

INTRODUCTION TO CORPORATE FINANCE

Chapter 1

OUTLINE

1. Types of Firms
2. Definition of Corporate Finance
3. The Financial Manager
4. The Goal of Financial Management
5. The Agency Problem
6. Financial Markets



FORMS OF BUSINESS ORGANIZATION

FORMS OF BUSINESS ORGANIZATION

There are 3 major forms of business organization, each with its pros and cons.

1. Sole Proprietorship
2. Partnership
3. Corporation

SOLE PROPRIETORSHIP

A business owned by a single individual. In general, the business has no existence apart from its owner: its life is limited to the proprietor's own life span.

SOLE PROPRIETORSHIP

Pros:

- Easy to start & simple structure

Cons:

- Unlimited liability from creditors
- Equity raised is limited to the proprietor's personal wealth

PARTNERSHIP

A business much like a sole proprietorship, but formed by two or more owners.

PARTNERSHIP

Pros:

- Easy to start & simple structure

Cons:

- Unlimited liability from creditors for general partners
- Difficult to transfer ownership

CORPORATION

A business created as a distinct legal entity composed of one or more individuals or entities.

CORPORATION

Pros:

- Limited liability for owners
- Easy transfer of ownership and raising of equity financing
- Unlimited life

Cons:

- Double taxation
- Relatively more difficult to establish

OTHER FORMS OF BUSINESS ORGANIZATION

We will focus on corporations, but other forms include:

S-corp

A corporation, but without double taxation, limited to about 100 shareholders

LLC

A limited liability corporation, operates as a sole proprietorship or partnership but retains limited liability and generally avoids double taxation

START A BUSINESS!

To begin filing paperwork, visit the [Kentucky Secretary of State's website](#).

Explore [business listings](#) as well.

TO SUMMARIZE

The forms of business organization each have pros and cons. Unlimited liability to creditors can be a significant drawback for sole proprietorships and partnerships.



WHAT IS CORPORATE FINANCE?

CORPORATE FINANCE ANSWERS 3 QUESTIONS

1. What long-term investments should the firm take on?
2. Where and how will the firm secure long-term financing?
3. How will the firm manage everyday financial activities?

LONG-TERM INVESTMENTS

- The process of planning and managing a firm's long term investments is known as capital budgeting.
- The value of the cash flow generated by an investment should exceed its cost.

INVESTMENT OPPORTUNITIES

Depend on the nature of the business:

- The Walt Disney Company expanding Disneyland Paris theme park or acquiring 20th Century Fox.
- Uber pulling out of south-east Asia.

LONG-TERM FINANCING

- Financing is needed to support long term investments
- The firm can borrow (debt) or use funds generated by selling ownership of the firm to investors (equity)

LONG-TERM FINANCING EXAMPLES

- [Tesla](#) raised \$1.8 billion by promising to pay back funds in the future (debt)
- [Snapchat](#) raised \$3.4 billion by selling ownership shares of the company (equity)

CAPITAL STRUCTURE

The mixture of debt and equity that comprises the firm.

- If the firm is a pie, the capital structure is how it is sliced
- The optimal mix of debt and equity is based on the costs associated with each
- Sources and timing of long-term financing is important

EVERYDAY FINANCIAL ACTIVITIES

Working Capital refers to a firm's short-term (or current) assets and liabilities.

- How much cash should be kept on hand for a particular firm?
- How many days worth of inventory should that firm hold?
- Should that firm purchase on credit from suppliers or obtain financing and pay cash?

TO SUMMARIZE

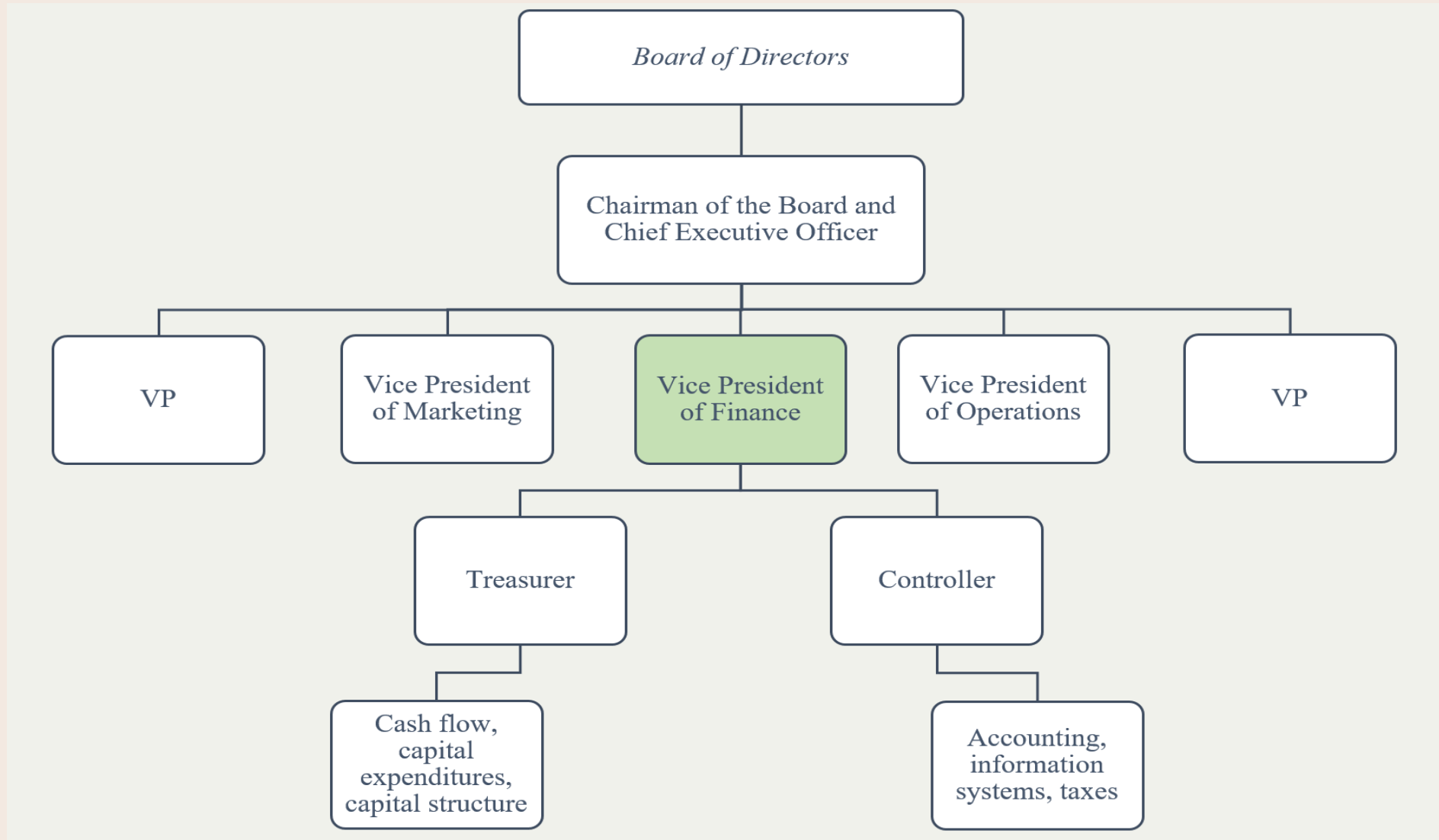
Corporate Finance seeks to answer questions regarding long-term investments, financing, and the capital structure of the firm.



THE FINANCIAL MANAGER

THE FINANCIAL MANAGER

In corporations, tasked with answering those three broad corporate finance questions we've discussed.





Board of Directors:
Tim Cook, Al Gore, and others

CEO and Chairman of the Board:
Tim Cook

CDO:
Jonathan Ive

CFO:
Luca Maestri

COO:
Jeff Williams



THE GOAL OF FINANCIAL MANAGEMENT

POSSIBLE GOALS OF THE FINANCIAL MANAGER

Maximize Sales?

But we can incur costs to the point where we make no profits.

Maximize Profits?

When? Now? Is this at the expense of the future?

Survive?

This could lead to less risk-taking and lower profits.

THE GOAL OF FINANCIAL MANAGEMENT

To maximize the current value per share of existing stock.



THE AGENCY PROBLEM

SEPARATION OF OWNERSHIP AND MANAGEMENT

The financial manager should seek to maximize value for the shareholders, not pursue their individual interests at the shareholders' expense.

THE AGENCY PROBLEM

The possibility of conflict between the owners (stockholders) of a firm and the management of a firm.

Examples:

- An investment isn't pursued because failure would cost the manager their job
- A manager only pursues certain investments so that they control more (empire building)

POTENTIAL SOLUTIONS

1. Tie manager performance to the performance of the firm (stock options)
2. Shareholder monitoring through voting at company elections

TO SUMMARIZE

The separation of owner and manager leads to the rise of the agency problem, but there are ways to minimize this issue.



FINANCIAL MARKETS & THE CORPORATION

FINANCIAL MARKETS

Allow for the raising of capital or exchange of ownership.

PRIMARY & SECONDARY MARKETS

1. *Primary Markets:* raise capital through public offerings or private placements (i.e., Snapchat's IPO)
2. *Secondary Markets:* trading ownership of a corporation; these transactions help to establish the value of the firm (i.e., buying and selling stock)

WHY MANAGERS CARE ABOUT THE STOCK PRICE

A public company doesn't profit or lose money when its share price fluctuates in the secondary market. But the price matters for a number of reasons:

1. Compensation
2. Raising capital in the future
3. Creditors
4. Takeover target
5. Use of shares to acquire other firms

TO SUMMARIZE

Financial markets matter for raising capital and assessing the health of the firm.



TAKEAWAYS

TAKEAWAYS

1. Three main forms of business organization, each with pros and cons.
2. Limited liability is an important feature of corporations and LLCs, encouraging entrepreneurship.
3. Corporate finance seeks to answer 3 main questions regarding investing, financing, and daily activities.
4. The financial manager deals with these questions and seeks to maximize the value of the firm.
5. But agency problems exist.
6. Financial markets allow for raising of capital and exchange of ownership, and managers care about the secondary markets.

END.



FINANCIAL STATEMENTS, TAXES, AND CASH FLOW

Chapter 2

OUTLINE

1. The Balance Sheet & Income Statement
2. Corporate Tax Rates (and the new law)
3. Cash Flow from Assets



FINANCIAL STATEMENTS

FINANCIAL STATEMENTS

Reports that provide information on the firm's conditions and activities.

1. Balance Sheet
2. Income Statement
3. Statement of Cash Flows (a later chapter)

WHERE TO FIND FINANCIAL STATEMENTS

Financial Statements for public companies are included in the annual 10-K filing, available on the company's or SEC's website.





THE BALANCE SHEET

THE BALANCE SHEET

Summarizes what a firm owns (its assets), what a firm owes (its liabilities) and the difference between the two (the firm's equity).

U.S. CORPORATION
2014 and 2015 Balance Sheets
(\$ in millions)

Assets		Liabilities and Owners' Equity			
	2014	2015		2014	2015
Current assets			Current liabilities		
Cash	\$ 104	\$ 160	Accounts payable	\$ 232	\$ 266
Accounts receivable	455	688	Notes payable	196	123
Inventory	<u>553</u>	<u>555</u>	Total	<u>\$ 428</u>	<u>\$ 389</u>
Total	<u>\$1,112</u>	<u>\$1,403</u>			
Fixed assets					
Net plant and equipment	<u>\$1,644</u>	<u>\$1,709</u>	Long-term debt	\$ 408	\$ 454
			Owners' equity		
			Common stock and paid-in surplus	600	640
			Retained earnings	<u>1,320</u>	<u>1,629</u>
			Total	<u>\$1,920</u>	<u>\$2,269</u>
Total assets	<u><u>\$2,756</u></u>	<u><u>\$3,112</u></u>	Total liabilities and owners' equity	<u><u>\$2,756</u></u>	<u><u>\$3,112</u></u>

THE BALANCE SHEET IDENTITY

The balance sheet must satisfy the *balance sheet identity*:

$$\text{Assets} = \text{Liabilities} + \text{Shareholders' Equity}$$

SHAREHOLDERS' EQUITY

Let's rearrange the Balance sheet identity:

$$\text{Shareholders' Equity} = \text{Assets} - \text{Liabilities}$$

What this tells us is that shareholders are entitled to what remains of the firm after debt holders are paid.

Thus, shareholders' equity is the *residual value*, and shareholders are the *residual claimants*.

U.S. CORPORATION 2014 and 2015 Balance Sheets (\$ in millions)					
Assets			Liabilities and Owners' Equity		
	2014	2015		2014	2015
Current assets			Current liabilities		
Cash	\$ 104	\$ 160	Accounts payable	\$ 232	\$ 266
Accounts receivable	455	688	Notes payable	196	123
Inventory	553	555	Total	\$ 428	\$ 389
Total	\$1,112	\$1,403			
Fixed assets					
Net plant and equipment	\$1,644	\$1,709	Long-term debt	\$ 408	\$ 454
			Owners' equity		
			Common stock and paid-in surplus	600	640
			Retained earnings	1,320	1,629
			Total	\$1,920	\$2,269
Total assets	\$2,756	\$3,112	Total liabilities and owners' equity	\$2,756	\$3,112

If this firm ceases to exist, the \$3,112 in total assets will be sold off to pay the liabilities of \$843. The difference $\$3,112 - 843 = \$2,269$ would be split among the shareholders.

NET WORKING CAPITAL

Net Working Capital is the difference between current assets and current liabilities.

$$\text{NWC} = \text{Current Assets} - \text{Current Liabilities}$$

For healthy firms, this is usually positive, indicating that *liquid* assets in the short term can pay accounts due within the short term.

LIQUIDITY

The ability to convert an asset to cash quickly without a significant loss in value.

Current assets are *liquid* because they can be easily sold.

IS LIQUIDITY GOOD?

Liquid firms are less likely to experience distress, but generally less profitable.

REAL-WORLD EXAMPLE

Using Harley-Davidson's balance sheet on the next slide, do the following for 2017:

1. Verify the balance sheet identity.
2. Calculate the net working capital. What does this mean?
3. Find the residual value of the firm. What does this mean?

