**$612,500,000**				
17							
18							
19	**Step 3**	Discount the Horizon Value to today					
20			=-PV(C3,3,,C16)				
21			PV(**rate**, nper, pmt, [fv], [type])				
22							

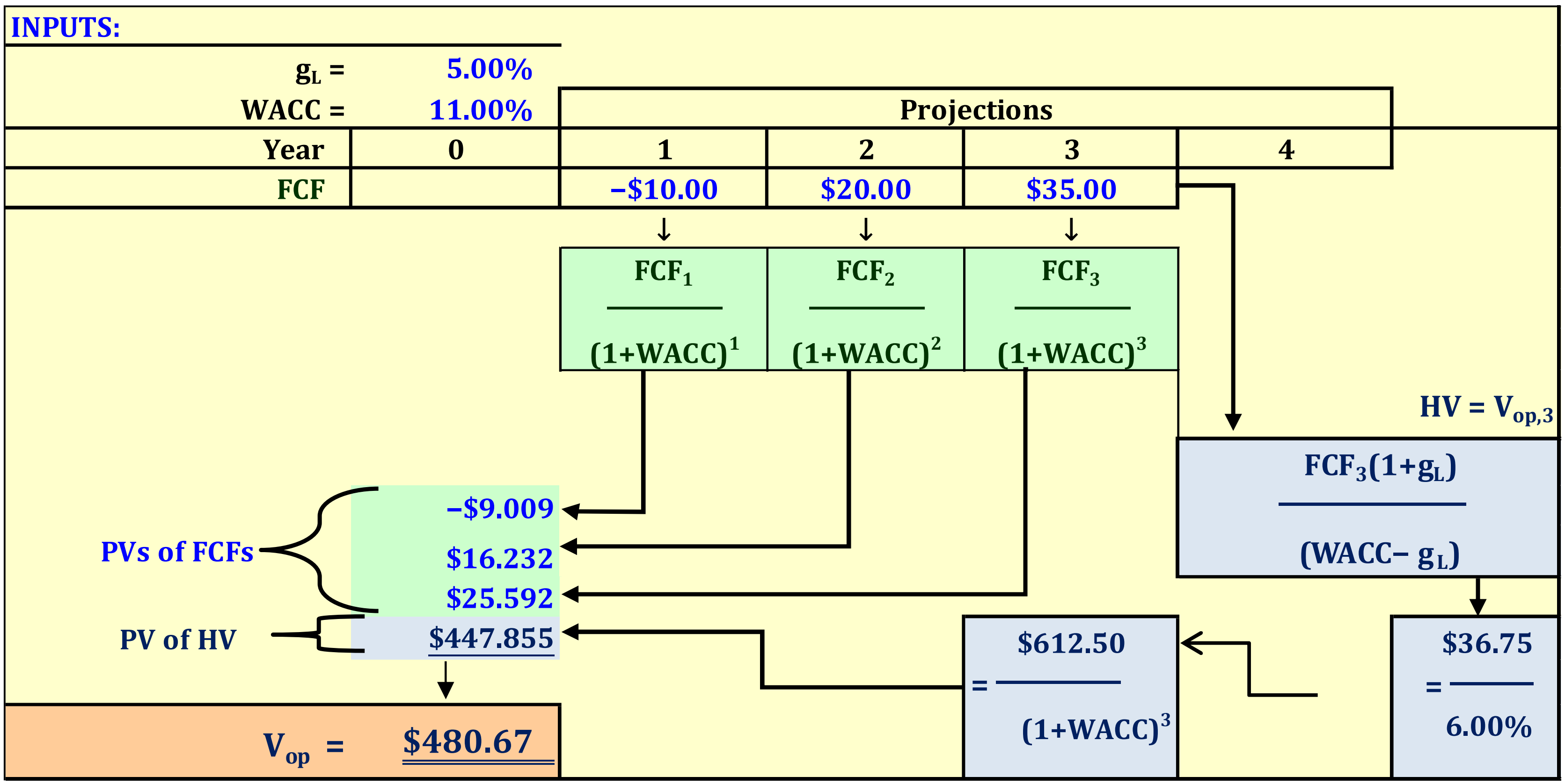
$447,854,721

Value of Operations at t=0: PV of FCF_1 through FCF_3 plus PV of HV_3

Year	0	1	2	3	4	5	… t
FCF		FCF_1	FCF_2	FCF_3			
	PV of FCF in explicit forecast	← ↲	← ↲	← ↲	$FCF_3(1+g_L)$	$FCF_4(1+g_L)$	$FCF_t(1+g_L)$
	+			HV_3	← ↲	← ↲	← ↲
	PV of HV	← ↲	← ↲	← ↲			
	= Value of operations Time 0						

- PV of HV is the PV of FCF beyond the explicit forecast. So PV of HV plus PV of FCF in explicit forecast is the PV of all future FCFs.

4. Add the Nonconstant + Constant = PV of the Operations



4. Add the Nonconstant + Constant = PV of the Operations

PV =C11+C20

	A	B	C	D	E	F
1					FCF	
2		FCF	$35,000,000		Year 1	($10,000,000)
3		WACC	11%		Year 2	$20,000,000
4		Constant Growth Rate	5%		Year 3	$35,000,000
5		ST Investments	$100,000,000			
6		Debt	$200,000,000			
7		Pref. Stock	$50,000,000			
8		Number of Shares	10,000,000			
9						
10	**Step 1**	PV of FCF in first three years				
11			**$32,815,138**			
12						
13						
14	**Step 2**	Growth of Constant FCF	$36,750,000.00	*$35*(1+.05)*		
15		Discount Rate	6%	*11% - 5%*		
16		PV of Horizon Cash Flows	**$612,500,000**			
17						
18						
19	**Step 3**	Discount the Horizon Value to today				
20			**$447,854,721**			
21						
22	**Step 4**	Add the Nonconstant + Constant = PV of the Operations				
23			=C11+C20			
24						

$480,669,859

Estimated Intrinsic Stock Price per Share

$V_{operations}$	\$480.67
+ ST Inv.	100.00
V_{Total}	\$580.67
−Debt	200.00
− Preferred Stk.	50.00
V_{Equity}	\$330.67
÷ n	10
$\hat{P}_0$	\$33.07

Estimated Intrinsic Stock Price per Share

	A	B	C	D	E	F
1					FCF	
2		FCF	$35,000,000		Year 1	($10,000,000)
3		WACC	11%		Year 2	$20,000,000
4		Constant Growth Rate	5%		Year 3	$35,000,000
5		ST Investments	$100,000,000			
6		Debt	$200,000,000			
7		Pref. Stock	$50,000,000			
8		Number of Shares	10,000,000			
9						
24						
25	**Steps 5-7**	Estimated Intrinsic Stock Price per Share				
26		Value of the operations	$480,669,859			
27		+ ST Investments	$100,000,000			
28		- Debt	($200,000,000)			
29		- Pref. Stock	($50,000,000)			
30		= Value of the Equity	$330,669,859			
31		÷ number of Shares	10,000,000			
32		Price per Share	$33.07			
33						

Putting it all together

	A	B	C	D	E	F	G
1					FCF		
2		FCF	$35,000,000		Year 1	($10,000,000)	
3		WACC	11%		Year 2	$20,000,000	
4		Constant Growth Rate	5%		Year 3	$35,000,000	
5		ST Investments	$100,000,000				
6		Debt	$200,000,000				
7		Pref. Stock	$50,000,000				
8		Number of Shares	10,000,000				
9							
10	<u>Step 1</u>	PV of FCF in first three years					
11			**$32,815,138**				
12							
13							
14	<u>Step 2</u>	Growth of Constant FCF	$36,750,000.00	$35*(1+.05)			
15		Discount Rate	6%	11% - 5%			
16		PV of Horizon Cash Flows	**$612,500,000**				
17							
18							
19	<u>Step 3</u>	Discount the Horizon Value to today					
20			**$447,854,721**				
21							
22	<u>Step 4</u>	Add the Nonconstant + Constant = PV of the Operations					
23			**$480,669,859**				
24							
25	<u>Steps 5-7</u>	Estimated Intrinsic Stock Price per Share					
26		Value of the operations	$480,669,859				
27		+ ST Investments	$100,000,000				
28		- Debt	($200,000,000)				
29		- Pref. Stock	($50,000,000)				
30		= Value of the Equity	$330,669,859				
31		÷ number of Shares	10,000,000				
32		Price per Share	$33.07				
33							

How much of the value of operations is based on cash flows from Year 4 and beyond?

- The horizon value is the value of all FCF from Year 4 and beyond, discounted back to Year 3.
- The present value of HV_3 is the present value of all FCF from Year 4 and beyond.
- The PV of HV_3 is the percent of total value due to long-term cash flows.

Where is the value in these operations?

	A	B	C	D	E	F	G
1					FCF		
2		FCF	$35,000,000		Year 1	($10,000,000)	
3		WACC	11%		Year 2	$20,000,000	
4		Constant Growth Rate	5%		Year 3	$35,000,000	
5		ST Investments	$100,000,000				
6		Debt	$200,000,000				
7		Pref. Stock	$50,000,000				
8		Number of Shares	10,000,000				
9							
10	**Step 1**	PV of FCF in first three years					
11			**$32,815,138**				
12							
13							
14	**Step 2**	Growth of Constant FCF	$36,750,000.00	*$35*(1+.05)*			
15		Discount Rate	6%	*11% - 5%*			
16		PV of Horizon Cash Flows	**$612,500,000**				
17							
18							
19	**Step 3**	Discount the Horizon Value to today					
20			**$447,854,721**				
21							
22	**Step 4**	Add the Nonconstant + Constant = PV of the Operations					
23			**$480,669,859**				
24							
25	**Steps 5-7**	Estimated Intrinsic Stock Price per Share					
26		Value of the operations	$480,669,859				
27		+ ST Investments	$100,000,000				
28		- Debt	($200,000,000)				
29		- Pref. Stock	($50,000,000)				
30		= Value of the Equity	$330,669,859				
31		÷ number of Shares	10,000,000				
32		Price per Share	$33.07				
33							

Years 1-3 = 32 million

Horizon Value = 447 million

Percent of Value Due to Long-Term Cash Flows

- $\% \text{ due to LT} = \frac{\$447.855}{\$480.67} = 0.93$

- In this example, 93% of value is due to cash flows 4 or more years into the future.

- For the average company, this percentage is around 80%.

Long-term versus Short-term Focus

- Why focus on quarterly earnings if most value is from longer-term cash flows?
  - Changes in quarterly earnings can signal changes future in cash flows. This would affect the current stock price.
  - Managers often have bonuses tied to quarterly earnings, so they have incentive to manage earnings.

Dividend Growth Model

Constant Dividend Growth Model ($g_L < r_S$)

1. Calculate the Required Rate of Return
2. Find the Dividend in Year 1 or D1
3. Apply the Dividend Model using D1

$$\hat{P}_0 = \frac{D_1}{r_s - g_L} = \frac{D_0\left(1 + g_L\right)}{r_s - g_L}$$

1. Calculate the Required rate of return

Beta = 1.2,
Risk Free = 7%,
Market Premium = 5%

Use the SML to calculate the Required Rate of Return:

Required rate of return

Beta = 1.2,
Risk Free = 7%,
Market Premium = 5%

Use the SML to calculate the Required Rate of Return:

$$
\begin{aligned}
r_s &= r_{RF} + (RP_M) b_{Firm} \\
&= 7\% + (5\%)(1.2) \\
&= 13\%
\end{aligned}
$$

$$
\begin{aligned}
r_s &= r_{RF} + (RP_M) b_{Firm} \\
&= 7\% + (5\%)(1.2) \\
&= 13\%
\end{aligned}
$$

Estimated Intrinsic Stock Value

1. Calculate the Required Rate of Return
2. Find the Dividend in Year 1 or D1
3. Apply the Dividend Model using D1

(1) Required Return = 13%, Dividend Time 0 = $2.00, Growth = 6%

$$(2)\ D_1 = D_0(1 + g_L)$$

$$= \$2.00(1.06) = \$2.12$$

$$(3)\ \hat{P}_0 = \frac{D_0(1+g_L)}{r_s - g_L} = \frac{D_1}{r_s - g_L}$$

$$\hat{P}_0 = \frac{\$2.12}{0.13 - 0.06} = \$30.29$$

Estimated Intrinsic Stock Value

C17 =(C14/(C10-C3))

	A	B	C	D	E
1					
2		Dividend Time 0	$2.00		
3		Growth	6%		
4		Risk Free Rate	7%		
5		Market Premium	5%		
6		Beta	1.2		
7					
8					
9	**Step 1**	Calculate the Required rate of return			
10		Required Rate of Return	**13%**		
11					
12					
13	**Step 2**	Find the Dividend in Year 1 or D1			
14		Dividend Year 1	**$2.12**		
15					
16	**Step 3**	Apply the Dividend Model using D1			
17		Intrinsic price per share	**$30.29**		
18					

1. Calculate the Required Rate of Return
2. Find the Dividend in Year 1 or D1
3. Apply the Dividend Model using D1

$$13\% = 7\% + (5\%)(1.2)$$

Calculate the Required Rate of Return

$$\$2.12 = \$2.00(1.06)$$

Find the Dividend in Year 1 or D1

$$\$30.29 = \frac{\$2.12}{0.13-0.06}$$

Apply the Dividend Model using D1

Multiples

Using Stock Price Multiples to Estimate Stock Price

- Analysts often use the P/E multiple (the price per share divided by the earnings per share).
- Example:
  - Estimate the average P/E ratio of comparable firms. This is the P/E multiple.
  - Multiply this average P/E ratio by the expected earnings of the company to estimate its stock price.

Using Entity Multiples

- The entity value (V) is:
  - the market value of equity (# shares of stock multiplied by the price per share)
  - plus the value of debt.
- Pick a measure, such as EBITDA, Sales, Customers, Eyeballs, etc.
- Calculate the average entity ratio for a sample of comparable firms. For example,
  - V/EBITDA
  - V/Customers

Using Entity Multiples (Continued)

- Find the entity value of the firm in question. For example,
  - Multiply the firm's sales by the V/Sales multiple.
  - Multiply the firm's # of customers by the V/Customers ratio
- The result is the firm's total value.
- Subtract the firm's debt to get the total value of its equity.
- Divide by the number of shares to calculate the price per share.

Problems with Market Multiple Methods

- It is often hard to find comparable firms.
- The average ratio for the sample of comparable firms often has a wide range.
  - For example, the average P/E ratio might be 20, but the range could be from 10 to 50. How do you know whether your firm should be compared to the low, average, or high performers?

Preferred Stock

- Hybrid security.
- Similar to bonds in that preferred stockholders receive a fixed dividend which must be paid before dividends can be paid on common stock.
- However, unlike bonds, preferred stock dividends can be omitted without fear of pushing the firm into bankruptcy.

Value of Preferred Stock (Dividend = \$2.10; r_{ps} = 7%)

$$V_{ps} = \frac{\text{Dividend}}{r_{ps}} = \frac{\$2.10}{7\%} = \$30$$

Appendix 1

Dividends

Comparing the FCF Model and Dividend Growth Model

- Can apply FCF model in more situations:
  - Privately held companies
  - Divisions of companies
  - Companies that pay zero (or very low) dividends
- FCF model requires forecasted financial statements to estimate FCF
  - Takes more effort than just forecasting dividends, but…
  - Provides more insights into value drivers.

Value of dividend-paying stock = PV of dividends discounted at required return

$$\hat{P}_0 = \frac{D_1}{(1+r_s)^1} + \frac{D_2}{(1+r_s)^2} + \frac{D_3}{(1+r_s)^3} + \ldots \frac{D_\infty}{(1+r_s)^\infty}$$

Conceptually correct, but how do you find the present value of an infinite stream?

Suppose dividends are expected to grow at a constant rate, g_L, forever.

$$D_1 = D_0(1 + g_L)^1$$

$$D_2 = D_0(1 + g_L)^2$$

$$D_t = D_0(1 + g_L)^t$$

What is the present value of a constant growth D_t when discounted at the stock's required return, r_s? See next slide.

Present Value of a Constant Growth Dividend

- $PV = \frac{D_t}{(1+r_s)^t} = \frac{D_0(1+g_L)^t}{(1+r_s)^t} = D_0\left[\frac{1+g_L}{1+r_s}\right]^t$
- What happens to $\left[\frac{1+g_L}{1+r_s}\right]^t$ as t gets bigger?
- If $g_L<r_s$: Then $\left[\frac{1+g_L}{1+r_s}\right]^t$ < 1.
- So the bracket approaches zero as t gets large.

Constant Dividend Growth Model (g_L<r_s)

- If g_L is constant and less than r_s, then $\sum_{t=1}^{\infty} D_0 \left[\frac{1+g_L}{1+r_s}\right]^t$ converges to:

$$\hat{P}_0 = \frac{D_1}{r_s - g_L} = \frac{D_0\left(1 + g_L\right)}{r_s - g_L}$$

What happens if $g_L > r_s$?

$$\hat{P}_0 = \frac{D_0\left(1+g_L\right)^1}{\left(1+r_s\right)^1} + \frac{D_0\left(1+g_L\right)^2}{\left(1+r_s\right)^2} + \ldots + \frac{D_0\left(1+g_L\right)^\infty}{\left(1+r_s\right)^\infty}$$

$$\text{If } g_L > r_{s,} \text{ then } \frac{\left(1+g_L\right)^t}{\left(1+r_s\right)^t} > 1, \text{ and } \hat{P}_0 = \infty$$

- **So g_L must be less than r_s for the constant growth model to be applicable!!**

Required rate of return: beta = 1.2, r_{RF} = 7%, and RP_M = 5%.

Use the SML to calculate r_s:

$$\begin{aligned} r_s &= r_{RF} + (RP_M) b_{Firm} \\ &= 7\% + (5\%)(1.2) \\ &= 13\% \end{aligned}$$

Estimated Intrinsic Stock Value:
D_0 = \$2.00, r_s = 13%, g_L = 6%

$$D_1 = D_0\left(1+g_L\right)$$

$$= \$2.00\left(1.06\right) = \$2.12$$

$$\hat{P}_0 = \frac{D_0\left(1+g_L\right)}{r_s - g_L} = \frac{D_1}{r_s - g_L}$$

$$\hat{P}_0 = \frac{\$2.12}{0.13 - 0.06} = \$30.29$$

Expected Stock Price in 1 Year

$$\text{In general: } \hat{P}_t = \frac{D_t + 1}{r_s - g_L}$$

$$D_1 = D_0\left(1 + g_L\right)$$

$$= \$2.12\left(1.06\right) = \$2.2472$$

$$\hat{P}_0 = \frac{D_1}{r_s - g_L}$$

$$= \frac{\$2.2472}{0.13 - 0.06} = \$32.10$$

Expected Dividend Yield and Capital Gains Yield (Year 1)

$$\text{Dividend yield} = \frac{D_1}{P_0} = \frac{\$2.12}{\$30.29} = 7.0\%$$

$$\text{CG yield} = \frac{\hat{P}_1 - P_0}{P_0} = \frac{\$32.10 - \$30.29}{\$30.29}$$

$$= 6.0\%$$

Total Year 1 Return

- Total return = Dividend yield + Capital gains yield.
- Total return = 7% + 6% = 13%.
- Total return = 13% = r_s.
- For constant growth stock:
    - Capital gains yield = 6% = g_L.

Rearrange model to rate of return form:

$$\hat{P}_0 = \frac{D_1}{r_s - g} \text{ to } \hat{r}_s = \frac{D_1}{P_0} + g.$$

$$\text{Then, } \hat{r}_s = \$2.12/\$30.29 + 0.06$$

$$= 0.07 + 0.06 = 13\%$$

Nonconstant Growth Stock

- Nonconstant growth of 30% for Year 0 to Year 1, 25% for Year 1 to Year 2, 15% for Year 2 to Year 3, and then long-run constant g_L = 6%.
- Can no longer use constant growth model.
- However, growth becomes constant after 3 years.

Steps to Estimate Current Stock Value

- Forecast dividends for nonconstant period, which ends at horizon date after which growth is constant at g_L.
- Find horizon value, which is PV of dividends beyond horizon date discounted back to horizon date
- Horizon value = $\hat{P}_t = \frac{D_t(1+g_L)}{r_s - g_L} = \frac{D_1}{r_s - g_L}$

Steps to Estimate Current Stock Price (Continued)

- Find PV of each dividend in the forecast period.
- Find PV of horizon value.
- Sum PV of dividends and PV of horizon value.
- Result is estimated current stock value.

Example of Estimating Current Stock Value (D_0 = \$2.00, r_s = 13%)

		$g_{0,1}$ = 30%	$g_{1,2}$ = 25%	$g_{2,3}$ = 15%	g_L = 6%
Year	0	1	2	3	4
Dividends		$D_0(1+g_{0,1})$ ↓ \$2.600	$D_1(1+g_{1,2})$ ↓ \$3.250	$D_2(1+g_{2,3})$ ↓ \$3.7375	
		↓			$\frac{D_4}{r_s - g_L}$
PVs of divs.	\$2.301	← \$2.600/$(1+r_s)^1$			$\frac{D_3(1+g_L)}{r_s - g_L}$
	\$2.545	← \$3.250/$(1+r_s)^2$			↓
	\$2.590	← \$3.7375/$(1+r_s)^3$			
PV of $\hat{P}_3$	<u>\$39.224</u>	\$56.596/$(1+r_s)^3$	←	$\hat{P}_3$ = \$56.596 ←	$\frac{\$3.9618}{0.07}$

$\hat{P}_0$ = **\$46.66**

Expected Dividend Yield and Capital Gains Yield (t = 0)

$$\text{At t} = 0:$$

$$\text{Dividend yield} = \frac{D_1}{P_0} = \frac{\$2.60}{\$46.66} = 5.6\%$$

$$\text{CG Yield} = 13.0\% - 5.6\% = 7.4\%$$

Expected Dividend Yield and Capital Gains Yield (after t = 3)

- During nonconstant growth, dividend yield and capital gains yield are not constant.
- If current growth is greater than g, current capital gains yield is greater than g.
- After t = 3, g_L = constant = 6%, so the capital gains yield = 6%.
- Because r_s = 13%, after t = 3 dividend yield = 13% – 6% = 7%.

Appendix 2

Valuation Math

Suppose FCFs are expected to grow at a constant rate, g_L, starting at t=1, and continue forever. What happens to FCF?

$$FCF_2 = FCF_1 (1 + g_L)^1$$

$$FCF_3 = FCF_1 (1 + g_L)^2$$

$$FCF_t = FCF_1 (1 + g_L)^{t-1}$$

- What is the value of operations if FCFs grow at a constant rate? See next slide.

Value of operations in terms of FCF_1 and g_L:

$$V_{op} = \frac{FCF_1}{(1+WACC)^1} + \frac{FCF_2(1+g_L)^1}{(1+WACC)^2} +$$

$$\frac{FCF_1(1+g_L)^2}{(1+WACC)^3} + \ldots \frac{FCF_1(1+g_L)^{t\text{-}1}}{(1+WACC)^t} + \ldots$$

- We can multiply and divide by $(1+g_L)$, for a reason that will soon be clear, as shown on the next slide.

Rewritten value of operations:

$$V_{op} = \frac{FCF_1(1+g_L)}{(1+WACC)^1(1+g_L)} + \frac{FCF_1(1+g_L)^1(1+g_L)}{(1+WACC)^2(1+g_L)}$$

$$+\frac{FCF_1(1+g_L)^2(1+g_L)}{(1+WACC)^3(1+g_L)} + \dots + \frac{FCF_1(1+g_L)^{t-1}(1+g_L)}{(1+WACC)^t(1+g_L)} + \dots$$

- We can group $\left[\frac{FCF_1}{1+g_L}\right]$, as shown on the next slide.

Value of operations with grouped terms:

$$V_{op} = \left[\frac{FCF_1}{(1+g_L)}\right]\frac{(1+g_L)^1}{(1+WACC)^1} + \left[\frac{FCF_1}{(1+g_L)}\right]\frac{(1+g_L)^2}{(1+WACC)^2}$$

$$+\left[\frac{FCF_1}{(1+g_L)}\right]\frac{(1+g_L)^3}{(1+WACC)^3} + \ldots + \left[\frac{FCF_1}{(1+g_L)}\right]\frac{(1+g_L)^t}{(1+WACC)^t} + \ldots$$

- We can group the $\frac{(1+g_L)}{(1+WACC)}$ terms, as shown on the next slide.

Value of operations if FCF grows at a constant rate:

$$V_{op} = \left[\frac{FCF_1}{1+g_L}\right]\left[\frac{1+g_L}{1+WACC}\right]^1 + \left[\frac{FCF_1}{1+g_L}\right]\left[\frac{1+g_L}{1+WACC}\right]^2$$

$$+ \left[\frac{FCF_1}{1+g_L}\right]\left[\frac{1+g_L}{1+WACC}\right]^3 \ldots + \left[\frac{FCF_1}{1+g_L}\right]\left[\frac{1+g_L}{1+WACC}\right]^t \ldots +$$

- What happens to $\left[\frac{1+g_L}{1+WAC}\right]^t$ if t gets large? It depends on the size of g_L relative to WACC. See next slide.

What happens to $\left[\frac{1+g_L}{1+WACC}\right]^t$ as t gets large?

- If g_L < WACC: Then $\left[\frac{1+g_L}{1+W}\right]^t$ < 1.
- If $g_L \geq$ WACC: Then $\left[\frac{1+g_L}{1+WACC}\right]^t \geq$ 1.
- What happens to the value of operations if $g_L \geq$ WACC? See next slide.

What happens to the value of operations if $g_L \geq$ WACC?

$$V_{op} = \left[\frac{FCF_1}{1+g_L}\right][\text{Bigger than } 1]^1 + \left[\frac{FCF_1}{1+g_L}\right][\text{Bigger than } 1]^2$$

$$+ \left[\frac{FCF_1}{1+g_L}\right][\text{Bigger than } 1]^3 + \ldots + \left[\frac{FCF_1}{1+g_L}\right][\text{Bigger than } 1]^\infty$$

- $V_{op} = \left[\frac{FCF_1}{1+g_L}\right]$ (Big) + $\left[\frac{FCF_1}{1+g_L}\right]$ (Bigger) + $\left[\frac{FCF_1}{1+g_L}\right]$ (Even Bigger) + …+ $\left[\frac{FCF_1}{1+g_L}\right]$ (Really big!) = Infinity! So g can't be greater than or equal to WACC!

What happens to the value of operations if $g_L \leq$ WACC?

$$V_{op} = \left[\frac{FCF_1}{1+g_L}\right][\text{Less than } 1]^1 + \left[\frac{FCF_1}{1+g_L}\right][\text{Less than } 1]^2$$

$$+ \left[\frac{FCF_1}{1+g_L}\right][\text{Less than } 1]^3 + \ldots + \left[\frac{FCF_1}{1+g_L}\right][\text{Less than } 1]^\infty$$

- $V_{op} = \left[\frac{FCF_1}{1+g_L}\right]$ (Small) + $\left[\frac{FCF_1}{1+g_L}\right]$ (Smaller) + $\left[\frac{FCF_1}{1+g_L}\right]$ (Even smaller) + …+ FCF_0 (Really small!) = ?
- All the terms get smaller and smaller, but what happens to the sum? See next slide

What is the sum of an infinite number of factors that get smaller at a geometric rate?

Consider this example. The first row is t. The second row is a number that is less than 1 that is compounded to the power of t. The third row is the cumulative sum.

t	1	2	3	4	. . . ∞
$(1/2)^t$	1/2	1/4	1/8	1/16	$1/\infty \approx 0$
$\Sigma(1/2)^t$	1/2	3/4	7/8	15/16	≈ 1

This sum converges to 1. Similarly, V_{op} converges (although not to 1). See next slide.

Constant Growth Formula for Value of Operations: g_L begins at Time 1

- If FCF are expected to grow at a constant rate of g_L from Time 1 and afterwards, and g_L<WACC:

$$V_{op,0} = \frac{FCF_1}{(WACC - gL)}$$

- This is the PV of all FCF from Time 1 through infinity, when discounted at WACC.

Constant Growth Formula for Value of Operations: g_L begins at Time 0

- If FCF are expected to grow at a constant rate of g_L from Time 0 and afterwards, and g_L<WACC:

$$V_{op,0} = \frac{FCF_0 \left(1 + g_L\right)}{\left(WACC - gL\right)}$$

- This is still the PV of all FCF from *Time 1* through infinity, when discounted at WACC.

Appendix 3

Forecasts and Ratios

Forecasting Free Cash Flows: A Simple Approach

- Forecast sales to grow at chosen growth rates.
- Forecast net operating profit after taxes (NOPAT) and total net operating capital (OpCap) as a percent of sales.

Current Situation (in millions)

- Most recent data:
  - Sales of \$2,000
  - Total net operating capital, OpCap = \$1,120
  - Operating profitability ratio
    - OP = NOPAT/Sales = 4.5%
  - Capital requirement ratio
    - CR = OpCap/Sales = 56%.
- The target weighted average cost of capital (WACC) is 9%.

Initial Operating Assumptions for the *No Change* Scenario

- Operating ratios remain unchanged from values in most recent year.
- Sales will grow by 10%, 8%, 5%, and 5% for the next four years.
- The long-term growth rate in sales is 5%.
- The target weighted average cost of capital (WACC) is 9%.