HARLEY-DAVIDSON, INC.
CONSOLIDATED BALANCE SHEETS
December 31, 2017 and 2016
(In thousands, except share amounts)

	2017	2016
ASSETS		
Current assets:		
Cash and cash equivalents	\$ 687,521	\$ 759,984
Marketable securities	—	5,519
Accounts receivable, net	329,986	285,106
Finance receivables, net	2,105,662	2,076,261
Inventories	538,202	499,917
Restricted cash	47,518	52,574
Other current assets	175,853	174,491
Total current assets	3,884,742	3,853,852
Finance receivables, net	4,859,424	4,759,197
Property, plant and equipment, net	967,781	981,593
Prepaid pension costs	19,816	—
Goodwill	55,947	53,391
Deferred income taxes	109,073	167,729
Other long-term assets	75,889	74,478
	<u>\$ 9,972,672</u>	<u>\$ 9,890,240</u>
LIABILITIES AND SHAREHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	\$ 227,597	\$ 235,318
Accrued liabilities	529,822	486,652
Short-term debt	1,273,482	1,055,708
Current portion of long-term debt, net	1,127,269	1,084,884
Total current liabilities	3,158,170	2,862,562
Long-term debt, net	4,587,258	4,666,975
Pension liability	54,606	84,442
Postretirement healthcare liability	118,753	173,267
Other long-term liabilities	209,608	182,836
Commitments and contingencies (Note 14)		
Shareholders' equity:		
Preferred stock, none issued	—	—
Common stock, 181,286,547 and 180,595,054 shares issued, respectively	1,813	1,806
Additional paid-in-capital	1,422,808	1,381,862
Retained earnings	1,607,570	1,337,673
Accumulated other comprehensive loss	(500,049)	(565,381)
Treasury stock (13,195,731 and 4,647,345 shares, respectively), at cost	(687,865)	(235,802)
Total shareholders' equity	1,844,277	1,920,158
	<u>\$ 9,972,672</u>	<u>\$ 9,890,240</u>

MARKET VALUE VS. BOOK VALUE

It's important to know that financial statements present *book* values.

- *Book value* -- what the firm originally paid for its assets (less depreciation), or the original face value of its debt.
- *Market value* -- the price at which assets, liabilities, or equity can be bought or sold.

The *market values* are more important to the decision making process of managers because those values are more reflective of the cash flows that would occur today.

A NOTE ABOUT EQUITY VALUE

Because equity on the balance sheet is the *book* value of equity:

Shareholders' Equity \neq Value of the Firm

TO SUMMARIZE

The Balance Sheet provides a snapshot of the firm, summarizing what the firm owns and owes. Equity is what is left after subtracting liabilities from assets.



THE INCOME STATEMENT

THE INCOME STATEMENT

Measures the performance over a period of time, recording the revenues and expenses of the firm.

U.S. CORPORATION
2015 Income Statement
(\$ in millions)

Net sales	\$1,509
Cost of goods sold	750
Depreciation	<u>65</u>
Earnings before interest and taxes	\$ 694
Interest paid	<u>70</u>
Taxable income	\$ 624
Taxes (34%)	<u>212</u>
Net income	<u><u>\$ 412</u></u>
Dividends	\$103
Addition to retained earnings	309

THE INCOME STATEMENT EQUATION

$$\text{Net Income} = \text{Revenues} - \text{Expenses}$$

A CAVEAT

Net income is *not* cash flow, because it includes non-cash expenses such as depreciation and amortization. These are expenses that the company isn't “paying out” with cash.

HARLEY-DAVIDSON, INC.
CONSOLIDATED STATEMENTS OF INCOME
Years ended December 31, 2017, 2016 and 2015
(In thousands, except per share amounts)

	2017	2016	2015
Revenue:			
Motorcycles and Related Products	\$ 4,915,027	\$ 5,271,376	\$ 5,308,744
Financial Services	732,197	725,082	686,658
Total revenue	5,647,224	5,996,458	5,995,402
Costs and expenses:			
Motorcycles and Related Products cost of goods sold	3,261,683	3,419,710	3,356,284
Financial Services interest expense	180,193	173,756	161,983
Financial Services provision for credit losses	132,444	136,617	101,345
Selling, administrative and engineering expense	1,181,641	1,217,439	1,220,095
Total costs and expenses	4,755,961	4,947,522	4,839,707
Operating income	891,263	1,048,936	1,155,695
Investment income	3,580	4,645	6,585
Interest expense	31,004	29,670	12,117
Income before provision for income taxes	863,839	1,023,911	1,150,163
Provision for income taxes	342,080	331,747	397,956
Net income	\$ 521,759	\$ 692,164	\$ 752,207
Earnings per common share:			
Basic	\$ 3.03	\$ 3.85	\$ 3.71
Diluted	\$ 3.02	\$ 3.83	\$ 3.69
Cash dividends per common share	\$ 1.46	\$ 1.40	\$ 1.24

TO SUMMARIZE

The income statement equation is straightforward, but it can include non-cash expenses. Net income is not to be confused for cash the firm made in a time period.



TAXES

THE TAX CODE

Complex and frequently changing. We take a simplified approach.

MARGINAL VS. AVERAGE TAX RATES

The *marginal rate* is the % paid on the next dollar earned.

The *average rate* is the total tax bill divided by the taxable income.



Table 1. Tax Brackets and Rates, 2018

Rate	For Unmarried Individuals, Taxable Income Over	For Married Individuals Filing Joint Returns, Taxable Income Over	For Heads of Households, Taxable Income Over
10%	\$0	\$0	\$0
12%	\$9,525	\$19,050	\$13,600
22%	\$38,700	\$77,400	\$51,800
24%	\$82,500	\$165,000	\$82,500
32%	\$157,500	\$315,000	\$157,500
35%	\$200,000	\$400,000	\$200,000
37%	\$500,000	\$600,000	\$500,000

MARGINAL AND AVERAGE TAX RATE EXAMPLE

Using the table of marginal rates on the previous slide:

1. Calculate the tax bill for married individuals filing joint returns with a taxable income of \$174,000 in 2018.
2. Find the average tax rate for this married couple.

MARGINAL AND AVERAGE TAX RATE EXAMPLE

$$\begin{aligned} \textit{Tax Bill} &= 0.10(\$19,050) + \\ &\quad 0.12(\$77,400 - \$19,050) + \\ &\quad 0.22(\$165,000 - \$77,400) + \\ &\quad 0.24(\$174,000 - \$165,000) \\ &= \$30,339 \end{aligned}$$

MARGINAL AND AVERAGE TAX RATE EXAMPLE

$$\begin{aligned} \text{Average Tax Rate} &= \frac{\text{Tax Bill}}{\text{Taxable Income}} \\ &= \frac{\$30,339}{\$174,000} \\ &= 17.44\% \end{aligned}$$

CORPORATE TAXES

The corporate tax bill was similarly calculated, but the new tax law created a 21% flat rate.

THE WALL STREET JOURNAL.

Trump Signs Sweeping Tax Overhaul Into Law

President also approves bill keeping government funded until mid-January



CORPORATE TAXES

The US had the highest tax rate among developed nations, but firms generally paid [much less](#) than the highest U.S. federal corporate income tax rate of 35%.

Look up what firms pay [here](#).

DEBT AND TAXES

A benefit of a firm using debt in their *capital structure* is that interest expense is *pre-tax*, resulting in a lower tax bill and more cash available to the firm and to shareholders.

PRE-TAX DEBT EXAMPLE

You are a shareholder of a corporation entitled to a dividend that is 20% of Net Income. You pay a 15% tax on the dividend. The firm has to pay \$150 in interest, and the corporate tax rate is 21%.

	<i>Pre-tax Interest</i>	<i>After-tax Interest</i>
Revenue	1,000	1,000
COGS	(600)	(600)
Depreciation	(80)	(80)
EBIT	320	320
Interest	(150)	--
Taxable Income	170	320
Taxes (21%)	(35.7)	(67.2)
		252.8
Interest	--	(150.0)
Net Income	134.3	102.8
Dividends (20% of N.I.)	26.9	20.6
Tax on Dividends (15%)	(4.0)	(3.1)
Cash to you	22.8	17.5

TO SUMMARIZE

Corporate taxes are complicated and can change (now a flat rate of 21% applies). The marginal tax rate is the percentage paid on the next dollar. In general, debt is favorably treated by tax law.



CASH FLOW

CASH FLOW

The difference between the number of dollars coming in and the number of dollars going out is the *cash flow* of the firm.

This is distinct from the *statement of cash flows* which we cover later.

Cash flow is perhaps a better metric for financial managers and investors than net income.

CASH FLOW FROM ASSETS

Total cash flow to creditors and stock holders.

$$\begin{aligned} CFFA &= \text{Operating Cash Flow} \\ &\quad - \text{Net Capital Spending} \\ &\quad - \Delta \text{ in NWC} \end{aligned}$$

CASH FLOW FROM ASSETS

where...

$$\begin{aligned} \text{Operating Cash Flow} &= \text{Earnings Before Interest \& Taxes} \\ &+ \text{Depreciation} \\ &- \text{Taxes} \end{aligned}$$

$$\begin{aligned} \text{Net Capital Spending} &= \text{Ending Net Fixed Assets} \\ &- \text{Beginning Net Fixed Assets} \\ &+ \text{Depreciation} \end{aligned}$$

$$\begin{aligned} \Delta \text{ in NWC} &= \text{Ending Net Working Capital} \\ &- \text{Beginning Net Working Capital} \end{aligned}$$

EXAMPLE- FIND THE OPERATING CASH FLOW

U.S. CORPORATION 2015 Income Statement (\$ in millions)	
Net sales	\$1,509
Cost of goods sold	750
Depreciation	<u>65</u>
Earnings before interest and taxes	\$ 694
Interest paid	<u>70</u>
Taxable income	\$ 624
Taxes (34%)	<u>212</u>
Net income	<u><u>\$ 412</u></u>
Dividends	\$103
Addition to retained earnings	309

$$OCF = \$694 + \$65 - \$212 = \$547$$

EXAMPLE- FIND THE NET CAPITAL SPENDING

U.S. CORPORATION 2014 and 2015 Balance Sheets (\$ in millions)					
Assets			Liabilities and Owners' Equity		
	2014	2015		2014	2015
Current assets			Current liabilities		
Cash	\$ 104	\$ 160	Accounts payable	\$ 232	\$ 266
Accounts receivable	455	688	Notes payable	196	123
Inventory	553	555	Total	\$ 428	\$ 389
Total	\$1,112	\$1,403			
Fixed assets			Long-term debt		
Net plant and equipment	\$1,644	\$1,709		\$ 408	\$ 454
			Owners' equity		
			Common stock and paid-in surplus	600	640
			Retained earnings	1,320	1,629
			Total	\$1,920	\$2,269
Total assets	\$2,756	\$3,112	Total liabilities and owners' equity	\$2,756	\$3,112

$$\text{NCS} = \$1,709 - \$1,644 + \$65 = \$130$$

EXAMPLE- FIND THE Δ IN NWC

U.S. CORPORATION 2014 and 2015 Balance Sheets (\$ in millions)					
Assets			Liabilities and Owners' Equity		
	2014	2015		2014	2015
Current assets			Current liabilities		
Cash	\$ 104	\$ 160	Accounts payable	\$ 232	\$ 266
Accounts receivable	455	688	Notes payable	196	123
Inventory	553	555	Total	\$ 428	\$ 389
Total	\$1,112	\$1,403			
Fixed assets			Long-term debt		
Net plant and equipment	\$1,644	\$1,709		\$ 408	\$ 454
			Owners' equity		
			Common stock and paid-in surplus	600	640
			Retained earnings	1,320	1,629
			Total	\$1,920	\$2,269
Total assets	\$2,756	\$3,112	Total liabilities and owners' equity	\$2,756	\$3,112

$$\Delta \text{ in NWC} = (\$1,403 - \$389) - (\$1,112 - \$428) = \$330$$

EXAMPLE- DETERMINE THE CFFA

$$\begin{aligned} CFFA &= \text{Operating Cash Flow} \\ &\quad - \text{Net Capital Spending} \\ &\quad - \Delta \text{ in NWC} \end{aligned}$$

$$CFFA = \$547 - \$130 - \$330 = \underline{\$87}$$

ANOTHER CFFA EXPRESSION

$$\text{Cash Flow from Assets (CFFA)} = \text{Cash Flow to Creditors} + \text{Cash Flow to Stock Holders}$$

CASH FLOW FROM ASSETS

And...

$$\begin{aligned} \text{Cash Flow to Creditors} &= \text{Interest Paid} \\ &\quad - \text{Net New Borrowing} \end{aligned}$$

$$\begin{aligned} \text{Cash Flow to Shareholders} &= \text{Dividends Paid} \\ &\quad - \text{Net New Equity Issued} \end{aligned}$$

$$\begin{aligned} \text{Net New Borrowing} &= \text{New Long Term Debt} \\ &\quad - \text{Old Long Term Debt} \end{aligned}$$

$$\begin{aligned} \text{Net Equity Issued} &= \text{New Common Equity} \\ &\quad - \text{Old Common Equity} \end{aligned}$$

EXAMPLE- FIND THE CFFA

A firm paid \$705 in interest and \$1,080 in dividends in 2017. From 2016 to 2017, long term debt increased from \$3,900 to \$4,890 while equity issued fell from \$5,800 to \$4,870.

$$\text{CFFA} = \$705 - (\$4,890 - \$3,900) + \$1,080 - (\$4,870 - \$5,800) =$$

\$1,725

TO SUMMARIZE

Cash Flow is important: we need to know how much firms make (in *cash*) and where it is going.

I. The cash flow identity
$\text{Cash flow from assets} = \text{Cash flow to creditors (bondholders)} + \text{Cash flow to stockholders (owners)}$
II. Cash flow from assets
$\text{Cash flow from assets} = \text{Operating cash flow} - \text{Net capital spending} - \text{Change in net working capital (NWC)}$
where:
$\text{Operating cash flow} = \text{Earnings before interest and taxes (EBIT)} + \text{Depreciation} - \text{Taxes}$
$\text{Net capital spending} = \text{Ending net fixed assets} - \text{Beginning net fixed assets} + \text{Depreciation}$
$\text{Change in NWC} = \text{Ending NWC} - \text{Beginning NWC}$
III. Cash flow to creditors (bondholders)
$\text{Cash flow to creditors} = \text{Interest paid} - \text{Net new borrowing}$
IV. Cash flow to stockholders (owners)
$\text{Cash flow to stockholders} = \text{Dividends paid} - \text{Net new equity raised}$



TAKEAWAYS

TAKEAWAYS

1. Market value matters more than book value when making decisions.
2. Net income includes non-cash expenses, making cash flow a better metric for understanding value to shareholders.
3. The marginal tax rate is the tax you pay on the next dollar.
4. The average tax rate is the total tax bill divided by taxable income.
5. The pre-tax nature of interest is a benefit of debt.
6. Cash Flow from Assets is the cash flow to stock holders and debt holders and can be calculated using income statement and balance sheet items.

END.

WORKING WITH FINANCIAL STATEMENTS

Chapter 3

OUTLINE

1. Cash Flows: A Closer Look
 - A. Sources and Uses of Cash
 - B. The Statement of Cash Flow
2. Standardized Financial Statements
3. Ratio Analysis
4. The DuPont Identity



CASH FLOWS: A CLOSER LOOK

SOURCES AND USES OF CASH

Firms generate cash by selling goods or products and use cash by paying for inputs and labor.