Assumptions

	Actual	Forecast			
Inputs	*0*	1	2	3	4
WACC	9.0%				
Sales	$2,000				
OpCap	$1,120				
Sales growth rate		10%	8%	5%	5%
NOPAT/Sales	4.5%	4.5%	4.5%	4.5%	4.5%
OpCAP/Sales	56.0%	56.0%	56.0%	56.0%	56.0%

Examples of Forecasting Items

- $Sales_1$ = \$2,000(1+0.10) = \$2,200
- $NOPAT_1$ = \$2,200(0.045) = \$99
- $OpCap_1$ = \$2,200(0.56) = \$1,232
- $FCF_t = NOPAT_t - (OpCap_t - OpCap_{t-1})$
- $ROIC_t = NOPAT_t/OpCap_t$

Forecasted FCF: No changes in operating ratios

Scenario: No Change	Actual	Forecast			
	0	1	2	3	4
Sales	*$2,000*	$2,200	$2,376	$2,495	$2,620
NOPAT		$99	$107	$112	$117.879
OpCap	*$1,120*	$1,232	$1,331	$1,397.088	$1,466.942
FCF		−$13	$8.36	$45.738	$48.025
Growth in FCF			-164%	447.1%	5.0%
ROIC	*8.0%*	8.0%	8.0%	8.0%	8.0%

- FCF is negative in Year 1.
- ROIC of 8% is less than WACC of 9%--not good!
- Note: There is no rounding in intermediate calculations.

Estimated Intrinsic Value (1 of 2)

$$\mathrm{HV}_4 = \frac{\mathrm{FCF}_4(1+\mathrm{g_L})}{\mathrm{WACC}-\mathrm{g_L})} = \frac{\$48.025(1+0.05)}{(0.09-0.05)} = \$1{,}260.65$$

$$\text{PV of HV}_4 = \frac{\mathrm{HV}_4}{(1+\mathrm{WACC})^4} = \frac{\$1{,}260.65}{(1+0.09)^4} = \$893.08$$

$$\text{PV of FCF} = \frac{\mathrm{FCF}_1}{(1+\mathrm{WACC})^1} + \frac{\mathrm{FCF}_2}{(1+\mathrm{WACC})^2} + \frac{\mathrm{FCF}_3}{(1+\mathrm{WACC})^3} + \frac{\mathrm{FCF}_4}{(1+\mathrm{WACC})^4}$$

$$\text{PV of FCF} = \frac{-\$13}{(1+0.09)^1} + \frac{\$8.36}{(1+0.09)^2} + \frac{\$45.738}{(1+0.09)^3} + \frac{\$48.025}{(1+0.09)^4}$$

$$\text{PV of FCF} = \$64.45$$

Estimated Intrinsic Value (2 of 2)

Scenario: No Change	
Horizon Value:	
HV_4 =	$1,260.65
Value of Operations:	
Present value of HV	$893.08
+ Present value of FCF	$64.45
Value of operations ≈	$958

The Value of Operations versus the Total Net Operating Capital

- The ROIC (8%) is too low compared to the WACC (9%).
- The capital is not earning enough to meet investors' required return, so:
  - Horizon value ($958) is less than the total net operating capital at the horizon ($1,467).
  - Current value of operations ($958) is less than the current total net operating capital ($1,120).
- ROIC must be greater than WACC/(1+g_L) for horizon value to be greater than the total net operating capital at the horizon.

Value Drivers

- The ROIC (8%) is too low compared to the WACC (9%).
- The capital is not earning enough to meet investors' required return, so:
  - Horizon value ($958) is less than the total net operating capital at the horizon ($1,467).
  - Current value of operations ($958) is less than the current total net operating capital ($1,120).
- ROIC must be greater than WACC/(1+g_L) for horizon value to be greater than the total net operating capital at the horizon.

Impact of Higher Growth Rates

	No Change	Improve Growth
$g_{0,1}$	10%	11%
$g_{1,2}$	8%	9%
$g_{2,3}$	5%	6%
$g_{3,4}$	5%	6%
g_L	5%	6%
OP	4.5%	4.5%
CR	56.0%	56.0%
ROIC	8.0%	**8.0%**
$V_{op,0}$	$958	**$933**
WACC	9.00%	9.00%

- Higher growth causes $V_{op,0}$ to fall.
- ROIC must be greater than WACC/(1+WACC) for growth to add value.
- WACC/(1+G) = 8.26%

Impact of Higher Operating Profitability

	No Change	Improve OP
$g_{0,1}$	10%	10%
$g_{1,2}$	8%	8%
$g_{2,3}$	5%	5%
$g_{3,4}$	5%	5%
g_L	5%	5%
OP	4.5%	5.5%
CR	56.0%	56.0%
ROIC	8.0%	**9.8%**
$V_{op,0}$	$958	**$1,523**
WACC	9.00%	9.00%

- Higher operating profitability increases the ROIC.
- ROIC of 9.8% > 8.26%
- The higher ROIC causes a big increase in $V_{op,0}$.

Impact of Lower Capital Requirements

	No Change	Improve CR
$g_{0,1}$	10%	10%
$g_{1,2}$	8%	8%
$g_{2,3}$	5%	5%
$g_{3,4}$	5%	5%
g_L	5%	5%
OP	4.5%	4.5%
CR	56.0%	51.0%
ROIC	8.0%	**8.8%**
$V_{op,0}$	$958	**$1,191**
WACC	9.00%	9.00%

- Lower capital requirements increases the ROIC.
- ROIC of 8.8% > 8.26%
- The higher ROIC causes an increase in $V_{op,0}$.

Impact of Simultaneous Improvements in OP and CR

	No Change	Improve OP and CR
$g_{0,1}$	10%	10%
$g_{1,2}$	8%	8%
$g_{2,3}$	5%	5%
$g_{3,4}$	5%	5%
g_L	5%	5%
OP	4.5%	5.5%
CR	56.0%	51.0%
ROIC	8.0%	**10.8%**
$V_{op,0}$	$958	**$1,756**
WACC	9.00%	9.00%

Impact of Simultaneous Improvements in Growth, OP, and CR

	No Change	Improve All
$g_{0,1}$	10%	11%
$g_{1,2}$	8%	9%
$g_{2,3}$	5%	6%
$g_{3,4}$	5%	6%
g_L	5%	6%
OP	4.5%	5.5%
CR	56.0%	51.0%
ROIC	8.0%	**10.8%**
$V_{op,0}$	$958	**$2,008**
WACC	9.00%	9.00%

- The ROIC is much higher due to the improvements in operations.
- With a higher ROIC, growth adds substantial value.

Summary: Value of operations for previous combinations of ROIC and g_L

	ROIC	ROIC	ROIC	ROIC	ROIC
		8.0%	8.8%	9.8%	10.8%
g_L	5%	$958	$1,191	$1,523	$1,756
g_L	6%	$933	$1,247	$1,694	$2,008

- The ROIC is much higher due to the improvements in operations.
- With a higher ROIC, growth adds substantial value.

Are volatile stock prices consistent with rational pricing?

- The previous slide shows that small changes in ROIC and growth cause large changes in value.
- Similarly, small changes in the cost of capital (WACC), perhaps due to changes in risk or interest rates, cause large changes in value.
- As new information arrives, investors continually update their estimates of operating profitability, capital requirements, growth, risk, and interest rates.
- If stock prices aren’t volatile, then this means there isn’t a good flow of information.

Analyzing and Valuing Privately Held Companies

FIN 6150

Learning Objectives

- Objective: How to analyze and value privately held firms
- Secondary objectives:
  - Challenges of valuing privately held firms;
  - Why and how private company financial statements may have to be recast; and
  - Adjusting the WACC applied to private firm free cash flows.

Overview of Private Firms

1. 99% of businesses are small
2. Small, private, or family businesses
   - contribute 75% of net new job growth
   - employ ½ of non-government workforce
3. However, these same businesses have more internal issues than publicly-listed firms
   - Usually don't have management succession,
   - Lack corporate governance,
   - Have an informal management structure,
   - Less-skilled, lower-level management,
   - Value ownership more than growth

Why do private owners need a valuation?

1. Part of merger or an acquisition
2. Settling an estate
3. Owners want to sell a position
4. Employees want to exercise stock options
5. Shareholder disputes
6. Court cases
7. Divorce
8. Payment of gift or estate taxes

Challenges of Valuing Privately Held Firms

- Lack of externally generated information
- Lack of adequate documentation of key intangible assets such as software, chemical formulae, recipes, etc.
- Lack of internal controls and rigorous reporting systems
- Firm specific problems
  - Narrow product offering
  - Lack of management depth
  - Lack of leverage with customers and vendors
  - Limited ability to finance future growth
- Common forms of manipulating reported income
  - Revenue may be understated, and expenses overstated to minimize tax liabilities
  - The opposite may be true if the firm is for sale

Case Study

- The company is private
- Company Financials
  - $2,480,000 EBITDA
  - 15% ROE
  - FCF Growth 2%
- The company is selling and will give up control
- Buyer wants to retain current management

Process for Valuing Privately Held Businesses

1. Adjust the Financial Statements
   - True profitability and cash flow in the current period
   - All projections into the future will begin with the baseline of the current period
2. Determine the appropriate valuation methodology
   - Fair-Market value vs. Fair value
   - DCF
   - Relative Value or Comps
   - Replacement Cost
   - Asset Oriented
3. Apply the correct discount rate
4. Adjust the value for (1) a *control premium*, (2) a *liquidity discount*, or (3) a *minority discount*

1 Adjusting the Income Statement

- Owner/officer’s salaries
- Benefits
- Travel and entertainment
- Auto expenses and personal life insurance
- Family members
- Rent or lease payments in excess of fair market value
- Professional service fees
- Depreciation expense
- Reserves

1

Areas Commonly Understated

- When a business is being sold, the following expense categories are often understated by the seller:
  - The marketing and advertising expenditures required to support an aggressive revenue growth forecast
  - Training sales forces to market new products
  - Environmental clean-up
  - Employee safety
  - Pending litigation

1

Areas Commonly Overlooked

- When a business is being sold, the following asset categories are often overlooked by the buyer as potential sources of value:
  - Customer lists
  - Intellectual property
  - Licenses
  - Distributorship agreements
  - Leases
  - Regulatory approvals
  - Employment contracts
  - Non-compete agreements

1 Adjusting the Target's Financial Statements

	Original Income Statement	Adjustments	Adjusted Income Statement	Comments
Revenue	8,000		8,000	
Cost of Sales	3,000	(100)	2,900	Convert LIFO to FIFO
Depreciation	100	(40)	60	Convert accelerated to straight line
Selling: Salaries/Benefits	1,000	(140)	860	Eliminate family member
Selling: Rent	200	(120)	80	Eliminate sales offices
Selling: Insurance	20	(10)	10	Reduce premiums
Selling: Advertising	20	10	30	Increase advertising
Selling: Travel & Enter	250	50	300	Increase travel
Admin.: Salaries/Benefits	600	(200)	400	Reduce owner's pay
Admin: Rent	150	(30)	120	Reduce office space
Admin: Directors'/Prof. Fees	280	(40)	240	Reduce fees
Total Expenses	5,620	(620)	5,000	
EBITDA	**2,480**		**3,060**	

Process for Valuing Privately Held Businesses

1. Adjust the Financial Statements
   - True profitability and cash flow in the current period
   - All projections into the future will begin with the baseline of the current period
2. Determine the appropriate valuation methodology
   - Fair-Market value vs. Fair value
   - DCF
   - Relative Value or Comps
   - Replacement Cost
   - Asset Oriented
3. Apply the correct discount rate
4. Adjust the value for (1) a *control premium*, (2) a *liquidity discount*, or (3) a *minority discount*

Company and Market Assumptions

2

Cash Flow	2,480,000
Adj Cash Flow	3,060,000
Debt	40%
Equity	60%
Tax Rate	30%
Interest on Debt	5%
Risk Free Rate	5%
Beta	1.3
Risk Premium	8%
Growth Rate	2%

"Back-of-the-envelope" Implied Valuation: **25 to 30 Million**

3.06 million ÷ (8%+2%) = 30.6 million

2 Calculate the Cost of Debt

[Interest x (1 - Tax Rate)] x [% of Debt in Cap Structure]

[5% x (1 - 30%)] x 40% = 1.4%

Cash Flow	2,480,000
Adj Cash Flow	3,060,000
Debt	40%
Equity	60%
Tax Rate	30%
Interest on Debt	5%
Risk Free Rate	5%
Beta	1.3
Risk Premium	8%
Growth Rate	2%

2 Calculate the Cost of Equity

[Risk Free Rate + (Beta x (Risk Premium))] x [Equity in Cap Structure]

[5% + (1.3*(8%))] x 60% = 9.24%

Cash Flow	2,480,000
Adj Cash Flow	3,060,000
Debt	40%
Equity	60%
Tax Rate	30%
Interest on Debt	5%
Risk Free Rate	5%
Beta	1.3
Risk Premium	8%
Growth Rate	2%

2

New WACC

Weighted Average Cost of Capital	
Cost of Debt	1.40%
Cost of Equity	9.24%
	10.64%

3

New Valuation

Back of the Envelope	
Cash Flow / Discount Rate	
Valuation	30,600,000
New Discount Rate	
Valuation	36,125,000
Difference	5,525,000

❸ New Valuation Calculation

Back of the Envelope		
Cash Flow / Discount Rate		
FCF Valuation	24,800,000	
Adj FCF Valuatior	30,600,000	
New Discount Rate		
Valuation	36,125,000	(Adj Cash Flow *(1+Growth Rate)) / (WACC - Growth Rate)
		(3,060 * (1+2%)) / (10.64% - 2%)
Difference	5,525,000	

Process for Valuing Privately Held Businesses

1. Adjust the Financial Statements
   - True profitability and cash flow in the current period
   - All projections into the future will begin with the baseline of the current period
2. Determine the appropriate valuation methodology
   - Fair-Market value vs. Fair value
   - DCF
   - Relative Value or Comps
   - Replacement Cost
   - Asset Oriented
3. Apply the correct WACC
4. Adjust the value for (1) a *control premium*, (2) a *liquidity discount*, or (3) a *minority discount*

4 Adjust the value for a Liquidity Discount

Liquidity Discount Analysis	*Target*	*Industry*	*Adjustments*
Industry Average Liqudity Discount		20%	20%
Firm Size	2.480 *EBITDA*	8.630 *EBITDA*	6%
Liquid Assets as a % of Total Assets	>50%		-2%
Financial Returns - ROE	20%	10%	-2%
Cash Flow growth rate	2%	10%	0%
Leverage	0.27	1.02	-2%
			20%

Liquidity Discount

PV = (36,125,000 + Synergies) * (1 - 20%)

Purchase Price after liquidity discount	**28,900,000**
Difference	*(7,225,000)*

4 Adjust the value for a Control Premium

Present Value of Equity	$28,900,000
Control Premium	10%
Control (yes)	50.1%

Control Premium Analysis	*Guideline*	*Adjustments*
Industry Average Control Premium	**Starting point depends on many factors**	**10%**
Target Management	- Retain	- No Change to Premium
	- Replace	- Increase Premium
Discretionary Expenses	- Cut if potential savings >5% of total expenses	- Increase Premium
	- Don't cut if potential savings <5% of total	- No Change to Premium
Nonoperating Assets	- Sell if potential gain >10% of purchase price	- Increase Premium
	- Defer decision if potential gain <10%	- No Change to Premium
Alternative Business Opportunities	- Pursue if NPV >20% of target's stand-alone value	- Increase Premium
	- Don't pursue if NPV <20%	- No Change to Premium
Estimated firm-specific control premium		**15%**

Post "Liquidity Discount" Valuation with Control Premium

PV = (28,900,000 * (1 + 15%)

Purchase Price to gain control	33,235,000
Purchase Price for 50.1% of the asset	16,650,735

What happened?