These activities are known as *sources* and *uses* of cash.

SOURCES AND USES OF CASH

J. Alfred Prufrock Corporation			
Balance Sheet			
(\$ in millions)			
Assets			
	2016	2017	Change
Current Assets			
Cash	\$ 84	\$ 98	14
Accounts Receivable	165	188	23
Inventory	393	422	29
Total	\$ 642	\$ 708	66
Fixed Assets			
Net Plant and Equipment	\$ 2731	\$ 2880	149
Total Assets	\$ 3373	\$ 3588	215
Liabilities and Owners' Equity			
Current Liabilities			
Accounts Payable	\$ 312	\$ 344	32
Notes Payable	231	196	(35)
Total	\$ 543	\$ 540	(3)
Long-term Debt	\$ 531	\$ 457	(74)
Owners' Equity			
Commons Stock and Paid-In Surplus	\$ 500	\$ 550	50
Retained Earnings	1799	2041	242
Total	\$ 2299	\$ 2591	292
Total Liabilities and Owners' Equity	\$ 3373	\$ 3588	215

An increase in non-cash assets → A use of cash. (Buying more inventory, building more factories.)

An increase in liabilities → A source of cash. (Money coming in through borrowing.)

SOURCES AND USES OF CASH

J. Alfred Prufrock Corporation			
Balance Sheet			
(\$ in millions)			
Assets			
	2016	2017	Change
Current Assets			
Cash	\$ 84	\$ 98	14
Accounts Receivable	165	188	23
Inventory	393	422	29
Total	\$ 642	\$ 708	66
Fixed Assets			
Net Plant and Equipment	\$ 2731	\$ 2880	149
Total Assets	\$ 3373	\$ 3588	215
Liabilities and Owners' Equity			
Current Liabilities			
Accounts Payable	\$ 312	\$ 344	32
Notes Payable	231	196	(35)
Total	\$ 543	\$ 540	(3)
Long-term Debt	\$ 531	\$ 457	(74)
Owners' Equity			
Commons Stock and Paid-In Surplus	\$ 500	\$ 550	50
Retained Earnings	1799	2041	242
Total	\$ 2299	\$ 2591	292
Total Liabilities and Owners' Equity	\$ 3373	\$ 3588	215

A decrease in non-cash assets → A source of cash. (Selling inventory, borrowers paying off their accounts which decreases A/R.)

A decrease in liabilities → A use of cash. (Paying off your accounts and notes payable)

THE STATEMENT OF CASH FLOWS

Summarizes a firm's uses and sources of cash over a period.

1. Operating
2. Investing
3. Financing

THE STATEMENT OF CASH FLOWS

J. Alfred Prufrock Corporation	
2017 Statement of Cash Flows	
(\$ in millions)	
Cash, beginning of year	\$ 84
Operating Activity	
Net Income	363
Plus:	
Depreciation	276
Increase in Accounts Payable	32
Less:	
Increase in Accounts Receivable	-23
Increase in Inventory	-29
Net cash from Operating Activity	619
Investment Activity	
Fixed Asset Acquisitions	-425
Net Cash for Investment Activity	-425
Financing Activity	
Decrease in Notes Payable	-35
Decrease in Long Term Debt	-74
Dividends Paid	-121
Increase in Common Stock	50
Net Cash from Financing Activity	-180
Net Increase in Cash	14
Cash, end of year	\$ 98

Notice that the net increase in cash on this statement is the same as the change in cash on the balance sheet.

REAL-WORLD EXAMPLE: ROYAL CARIBBEAN



1. What is the largest single source and use of cash?
2. Why is depreciation and amortization added back to net income?
3. Where are most of the cash flows coming from (operating, investing, or financing activities)?

CONSOLIDATED STATEMENTS OF CASH FLOWS

	Year Ended December 31,		
	2017	2016	2015
	(in thousands)		
Operating Activities			
Net income	\$ 1,625,133	\$ 1,283,388	\$ 665,783
Adjustments:			
Depreciation and amortization	951,194	894,915	827,008
Impairment of Pullmantur related assets	—	—	411,267
Net deferred income tax expense (benefit)	1,730	2,608	(10,001)
Share-based compensation expense	69,459	32,659	36,073
Equity investment income	(156,247)	(128,350)	(81,026)
Amortization of debt issuance costs	45,943	52,795	52,153
Gain on sale of property and equipment	(30,902)	—	—
(Gain) loss on derivative instruments not designated as hedges	(61,704)	45,670	59,162
Changes in operating assets and liabilities:			
(Increase) decrease in trade and other receivables, net	(32,043)	4,759	63,102
Decrease (increase) in inventories	2,424	(1,679)	1,197
Decrease (increase) in prepaid expenses and other assets	20,859	11,519	(2,262)
Increase (decrease) in accounts payable	36,780	29,564	(25,278)
Increase (decrease) in accrued interest	1,303	7,841	(10,749)
Increase in accrued expenses and other liabilities	34,215	20,718	33,859
Increase (decrease) in customer deposits	274,705	188,632	(92,849)
Dividends received from unconsolidated affiliates	109,677	75,942	33,338
Other, net	(17,960)	(4,291)	(14,411)
Net cash provided by operating activities	2,874,566	2,516,690	1,946,366
Investing Activities			
Purchases of property and equipment	(564,138)	(2,494,363)	(1,613,340)
Cash received (paid) on settlement of derivative financial instruments	63,224	(213,202)	(178,597)
Investments in and loans to unconsolidated affiliates	(10,396)	(9,155)	(56,163)
Cash received on loans to unconsolidated affiliates	62,303	38,213	124,253
Proceeds from sale of property and equipment	230,000	—	—
Other, net ⁽¹⁾	5,415	(46,385)	(19,128)
Net cash used in investing activities	(213,592)	(2,724,892)	(1,742,975)
Financing Activities			
Debt proceeds	5,866,966	7,338,560	4,399,501
Debt issuance costs	(51,590)	(88,241)	(68,020)
Repayments of debt	(7,835,087)	(6,365,570)	(4,118,553)
Purchase of treasury stock	(224,998)	(299,960)	(200,000)
Dividends paid	(437,455)	(346,487)	(280,212)
Proceeds from exercise of common stock options	2,525	2,258	11,252
Other, net	3,843	3,249	2,520
Net cash (used in) provided by financing activities	(2,675,796)	243,809	(253,512)
Effect of exchange rate changes on cash	2,331	(24,569)	(17,555)
Net (decrease) increase in cash and cash equivalents	(12,491)	11,038	(67,676)

TO SUMMARIZE

At the most fundamental level, firms generate and spend cash. The Statement of Cash Flows presents the sources and uses of cash.



STANDARDIZED FINANCIAL STATEMENTS

COMMON SIZE STATEMENTS

These statements present items in percentage terms, allowing for comparison to firms of different sizes or to the past.

THE COMMON SIZE BALANCE SHEET

J. Alfred Prufrock Corporation					
Balance Sheet					
(\$ in millions)					
Assets					
Current Assets	2016		2017		Change
Cash	\$ 84	2.5%	\$ 98	2.7%	0.2%
Accounts Receivable	165	4.9	188	5.2	.3
Inventory	393	11.7	422	11.8	.1
Total	\$ 642	19.0	\$ 708	19.7	.7
Fixed Assets					
Net Plant and Equipment	\$ 2731	81.0	\$ 2880	80.3	(0.7)
Total Assets	\$ 3373	100.0	\$ 3588	100.0	.0
Liabilities and Owners' Equity					
Current Liabilities					
Accounts Payable	\$ 312	9.2%	\$ 344	9.6%	0.3%
Notes Payable	231	6.8	196	5.5	(1.4)
Total	\$ 543	16.1	\$ 540	15.1	(1.0)
Long-term Debt	\$ 531	15.7	\$ 457	12.7	(3.0)
Owners' Equity					
Commons Stock and Paid-In Surplus	\$ 500	14.8	\$ 550	15.3	.5
Retained Earnings	1799	53.3	2041	56.9	3.5
Total	\$ 2299	68.2	\$ 2591	72.2	4.1
Total Liabilities and Owners' Equity	\$ 3373	100.0	\$ 3588	100.0	.0

Presented as a % of total assets.

Notice that *Net Plant and Equipment* increased from 2016 to 2017, but that it fell as a percentage of assets.

THE COMMON SIZE INCOME STATEMENT

J. Alfred Prufrock Corporation
2017 Income Statement

Sales	100.0%
Cost of Goods Sold	58.2
Depreciation	11.9
Earnings before interest and taxes (EBIT)	29.9
Interest paid	6.1
Taxable income	23.8
Taxes (34%)	8.1
Net Income	15.7%
Dividends	5.2%
Addition to retained earnings	10.5%

Presented as a % of Sales.

For every \$1 of sales, \$0.58 goes to paying for inputs. \$0.15 is profit (net income).

COMMON SIZE STATEMENTS EXAMPLE

Walgreen's had \$118.21B in sales in 2017. Its cost of goods sold was \$90.71B. CVS had \$184.77B in sales in 2017. Its cost of goods sold was \$156.22B. Which firm is better at keeping costs down?

Walgreens: $\text{COGS}/\text{Sales} = 76.7\%$

CVS: $\text{COGS}/\text{Sales} = 84.5\%$

Walgreens costs are lower as a percentage of sales.

TO SUMMARIZE

Common size statements put the value of financial statement items into perspective, relative to past years or other firms.



RATIO ANALYSIS

FINANCIAL RATIOS

Relationships used for assessing the health of the firm and comparative standing of the firm.

There are many ratios. We focus on a few more important ones here that fit into these categories:

- Short Term Solvency & Liquidity
- Leverage & Long Term Solvency
- Turnover
- Market Value
- Profitability

SHORT TERM SOLVENCY & LIQUIDITY

Measures of short term liquidity. Generally, the higher the better for short term creditors.

$$\textit{Current} = \frac{\textit{Current Assets}}{\textit{Current Liabilities}}$$

$$\textit{Quick} = \frac{\textit{Current Assets} - \textit{Inventory}}{\textit{Current Liabilities}}$$

SHORT TERM SOLVENCY & LIQUIDITY EXAMPLE

Interpret J. Alfred Prufrock's 2017 (1) Current Ratio of 1.31 and (2) Quick Ratio of 0.53.

1. The firm has \$1.31 of current assets for every \$1 in current liabilities, or the firm covered its current liabilities 1.31 over with current assets.
2. Net of inventory, which may be difficult to sell off immediately, it can only cover 53% of its current liabilities with current assets.

LEVERAGE & LONG TERM SOLVENCY

Address a firm's long-term ability to meet its obligations. Shows the *financial leverage*—the use of debt—of the firm.

$$\text{Total Debt} = \frac{\text{Total Assets} - \text{Total Equity}}{\text{Total Assets}}$$

$$\text{Debt to Equity} = \frac{\text{Debt}}{\text{Total Equity}}$$

LEVERAGE & LONG TERM SOLVENCY

$$\text{Equity Multiplier} = \frac{\text{Total Assets}}{\text{Total Equity}} = 1 + \frac{\text{Debt}}{\text{Total Equity}}$$

$$\text{Cash Coverage} = \frac{\text{EBIT} + \text{Depreciation}}{\text{Interest Expense}}$$

LEVERAGE & LONG TERM SOLVENCY EXAMPLE

Interpret J. Alfred Prufrock's 2017 (1) Total Debt Ratio of 0.28, (2) Debt to Equity Ratio of 0.38, (3) Equity Multiplier of 1.38, and (4) Cash Coverage Ratio of 6.9.

1. The firm uses 28% debt (and thus $1 - 0.28 = 72\%$ equity).
2. Debt is 38% of equity. Look to the industry to determine if this is high or low.
3. The equity multiplier is $1 +$ the Debt to Equity Ratio. The company's assets are worth 1.38 times its equity, highlighting the use of leverage.
4. Cash earnings before interest and taxes can pay the interest expense 6.9 times over.

TURNOVER

Measures asset utilization, or how efficiently or intensively a firm uses its assets to generate sales.

$$\text{Inventory Turnover} = \frac{\text{COGS}}{\text{Inventory}}$$

$$\text{Total Asset Turnover} = \frac{\text{Sales}}{\text{Total Assets}}$$

TURNOVER EXAMPLE

Interpret J. Alfred Prufrock's 2017 (1) Inventory Turnover Ratio of 3.2 and (2) Total Asset Turnover of 0.64.

1. The firm “sold through” its inventory 3.2 times.
2. For every dollar in assets, the firm generated \$0.64 in sales.

MARKET VALUE

Calculated for publicly-traded firms only, these ratios can tell the relative value of a share or how attractive the firms is as an investment.

$$\text{Earnings per Share} = \frac{\text{Net Income}}{\text{Shares Outstanding}}$$

$$\text{Price to Earnings} = \frac{\text{Price per Share}}{\text{Earnings per Share}}$$

$$\text{Tobin's } Q = \frac{\text{Market Value of Assets}}{\text{Replacement Cost of Assets}}$$

MARKET VALUE EXAMPLE

Interpret J. Alfred Prufrock's 2017 (1) Earnings per Share of 11, (2) Price to Earnings Ratio of 8, and (3) Tobin's Q of 1.08.

1. Net income amounts to \$11 per share.
2. Each of the firm's shares trades for 8 times more than the earnings associated with it, indicating potential for future growth opportunities.
3. A Q above 1 indicates that the assets of the firm are worth more than what it would take to replace them; therefore, it is likely the firm has attractive investment opportunities.

PROFITABILITY

Measures how efficiently a firm uses its assets and manages operations.

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

$$\textit{Return on Assets} = \frac{\textit{Net Income}}{\textit{Total Assets}}$$

$$\textit{Return on Equity} = \frac{\textit{Net Income}}{\textit{Total Equity}}$$

PROFITABILITY EXAMPLE

Interpret J. Alfred Prufrock's 2017 (1) Profit Margin of 15.71%, (2) ROA of 10.12%, and (3) ROE of 14.01%.

1. The firm generates a little less than \$0.16 in profit for every dollar in sales.
2. The firm generates \$0.10 for every dollar of (book) assets.
3. The firm generates \$0.14 for every dollar of (book) equity. This is important given that the goal is to maximize the value of the firm per share for shareholders.

USING RATIOS AND FINANCIAL STATEMENTS

Ratios and financial statements are used *internally* for performance evaluation and planning/budgeting and *externally* by creditors, suppliers, investors, customers, and stockholders.

BENCHMARKING

Firms can be compared to *the past* by benchmarking against its past ratios and to *peers* within the same SIC or NAICS code.

But these SIC and NAICS groupings are not perfect.

OTHER ISSUES

- Conglomerates are hard to classify
- Differences in accounting measures for multinational firms
- Seasonality and timing of fiscal years can present issues

TO SUMMARIZE

Ratios are useful tools for internal and external parties to determine performance, efficiency, and profitability of a firm relative to its past or other similar firms.



DUPONT ANALYSIS

THE DUPONT IDENTITY

An expression that shows the Return on Equity (ROE) can be represented as the product of the Profit Margin, the Total Asset Turnover, and the Equity Multiplier.

Thus, the ROE can be decomposed into Operating Efficiency (controlling costs), Asset Use Efficiency (managing productive resources), and Leverage (use of debt financing).

THE DUPONT IDENTITY

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

$$ROE = \frac{\text{Net Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}} \times \frac{\text{Assets}}{\text{Equity}}$$

$$ROE = \frac{\text{Net Income}}{\cancel{\text{Sales}}} \times \frac{\cancel{\text{Sales}}}{\cancel{\text{Assets}}} \times \frac{\cancel{\text{Assets}}}{\text{Equity}} = \frac{\text{Net Income}}{\text{Equity}}$$

THE DUPONT IDENTITY

$$ROE = \frac{\text{Net Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}} \times \frac{\text{Assets}}{\text{Equity}}$$

$$ROE = \text{Profit Margin} \times \text{Total Asset Turnover} \times \text{Equity Multiplier}$$

$$ROE = \text{Operating Efficiency} \times \text{Asset Use Efficiency} \times \text{Leverage}$$

EXAMPLE: VERA BRADLEY INC.

Obtain [Vera Bradley's Financial Statements](#) and find the ROE by calculating the profit margin, total asset turnover, and equity multiplier for 2018. Compare to 2017 and discuss where the difference is.

EXAMPLE: VERA BRADLEY INC.

2018: Net Income=7.02M, Sales=454.65M, Assets= 350.67M
Equity=285.28M

$$ROE = \frac{Net\ Income}{Sales} \times \frac{Sales}{Assets} \times \frac{Assets}{Equity}$$

$$ROE_{2018} = 0.015 \times 1.30 \times 1.23 = 0.024$$

EXAMPLE: VERA BRADLEY INC.

2017: Net Income=19.76M, Sales=485.94M, Assets= 373.51,
Equity=283.79M

$$ROE = \frac{\text{Net Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}} \times \frac{\text{Assets}}{\text{Equity}}$$

$$ROE_{2017} = 0.04 \times 1.30 \times 1.32 = 0.07$$

EXAMPLE: VERA BRADLEY INC.

$$ROE_{2017} = 0.04 \times 1.30 \times 1.32 = 0.07$$

$$ROE_{2018} = 0.015 \times 1.30 \times 1.23 = 0.024$$

Profit margin fell most substantially. Vera Bradley is less *operationally efficient* than it was in 2017.

TO SUMMARIZE

By breaking down the ROE into its component parts, we can see what specifically contributes to satisfactory or unsatisfactory levels of return on equity.

	ROE		Profit margin		Total asset turnover		Equity multiplier
Yahoo!							
2013	10.4%	=	29.2%	×	.279	×	1.29
2012	8.0	=	23.4	×	.292	×	1.17
2011	8.4	=	21.0	×	.368	×	1.18
Google							
2013	14.8%	=	21.6%	×	.539	×	1.27
2012	15.0	=	21.5	×	.535	×	1.31
2011	16.7	=	25.7	×	.522	×	1.25



TAKEAWAYS

TAKEAWAYS

1. Firms generate and use cash, and the sources and uses of cash are important to identify.
2. The Statement of Cash Flow identifies where cash is coming from and where it is going.
3. As a measure of performance, cash flow may be better than net income because it doesn't include non-cash expenses such as depreciation and amortization.
4. Standardized financial statements and ratios help us to compare a firm to its past self or to peer firms.
5. The DuPont Identity allows us to decompose ROE into operating efficiency, asset use efficiency, and financial leverage.

END.



THE TIME VALUE OF MONEY

Chapter 5

OUTLINE

1. The Time Value of Money
2. Future Value and Compounding
3. Present Value and Discounting
4. Applications



THE TIME VALUE OF MONEY

THE TIME VALUE OF MONEY

In general, a dollar today is worth more than a dollar in the future.

A SIMPLE EXAMPLE

You win a raffle for \$1,000. You can either pick up the money today or in one year. A local bank pays 5% interest per year. Does it matter when you collect the prize money?

If you collect today, it is worth \$1,000 plus 5% of \$1,000 \rightarrow \$1,050 after one year.

If you collect in one year, it is still worth \$1,000 when you pick it up.

Obviously, take the money now!

HOW IMPORTANT IS THIS?

This is the *single most important* concept in this course, and a central theme in finance.

Finance applications:

- Stock valuation
- Bond valuation
- Project valuation
- Company valuation

Other applications:

- Buying a house
- Saving for retirement
- Pursuing an advanced degree

TO SUMMARIZE

A dollar today is worth more than a dollar in the future!



FUTURE VALUE AND COMPOUNDING

FUTURE VALUE

The amount an investment is worth after one or more periods.

RAFFLE EXAMPLE REVISITED

You win a raffle for \$1,000. A local bank pays 5% interest per year. You collect the money today and keep it at the bank for 1 year.

What do think the Future Value (FV) is?

$$\begin{aligned} FV &= \$1,000 + \$1,000 \times (0.05) \\ &= \$1,000 \times (1 + 0.05) \\ &= \$1,000 \times (1.05) \\ &= \$1,050 \end{aligned}$$

The future value of \$1,000 invested for one year at 5% is \$1,050.

RAFFLE EXAMPLE REVISITED

What if you collect the money and decide to keep it at the bank for *two* years?

What do think the Future Value (FV) is?

$$\begin{aligned}FV_{One\ Year} &= \$1,000 + \$1,000 \times (0.05) \\ &= \$1,000 \times (1 + 0.05) \\ &= \$1,000 \times (1.05) \\ &= \$1,050\end{aligned}$$

$$\begin{aligned}FV_{Two\ Years} &= \$1,050 + \$1,050 \times (0.05) \\ &= \$1,050 \times (1 + 0.05) \\ &= FV_{One\ Year} \times (1 + 0.05) \\ &= \$1,000 \times (1.05) \times (1.05) \\ &= \$1,102.50\end{aligned}$$

The future value of \$1,000 invested for two years at 5% is \$1,102.50.

COMPOUND INTEREST

We see from the example that we earn *interest on our interest* as well as interest on the original investment, the *principal*.

This is known as *compound interest*.

COMPOUNDING OVER MANY PERIODS

What if you collect the \$1,000 and decide to keep it at the bank for 10 years?

$$FV_{One\ Year} = \$1,000 \times (1.05)$$

$$FV_{Two\ Years} = \$1,000 \times (1.05) \times (1.05)$$

$$FV_{Three\ Years} = \$1,000 \times (1.05) \times (1.05) \times (1.05)$$

...

$$FV_{Ten\ Years} = \$1,000 \times (1.05)^{10} = \$1,628.89$$

CALCULATING THE FUTURE VALUE

$$FV = PV(1 + r)^t$$

The future value of a sum is equal to the value of the sum today (the present value or principal, PV) times 1 plus the interest rate r raised to the number of compounding periods t . The expression $(1 + r)^t$ is known as the *future value interest factor*.

PRACTICE PROBLEM: VACATION

You've just earned a bonus of \$2,000. You'd like to eventually take a nice vacation, and the total cost of the trip you want is \$3,200. The travel agency guarantees that price won't increase for the next 5 years. You found an investment that returns 9% per year. Will you be able to afford the trip with your bonus money before the price goes up?

$$FV = \$2,000(1 + 0.09)^5 = \$3,077.25$$

You can't afford the vacation!

PRACTICE PROBLEM: BIOLOGY

You've engineered a mutant gene that increases in size by 40% every month. It currently has a diameter of 2 nm. How big will the gene be after 8 months?

$$FV = 2 \text{ nm}(1 + 0.40)^8 = 29.52 \text{ nm}$$

Important: Notice that the rate and the compounding periods are the same unit - months.

SIMPLE INTEREST

If we do not allow interest to compound, the future value of our investment is much less, particularly for long periods.

Year	Beginning Amount	Simple Interest	Compound Interest	Total Interest Earned	Ending Amount
1	\$100.00	\$10	\$.00	\$10.00	\$110.00
2	110.00	10	1.00	11.00	121.00
3	121.00	10	2.10	12.10	133.10
4	133.10	10	3.31	13.31	146.41
5	146.41	<u>10</u>	<u>4.64</u>	<u>14.64</u>	161.05
Total		\$50	\$11.05	\$61.05	

TO SUMMARIZE

We calculate the *future value* of the *principal* by multiplying $1 + \text{the growth rate}$ raised to the number of compounding periods.



PRESENT VALUE AND DISCOUNTING

THE PRESENT VALUE

The current value of future cash flows *discounted* at the appropriate *discount* rate.

VACATION EXAMPLE REVISITED

You know you can invest your vacation money and earn 9% per year. How much money do you need to put into your investment today in order to have \$3,200 in 5 years?

$$FV = PV(1 + r)^t$$

$$\$3,200 = PV(1 + 0.09)^5$$

$$PV = \frac{\$3,200}{(1 + 0.09)^5}$$

$$PV = \$2,079.78$$

Thus, the present value of \$3,200 discounted back 5 years at 9% per year is \$2,079.78. Save this amount to afford your vacation.

DISCOUNTING

To *discount* is to calculate the value today of some future amount. The *discount rate* is the rate you used to calculate the present value.

Think of this as the opposite of *compounding*.

CALCULATING THE PRESENT VALUE

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

The present value of a sum is equal to the value of a sum in the future (the lump sum or future value, FV) divided by 1 plus the discount rate r raised to the number of discounting periods t . The expression $1/(1 + r)^t$ is known as the *present value interest factor*.

PRACTICE PROBLEM: FUNDING RETIREMENT BONUSES

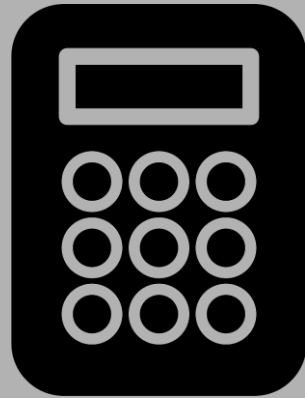
The board of directors of the company you work for approaches you with a problem. They estimate 17 employees will be retiring in exactly 8 years, and that each is due a retirement bonus of \$1,000 at that time. The board has a safe investment account where they can earn 4% per year. How much do they need to put into this account to be able to pay those retirement bonuses?

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

$$PV = \frac{17 \times \$1,000}{(1 + 0.04)^8} = \$12,421.73$$

TO SUMMARIZE

The present value is the *discounted* value of some future sum, which we find by dividing that value by $1 + \text{the discount rate}$ raised to the number of discounting periods.



APPLICATIONS

USING A FINANCIAL CALCULATOR: THE TI BA II PLUS

1. Display the maximum number of decimal places:

2ND → **FORMAT** → use arrows to navigate to **DEC** → **9** → **ENTER**

2. For now, make sure there is no “BGN” above your zero on your screen:

2ND → **BGN** → **2ND** → **SET**

3. Before each TVM problem, clear your work:

2ND → **CLR TVM**

4. Always remember to put a negative sign in front of cash outflows.

PRACTICE PROBLEM: LAWSUIT

You've been sued! You have to pay the \$10,000 settlement in 3 years. How much do you have to put away today if you can earn 3% at the bank per year?

This is a PV problem.

2ND → CLR TVM

N = 3 → the number of years

I/Y = 3 → the interest rate

FV = -10000 → the future value, a cash outflow

CPT PV = 9151.41

You should put away at least \$9,151.41.

PRACTICE PROBLEM: BUYING A MOTORCYCLE

The [Scout FTR 1200](#) is being released in 4 years and will cost \$13,000. You put \$11,000 in an investment that yields 8% annually. Will you be able to afford it when it's released?

This is a FV problem.

2ND → CLR TVM

N = 4 → the number of years

I/Y = 8 → the interest rate

PV = -11000 → the future value, a cash outflow

CPT FV = 14965.38

You'll have \$14,965.38, which is enough to pay for the \$11,000 bike.

PRACTICE PROBLEM: SAVING FOR COLLEGE

When you have your first child, you will put away \$30,000 to save for their college which you estimate will cost \$100,000 in 18 years. What annual rate of interest do you need to earn in order to be able to afford tuition at that time?

Here, find the interest rate.

2ND → CLR TVM

N = 18 → the number of years

PV = -30000 → the present value, a cash *outflow* (giving money to the bank)

FV = 100000 → the future value, a cash *inflow* (getting money from the bank)

CPT I/Y = 6.92

You'll need to save at an annual rate of 6.92%.

PRACTICE PROBLEM: TRICKY TIMELINES

How much do you need to invest in 3 years if you plan on having \$30,000 in 10 years? You'll invest at 12% per year.

This is a PV problem.

2ND → CLR TVM

$$N = 10 - 3 = 7$$

$$I/Y = 12$$

FV = 30000 → a cash inflow

CPT PV = -13,570.48 → a cash *outflow* that you are depositing in an investment account.

You'll need to put away \$13,570.48 in 3 years to have \$30,000 in 10 years.

PRACTICE PROBLEM: A SIGNING BONUS

In 2 years, you will graduate and your employer will give you a signing bonus of 10% of your \$48,000 salary. At that time, you plan on investing it at 4% per year until you have \$12,000, enough for you to take a 3 year backpacking trip. In how many years from now will you be able to afford this trip?

Here, find the number of years plus 2, the number of years until you get your signing bonus.

2ND → CLR TVM

PV = $-48000 * 10\% = -4800$ → a cash *outflow*

I/Y = 4

FV = 12000 → a cash *inflow*

CPT N = 23.36

You'll need to leave this in your account for 23.36 years, but you won't get your bonus for 2 more years. You can afford the trip in 25.36 years.



TAKEAWAYS

TAKEAWAYS

1. A dollar today is worth more than a dollar in the future.
2. The future value is a function of the present value, the interest rate, and the number of compounding periods.
3. The present value is a function of the future value, the discount rate, and the number of discounting periods.
4. Applications extend beyond just finance.

END.