1	Initial “back of the envelope” valuation =	24,800,000
	Adjusted the FCF, new valuation	30,600,000
2	Adusted the WACC to	10.64%
3	Applied the new valuation	36,125,000
4	Applied the Liquidity Discount (20%)	28,900,000
	Applied the Control Premium (15%)	33,235,000
	Control Price for 50.1%	16,650,735

- **Is this company happy or frustrated with you?**
- **What would you change or how would you negotiate?**

Conclusion

- Valuing private firms tends to be more challenging than public firms because of the dearth of reliable, timely data.
- The purpose of recasting private company statements is to calculate an accurate current profit or cash flow number.
- Adjustment analysis seeks to take subjective information and make it objective
- Private firms don’t always operate under the same set of rules as publicly-listed companies, even if those rules would help them.

Public and Private Financing: Initial Offerings, Seasoned Offerings, and Investment Banks

Chapter 18

FIN 6150

Topics in Chapter

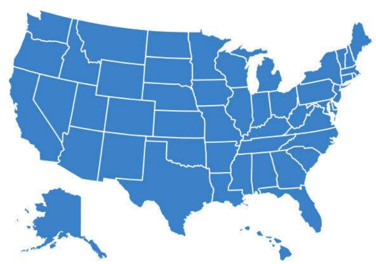
- Initial Public Offerings
- Investment Banking and Regulation
- The Maturity Structure of Debt
- Refunding Operations
- The Risk Structure of Debt

What agencies regulate securities markets?

The SEC regulates:

- Interstate public offerings.
- National stock exchanges.
- Trading by corporate insiders.
- The corporate proxy process.

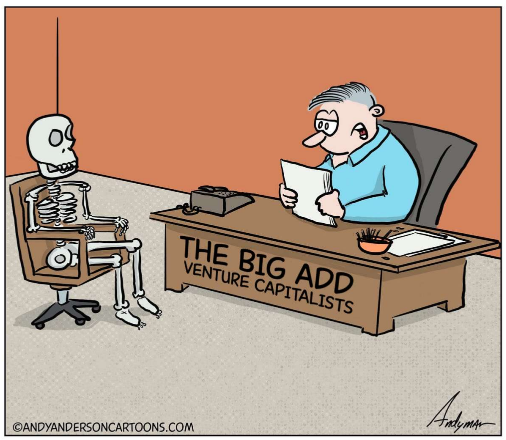
The Federal Reserve Board controls margin requirements.



Each individual state controls the issuance of securities within their boundaries.

The exchanges and the National Association of Securities Dealers (NASD), takes actions to ensure the integrity and credibility of the trading system.

How are start-up firms usually financed?



YOUR BUSINESS IDEA IS GREAT BUT YOU DON'T HAVE ENOUGH SKIN IN THE GAME.

"I'm looking for an angel investor."

Differentiate between a private placement and a public offering.

- In a private placement, such as to angels or VCs, securities are sold to a few investors rather than to the public at large.
- Privately placed stock is not registered, so sales must be “accredited” (high net-worth) investors.
  - Send out “offering memorandum” with 20-30 pages of data and information, prepared by securities lawyers.
  - Buyers certify that they meet net worth/income requirements, and they will not sell to unqualified investors.
- In a public offering, securities are offered to the public and must be registered with SEC.

Why would a company consider going public?

- Advantages of going public
  - Current stockholders can diversify.
  - Liquidity is increased.
  - Easier to raise capital in the future.
  - Going public establishes firm value.
  - Makes it more feasible to use stock as employee incentives.
  - Increases customer recognition.

Disadvantages of Going Public

- Must file numerous reports.
- Operating data must be disclosed.
- Officers must disclose holdings.
- Special “deals” to insiders will be more difficult to undertake.
- A small new issue may not be actively traded, so market-determined price may not reflect true value.
- Managing investor relations is time-consuming.

The steps of an IPO:

1. Select investment banker
2. File registration document (S-1) with SEC
3. Choose price range for preliminary (or “red herring”) prospectus
4. Go on roadshow
5. Set final offer price in final prospectus

What criteria are important in choosing an investment banker?

- Reputation and experience in this industry
- Existing mix of institutional and retail (i.e., individual) clients
- Support in the post-IPO secondary market
  - Reputation of analyst covering the stock

Would companies going public use a negotiated deal or a competitive bid?

- A negotiated deal is preferred most often.
  - The competitive bid process is only feasible for large issues by major firms. Even here, the use of bids is rare for equity issues.
  - It would cost investment bankers too much to learn enough about the company to make an intelligent bid.

What would the sale be on an underwritten or best-efforts basis?

- **Most offerings are underwritten**.
- In very small, risky deals, the investment banker may insist on a best-efforts basis.
- On an underwritten deal, the price is not set until
  - Investor interest is assessed.
  - Oral commitments are obtained.

How an IPO is priced

1. Estimate the pre-IPO value of equity:
    - Free cash flow valuation model
    - Comparables:
        - Price to earnings ratio
        - Price to cash flow ratio
        - Price to sales ratio
        - Number of visits to web pages

2. Decide on either:
    - Amount of dollars company needs (net of flotation costs)
    - Percent of company that owners want to retain

3. Based on this info, determine the offer price

Steps to price an IPO

1. Determine the
   - Gross Proceeds needed and
   - Post-IPO Equity Value (Post-money value)

2. Determine Ownership % new investors require

3. Determine number of new shares required

4. Set the offer price

IPO Pricing Assumptions

- Pre-IPO value of equity = $63 million
  - This is sometimes referred to as the "Pre-money" valuation
- Number of existing shares = 4 million
  - These shares are typically divided among a small number of people
- Amount company needs to raise: $18.6 million
  - This amount was determined by the company on amount they will need to grow
- Underwriter spread = 7%
  - This is bank's commission

Assumptions

Pre-money = $63 million

Existing shares = 4 mil

Capital raise: $18.6 mil

Underwriter spread = 7%

1. Gross Proceeds to raise and Post-IPO Equity Valuation

- Gross proceeds required to get net proceeds:
  - Gross proceeds = Net proceeds/(1– F)
  - Gross proceeds = $18.6/(1– 0.07)
  - Gross proceeds = **$20 million**.

<u>Assumptions</u>
Pre-money = $63 million
Existing shares = 4 mil
Capital raise: $18.6 mil
Underwriter spread = 7%

- Determine Post-IPO valuation
  - Post-money valuation = Pre-money valuation + Required Capital
  - Post-money valuation = $63 + $20*(1 – 0.07)
  - Post-money valuation = **$81.6 million**.

2. Determine Ownership % new investors require

- Determine percentage of post-IPO value of the firm that investors require
  - % required = Capital Raise/Post IPO-valuation
  - % required = $20/$81.6 = **24.51%**

Assumptions

Pre-money = $63 million
Existing shares = 4 mil
Capital raise: $18.6 mil
Underwriter spread = 7%
Capital raise: $20 mil
Post-money = $81.6 mil

3. Determine number of new shares required

- Determine number of new shares for required
  - New Shares Required =
    [(% to new)(Existing shares)] / (1 – % to new)
  - New Shares = [(0.2451)(4)] / (1 – 0.2451)
  - New Shares = 1,298,701 or **1.30 million**

Assumptions
Pre-money = $63 million
Existing shares = 4 mil
Capital raise: $18.6 mil
Underwriter spread = 7%
Capital raise: $20 mil
Post-money = $81.6 mil
Own % req: 24.5%

4. Set the offer price

- The offer price is the amount invested divided by the number of shares
  - Offer Price = Net proceeds / New Shares required
  - Offer Price = $20/1.3 = **$15.38**

Will this be the final offer price?

Assumptions
Pre-money = $63 million
Existing shares = 4 mil
Capital raise: $18.6 mil
Underwriter spread = 7%
Capital raise: $20 mil
Post-money = $81.6 mil
Own % req: 24.5%
New Shares: 1.3 mil

IPO Pricing Conclusion

<u>Assumptions</u>

Pre-money = $63 million
Existing shares = 4 mil
Capital raise: $18.6 mil
Underwriter spread = 7%

1	**Gross Proceeds and Post-IPO Equity**	
1a	Net proceeds = Capital Required/(1– F)	**$20,000,000**
1b	Post-money valuation = Pre-money + Capital Required	**$81,600,000**
2	**Determine Ownership % new investors require**	
	% required = Net Proceeds/Post IPO-valuation	**24.5%**
3	**Determine number of new shares required**	
	[(% to new)(Existing)] / (1 – % to new)	**1,298,701**
4	**Set the offer price**	
	Offer Price = Net proceeds / New Shares required	**$15.40**

What is a roadshow?

- Senior management team, investment banker, and lawyer visit potential institutional investors
- Usually travel to ten to twenty cities in a two-week period, making three to five presentations each day.
- Management can't say anything that is not in prospectus, because company is in "quiet period."

What is “book building?”

- Investment banker asks investors to indicate how many shares they plan to buy, and records this in a “book”.
- Investment banker hopes for oversubscribed issue.
- Based on demand, investment banker sets final offer price on evening before IPO.

S.N.	Number of Qualified Institutional Investors	Price Bided	Number Shares Bided	Number of Shares Allotted	Remarks
1	3	250	50,000	50,000	-
2	7	245	1,50,000	2,00,000	-
3	10	235	2,00,000	4,00,000	-
4	17	230	2,50,000	6,50,000	-
5	15	228	2,35,000	9,25,000	-
6	21	225	5,00,000	10,00,000	(The remaining 75,000 shares shall be allocated to 21 applicants on a pro-rata basis)
7	15	220	3,00,000	-	Not allotted due to the bidding price is below the cut-off price.
8	20	218	3,50,000	-	Not allotted due to the bidding price is below the cut-off price.

What are typical first-day returns?

- For 75% of IPOs, price goes up on first day.
- Average first-day return is 16.8%.
- About 10% of IPOs have first-day returns greater than 30%.
- For some companies, the first-day return is well over 100%.

On its first day of trading, April 18, 2019, Zoom's stock:

- IPO Price: $36.00 per share. Original range of $32.00 to $35.00
- Closing Price: $62 per share.
- Percentage Gain: 72%
- Market Capitalization: $16 bil. (*21 bil today; reached 160 bil in 2020*)

Are first-day returns due to a conflict of interest between the company and the investment banker?

- There is an inherent conflict of interest, because the banker has an incentive to set a low price:
  - to make brokerage customers happy.
  - to make it easy to sell the issue.
- Firm would like price to be high.
- Note that original owners generally sell only a small part of their stock, so if price increases, they benefit.
- Later offerings easier if first goes well.

What are the long-term returns to investors in IPOs?

- Two-year return following IPO is lower than for comparable non-IPO firms.
- On average, the IPO offer price is too low, and the first-day run-up is too high.

What are the direct costs of an IPO?

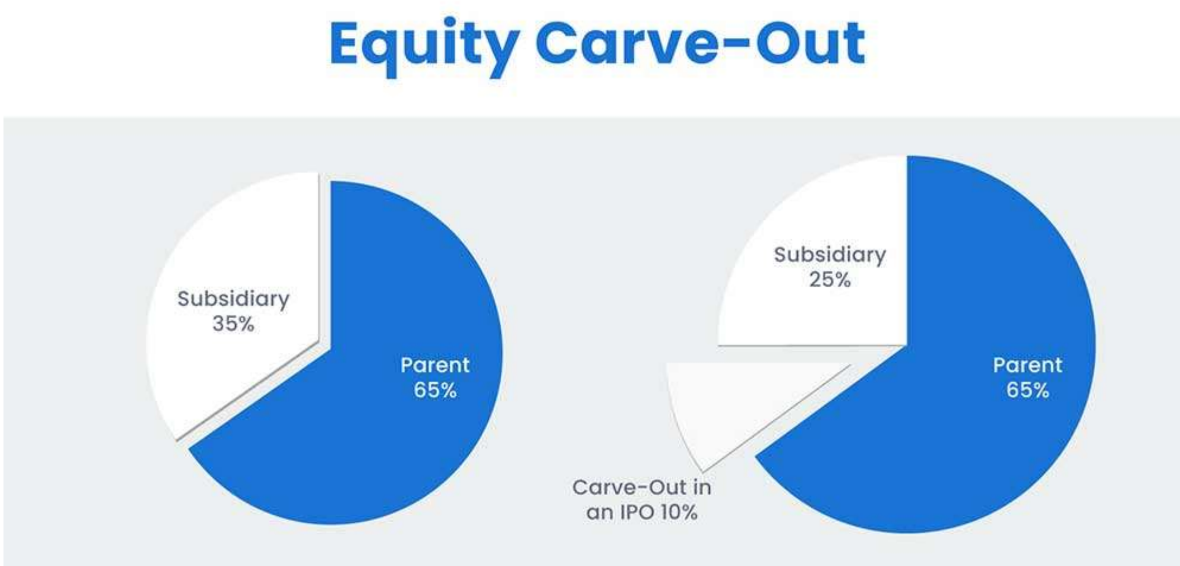
- Underwriter usually charges a 7% spread between offer price and proceeds to issuer.
- Direct costs to lawyers, printers, accountants, etc. can be over $400,000.

What are the indirect costs of an IPO?

- Money left on the table
  - (End of price on first day - Offer price) x   Number of shares
- Typical IPO raises about $70 million and leaves $9 million on table.
- Preparing for IPO consumes most of management’s attention during the pre-IPO months.