DISCOUNTED CASH FLOW VALUATION

Chapter 6

OUTLINE

1. FV of Multiple Cash Flows
2. PV of Multiple Cash Flows
3. Annuities and Perpetuities
4. Interest Rates
5. Types of Loans

FV OF MULTIPLE CASH FLOWS

FV AND PV REVIEW

In the previous section, we've calculated the FV and PV for *one* lump sum using the following formulas:

$$FV = PV(1 + r)^t$$

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

But many investments have multiple cash flows:

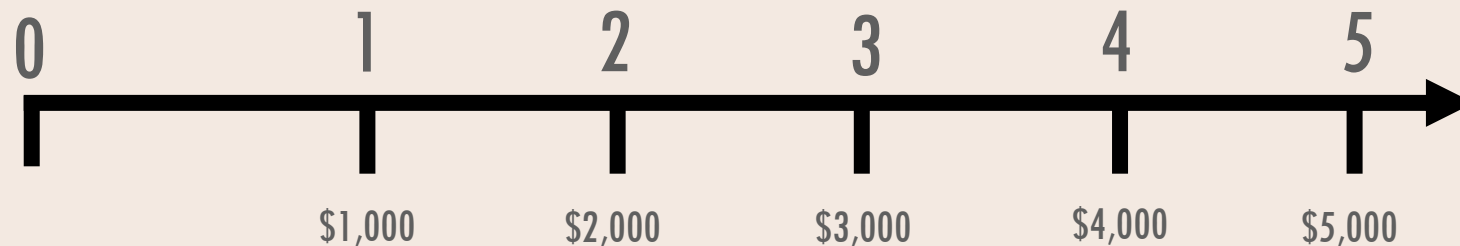
- Example: Costco builds a new store that results in sales each year for many years.

FV OF MULTIPLE CASH FLOWS

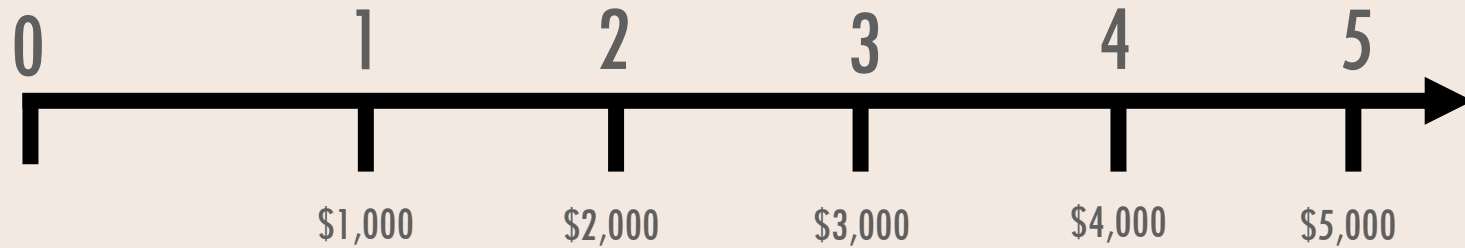
To find the FV of multiple sums over time, find the sum of the individual future values.

FV OF MULTIPLE CASH FLOWS: FIRST PAYMENT LATER

What is the value in 5 years of a series of 5 payments to a bank account earning 10% annually, assuming the payments start at \$1,000 and increase by \$1,000 each year? You make your first payment at the end of this year.



FV OF MULTIPLE CASH FLOWS: FIRST PAYMENT LATER



$$\$1,000 \times 1.1^4 = \$1,464.10$$

$$\$2,000 \times 1.1^3 = \$2,662.00$$

$$\$3,000 \times 1.1^2 = \$3,630.00$$

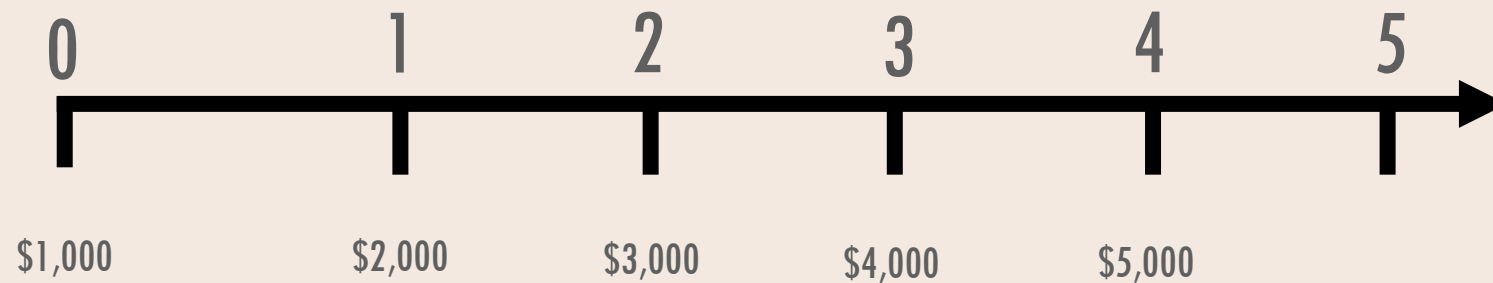
$$\$4,000 \times 1.1^1 = \$4,400.00$$

$$\$5,000 = \underline{\$5,000.00}$$

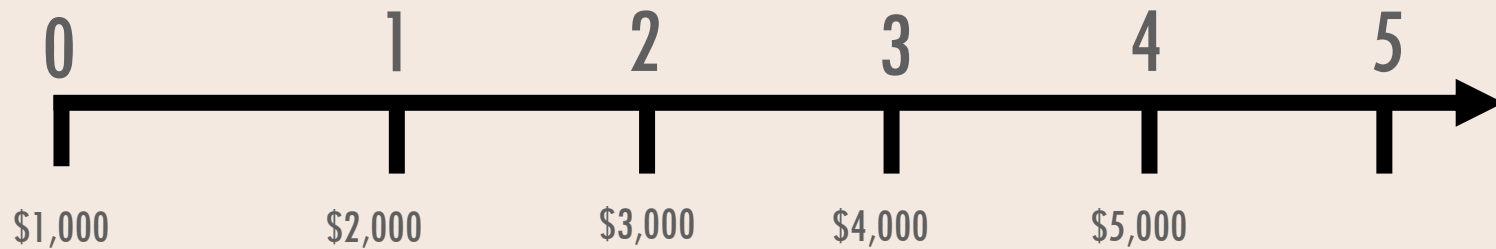
$$\underline{\$17,156.10}$$

FV OF MULTIPLE CASH FLOWS: FIRST PAYMENT TODAY

What is the value in 5 years of a series of 5 payments to a bank account earning 10% annually assuming the payments start at \$1,000 and increase by \$1,000 each year? You make your first payment at the beginning of this year.



FV OF MULTIPLE CASH FLOWS: FIRST PAYMENT TODAY



$$\$1,000 \times 1.1^5 = \$1,610.51$$

$$\$2,000 \times 1.1^4 = \$2,928.20$$

$$\$3,000 \times 1.1^3 = \$3,993.00$$

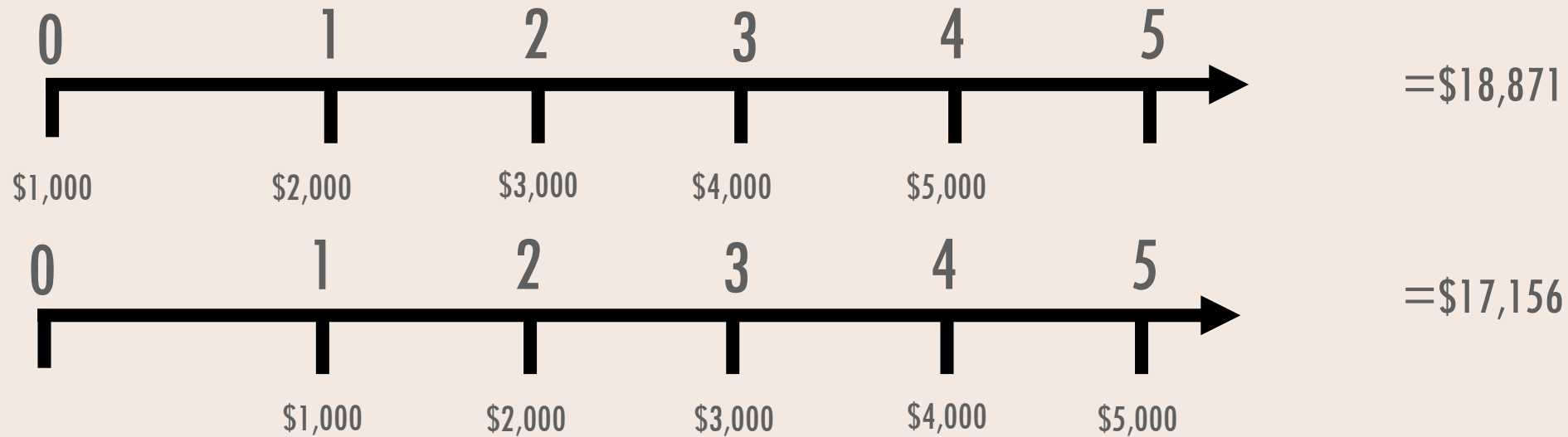
$$\$4,000 \times 1.1^2 = \$4,840.00$$

$$\$5,000 \times 1.1^1 = \underline{\$5,500.00}$$

$$\underline{\$18,871.71}$$

TIMING OF PAYMENT MATTERS!

In the two previous examples, the only thing that changed was the timing, and we had quite different results.



TO SUMMARIZE

The future value of a series of amounts is the sum of each amount's future value.

PV OF MULTIPLE CASH FLOWS

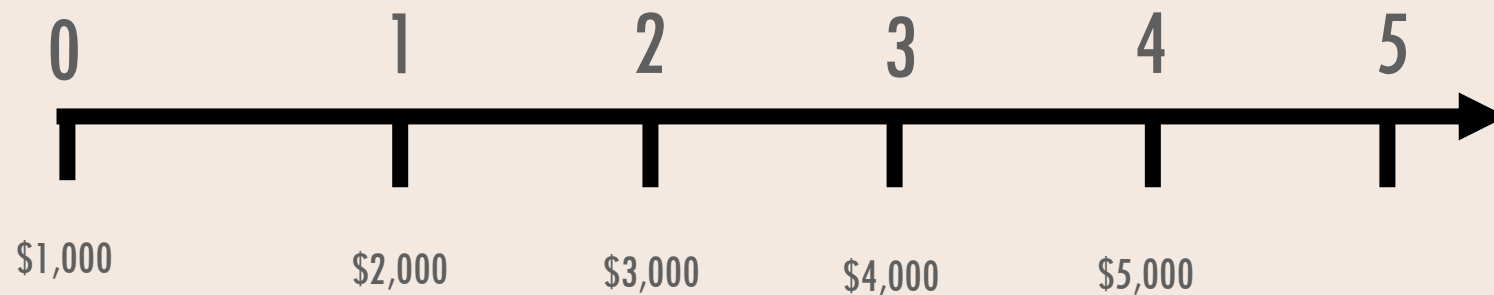
PV OF MULTIPLE CASH FLOWS

To find the PV of multiple sums over time, find the sum of the individual present values.

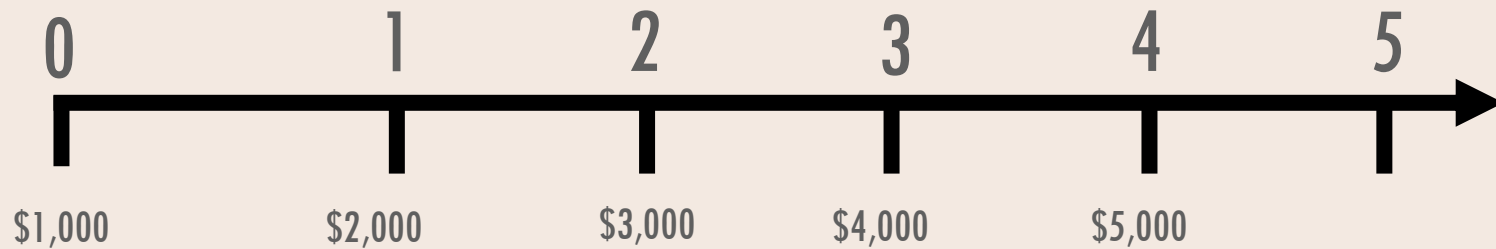
$$PV = \frac{FV}{(1 + r)^t}$$

PV OF MULTIPLE CASH FLOWS: FIRST PAYMENT TODAY

What is the value today of a series of 5 payments made to a bank account earning 10% annually assuming the payments start at \$1,000 and increase by \$1,000 each year? The first payment is at the beginning of this year.



PV OF MULTIPLE CASH FLOWS: FIRST PAYMENT TODAY



$$\$1,000 / 1.1^0 = \$1,000.00$$

$$\$2,000 / 1.1^1 = \$1,818.18$$

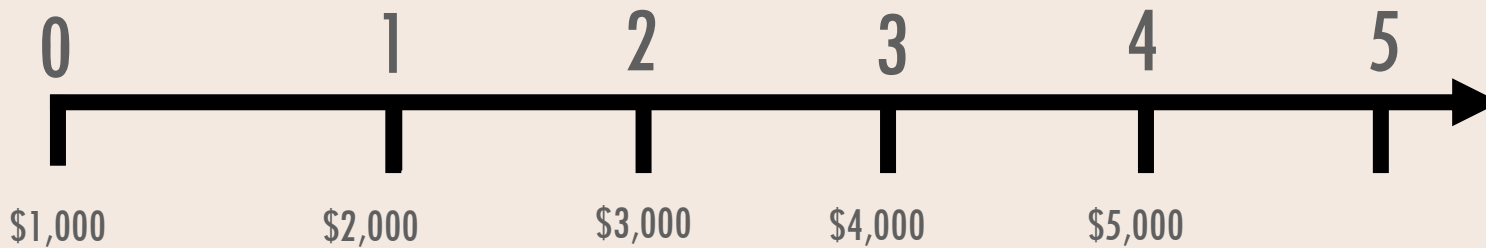
$$\$3,000 / 1.1^2 = \$2,479.34$$

$$\$4,000 / 1.1^3 = \$3,005.26$$

$$\$5,000 / 1.1^4 = \underline{\$3,415.07}$$

$$\underline{\$11,717.85}$$

PV OF MULTIPLE CASH FLOWS: CALCULATOR



CF

2ND CLR WORK

2ND CLR TVM

$CF_0 = 1000, C_01 = 2000, F_01 = 1, C_02 = 3000, F_02 = 1, \dots, C_04 = 5000, F_04 = 1$

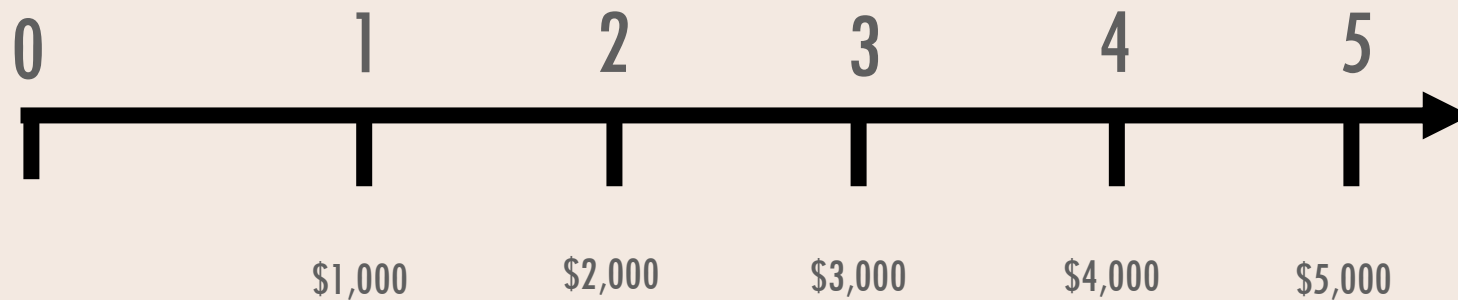
NPV

$I = 10$

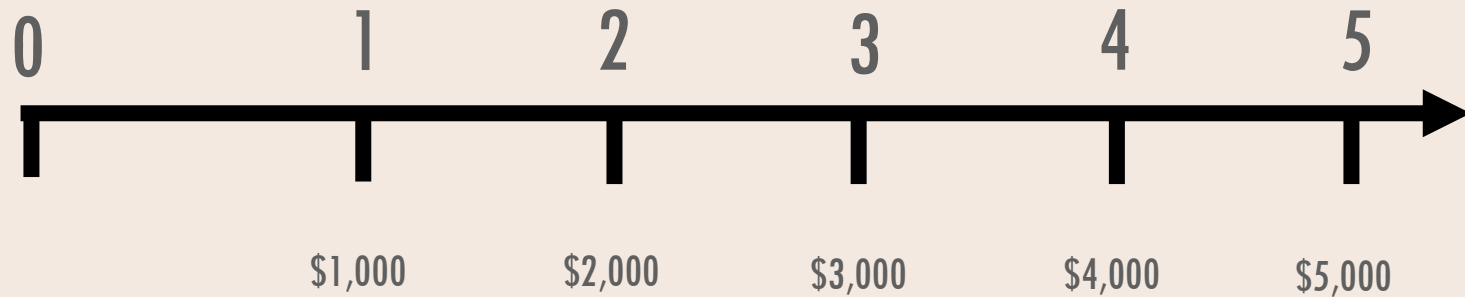
CPT NPV = 11,717.85

PV OF MULTIPLE CASH FLOWS: FIRST PAYMENT LATER

What is the value today of a series of 5 payments made to a bank account earning 10% annually assuming the payments start at \$1,000 and increase by \$1,000 each year? You make your first payment at the beginning of next year.



PV OF MULTIPLE CASH FLOWS: FIRST PAYMENT TODAY



$$\$1,000 / 1.1^1 = \$909.09$$

$$\$2,000 / 1.1^2 = \$1,652.89$$

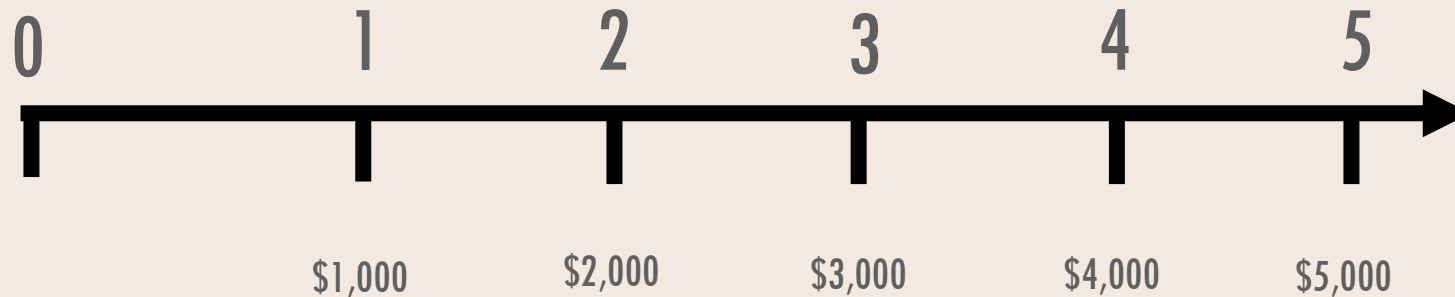
$$\$3,000 / 1.1^3 = \$2,253.94$$

$$\$4,000 / 1.1^4 = \$2,732.05$$

$$\$5,000 / 1.1^5 = \underline{\$3,104.61}$$

$$\underline{\$10,652.58}$$

PV OF MULTIPLE CASH FLOWS: CALCULATOR



CF

2ND CLR WORK

2ND CLR TVM

$CF_0 = 0, C_01 = 1000, F_01 = 1, C_02 = 2000, F_02 = 1, \dots, C_05 = 5000, F_05 = 1$

NPV

$I = 10$

CPT NPV = 10,652.58

TO SUMMARIZE

We find the present value of multiple future cash flows by discounting each of these cash flows to the present and summing them.

ANNUITIES AND PERPETUITIES

STEADY STREAM OF CASH FLOWS

In the previous examples, the future cash flows could vary in size. We now look at streams of cash flow where the cash flows for each period are the same, or grow by the same amount, each period.

ANNUITIES

A level stream of cash flows over a period of time that either doesn't change or grows at the same rate each period.

Ordinary Annuity: cash flows at the end of each period

Annuity Due: cash flows at the beginning of each period

ORDINARY ANNUITY EXAMPLE

There is an investment opportunity that promises to pay \$500 at the end of each of the next three years. If you want to earn 10%, what's the most you should pay for this investment?

Using the same method we've just learned:

$$PV = (\$500/1.1^1) + (\$500/1.1^2) + (\$500/1.1^3) = \$1,243.43$$

ORDINARY ANNUITY EXAMPLE

Because the payments are the same each year, we can use a formula:

$$\text{Ordinary Annuity PV} = C \times \frac{1 - [1/(1 + r)^t]}{r}$$

Where C is the payment amount.

ORDINARY ANNUITY EXAMPLE

Plugging in the values:

$$\begin{aligned} \text{Ordinary Annuity } PV &= C \times \frac{1 - [1/(1 + r)^t]}{r} \\ &= 500 \times \frac{1 - [1/(1 + 0.10)^3]}{0.10} \\ &= \$1,243.43 \end{aligned}$$

ORDINARY ANNUITY EXAMPLE

We can also calculate the PV of these cash flows in our calculator using the PMT key:

$$N=3$$

$$I/Y=10$$

$$PMT = 500$$

$$CPT PV = \underline{-\$1,243.43}$$

ORDINARY ANNUITY EXAMPLE 2

You want to purchase the new 256 GB Apple iPhone X that costs \$1,149. Assume that you put this on your Chase Freedom credit card, and you can only make the minimum monthly payment of \$20. This credit card charges 1.5% a month. How long until you pay off this phone?

$$PV=1149$$

$$I/Y=1.5$$

$$PMT=-20$$

$$CPT N = \underline{133 \text{ months}} \approx 11 \text{ years!}$$

ORDINARY ANNUITY EXAMPLE 3

Instead of buying that new iPhone, let's invest the \$20 a month in the stock market. You expect to earn about 1% a month. How much will you have after 11 years?

We can use the *FV of an Annuity* formula:

$$\begin{aligned} \text{Ordinary Annuity } FV &= C \times \frac{(1 + r)^t - 1}{r} \\ &= 20 \times \frac{(1 + 0.01)^{11 \times 12} - 1}{0.01} = 5,438 \end{aligned}$$

Verify in your calculator.

ANNUITIES DUE

Here, the first cash flow happens immediately and not at the end of the period.

There's a simple correction:

- (1) Calculate the PV or FV as an ordinary annuity
- (2) Multiply that PV or FV by $(1+r)$

In a calculator, switch the mode to BGN.

ANNUITIES DUE EXAMPLE

You want to save up for backstage passes for Beyoncé's upcoming concert. You'll deposit \$50 a month starting today. The concert is in 12 months, and you can save at 2% per month. Will you be able to afford the \$680 passes?

$$N=12$$

$$PMT=-50$$

$$I/Y=2\%$$

$$CPT FV = 670.60$$

$$\text{Then, } 670.60 \times (1 + 0.02) = \underline{\$684.02}$$

PERPETUITIES

An annuity in which the cash flows continue forever.

$$PV \text{ of a Perpetuity} = \frac{C}{r}$$

PERPETUITIES EXAMPLE

You are interested in buying preferred stock in a company that pays a \$3 dividend every quarter. Other companies similar to this one return about 2% every quarter. How much should you pay for the preferred stock?

$$PV \text{ of the Perpetuity} = \frac{3}{0.02} = \$150$$

PV OF GROWING ANNUITIES AND PERPETUITIES

You win a lottery that pays you \$200,000 at the end of this year. The amount paid each year increases by 5%, so in the 2nd year, you are paid \$210,000. In the 3rd year you are paid \$220,500, and so on for 20 years. What is the present value if we discount by 11%?

Use the formula:

$$\text{Growing annuity present value} = C \times \frac{1 - \left(\frac{1+g}{1+r}\right)^t}{r - g}$$

PV OF GROWING ANNUITIES AND PERPETUITIES

$$\begin{aligned} \text{Growing annuity present value} &= C \times \frac{1 - \left(\frac{1+g}{1+r}\right)^t}{r - g} \\ &= 200000 \times \frac{1 - \left(\frac{1+0.05}{1+0.11}\right)^{20}}{0.11 - 0.05} \\ &= 2,236,337.06 \end{aligned}$$

GROWING PERPETUITIES

$$\textit{Growing perpetuity present value} = \frac{C}{r - g}$$

GROWING PERPETUITIES EXAMPLE

You have a structured settlement, but you need cash now. You call J.G. Wentworth, 877-CASH-NOW. You explain that you will receive \$1,000 in the first year, which grows by 2% per year forever. J. G. Wentworth discounts these cash flows at 4%. How much cash will they give you now?

$$\begin{aligned} \text{Growing perpetuity present value} &= \frac{C}{r - g} \\ &= \frac{\$1,000}{0.04 - 0.02} = \$50,000 \end{aligned}$$

TO SUMMARIZE

Annuities and perpetuities involve steady cash flows over a period of time or cash flows that grow at a constant rate over time.


INTEREST RATES

INTEREST RATES AND COMPOUNDING

The *quoted* interest rate we see in car and mortgage commercials or on bank websites is generally expressed as an annual rate.

Retail Offers

2018 Ford F-150 XL
SuperCrew 101A
2.7L V6 EcoBoost



2.9% APR for 60 mos.
Ford Credit Financing
+
\$3,550
Cash Back
+
\$750
Ford Credit Bonus Cash

[* Disclaimer](#)
[Print](#)

Online Savings

★★★★★

Get more for your money.

1.60%
Annual Percentage Yield
All balance tiers.
No monthly maintenance fees.
24/7 customer care.

But how often the interest is *compounded* matters substantially.

INTEREST RATES AND COMPOUNDING

Example: You see your local bank is quoting a 10% return on an account that *compounds semiannually*. You put \$100 in this account. How much interest will you have earned (in percent) by the end of the year?

Because we have 2 six-month periods, the interest rate is $10/2 = 5\%$ for each period

For the first period: $\$100 \times 1.05 = \105

For the second period: $\$105 \times 1.05 = \110.25

The future value is \$110.25 which grew from \$100. This is a 10.25% increase, not a 10% increase!

APR, EAR, AND APY

The *annual percentage rate* (APR) is the quoted annual rate, or the interest rate charged per period times the number of periods over which it compounds.

The *effective annual rate* (EAR), or the *annual percentage yield* (APY) is the rate you actually pay or earn based on the compounding.

In the previous example, $APR = 10\%$ and $EAR = APY = 10.25\%$.

APR, EAR, AND APY EXAMPLE

You bank offers to pay you 12% compounded quarterly. What is the APR? What is the EAR? What is the APY?

$$\text{APR} = 12\%$$

For the first period:	$\$100 \times 1.03 = 103$
For the second period:	$\$103 \times 1.03 = 106.09$
For the third period:	$\$106.09 \times 1.03 = 109.2727$
For the fourth period:	$\$109.2727 \times 1.03 = 112.55088$

Thus, the $\text{EAR} = \text{APY} = 12.55\%$

APR, EAR, AND APY EXAMPLE (CALCULATOR)

You bank offers to pay you 12% compounded quarterly. What is the APR? What is the EAR? What is the APY?

$$\text{APR} = 12\%$$

In your calculator:

$$N = 4, I/Y = 12/4 = 3, PV = -100, \text{CPT } FV = 112.55088$$

Thus, the EAR = APY = 12.55%

APR, EAR, AND APY EXAMPLE 2

You bank offers to pay you 7% compounded daily on a loan that requires a minimum deposit of \$6,000. You put in exactly the minimum deposit. What is the APR? What is the EAR? What is the APY? What will be in the account after 2 years?

APR and EAR/APY

$$\text{APR} = 7\%$$

$$N = 365, I/Y = 7/365 = 0.019178082, PV = -100, \text{CPT FV} = 107.2501$$

$$\text{EAR} = \text{APY} = 7.25\%$$

Future Value

$$N = 365 \times 2 = 730, I/Y = 7/365 = 0.019178082, PV = -6000, \text{CPT FV} = \mathbf{\$6,901.55}$$

APR AND EAR CONVERSION

To directly convert a quoted APR to an EAR or APY:

$$EAR = \left[1 + \frac{APR}{m}\right]^m - 1$$

Where m is the number of compounding periods.

For *continuous* compounding:

$$EAR = e^{APR} - 1$$

CONVERSION EXAMPLES

Convert a quoted rate of 8% compounded weekly to an EAR.

$$EAR = \left[1 + \frac{APR}{m}\right]^m - 1$$

$$EAR = \left[1 + \frac{0.08}{52}\right]^{52} - 1 = 8.32\%$$

Convert a continuously compounded quoted rate of 14% to an EAR.

$$EAR = e^{APR} - 1$$

$$EAR = e^{0.14} - 1 = 15.03\%$$

REAL WORLD EXAMPLE

You want to purchase a new Porsche for \$74,500 and the finance office at the dealership quoted you an APR of 5.6% for a 48 month loan to buy the car. What will your monthly payments be? What is the EAR?

Monthly Payments

$N = 48, I/Y = 5.6/12 = 0.466667, PV = 74500, CPT \text{ PMT} = -1,736.00$

EAR

$EAR = [1 + (.056 / 12)]^{12} - 1 = 5.75\%$

TO SUMMARIZE

Interest rates are quoted in annual terms, often as an APR.
Understanding the number of compounding periods is important for knowing the actual rate we save or borrow at, the EAR or APY.

TYPES OF LOANS

PURE DISCOUNT LOANS

The simplest type of loan- you receive money today and pay back a lump sum in the appropriate number of periods.