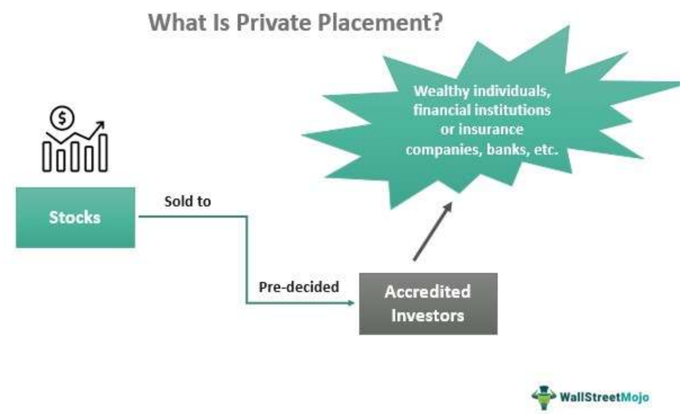
What are equity carve-outs?

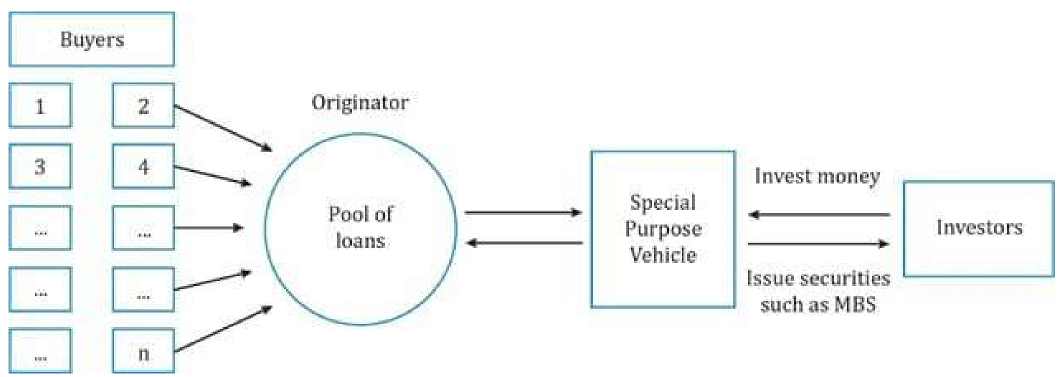
- A special IPO in which a parent company creates a new public company by selling stock in a subsidiary to outside investors.
- Parent usually retains controlling interest in new public company.



Other Ways to Access Capital Market

- Seasoned equity offerings
  - Public offering
  - Private investment in public equity (PIPE)
- Shelf registration (SEC Rule 415).
- Private placements
- Asset securitization
  - Mortgage-Backed Securities
  - Collateralized Debt Obligations (CDOs)
  - Auto Loans
  - Credit Card
  - Student Loan





Investment Banking Company Activities

- Repeal of Glass-Stegall in 1999 blurred line between traditional investment banks and other financial institutions.
- Investment banking companies engage in:
  - Underwriting debt and equity offerings (traditional activity)
  - Mergers and acquisitions
    - Finding targets
    - Advising
    - Underwriting financing
  - Securitization
  - Asset management
    - Clients
    - Own funds
  - Trading operations

Investment Banks and Risks

- Traditional investment banks were primarily fee-generating organizations
- Investment banks in 2007:
  - Highly levered, often with ST borrowings (such as commercial paper)
  - Large positions in risky assets, including mortgage-backed securities and credit default swaps.
- Investment banks in 2014
  - Many from 2007 “failed” and were sold (Bear Stearns; Merrill Lynch), liquidated (Lehman Brothers), or converted into banks to get TARP (Goldman Sachs)

What is meant by going private?

- Going private is the reverse of going public.
- Typically, the firm’s managers team up with a small group of outside investors and purchase all of the publicly held shares of the firm.
- The new equity holders usually use a large amount of debt financing, so such transactions are called leveraged buyouts (LBOs).

Advantages of Going Private

- Gives managers greater incentives and more flexibility in running the company.
- Removes pressure to report high earnings in the short run.
- After several years as a private firm, owners typically go public again. Firm is presumably operating more efficiently and sells for more.

"We need either bigger needles or smaller camels."

Disadvantages of Going Private

- Firms that have recently gone private are normally leveraged to the hilt, so it’s difficult to raise new capital.
- A difficult period that normally could be weathered might bankrupt the company.

What is Private Equity?

"I've decided to give you free rein to do this deal exactly as I would have done it."

Private Equity Funds

- Private equity funds are often limited partnerships (although a few are publicly traded companies).
- Use their own equity and a large amount of borrowed cash to purchase equity in an company (often a private company or wholly owned subsidiary/division, but sometimes a public company).
- Sit on board, provide incentives to managers.
- Harvest by sale of IPO.

Managing Debt Risk with Project Financing

- Project financings are used to finance a specific large capital project.
- Sponsors provide the equity capital, while the rest of the project's capital is supplied by lenders and/or lessors.
- Interest is paid from project's cash flows, and borrowers don't have recourse.

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TIMOTHY A. LUEHRMAN
JOEL L. HEILPRIN

Mercury Athletic Footwear: Valuing the Opportunity

In March 2007, John Liedtke, the head of business development for Active Gear, Inc., a privately held footwear company, was contemplating an acquisition opportunity. West Coast Fashions, Inc. (WCF), a large designer and marketer of men's and women's branded apparel had recently announced plans for a strategic reorganization. The plan called for a divestiture of certain non-core assets and a renewed focus on WCF's higher-end business, business-casual, and formal-wear apparel businesses. One of the divisions WCF intended to shed was Mercury Athletic, its footwear division. Liedtke knew that acquiring Mercury would roughly double Active Gear's revenue, increase its leverage with contract manufacturers, and expand its presence with key retailers and distributors. He also expected that Active Gear's bankers would quickly approach the company about a possible bid for Mercury; consequently, he wanted to complete his own rough evaluation of the opportunity before hearing the bankers' pitch.

Athletic and Casual Footwear Industry

Footwear was a mature, highly competitive industry marked by low growth, but fairly stable profit margins. Despite the industry's overall stability, the performance of individual firms could be quite volatile as they vied with one another to anticipate and exploit fashion trends. The market for athletic and casual shoes remained fragmented, despite the presence of a small number of global footwear brands. In the casual segment, companies competed on the basis of style, price, and general quality. In the athletic segment, competition revolved around brand image, specialized engineering for performance, and price.

Within the fashion-sensitive part of the industry, product lifecycles tended to be short, sometimes lasting only a season. Consequently, active management of inventory and production lead times were critical success factors. Although a few firms sold their products in company-owned retail stores, the large majority of athletic and casual footwear was sold through department stores, independent specialty retailers, sporting goods stores, boutiques, and wholesalers. In 2007, many

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HBS Professor Timothy A. Luehrman and Illinois Institute of Technology Adjunct Finance Professor Joel L. Heilprin prepared this case specifically for the Harvard Business School Brief Case Collection. Though inspired by real events, the case does not represent a specific situation at an existing company, and any resemblance to actual persons or entities is unintended. Cases are developed solely as the basis for class discussion and are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective management.

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companies were actively engaged in attempts to sell directly to customers via web-based e-commerce platforms. So far, successes in this venue had been small in both size and number.

New footwear was produced on a cycle that required 8 to 10 months to complete a new design, associated samples, and production specifications. Another 4 to 6 months were required for manufacturing start-up before new orders could be filled. Despite significant import taxes and tariffs in the United States and European Union, the great majority of North American and European footwear companies used independent contract manufacturers to produce their shoes. Most of these independent manufacturers were located in China.[1]

Active Gear, Inc.

Active Gear (AGI) was founded in 1965 to produce and market high-quality specialty shoes for golf and tennis players. The company's products were among the first to incorporate sculpted cushioned insoles and a selection of high-performance tread patterns designed for specific surfaces and/or playing conditions. AGI began selling its shoes primarily in golf and tennis pro shops and a few specialty sporting goods stores. As its products became more established, AGI moved into larger department and retail stores. The company also exported its shoes to Europe and, to a lesser extent, Japan. Sales outside the United States were made through a network of wholesalers, which the company still employed in 2007.

Beginning in the 1970s, Active Gear moved into casual and recreational footwear aimed at what had become its core customer demographic: affluent urban and suburban family members aged 25 to 45. AGI was among the first companies to offer fashionable walking, hiking, and boating footwear. By the early 1980s, the Active Gear brand and logo were associated with a lifestyle that was prosperous, active, and fashion-conscious.

After years of steady if unspectacular growth, AGI's 2006 revenue and operating income were $470.3 million and $60.4 million, respectively, with 42% of revenue from athletic shoes and the balance from casual footwear. [Historical income statements and balance sheets for AGI are presented in **Exhibits 1** and **2**.] The firm's athletic shoes had evolved from high-performance footwear to athletic fashion wear with a classic image. The company's traditional casual shoes also offered classic styling, but were aimed at a broader, more mainstream market.

AGI's casual footwear was sold by more than 5,700 North American department, specialty, and general retail stores via a network of wholesalers and independent distributors. Sales of athletic footwear were made through independent sales representatives to a limited number of sporting goods stores, pro shops, and specialty athletic footwear retailers. A small percentage of both casual and athletic shoes were sold through Active Gear's website.

By focusing on a smaller portfolio of classic products with longer lifecycles, Active Gear was able to maintain relatively simple production and supply chains. This in turn allowed the firm to avoid the worst of the industry's cycles of inventory write-downs and missed profit opportunities. AGI's simplified approach to brand and inventory management also contributed to its strong operating margins. **Table 1** shows AGI's Days Sales in Inventory compared to Mercury and other selected footwear producers.

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[1] U.S. import taxes ranged from 8.5% to 10.0% for leather footwear, and 6.0% to 20.0% for synthetic footwear. Duties in the EU averaged 7.0% to 8.0% for leather and 16.5% for synthetic footwear.

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Table 1

Casual & Athletic Shoe Companies	Days Sales in Inventory
D&B Shoe Company	61.3
Marina Wilderness	39.5
General Shoe Corp.	73.2
Kinsley Coulter Products	31.1
Victory Athletic	50.0
Surfside Footwear	60.0
Alpine Company	42.9
Heartland Outdoor Footwear	58.1
Templeton Athletic	42.5
Average	50.9
Active Gear	42.5
Mercury Athletic	61.1

Like most footwear makers, AGI outsourced production to a network of contract manufacturers located in China. To ensure quality and on-time delivery, AGI conducted a rigorous screening and certification program for all of its manufacturers. The company also maintained a staff of 85 full-time professionals who monitored contract manufacturing on-site from the initial sourcing of materials all the way through final inspection.

Financial Policy & Performance

Active Gear was among the most profitable firms in the footwear industry (**Exhibit 3** presents recent data for selected publicly traded footwear producers). However, the company was much smaller than many competitors, and AGI's executives felt its small size was becoming a competitive disadvantage. A recent wave of consolidation among Chinese contract manufacturers created pressure to boost capacity utilization; this was expected to favor larger firms who could offer the manufacturers longer production runs. Active Gear had recently increased its supplier concentration—reducing the number of its contract manufacturers—in an effort to improve its negotiating position. Until recently, AGI's largest supplier accounted for no more than 12% of its volume; by 2006 this figure was approximately 20%, and the two next-largest firms together accounted for 22%.

On the customer side, the rise of "big box" retailers threatened AGI's growth. To protect the company's brand image, Active Gear did not sell through discount retailers. While this policy helped preserve operating margins, it was believed to have hurt sales growth. During 2000–2006 AGI grew its revenue at a compound average rate of only 6% per year compared with nearly 10% for the group shown in **Exhibit 3**. During the past three years AGI grew even more slowly—at an average annual rate of only 2.2%. Continuing pressure from suppliers and competitors caused some deterioration of basic performance metrics, such as return on net operating assets, return on equity, and asset turnover, during 2004–2006 (see **Exhibit 1**).

Mercury Athletic Footwear

Mercury Athletic Footwear designed and distributed branded athletic and casual footwear, principally to the youth market. Its 2006 revenue and EBITDA were $431.1 million and $51.8 million, respectively. **Exhibit 4** presents recent income statements and balance sheets for Mercury.

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West Coast Fashions had purchased Mercury from its founder, Daniel Fiore, in late 2003. Fiore had started Mercury 35 years earlier, but developed health problems that forced him to sell the business. At the time of the transaction, WCF was in a period of rapid expansion, driven by an aggressive acquisition strategy; it planned to extend the Mercury brand by creating a complementary line of apparel. WCF executives also believed that its larger, more established network of distributors would substantially widen Mercury's distribution with department stores and large discount retailers and boost sales for both shoes and apparel.

Mercury's performance since the acquisition was mixed, but disappointing on the whole. WCF did exploit its own distribution network to expand Mercury's sales. However, the new Mercury Athletic line of branded apparel never gained much traction with consumers. The most loyal purchasers of Mercury's footwear were 15 to 25 years old, with an active interest in extreme sports. These customers were either uninterested in branded apparel, or the specific apparel offered by Mercury simply did not appeal to their tastes. Further, WCF's efforts to establish the apparel line included price cuts and promotions that hurt operating margins. In late 2006, WCF's board concluded that Mercury's size, customers, and brand image did not fit with WCF's and had determined to sell the business in the context of a broader reorganization. Mercury's managers were eager to abandon the apparel line and return to an exclusive focus on footwear.

Mercury Products

Mercury competed in four main segments: men's and women's athletic and casual footwear. During the 1990s, Mercury's athletic shoes became popular among extreme sports enthusiasts and within the associated X-Games subculture. As a result, the company's brand acquired an iconoclastic nonconformist image that the company tried to exploit by adding a line of active casual footwear targeted at the same demographic.

Traditionally the company had promoted the Mercury brand without emphasizing individual products. In support of this strategy, Mercury closely monitored styles and images that evolved from a global youth culture that included alternative music, television, film, and clothing. The company also sponsored, or co-sponsored, certain athletic and cultural events with demonstrated appeal to its target demographic. Such events included skateboarding, snowboarding, and BMX competitions, as well as alternative music festivals and concerts.

Mercury's price points were predominantly mid-range, but the company also had a few brands in higher and lower price ranges. Mercury's shoes were sold throughout North America in a wide range of retail, athletic, department, and specialty stores, and via catalogs and the Internet. No single geographic region accounted for more than 10% of sales.

Production & Operations

Mercury sourced substantially all of its production from independent contractors in Asia. The company had developed an operational infrastructure intended to help it adapt quickly to changes in customer tastes and corresponding product specifications. The company had relatively little capital spending and focused its resources instead on market research and product design. It sourced the majority of its raw materials from foreign suppliers, and had 73 professional and technical personnel in China alone to oversee the quality, production, packaging, and shipping of all its footwear.

Although Mercury was a wholly owned subsidiary of WCF, it operated with considerable autonomy. It maintained its own financial statements, databases, resource management systems, and distribution facilities. As of December 31, 2006, the company had 1,123 full- and part-time employees.