Suppose you will receive a bonus of \$25,000 in five years, but you want money now. The bank charges 12% on loans. How much will they lend you today if you will pay back in five years the full \$25,000?

$$PV = \$25,000 / (1.12^5) = \$14,186$$

INTEREST-ONLY LOANS

Here, the borrower pays interest each period then the entire loan amount or principal in the future.

We will cover this when we get to *bond valuation* in the next chapter.

AMORTIZED LOANS

In an amortized loan, a portion of each payment includes interest and a principal reduction.

Mortgages, student loans, credit cards, and car notes are generally amortized loans.

MORTGAGE EXAMPLE

You want to obtain a \$400,000 loan to purchase a new home. As with most mortgages, the term is 30 years but payments (and compounding) is monthly. The interest rate the bank quotes you is 4.3% per year (the APR). What are your payments?

$$N = 30 \times 12 = 360, \quad I/Y = 4.3/12 = 0.35833333, \quad PV = 400000, \quad \text{CPT PMT} = -1979.49$$

You will pay **\$1,979.49** a month.

[Amortization schedule creator.](#)



TAKEAWAYS

TAKEAWAYS

1. We obtain the PV or FV of multiple cash flows by summing the PV or FV of each cash flow overtime.
2. The timing of the first payment in a series of cash flows matters.
3. Annuities have constant or constant growth payments overtime.
4. Perpetuities have a steady stream of payments forever.
5. The quoted return and the effective return are different due to compounding.

END.



INTEREST RATES AND BOND VALUATION

Chapter 7

OUTLINE

1. Introduction to Bonds and Bond Valuation
2. Bond Features and Definitions
3. Bond Markets, Inflation, and Interest Rates

INTRODUCTION TO BONDS AND BOND VALUATION

BONDS

A debt instrument issued by corporations or governments to borrow money for investments.

Generally an *interest-only* loan, with regular interest payments (called coupons) and the principal payment at the end.

AN EXAMPLE OF A CORPORATE BOND

The CFO of Coca-Cola would like to raise \$1,000,000 in debt financing to be repaid in 10 years. They will borrow at a rate of 8%. They'll sell 1,000 total bonds, so that each has a face value of \$1,000.



AN EXAMPLE OF A CORPORATE BOND

Year	0	1	2	3	4	5	6	7	8	9	10
Coupon		\$80	\$80	\$80	\$80	\$80	\$80	\$80	\$80	\$80	\$80
Face Value											\$1,000
Payment		<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$1,080</u>

Coupon: $8\% \times \$1,000 = \80 paid to the bond holder each year, where 8% is the *coupon rate*

Face Value, Principal, or Par = \$1000, or the amount borrowed and paid back in the final year for each bond.

HOW MUCH WOULD YOU PAY FOR THE BOND?

We can determine the value of the bond by combining:

1. The Present Value of the Coupons
2. The Present Value of the Principal

$$\text{Bond Value} = \left[C \times \frac{1 - \frac{1}{(1+r)^t}}{r} \right] + \frac{FV}{(1+r)^t}$$

But what is the discount rate? The coupon rate stays the same, but the interest rates in the market change.

YIELD TO MATURITY

The YTM is the rate required in the market on a bond, also called the *yield*.

The coupon rate is often different from the yield. When the value = principal, however, the coupon rate equals the yield.

The YTM can be thought of as the EAR.

AN EXAMPLE OF A CORPORATE BOND

What is the value of this bond *today* given that the prevailing interest rate in the market is 8%?

Year	0	1	2	3	4	5	6	7	8	9	10
Coupon		\$80	\$80	\$80	\$80	\$80	\$80	\$80	\$80	\$80	\$80
Face Value											\$1,000
Payment		<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$1,080</u>

PV of the Coupons:

$N = 10, PMT = 80, I/Y = YTM = 8, CPT PV = -536.81$

PV of the Face Value:

$N = 10, FV = 1000, I/Y = YTM = 8, CPT PV = -463.19$

Value of the Bond:

$536.81 + 463.19 = \$1,000$ or $N=10, FV = 1000, I/Y=YTM=8, PMT=80, CPT PV = -\$1,000$

AN EXAMPLE OF A CORPORATE BOND

Now assume one year has passed. Investors now demand a 10% yield for Coca-Cola bonds. What is the value of the bond now?

Year	0	1	2	3	4	5	6	7	8	9	10
Coupon		\$80	\$80	\$80	\$80	\$80	\$80	\$80	\$80	\$80	\$80
Face Value											\$1,000
Payment		<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$80</u>	<u>\$1,080</u>

PV of the Coupons:

$N = 9, PMT = 80, I/Y = YTM = 10, CPT PV = -460.72$

PV of the Face Value:

$N = 9, FV = 1000, I/Y = YTM = 10, CPT PV = -424.10$

Value of the Bond:

$460.72 + 424.10 = \$884.82$ or $N=9, PMT=80, FV=1000, I/Y=YTM=10, CPT PV = -\884.82

PREMIUM AND DISCOUNT BONDS

Discount Bonds sell for less than face value, or

D: Price < Par
and
D: Coupon % < YTM %

Premium Bonds sell for more than face value, or

P: Price > Par
and
P: Coupon % > YTM %

SEMIANNUAL COUPONS

In practice, coupons are paid twice a year.

Pepsi raised \$1,000,000 in debt financing, and 7 years are left on this debt issue. The YTM on these bond are 16% and the coupon rate is 14%. 1,000 bonds were sold, so that each has a face value of \$1,000. Payments are made semiannually. What is the value today for these bonds?



SEMIANNUAL COUPONS

The coupon rate is like an APR- a bond holder will receive $14\%/2 = 7\%$ (or $\$1000 \times 0.07 = \70) each period. There are $2 \times 7 = 14$ periods. The discount rate is the $YTM/2 = 16\%/2 = 8\%$

Year	0	1	2	3	...	12	13	14
Coupon		\$70	\$70	\$70	\$70	\$70	\$70
Face Value							\$1,000
Payment		<u>\$70</u>	<u>\$70</u>	<u>\$70</u>	<u>\$70</u>	<u>\$70</u>	<u>\$1,070</u>

PV of the Coupons

$N = 14, PMT = 70, I/Y = 8, CPT PV = -577.10$

PV of the Face Value

$N = 14, FV = 1000, I/Y = 8, CPT PV = -340.46$

Value of the Bond

$577.10 + 340.46 = \$917.56$

PRICE AND YIELDS

Bond price and yield (or interest rates) always move in *opposite* directions.

As YTM increases, bond price falls.

As YTM decreases, bond price rises.

FINDING A BOND YIELD

To find a bond yield given the other characteristics of the bond, we have to rely on trial and error.

FINDING A BOND YIELD

Example: Suppose you are quoted \$955.14 for a 6 year, 8% annual coupon bond. To determine the YTM, plug in $C = 80$, $t=6$, $FV = 1000$, and $\text{Bond Value} = 955.14$ into the equation below. Then plug in guesses for r until both sides equate.

$$\text{Bond Value} = \left[C \times \frac{1 - \frac{1}{(1+r)^t}}{r} \right] + \frac{FV}{(1+r)^t}$$

Because this is a discount bond, your guess should start above 8%. This one is just under 9%).

You can also use the yield on similar bonds as a starting point.

CURRENT YIELD

The annual coupon divided by the current bond price. This is the effective rate of interest for a bond at its current price. This is the actual income rate of return as opposed to the coupon rate or YTM.

$$\text{Current Yield} = \frac{\text{Annual Coupon}}{\text{Bond Price}}$$

CURRENT YIELD EXAMPLE

Assume you buy that Coca-Cola bond for \$955.14. The coupons are \$80. What is the income rate of return (that is, what is the coupon relative to the bond price)?

$$\text{Current Yield} = 80/955.14 = 8.38\%$$

Notice that the current yield doesn't take into account if the bond is selling at a discount or premium.

TO SUMMARIZE

Bonds are debt instruments. We value bonds by using present value techniques, discounting at the YTM.

BOND FEATURES AND DEFINITIONS

REVIEW OF SECURITIES

Corporations issue both *equity* and *debt* securities

EQUITY: represent ownership interest with a residual claim

DEBT: represent something that must be repaid

These are stock (equity) and bonds (debt).

Corporations issuing bonds are borrowing and are called **DEBTORS**. Those that hold the bond and are getting repaid are **CREDITORS** or lenders.

EXAMPLE OF SECURITIES

TJX Companies (TJX): TJ Maxx, HomeGoods, Marshalls



Visit finra-markets.morningstar.com to see at what price the *equity* shares are trading and to explore the *debt* offerings (the bonds).

DEBT VS. EQUITY

1. Debt is not ownership interest in the firm. Creditors only get back money according to the terms of the lending agreement.
2. Interest payments are tax deductible (unlike dividends) because it is a cost of doing business.
3. Unpaid debt is a liability to the firm. Equity is not a liability and unpaid dividends do not need to be paid.

DEBT VS. EQUITY EXAMPLE

Let's look at TJX's income statement and balance sheet.

1. Where is the interest expense on the income statement? The dividends?
2. Where is debt on the balance sheet?

DEBT VS. EQUITY EXAMPLE

The TJX Companies, Inc.

CONSOLIDATED STATEMENTS OF INCOME

Amounts in thousands except per share amounts	Fiscal Year Ended		
	February 3, 2018	January 28, 2017	January 30, 2016
	(53 weeks)		
Net sales	\$35,864,664	\$33,183,744	\$30,944,938
Cost of sales, including buying and occupancy costs	25,502,167	23,565,754	22,034,523
Selling, general and administrative expenses	6,375,071	5,768,467	5,205,715
Impairment of goodwill and other long-lived assets, related to Sierra Trading Post ("STP")	99,250	—	—
Loss on early extinguishment of debt	—	51,773	—
Pension settlement charge	—	31,173	—
Interest expense, net	31,588	43,534	46,400
Income before provision for income taxes	3,856,588	3,723,043	3,658,300
Provision for income taxes	1,248,640	1,424,809	1,380,642
Net income	\$ 2,607,948	\$ 2,298,234	\$ 2,277,658
Basic earnings per share:			
Net income	\$ 4.10	\$ 3.51	\$ 3.38
Weighted average common shares – basic	636,827	655,647	673,484
Diluted earnings per share:			
Net income	\$ 4.04	\$ 3.46	\$ 3.33
Weighted average common shares – diluted	646,105	664,432	683,251
Cash dividends declared per share	\$ 1.25	\$ 1.04	\$ 0.84

DEBT VS. EQUITY EXAMPLE

The TJX Companies, Inc.

CONSOLIDATED BALANCE SHEETS

	Fiscal Year Ended	
	February 3, 2018	January 28, 2017
Amounts in thousands except share amounts		
ASSETS		
Current assets:		
Cash and cash equivalents	\$ 2,758,477	\$ 2,929,849
Short-term investments	506,165	543,242
Accounts receivable, net	327,166	258,831
Merchandise inventories	4,187,243	3,644,959
Prepaid expenses and other current assets	706,676	373,893
Total current assets	8,485,727	7,750,774
Net property at cost	5,006,053	4,532,894
Non-current deferred income taxes, net	6,558	6,193
Goodwill	100,069	195,871
Other assets	459,608	398,076
TOTAL ASSETS	\$ 14,058,015	\$ 12,883,808
LIABILITIES		
Current liabilities:		
Accounts payable	\$ 2,488,373	\$ 2,230,904
Accrued expenses and other current liabilities	2,522,961	2,320,464
Federal, state and foreign income taxes payable	114,203	206,288
Total current liabilities	5,125,537	4,757,656
Other long-term liabilities	1,320,505	1,073,954
Non-current deferred income taxes, net	233,057	314,000
Long-term debt	2,230,607	2,227,599
Commitments and contingencies (See Note L and Note N)		
SHAREHOLDERS' EQUITY		
Preferred stock, authorized 5,000,000 shares, par value \$1, no shares issued	—	—
Common stock, authorized 1,200,000,000 shares, par value \$1, issued and outstanding 628,009,022 and 646,319,046, respectively	628,009	646,319
Additional paid-in capital	—	—
Accumulated other comprehensive income (loss)	(441,859)	(694,226)
Retained earnings	4,962,159	4,558,506
Total shareholders' equity	5,148,309	4,510,599
TOTAL LIABILITIES AND SHAREHOLDERS' EQUITY	\$ 14,058,015	\$ 12,883,808

LONG-TERM DEBT

Debt securities with maturities greater than one year.

Typically, debt with maturities less than 10 years are called **NOTES** while debt with maturities longer than 10 years are called **BONDS**.

Long term debt can be **PRIVATELY PLACED** (not offered to the public) and **PUBLIC-ISSUED** (offered to the public).

THE INDENTURE

The written agreement between the corporation and the lender that details the terms.

A legal document that includes:

- General terms of the bond

- The amount issued

- Description of property used as collateral (what the lenders get if the borrowers default- your house if you have a mortgage!)

- Repayment arrangements

GENERAL TERMS OF THE BOND

REGISTERED (payment made to the registered holder) or **BEARER** (payment made to the holder-can be easily stolen).

DEBENTURE (unsecured debt with a claim only on property not pledged elsewhere) or **COLLATERALIZED** (backed by property).

SENIORITY (if you hold *subordinated* debt, the *senior* debt gets paid back first in the event of a default)

SINKING FUNDS (a fund established by the borrower with the **TRUSTEE**, a bank or intermediary that handles the account, to retire debt that it doesn't need to issue)

GENERAL TERMS OF THE BOND CONT.

CALL PROVISIONS: allow the borrower to pay a set price for a bond, often higher than the face value, the call premium, in order to recall your bond and no longer make payments.

PROTECTIVE COVENANTS: rules for borrower, such as limiting dividends, maintaining a certain level of working capital, restrictions for issuance of more debt, etc.

BOND RATINGS

Moody's, Fitch, and Standard & Poor's (S&P) rate bonds based on their probability of default.

Lenders generally require that bonds with low ratings pay higher yields.

INVESTMENT GRADE bonds are higher quality than **SPECULATIVE GRADE (JUNK) BONDS**

Moody's		S&P		Fitch		Rating description		
Long-term	Short-term	Long-term	Short-term	Long-term	Short-term			
Aaa	P-1	AAA	A-1+	AAA	F1+	Prime	Investment-grade	
Aa1		AA+		AA+		High grade		
Aa2		AA		AA		Upper medium grade		
Aa3		AA-		AA-				
A1	P-2	A+	A-1	A+	F1	Upper medium grade		
A2		A		A				
A3	P-2	A-	A-2	A-	F2	Lower medium grade		
Baa1		BBB+		BBB+				
Baa2	P-3	BBB	A-3	BBB	F3	Lower medium grade		
Baa3		BBB-		BBB-				
Ba1	Not prime	BB+	B	BB+	B	Non-investment grade speculative	Non-investment grade AKA high-yield bonds AKA junk bonds	
Ba2		BB		BB				
Ba3		BB-		BB-				
B1		B+		B+				
B2		B		B				
B3		B-		B-				
Caa1		C	CCC+	C	CCC	C		Substantial risks
Caa2			CCC					Extremely speculative
Caa3			CCC-					Default imminent with little prospect for recovery
Ca			CC					
C	D	/	/	DDD	/	In default		
/				DD				
/				D				

US GOVERNMENT BONDS

Issued by the US government, the largest borrower in the world.

TREASURY BILLS (called **T-BILLS**) have a maturity of less than a year.

TREASURY NOTES have maturities between 1 and 10 years.

TREASURY BONDS have maturities greater than 10 years.

Assumed that there is no default risk- they print money.

MUNICIPAL BONDS

Issued by state and local governments, but *can* default.

The coupon payments made to lenders are exempt from federal income taxes, making it an attractive investment for high-tax bracket investors.

ZERO COUPON BONDS

Don't make coupon payments: simply sell for a discount and are paid back in full at the maturity.

You still pay taxes as if you were receiving coupons.

TO SUMMARIZE

Bonds are debt securities. The bond holder is the lender. The indenture provides terms and provisions for the bond. Rating agencies evaluate default risk. The federal and local governments also borrow money through bonds.

[finra-markets.morningstar.com](https://www.finra-markets.morningstar.com)

BOND MARKETS, INFLATION, AND INTEREST RATES

BOND MARKETS


Bonds are traded *over the counter* (OTC), meaning that *dealers* buy and sell bonds from various parties.

BID- the price the dealer will pay you for a bond

ASK- the price at which the dealer will sell you a bond

BID-ASK SPREAD- the positive difference between the bid and ask prices

U.S. TREASURY QUOTES

U.S. Treasury Quotes					
TREASURY NOTES & BONDS					
GO TO: Bills					
Monday, June 11, 2018		Find Historical Data  WHAT'S THIS?			
<p>Treasury note and bond data are representative over-the-counter quotations as of 3pm Eastern time. For notes and bonds callable prior to maturity, yields are computed to the earliest call date for issues quoted above par and to the maturity date for issues below par.</p>					
Maturity	Coupon	Bid	Asked	Chg	Asked yield
11/15/2020	1.750	97.9922	98.0078	-0.0938	2.603
11/15/2020	2.625	100.0078	100.0234	-0.1016	2.615
11/30/2020	1.625	97.6328	97.6484	-0.0859	2.615
11/30/2020	2.000	98.5391	98.5547	-0.0703	2.609
12/15/2020	1.875	98.2188	98.2344	-0.0703	2.607
12/31/2020	1.750	97.8594	97.8750	-0.0703	2.617
12/31/2020	2.375	99.3828	99.3984	-0.0781	2.620
1/15/2021	2.000	98.4297	98.4453	-0.0703	2.624
1/31/2021	1.375	96.8047	96.8203	-0.0859	2.631
4/15/2021	2.125	98.7024	98.7180	-0.0704	2.624

http://www.wsj.com/mdc/public/page/2_3020-treasury.html

Looking at the first row:

MATURITY = 11/15/2020

COUPON RATE = 1.750%, but semiannual payments of $1.750/2 = 0.875\%$

BID = the dealer will pay you is 97.99% of par

ASKED = you'll have to pay the dealer 98.0078% of par to purchase

CHG = this bond's ask price fell 0.0938% from yesterday

ASKED YIELD = the YTM based on Asked price

REAL AND NOMINAL INTEREST RATES

NOMINAL INTEREST RATES have not been adjusted for inflation.

REAL INTEREST RATE *have* been adjusted for inflation.

REAL AND NOMINAL RATES EXAMPLE

You are throwing a Super Bowl party in exactly one year. You plan on buying several Little Caesar's Hot -N- Ready Pizzas for \$5 each. You put exactly \$100 in an investment today that returns 15.5% annually.

How many pizzas can you afford for the Super Bowl? Assume an inflation rate of 5%.

If we purchased pizzas today, it would be 20 pizzas.

Investment growth: $\$100 \times 1.155 = \115.50

Pizza price: $\$5 \times 1.05 = \5.25

Pizza purchase: $\$115.50 / \$5.25 = 22$ pizzas

We could have bought 23 pizzas if no inflation.

REAL AND NOMINAL RATES EXAMPLE

So, even though our investment grew at 15.5%, our purchasing power only grew by:

$$\frac{22 \text{ pizzas} - 20 \text{ pizzas}}{20 \text{ pizzas}} = 10\%$$

Thus, the **REAL RATE** of return on my investment is 10%, whereas the **NOMINAL RATE** is 15.5%.

Put another way:

The **NOMINAL RATE** on an investment is the % change in dollars you have.

The **REAL RATE** on an investment is the % change in how much you can buy.

REAL AND NOMINAL RATES EXAMPLE

To determine the purchasing power of our investment, we can *deflate* our future investment value by dividing it by $(1 + \text{Inflation})$:

$$\text{\$115.50} / 1.05 = \text{\$110}$$

This means our purchasing power in one year will actually be **\\$110** in today's dollar terms.

$$\text{\$110 in today's terms} / \text{\$5 cost in today's terms} = 22 \text{ pizzas}$$

THE FISHER EFFECT

Named after the economist Irving Fisher, a relationship between nominal rates (R), real rates (r), and the inflation rate (h).

$$1 + R = (1 + r) \times (1 + h)$$

$$R \approx r + h$$

THE FISHER EFFECT EXAMPLE

You want to withdraw \$25,000 of *purchasing power* each year for the next 3 years to finance your child's college tuition. How much do you need to invest today in an account earning 10% to be able to do this? Assume inflation of 4% per year.

1. We can discount *nominal* cash flows at the *nominal* rate.
2. We can discount *real* cash flows at the *real* rate.
3. (1) and (2) above will be equal.

(1) NOMINAL CASH FLOWS AT THE NOMINAL RATE

We want \$25,000 in purchasing power, so the nominal withdrawals should be:

$$C_1 = \$25,000 \times 1.04^1 = \$26,000$$

$$C_2 = \$25,000 \times 1.04^2 = \$27,040$$

$$C_3 = \$25,000 \times 1.04^3 = \$28,121.60$$

And the PV at the nominal rate of 10% is:

$$PV = 26000/1.10^1 + 27040/1.10^2 + 28121.60/1.10^3 = \$67,112$$

(2) REAL CASH FLOWS AT THE REAL RATE

First find the real rate:

$$\begin{aligned}1 + R &= (1 + r) \times (1 + h) \\1 + 0.10 &= (1 + r)(1 + 0.04) \\r &= 0.0577\end{aligned}$$

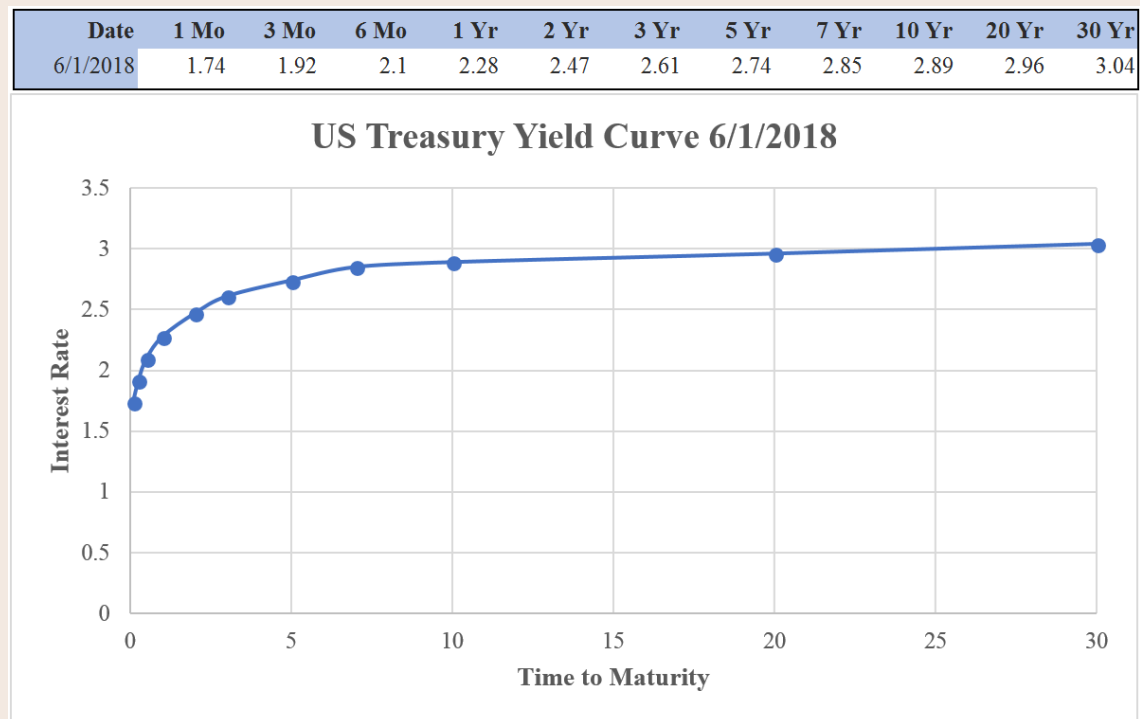
Now, find the PV at this rate.

$$N = 3, I/Y = 5.76923, PMT = 25000, CPT PV = \$67,112$$

As expected, the two methods yield the same result.

THE TERM STRUCTURE OF INTEREST RATES

The relationship between interest rates and time to maturities.



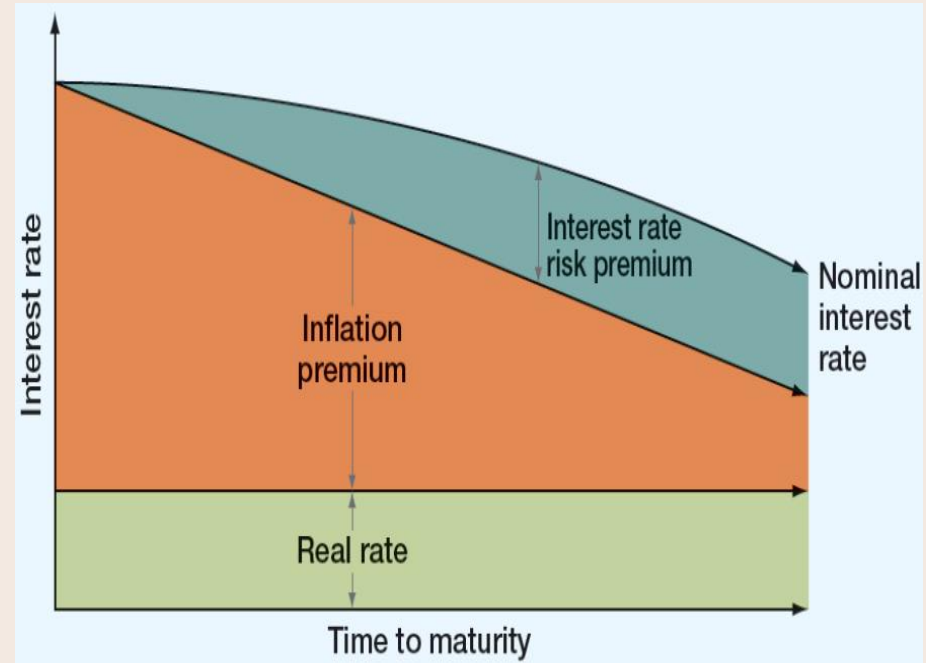
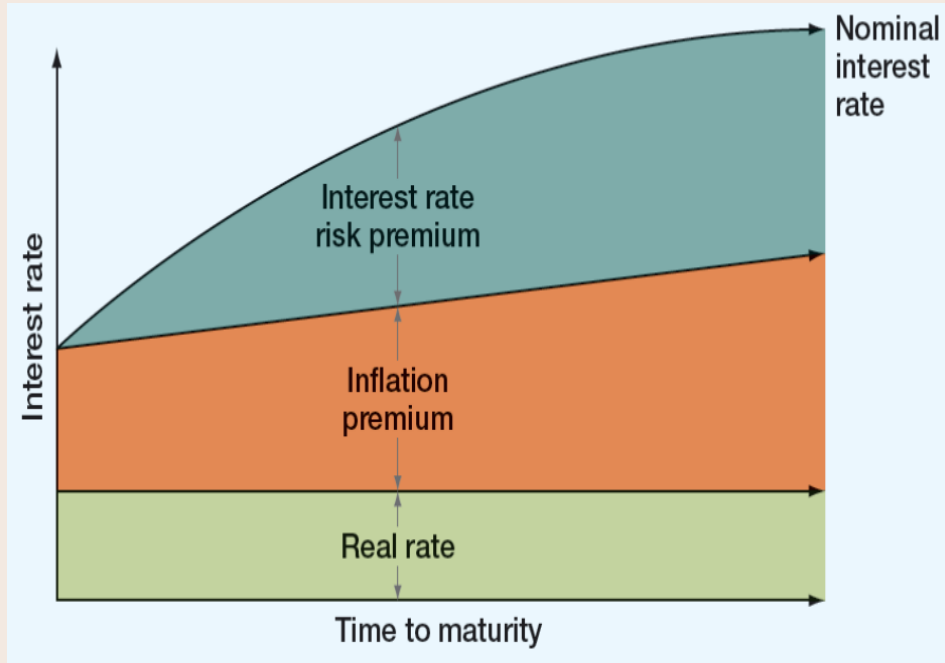
COMPONENTS OF THE TERM STRUCTURE

There are three components of the term structure:

1. **REAL RATE OF INTEREST**- what investors require for forgoing the use of their money.
2. **INFLATION PREMIUM**- compensation for the loss of purchasing power.
3. **INTEREST RATE RISK PREMIUM**- compensation for holding long-term bonds and bearing the risk of loss resulting from a change in interest rates.

The term structure can be upward or downward sloping (perhaps due to beliefs that inflation is falling).

COMPONENTS OF THE TERM STRUCTURE



TO SUMMARIZE

Bonds are traded over the counter. Real Rates consider *purchasing power* whereas Nominal Rates consider the growth in *dollars*. The term structure of interest rates is comprised of the real rate of interest, the inflation premium, and the interest rate risk premium.



TAKEAWAYS

TAKEAWAYS

1. Bonds are debt instruments issued to raise money for projects.
2. The value of a bond is found by finding the present value of the coupons and adding it to the present value of the lump sum payment at the end.
3. The Yield to Maturity is the rate required in the market on a bond.
4. The indenture includes many bond terms, including who is paid first and restrictions on borrowing.
5. Real rates are found by removing the affects of inflation from the interest rate.

END.