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Financial Performance

Following the acquisition by WCF, Mercury's financial performance had been disappointing. The growing popularity of extreme sports, along with WCF's large distribution network, supported top line growth of 20% during 2006 and at a compounded annual rate of 10.5% from the date of the acquisition. However, when Fiore sold the company to WCF, Mercury's EBITDA margin had been steady for years between 14.0–14.5%. In contrast, during 2004–2006 Mercury's EBITDA margin averaged 11.6%.

Several factors contributed to the diminished profitability. First, some of Mercury's sales growth resulted from lower prices. In particular, Mercury had discounted part of its line to get product on the shelves of large discount retailers. These pricing concessions explained part of the financial performance displayed in **Table 2**. However, a related problem, discussed further below, was Mercury's unsuccessful entry into women's casual footwear. Finally, the firm's rapid sales increase, proliferation of brands, and underperforming women's lines strained its infrastructure and eroded operating efficiency. In 2006 Mercury's DSI[2] was more than 10 days longer than the industry average, and the company's return on net operating assets was only 12.9%, compared with an industry average of approximately 20%.[3]

Table 2

Mercury Operating Metrics	2004	2005	2006
Return on net assets	17.0%	8.6%	11.1%
Return on equity	18.5%	9.6%	12.1%
Asset turnover	2.4x	1.4x	1.6x

Performance data for each of Mercury's product segments are presented in **Exhibit 5**.

Men's Athletic Footwear

Men's athletic footwear was by far the company's largest segment and constituted its core business. Revenue for this segment grew more than 40% over the prior year, and at an average compounded rate of 29% between 2004 and 2006. Mercury's managers attributed the growth primarily to increased sales through large discount retailers, which began handling Mercury's products nationwide in the second quarter of 2005.

In addition to robust sales growth, men's athletic footwear enjoyed operating margins that were consistently higher than rival firms'. On the one hand, loyal customers associated with extreme sports paid medium to high prices for Mercury footwear. On the other, Mercury's shoes were relatively inexpensive to produce: simple designs in combination with basic materials reduced complexity and cost in manufacturing. Operating margins for men's athletic footwear had been approximately 14% historically. A slight decline in 2005 was due to roll-out costs associated with introducing the line to discount retailers.

Men's Casual Footwear

Sales of men's casual footwear peaked in 2004, and had declined since then at an average rate of 6.25% per year. Mercury attributed much of the decline to a combination of cannibalization and

[2] DSI or days sales inventory is computed here as end-of-year inventory / (revenue /360).

[3] Return on net operating assets equals net operating profit after tax / end-of-period net operating assets. Asset turnover is computed as revenue divided by end-of-period net operating assets.

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unfortunate shipping problems. The firm introduced a new fashion line for the 2005 holiday season that was received enthusiastically by retailers, who placed strong orders. When bad weather and strikes by dockworkers delayed deliveries, Mercury's holiday sales were disappointing: stores had trimmed their orders for Mercury's existing men's casual products to make room for the new line, which showed up late. When sales failed to recover satisfactorily in 2006, Mercury took steps to upgrade parts of the line and boost support of the casual segment generally. As a result, Mercury expected 2007 and following years to show steady improvement.

Despite its small size and recent sales declines, the men's casual segment consistently posted Mercury's highest profit margins. High profitability was attributed to a marketing and distribution strategy in which casual products were sold exclusively through specialty shops with proven ability to reach the youth demographic. In addition to supporting prices, the exclusivity reinforced the brand's image. Finally, this set of retailers tended to be quite fragmented, and most lacked a national footprint, which allowed Mercury to obtain very favorable terms.

Women's Athletic Footwear

In contrast to the relative strength of the men's lines, Mercury's lines for women had subpar performance. Women's athletic footwear turned in solid sales growth, averaging 13.5% per year during 2004–2006. However, as with the men's line, much of this growth was due to the recent introduction of Mercury's shoes to large discount retailers. An equally important driver was the growing participation of women in extreme sports.

Operating margins for women's athletic footwear averaged just over 10%, which was below the industry mean of 11.9%. Mercury's managers felt the primary reason for lower margins was the high cost of building brand image and awareness among women. Prior to the acquisition by WCF, Mercury had done almost no marketing specifically targeted at female consumers. Since then, targeted advertising and promotional programs had improved the brand's standing among women, and Mercury's managers anticipated better margins in the immediate future.

Women's Casual Footwear

Women's casual footwear was Mercury's worst-performing line of shoes. WCF had expected that its expertise in marketing upscale women's apparel would naturally boost the line of women's casual footwear that Mercury introduced just after the acquisition. The new line was launched with heavy promotion in 2004, but sales began to falter in 2005, as soon as promotional support was reduced. During 2004–2006 sales dropped alarmingly, which led to multiple rounds of inventory write-downs. These in turn further eroded margins and led to operating losses. By the end of 2006, the line was considered all but dead and Mercury's managers were not eager to try the experiment again.

Valuing Mercury Athletic

To perform a preliminary valuation, Liedtke developed a base case set of financial projections based on forecasts of revenue and operating income for each of Mercury's four main segments as shown in **Exhibit 6**. Liedtke's base case assumed that women's casual footwear would be wound down within one year following an acquisition, as he doubted that WCF would be willing to sell Mercury without it. He further assumed that Mercury's historical corporate overhead-to-revenue ratio would conform to historical averages. To accompany the operating projections, Liedtke prepared projections for certain balance sheet accounts for Mercury, shown in **Exhibit 7**; these corresponded to operating assets and liabilities that Liedtke expected would be required to support his operating projections. He did not prepare projections for debt or equity accounts since Mercury

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likely would not have its own balance sheet and capital structure following an acquisition by AGI. To estimate a discount rate, Liedtke planned to assume the same degree of leverage for Mercury that AGI currently used, which he estimated to be 20%, measured as debt divided by the market value of AGI's invested capital. Given current credit market conditions, he expected this degree of leverage to imply a cost of debt of 6.0%.[4] Finally, his analysis would assume a 40% tax rate, equal to AGI's anticipated marginal tax rate.

After examining Mercury's value using the base case assumptions, Liedtke also wanted to consider the value of possible synergies. Specifically, he believed that AGI's inventory management system could be adopted by Mercury at little incremental cost and would reduce Mercury's DSI to the same level as AGI's. In addition, he thought it was possible that Mercury's women's casual footwear line could be folded into Active Gear's, rather than discontinued. In that case, he thought the combined businesses could achieve an EBIT margin of 9% and revenue growth of 3%.

[4] At the time of Liedtke's analysis, U.S. Treasury obligations with maturities of 1, 5, 10, and 20 years were yielding 4.50%, 4.69.%, 4.73%, and 4.93%, respectively.

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Exhibit 1 Active Gear, Inc. Historical Income Statements, years ended December 31 ($ in thousands)

Operating Results:	2004	2005	2006
Revenue	$ 450,174	$ 469,704	$ 470,286
Less: Cost of Goods Sold	223,617	231,583	234,494
Gross Profit	226,557	238,121	235,792
Less: Selling Expenses	127,705	130,242	130,471
Less: General & Administrative Expenses	31,437	33,938	36,535
EBITDA	67,415	73,942	68,786
Less: Depreciation & Amortization	7,049	7,343	8,366
EBIT	60,367	66,599	60,420
Less: Net Interest Expense	5,092	5,143	5,098
Less: Other, net	1,211	(752)	24
EBT	54,064	62,208	55,298
Less: Taxes	19,192	21,089	19,349
Net Income	$ 34,872	$ 41,120	$ 35,949
Margins:			
Revenue Growth	1.7%	4.3%	0.1%
Gross Profit Margin	50.3%	50.7%	50.1%
EBITDA Margin	15.0%	15.7%	14.6%
EBIT Margin	13.4%	14.2%	12.8%
EBT Margin	12.0%	13.2%	11.8%
Tax Rate	35.5%	33.9%	35.0%
Net Income Margin	7.7%	8.8%	7.6%

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Exhibit 2 Active Gear, Inc. Historical Balance Sheets, at December 31 ($ in thousands)

	2004	2005	2006
Assets:			
Cash & Cash Equivalents	$ 92,735	$ 63,949	$ 54,509
Accounts Receivable	46,507	50,649	61,322
Inventory	38,493	50,140	56,030
Prepaid Expenses	8,298	10,051	12,223
Deferred Taxes	8,681	8,080	6,519
Derivative Assets	0	1,813	53
Total Current Assets	**194,714**	**184,682**	**190,655**
Property, Plant & Equipment	23,694	24,712	28,392
Intangible Assets	6,414	12,273	14,360
Goodwill	4,249	11,851	11,915
Other Assets	2,982	3,079	3,249
Total Assets	**$ 232,053**	**$ 236,596**	**$ 248,571**
Liabilities & Owners' Equity:			
Accounts Payable	$ 15,711	$ 29,188	$ 33,009
Accrued Expenses	37,211	30,553	36,718
Taxes Payable	10,421	13,263	10,162
Derivative Liabilities	0	0	0
Other	4,514	0	878
Total Current Liabilities	**$ 67,858**	**$ 73,004**	**$ 80,767**
Long Term Debt	178,173	150,240	140,047
Deferred Compensation	3,763	4,814	3,919
Deferred Taxes	2,180	323	0
Total Owners' Equity	(19,921)	8,216	23,837
Total Liabilities & Owners' Equity	**$ 232,053**	**$ 236,596**	**$ 248,571**

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Exhibit 3 Selected Data on Public Footwear Companies, March 15, 2007, except as noted (non-ratio values in $ in thousands)

Company	Equity Market Value	Net Debt (1)	D/E	Equity Beta	LTM Revenue	LTM Earnings	Revenue CAGR 2000-06
D&B Shoe Company	420,098	125,442	29.9%	2.68	2,545,058	67,679	6.6%
Marina Wilderness	1,205,795	(91,559)	-7.6%	1.94	313,556	41,923	17.8%
General Shoe Corp.	533,463	171,835	32.2%	1.92	1,322,392	64,567	11.2%
Kinsley Coulter Products	165,560	82,236	49.7%	1.12	552,594	27,568	4.6%
Victory Athletic	35,303,250	7,653,207	21.7%	0.97	15,403,547	1,433,760	7.9%
Surfside Footwear	570,684	195,540	34.3%	2.13	1,241,529	73,124	10.1%
Alpine Company	1,056,033	300,550	28.5%	1.27	1,614,648	112,015	6.2%
Heartland Outdoor Footwear	1,454,875	(97,018)	-6.7%	1.01	1,176,144	86,156	8.5%
Templeton Athletic	397,709	169,579	42.6%	0.98	516,182	79,170	14.4%
Average			24.9%				9.7%

Company	EBIT Margin	EBITDA Margin	Net Inc. Margin	EBIT Multiple	EBITDA Multiple	P/E Multiple	B/V Multiple
D&B Shoe Company	4.4%	6.1%	2.7%	5.5x	3.9x	6.8x	0.9x
Marina Wilderness	22.1%	23.1%	13.4%	18.0x	16.9x	31.6x	6.0x
General Shoe Corp.	8.8%	11.5%	4.9%	6.8x	5.1x	9.1x	1.6x
Kinsley Coulter Products	6.9%	8.9%	5.0%	7.3x	5.5x	6.6x	0.7x
Victory Athletic	14.1%	16.0%	9.3%	22.1x	19.2x	27.1x	6.0x
Surfside Footwear	9.3%	10.8%	5.9%	7.4x	6.3x	8.6x	1.4x
Alpine Company	10.4%	12.2%	6.9%	9.0x	7.6x	10.4x	2.0x
Heartland Outdoor Footwear	10.8%	12.6%	7.3%	12.0x	10.1x	18.6x	3.1x
Templeton Athletic	19.9%	20.2%	15.3%	6.2x	6.0x	5.5x	1.2x
Average	**11.9%**	**13.5%**	**7.9%**	**10.5x**	**9.0x**	**13.8x**	**2.5x**

(1) Net debt is defined as Debt less cash & cash equivalents

Note: Market multiples are based on three year averages. "LTM" denotes latest twelve months.

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Exhibit 4 Mercury Athletic Footwear Historical Financial Statements ($ in thousands)

Operating Results:	2004	2005	2006
Net Revenue	**$ 340,578**	**$ 358,780**	**$ 431,121**
Less: Cost of Goods Sold	198,115	205,820	239,383
Gross Profit	**142,463**	**152,960**	**191,738**
Less: Selling, General & Administrative	102,410	113,892	139,933
EBITDA	**40,053**	**39,067**	**51,804**
Less: Depreciation & Amortization	7,699	8,001	9,506
EBIT	**32,353**	**31,066**	**42,299**
Less: Corporate Administrative Charge	275	305	366
EBT	**32,079**	**30,761**	**41,933**
Less: Taxes	12,190	11,689	15,934
Net Income	**$ 19,889**	**$ 19,072**	**$ 25,998**

Assets:	2004	2005	2006
Cash & Cash Equivalents	$ 12,203	$ 20,187	$ 10,676
Accounts Receivable	29,115	38,654	45,910
Inventory	53,552	70,818	73,149
Prepaid Expenses	7,809	15,810	10,172
Total Current Assets	**102,679**	**145,470**	**139,908**
Property, Plant & Equipment	33,090	31,334	32,618
Trademarks & Other Intangibles	1,031	35,740	43,853
Goodwill	554	34,605	43,051
Other Assets	5,657	11,884	11,162
Total Assets	**$ 143,011**	**$ 259,032**	**$ 270,592**
Liabilities & Owners' Equity:			
Accounts Payable	$ 12,838	$ 14,753	$ 16,981
Accrued Expenses	13,040	21,955	18,810
Total Current Liabilities	**25,878**	**36,708**	**35,791**
Deferred Taxes	1,635	13,795	11,654
Pension Obligation	8,131	9,256	9,080
Owners' Equity	107,367	199,274	214,067
Total Liabilities & Owners' Equity	**$ 143,011**	**$ 259,032**	**$ 270,592**

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Exhibit 5 Mercury Athletic Footwear Segment Data, 2004-2006 ($ in thousands)

	Men's Athletic	Men's Casual	Women's Athletic	Women's Casual	Unallocated Corporate	Consolidated
Fiscal Year 2006:						
Revenue	$ 219,093	51,663	123,563	36,802	0	431,121
Operating Income	31,421	8,242	12,703	(843)	(9,224)	42,299
Total Assets	$ 148,576	28,457	27,978	34,701	30,880	270,592
Fiscal Year 2005:						
Revenue	$ 151,900	55,402	108,097	43,381	0	358,780
Operating Income	18,398	9,077	11,631	(1,013)	(7,027)	31,066
Total Assets	$ 173,482	30,842	24,267	12,197	18,244	259,032
Fiscal Year 2004:						
Revenue	$ 131,636	58,787	95,897	54,258	0	340,578
Operating Income	17,720	9,196	9,109	462	(4,134)	32,353
Total Assets	$ 39,543	34,966	22,526	15,056	30,919	143,011

	Men's Athletic	Men's Casual	Women's Athletic	Women's Casual	Unallocated Corporate	Consolidated
2006 EBIT Margins	14.3%	16.0%	10.3%	-2.3%	-2.1%	9.8%
2005 EBIT Margins	12.1%	16.4%	10.8%	-2.3%	-2.0%	8.7%
2004 EBIT Margins	13.5%	15.6%	9.5%	0.9%	-1.2%	9.5%

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Exhibit 6 Mercury Athletic Footwear: Base Case Projected Segment Performance ($ in thousands)

Men's Athletic:	2007	2008	2009	2010	2011
Revenue	**$ 251,957**	**$ 282,192**	**$ 310,411**	**$ 335,244**	**$ 352,006**
Less: Operating Expenses*	218,435	244,647	269,112	290,641	305,173
Operating Income	**33,522**	**37,545**	**41,299**	**44,603**	**46,834**
Men's Casual:					
Revenue	52,179	53,223	54,287	55,916	57,594
Less: Operating Expenses*	43,834	44,711	45,605	46,973	48,382
Operating Income	**8,345**	**8,512**	**8,682**	**8,943**	**9,211**
Women's Athletic:					
Revenue	**138,390**	**153,613**	**167,438**	**179,159**	**188,117**
Less: Operating Expenses*	124,302	137,976	150,393	160,921	168,967
Operating Income	14,088	15,638	17,045	18,238	19,150
Women's Casual:					
Revenue	**36,802**	**0**	**0**	**0**	**0**
Less: Operating Expenses*	37,265	0	0	0	0
Operating Income	**(463)**	**0**	**0**	**0**	**0**
Consolidated Revenue	**479,329**	**489,028**	**532,137**	**570,319**	**597,717**
Less: Operating Expenses*	423,837	427,333	465,110	498,535	522,522
Less: Corporate Overhead	8,487	8,659	9,422	10,098	10,583
Consolidated Operating Income	**$ 47,005**	**$ 53,036**	**$ 57,605**	**$ 61,686**	**$ 64,612**
Estimated Capital Expenditures	11,983	12,226	13,303	14,258	14,943
Estimated Depreciation	9,587	9,781	10,643	11,406	11,954

* Operating Expenses include an allocation of depreciation for each segment.

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Exhibit 7 Mercury Athletic Footwear: Projection of Selected Balance Sheet Accounts; 2007–2011 ($ in thousands)

Selected Balance Sheet Accounts:	2007	2008	2009	2010	2011
Assets					
Cash Used in Operations	$ 4,161	$ 4,195	$ 4,566	$ 4,894	$ 5,130
Accounts Receivable	47,888	48,857	53,164	56,978	59,715
Inventory	83,770	85,465	92,999	99,672	104,460
Prepaid Expenses	14,474	14,767	16,069	17,222	18,049
Property, Plant & Equipment	35,015	37,460	40,120	42,972	45,961
Trademarks & Other Intangibles	43,853	43,853	43,853	43,853	43,853
Goodwill	43,051	43,051	43,051	43,051	43,051
Other Assets	11,162	11,162	11,162	11,162	11,162
Liabilities					
Accounts Payable	$ 18,830	$ 18,985	$ 20,664	$ 22,149	$ 23,214
Accrued Expenses	22,778	22,966	24,996	26,792	28,081
Deferred Taxes	11,654	11,654	11,654	11,654	11,654
Pension Obligation	9,080	9,080	9,080	9,080	9,080

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Questions	Answers
Is Mercury an appropriate target for AGI? Why or Why not?	Yes this aquation makes sense for AGI as they are already in a similar industry and this would not be a durastic product strategy change.
Possible Synergies in the transaction	**Working Capital Synergies:** Implementing an AGI inventory management system can reduce Mercury's DSI to AGI levels. **Mercury's Women's Casual Footwear Line:** If Mercury's women's casual footwear line is combined into Active Gear's, the consolidated businesses could achieve an EBIT margin of 9% and revenue growth of 3%.
Ask yourself if you agree with the analysis that Liedtke performed. Are they appropriate? How would you recommend modifying them?	The assumptions made by Liedtke for tax rate was a good estimate as I calculated the current rate to be 38%. I might modify the cost or weight of debt to the current industry averages.
Ask yourself if you think your analysis is conservative or aggressive. Why or why not?	I think my assumptions are pretty conservative cause I'm using the casual footwear sales growth as my metric for growth.

Valuation Model

WACC	10.90%
Prehorizon	$91,528.46
Horizon	$378,304.45
PV Horizon	$225,478.63
PV Operations	$317,007.10
Company Value	$456,915.48
Equity Value	$436,180.97

Assumptions

Valuation Year	2006
Horizon Year	2011
Years to Horizon	5
Risk Free Rate	4.93%
Market Premium	5.00%
Tax Rate	40%
Weight of Debt	20%
Weight of Equity	80%
Beta	1.56
Cost of Debt	6%
Cost of Equity	12.73%
Growth	3%
ST Investments	$139,908.38
Debt	$20,734.51

	Historical			Projections				
	2004	2005	2006	2007	2008	2009	2010	2011
EBIT	$32,353.42	$31,066.05	$42,298.83	$47,005.74	$53,035.97	$57,604.81	$61,686.33	$64,611.59
Depreciation	$7,699.42	$8,001.37	$9,505.63	$9,586.58	$9,780.56	$10,642.74	$11,406.38	$11,954.34
Current Assets	$102,679.47	$145,469.75	$139,908.38	$150,293.07	$153,284.21	$166,797.58	$178,766.25	$187,354.40
Current Liablities	$25,878.03	$36,707.97	$35,791.14	$41,608.88	$41,950.87	$45,659.40	$48,940.68	$51,295.50
NWC	$76,801.44	$108,761.78	$104,117.24	$108,684.19	$111,333.34	$121,138.18	$129,825.57	$136,058.90
Change in NWC	-	$31,960.34	-$4,644.54	$4,566.95	$2,649.14	$9,804.84	$8,687.39	$6,233.33
PP&E	$33,090.06	$31,333.87	$32,617.92	$35,014.57	$37,459.71	$40,120.39	$42,971.99	$45,960.57
Change in PP&E	-	-$1,756.19	$1,284.05	$2,396.65	$2,445.14	$2,660.68	$2,851.60	$2,988.58
Capital Expenditures	-	$6,245.18	$10,789.68	$11,983.23	$12,225.70	$13,303.42	$14,257.98	$14,942.92
Free Cash Flow	-	-$952.28	$43,189.17	$21,239.85	$26,727.30	$22,097.36	$25,472.81	$29,545.04

EBIT Margin	9.5%	8.7%	9.8%	9.8%	10.8%	10.8%	10.8%	10.8%
Net Profit Margin	5.8%	5.3%	6.0%	5.9%	6.5%	6.5%	6.5%	6.5%
ROA	13.9%	7.4%	18.2%	10.0%	11.0%	11.3%	11.6%	11.7%
BEP	22.6%	12.0%	15.6%	16.6%	18.4%	18.9%	19.3%	19.5%
Current	4.0	4.1	3.9	3.6	3.7	3.7	3.7	3.7
Quick	1.9	2.0	1.9	1.6	1.6	1.6	1.6	1.6

Project:	MERCURY ACTION ATHLETIC
Analysis:	Synergies & Assumptions
Draft:	N
Footer:	Harvard Business Publishing

MERCURY ACTION ATHLETIC **Synergies & Assumptions**

	Synergies:	
Working Capital Synergies:		**1**
1) DSI Base Case	0.0x	
2) DSI w/Synergy	0.0x	
Women's Casual - Sales Growth:		**1**
1) Base Case Aft. Yr. 1	0.0%	
2) Synergy Case Aft. Yr. 1	3.0%	
Women's Casual - EBIT Margin:		**1**
1) Base Case Aft. Yr. 1	0.0%	
2) Synergy Case Aft. Yr. 1	9.0%	

MERCURY ATHLETIC FOOTWEAR

Exhibit 1 *Active Gear, Inc. - Historical Income Statements*

Years ended December 31 ($ in thousands except margins)

Operating Results:	2004	2005	2006
Revenue	**450,174**	**469,704**	**470,286**
Less: Cost of Goods Sold	223,617	231,583	234,494
Gross Profit	**226,557**	**238,121**	**235,792**
Less: Selling Expenses	127,705	130,242	130,471
Less: General & Administrative Expenses	31,437	33,938	36,535
EBITDA	**67,415**	**73,942**	**68,786**
Less: Depreciation & Amortization	7,049	7,343	8,366
EBIT	**60,367**	**66,599**	**60,420**
Less: Net Interest Expense	5,092	5,143	5,098
Less: Other, net	1,211	(752)	24
EBT	**54,064**	**62,208**	**55,298**
Less: Taxes	19,192	21,089	19,349
Net Income	**34,872**	**41,120**	**35,949**
Margins:			
Revenue Growth	1.7%	4.3%	0.1%
Gross Profit Margin	50.3%	50.7%	50.1%
EBITDA Margin	15.0%	15.7%	14.6%
EBIT Margin	13.4%	14.2%	12.8%
EBT Margin	12.0%	13.2%	11.8%
Tax Rate	35.5%	33.9%	35.0%
Net Income Margin	7.7%	8.8%	7.6%

MERCURY ATHLETIC FOOTWEAR

Exhibit 2 *Active Gear, Inc. - Historical Balance Sheets*

Years ended December 31 ($ in thousands)

Assets:	2004	2005	2006	
Cash & Cash Equivalents	92,735	63,949	54,509	
Accounts Receivable	46,507	50,649	61,322	
Inventory	38,493	50,140	56,030	
Prepaid Expenses	8,298	10,051	12,223	
Deferred Taxes	8,681	8,080	6,519	
Derivative Assets	0	1,813	53	
Total Current Assets	**194,714**	**184,682**	**190,655**	
Property, Plant & Equipment	23,694	24,712	28,392	
Intangible Assets	6,414	12,273	14,360	
Goodwill	4,249	11,851	11,915	
Other Assets	2,982	3,079	3,249	
Total Assets	**232,053**	**236,596**	**248,571**	**164,195**
Liabilities & Owners' Equity:				
Accounts Payable	15,711	29,188	33,009	
Accrued Expenses	37,211	30,553	36,718	
Taxes Payable	10,421	13,263	10,162	
Derivative Liabilities	0	0	0	
Other	4,514	0	878	
Total Current Liabilities	**67,858**	**73,004**	**80,767**	
Long Term Debt	178,173	150,240	140,047	
Deferred Compensation	3,763	4,814	3,919	
Deferred Taxes	2,180	323	0	
Total Owners' Equity	(19,921)	8,216	23,837	
Total Liabilities & Owners' Equity	**232,053**	**236,596**	**248,571**	

MERCURY ATHLETIC FOOTWEAR

Exhibit 3 *Selected Data on Public Footwear Companies*

March 15, 2007 except as noted (non-ratio values in $ thousands)

Company	Equity Market Value	Net Debt (1)	D/E	Equity Beta	LTM Revenue	LTM Earnings	Revenue CAGR 2000-06
D&B Shoe Company	420,098	125,442	29.9%	2.68	2,545,058	67,679	6.6%
Marina Wilderness	1,205,795	(91,559)	-7.6%	1.94	313,556	41,923	17.8%
General Shoe Corp.	533,463	171,835	32.2%	1.92	1,322,392	64,567	11.2%
Kinsley Coulter Products	165,560	82,236	49.7%	1.12	552,594	27,568	4.6%
Victory Athletic	35,303,250	7,653,207	21.7%	0.97	15,403,547	1,433,760	7.9%
Surfside Footwear	570,684	195,540	34.3%	2.13	1,241,529	73,124	10.1%
Alpine Company	1,056,033	300,550	28.5%	1.27	1,614,648	112,015	6.2%
Heartland Outdoor Footwear	1,454,875	(97,018)	-6.7%	1.01	1,176,144	86,156	8.5%
Templeton Athletic	397,709	169,579	42.6%	0.98	516,182	79,170	14.4%
Average			24.9%				9.7%

Company	EBIT Margin	EBITDA Margin	Net Inc. Margin	EBIT Multiple	EBITDA Multiple	P/E Multiple	B/V Multiple
D&B Shoe Company	4.4%	6.1%	2.7%	5.5x	3.9x	6.8x	0.9x
Marina Wilderness	22.1%	23.1%	13.4%	18.0x	16.9x	31.6x	6.0x
General Shoe Corp.	8.8%	11.5%	4.9%	6.8x	5.1x	9.1x	1.6x
Kinsley Coulter Products	6.9%	8.9%	5.0%	7.3x	5.5x	6.6x	0.7x
Victory Athletic	14.1%	16.0%	9.3%	22.1x	19.2x	27.1x	6.0x
Surfside Footwear	9.3%	10.8%	5.9%	7.4x	6.3x	8.6x	1.4x
Alpine Company	10.4%	12.2%	6.9%	9.0x	7.6x	10.4x	2.0x
Heartland Outdoor Footwear	10.8%	12.6%	7.3%	12.0x	10.1x	18.6x	3.1x
Templeton Athletic	19.9%	20.2%	15.3%	6.2x	6.0x	5.5x	1.2x
Average	**11.9%**	**13.5%**	**7.9%**	**10.5x**	**9.0x**	**13.8x**	**2.5x**

(1) Net debt is defined as debt less cash & cash equivalents

Note: Market multiples are based on three year averages. "LTM" denotes latest twelve months.

MERCURY ATHLETIC FOOTWEAR

Exhibit 4 *Mercury Athletic Footwear Historical Financial Statements*

Years ended December 31 ($ in thousands)

Operating Results:	2004	2005	2006
Net Revenue	**340,578**	**358,780**	**431,121**
Less: Cost of Goods Sold	198,115	205,820	239,383
Gross Profit	**142,463**	**152,960**	**191,738**
Less: Selling, General & Administrative	102,410	113,892	139,933
EBITDA	**40,053**	**39,067**	**51,804**
Less: Depreciation & Amortization	7,699	8,001	9,506
EBIT	**32,353**	**31,066**	**42,299**
Less: Corporate Administrative Charge	275	305	366
EBT	**32,079**	**30,761**	**41,933**
Less: Taxes	12,190	11,689	15,934
Net Income	**19,889**	**19,072**	**25,998**

Assets:	2004	2005	2006
Cash & Cash Equivalents	12,203	20,187	10,676
Accounts Receivable	29,115	38,654	45,910
Inventory	53,552	70,818	73,149
Prepaid Expenses	7,809	15,810	10,172
Total Current Assets	**102,679**	**145,470**	**139,908**
Property, Plant & Equipment	33,090	31,334	32,618
Trademarks & Other Intangibles	1,031	35,740	43,853
Goodwill	554	34,605	43,051
Other Assets	5,657	11,884	11,162
Total Assets	**143,011**	**259,032**	**270,592**
Liabilities & Owners' Equity:			
Accounts Payable	12,838	14,753	16,981
Accrued Expenses	13,040	21,955	18,810
Total Current Liabilities	**25,878**	**36,708**	**35,791**
Deferred Taxes	1,635	13,795	11,654
Pension Obligation	8,131	9,256	9,080
Owners' Equity	107,367	199,274	214,067
Total Liabilities & Owners' Equity	**143,011**	**259,032**	**270,592**

MERCURY ATHLETIC FOOTWEAR

Exhibit 5 *Mercury Athletic Footwear Segment Data, 2004-2006*

($ in thousands, except margins)

Fiscal Year 2006:	**Men's Athletic**	**Men's Casual**	**Women's Athletic**	**Women's Casual**	**Unallocated Corporate**	**Consolidated**
Revenue	219,093	51,663	123,563	36,802	0	431,121
Operating Income	31,421	8,242	12,703	(843)	(9,224)	42,299
Total Assets	148,576	28,457	27,978	34,701	30,880	270,592
Fiscal Year 2005:						
Revenue	151,900	55,402	108,097	43,381	0	358,780
Operating Income	18,398	9,077	11,631	(1,013)	(7,027)	31,066
Total Assets	173,482	30,842	24,267	12,197	18,244	259,032
Fiscal Year 2004:						
Revenue	131,636	58,787	95,897	54,258	0	340,578
Operating Income	17,720	9,196	9,109	462	(4,134)	32,353
Total Assets	39,543	34,966	22,526	15,056	30,919	143,011

	Men's Athletic	**Men's Casual**	**Women's Athletic**	**Women's Casual**	**Unallocated Corporate**	**Consolidated**
2006 EBIT Margins	14.3%	16.0%	10.3%	-2.3%	-2.1%	9.8%
2005 EBIT Margins	12.1%	16.4%	10.8%	-2.3%	-2.0%	8.7%
2004 EBIT Margins	13.5%	15.6%	9.5%	0.9%	-1.2%	9.5%

MERCURY ATHLETIC FOOTWEAR

Exhibit 6 *Mercury Athletic Footwear: Base Case Projected Segment Performance*

($ in thousands)

	2007	2008	2009	2010	2011
Men's Athletic:					
Revenue	**251,957**	**282,192**	**310,411**	**335,244**	**352,006**
Less: Operating Expenses*	218,435	244,647	269,112	290,641	305,173
Operating Income	**33,522**	**37,545**	**41,299**	**44,603**	**46,834**
Men's Casual:					
Revenue	**52,179**	**53,223**	**54,287**	**55,916**	**57,594**
Less: Operating Expenses*	43,834	44,711	45,605	46,973	48,382
Operating Income	**8,345**	**8,512**	**8,682**	**8,943**	**9,211**
Women's Athletic:					
Revenue	**138,390**	**153,613**	**167,438**	**179,159**	**188,117**
Less: Operating Expenses*	124,302	137,976	150,393	160,921	168,967
Operating Income	**14,088**	**15,638**	**17,045**	**18,238**	**19,150**
Women's Casual:					
Revenue	**36,802**	**0**	**0**	**0**	**0**
Less: Operating Expenses*	37,265	0	0	0	0
Operating Income	**(463)**	**0**	**0**	**0**	**0**
Consolidated Revenue	**479,329**	**489,028**	**532,137**	**570,319**	**597,717**
Less: Operating Expenses*	423,836	427,333	465,110	498,535	522,522
Less: Corporate Overhead	8,487	8,659	9,422	10,098	10,583
Consolidated Operating Income	**47,006**	**53,036**	**57,605**	**61,686**	**64,612**
Estimated Capital Expenditures	11,983	12,226	13,303	14,258	14,943
Estimated Depreciation	9,587	9,781	10,643	11,406	11,954

* Operating Expenses include an allocation of depreciation for each segment.

MERCURY ATHLETIC FOOTWEAR

Exhibit 7 *MercuryAthletic Footwear: Projecitons of Selected Balance Sheet Accounts, 2007-2011*

($ in thousands)

Select Balance Sheet Accounts	2007	2008	2009	2010	2011
Cash Used in Operations	4,161	4,195	4,566	4,894	5,130
Accounts Receivable	47,888	48,857	53,164	56,978	59,715
Inventory	83,770	85,465	92,999	99,672	104,460
Prepaid Expenses	14,474	14,767	16,069	17,222	18,049
Property, Plant & Equipment	35,015	37,460	40,120	42,972	45,961
Trademarks & Other Intangibles	43,853	43,853	43,853	43,853	43,853
Goodwill	43,051	43,051	43,051	43,051	43,051
Other Assets	11,162	11,162	11,162	11,162	11,162
Liabilities					
Accounts Payable	18,830	18,985	20,664	22,149	23,214
Accrued Expenses	22,778	22,966	24,996	26,792	28,081
Deferred Taxes	11,654	11,654	11,654	11,654	11,654
Pension Obligation	9,080	9,080	9,080	9,080	9,080

Formulas and Definitions

Chapter 2

- Net Worth: $Current\ Assets - Current\ Liabilities$
- Return on Invested Capital: $ROIC = NOPAT/Invest\ Capital$
- EBITDA: $Earnings + Interest + Tax + Depr\&Amor$
- Operating Profitability: $OP = NOPAT + Sales$
- Capital Utilization: $CR = Total\ Op.\ Cap./Sales$

- Market Value Added(MVA): $Market\ Value\ of\ Shares - Book\ Value\ of\ Shareholders'\ Equity$
- Economic Value Added(EVA): $NOPAT - (Operating\ Capital * WACC)$

Steps to Calculate the FCF

$$FCF = EBIT(1-T) + Depreciation - \Delta NWC - Capex$$

1. Net Operating Profit After Tax if it had no debt: $NOPAT = EBIT * (1 - Tax\ Rate)$
2. Net Working Current Assets: $NOWC = Operating\ Assets_{Current} - Operating\ Liabilities_{Current}$
3. Total Net Operating Capital: $TNOC_{This\ Year} = NOWC + Operating\ Assets_{Long-term}$
4. Net Investment in Operating Capital: $NIOC = TNOC_{This\ Year} - TNOC_{Last\ Year}$
5. Free Cash Flow: $FCF = NOPAT - NIOC$

Chapter 3

Profitability

- $Operating\ Margin = EBIT/Sales$
- $Profit\ Margin = Net\ Income/Sales$
- $ROA = Net\ Income/Assets$
- $ROE = Net\ Income/Equity$
- $BEP = EBIT/Assets$

Effects of Debt

- ROA Lowered by Debt
- ROE Increased by Debt

Asset Management

- $Inventory\ Turnover = COGS/Inventories$
- $DSO = Receivables/Average\ Sales/Days = Receivables/Annual\ Sales/365$
- $Fixed\ Asset\ Turnover = Sales/Net\ Fixed\ Assets$
- $Total\ Asset\ Turnover = Sales/Assets$

Liquidity

- $Current = Current\ Assets/Current\ Liabilities$
- $Quick = (Current\ Assets - Inv)/Current\ Liabilities$

Debt Management

- $Debt\ Ratio = Debt/Assets$
- $Debt\ to\ Equity = Debt/Equity$
- $Equity\ Multiplier\ (Financial\ Leverage) = Assets/Equity$
- $Times\ Interest\ Earned\ (TIE) = EBIT/Interest$
- $EBITDA\ Coverage = (EBIT + Depr\&Amor + Lease\ PMTs)/(Interest + Principal + Lease\ PMT)$

Market Value

- $Price\ Earnings(PE) = Price/Earnings$
- $Earnings\ Yield = Earnings/Price$
- $Market\ to\ Book = Market/Book$

Dupont (ROE)

- $Net\ Income/Sales * Sales/Assets * Assets/Shareholders'\ Equity$
- $Net\ Profit\ Margin * Asset\ Turnover * Financial\ Leverage$

Chapter 4/5

Time Value of Money

- Compounding: Process of finding the Future Value
- Discounting: Process of finding the Present Value
- Annuity: Series of equal periodic payments (PMT) for a specified number of periods
  - Ordinary Annuity: Annuity whose payments occur at the end of each period
  - Annuity Due: Annuity whose payments occur at the beginning of each period
  - Perpetuity: Annuity with an infinite number of payments ($PV = PMT/I$)
  - Growing Annuity: Stream of cash flows that grow constantly for several years
- Amortized Loan: Paid off with equal payments over a specified period
  - Amortization Schedule: Shows how much of each payment constitutes interest, how much is used to reduce the principal, and the unpaid balance at the end of each period

Market Interest Rate

- r_d: Required rate of return on a debt security
- r^*: Risk Free Rate
- IP: Inflation Premium
- MRP: Maturity Risk Premium
- DRP: Default Risk Premium
- LP: Liquidity Premium

Identity: $r_d = r^* + IP + MRP + DRP + LP$

Bond Spread: $Spread = DRP + LP$

Rule of 72: $72/(Rate * 100)$

Bond Definitions

Pricing

Discount

- If the Coupon Rate is lower than the Bond Rate
- If selling below Par

Premium

- If the Bond Rate is lower than the Coupon Rate
- If selling above Par

Effect of Rate to Bond Value

Inverse Relationship

- Interest Rate goes up → Value goes down
- Interest Rate goes down → Value goes up
- Interest Rate stays constant → Value stays constant

Yields

- Yield to Maturity (YTM): Rate if you hold it to maturity
- Yield to Call (YTC): Rate if the bond is called
- Current Yield: $Annual\ Coupon\ PMT/Current\ Price$
- Capital Gains Yield: $YTM - Current\ Yield$

Semiannual Bonds -- Valuation and Yield

- Multiply years by 2 to get periods: $2N$
- Divide nominal rate by 2 to get periodic rate: $r_d/2$
- Divide annual INT by 2 to get PMT: $INT/2$

Chapter 6/9

Risk and Return

- Beta (β) = $correlation_{asset} * (std\ dev_{asset}/std\ dev_{market})$
- CAPM:
  - $Req\ Return = R_{fr} + beta(R_{Market} - R_{fr}) = R_{fr} + beta * RP_{Market}$
    - $Req\ Price = Price * Req\ Return$
    - $Exp\ Price = Price * beta$

WACC

$Weight_{debt} * Cost_{debt} + Weight_{equity} * Cost_{equity} + Weight_{ps} * Cost_{ps}$

- Cost of Debt: $r_{debt} = Interest\ Rate * (1 - Tax)$
- Cost of Equity:
  - CAPM: $r_s = r_{RF} + (r_M - r_{RF})b = r_{RF} + (RP_M)b$.
  - Dividend Growth: $r_s = D_1/P_0 + g$ (using a dividend method of return)
  - Bond-Yield-Plus-Judgmental-Risk Premium: $r_s = r_d + RP_{Bond}$
- Cost of Pref: $r_{ps} = Dps/(P_{ps}(1 - F))$

Chapter 7

Back-of-the-Envelope Estimation

- $NOPAT/WACC$
- $EBIT/WACC$

DCF

Constant Growth

1. Find the value of the operations: $V_{Op} = FCF * (1+G)/(WACC - G)$
2. Compute the total value of the company: Add short-term investments
3. Intrinsic Value of the Firm: Subtract debt and preferred stock
4. Value Per Share: Divide the equity by the number of shares

Non-Constant Growth

1. Find PV of prehorizon nonconstant cash flows (NPV of FCFs w/ rate being WACC)
2. Calculate the Horizon Value of the constant cash flows
    - Horizon Value: $HV = FCF * (1+G)/(WACC - G)$
    - Perpetuity: $PV = PMT/Rate$
    - Rate: $WACC - Growth$
3. Discount the Horizon Value to today
    - $HV/(1+WACC)^n$
    - Do a PV using the WACC and Horizon Value (FV: Horizon Value, NPER: Years to the horizon, Rate: WACC)
4. PV of the Operations: $PV_{Op} = Nonconstant + Constant$
5. Compute the total value of the company: Add short-term investments
6. Intrinsic Value of the Firm: Subtract debt and preferred stock
7. Value Per Share: Divide the equity by the number of shares

Dividend Growth

$$P_0 = D_1/(r_s - g) = D_0(1+g)/(r_s - g)$$

1. Calculate the Required Rate of Return
    - CAPM: $r_s = r_{RF} + (r_M - r_{RF})b = r_{RF} + (RP_M)b$.
    - Dividend Growth: $r_s = D_1/P_0 + g$
    - Bond-Yield-Plus-Judgmental-Risk Premium: $r_s = r_d + RP_{Bond}$
2. Find the Dividend in Year 1: $D_1 = D_0(1+g)$
3. Apply the Dividend Model using D1

Multiples

Used to compare companies with other companies

1. Entity Value (V)
    - The market value of equity (# shares of stock multiplied by the price per share)
    - Plus the value of debt
2. Pick a measure: Using EBITDA, Sales, or ratios like PE
3. Calculate the average entity ratio for a sample of comparable firms
    - V/EBITDA
    - V/Sales
4. Find the entity value of the firm in question
    - Multiply the firm's sales by the V/Sales multiple
    - Multiply the firm's # of customers by the V/Customers ratio
5. The result is the firm's total value
6. Subtract the firm's debt to get the total value of its equity
7. Divide by the number of shares to calculate the price per share

Private Valuation

1. Adjust (Recast) the Financial Statements
    - True profitability and cash flow in the current period
    - All projections into the future will begin with the baseline of the current period
2. Determine the appropriate valuation methodology
    - Back of the Envelope Estimation
    - Fair-market value vs. Fair-value
    - DCF
    - Relative Value or Comps
    - Replacement Cost
    - Asset Oriented
3. Apply the correct discount rate
4. Adjust the value for premiums and add synergies (Revenue and Cost)
    - Control Premium
    - Liquidity Discount
    - Minority Discount

Chapter 18

Steps to IPO

1. Select an investment banker (Reputation, Experience in industry)
2. File registration document (S-1) with SEC
3. Choose price range for preliminary (or "red herring") prospectus
4. Go on a roadshow
5. Set the final offer price in final prospectus

How an IPO is Priced

1. Determine gross proceeds and post-IPO equity value
    - $Net\ Proceeds = Capital\ Required/(1 - F)$
    - $Valuation_{Post-IPO} = Valuation_{Pre-IPO} + Capital\ Required$
2. Determine the ownership % new investors require: $\%\ Required = Net\ Proceeds/Valuation_{Post-IPO}$
3. Determine the number of new shares required: $New\ Shares\ Required = [(\%\ to\ new)(Existing)]/(1 - \%\ to\ new)$
4. Set offer price: $Offer\ Price = Net\ Proceeds/New\ Shares\ Required$