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investment research

Basic Financial Training (BFT) Textbook
2nd Edition (2022)

Lecture notes by three under-qualified undergraduates:
Nathan Nangia, Evan Xiang, and Mingda Zhang

Authors' Letter

Dear New Recruits,

Welcome to Promontory Investment Research (PIR)! After a long and arduous interview process, we are excited to welcome you to our flagship program, Basic Financial Training (BFT).

The purpose of BFT is simple: to provide you with a rigorous, intuitive, and relatively comprehensive overview of fundamental analysis. As a result of these lofty goals and initially counter-intuitive material, the program is difficult and accelerated. To ease this burden, we have taken the time to author these notes. This first edition covers more material than lectures—it has additional examples, analogies, and alternative explanations. Lectures and the *BFT Textbook* should be used in tandem—do not rely on one or the other alone.

Despite our best intentions, these notes are a first edition. They are not comprehensive and likely have the occasional confusing explanation. Some other excellent resources include Mckinsey's Valuation, Investopedia, Warren Buffet's Essays, and Professor Aswath Damodaran's blog. Our textbook is mostly a reframing and condensing of key points from these resources (and others).

Next, it is important to discuss the outcomes of BFT, what we hope you walk away with. On the surface, the course will teach you all the concepts and skills required to author your own equity research report. However, this goal is secondary; the primary goal is to build a rigorous intuition. Much like introductory major classes seek to teach that major's approach (ECON 200 teaches the "economic approach," STAT 244 teaches "statistical methods", etc.), we aim to teach you the fundamental investor's approach. Investing is truly an interdisciplinary study—the fundamental investor's approach has groundings in economics, statistics, psychology, mathematics, and more. Thus, we aim to teach you just enough economics, competitive strategy, and accounting in a general enough way to think about the world. The course tries to introduce another way of thinking to your hopefully active examination of the world around you. Ultimately, BFT should be a test of intellectual curiosity; it aims to challenge the way you currently think with economics, financial theory, and competitive strategy as its basis.

Finally, it is imperative that we thank all those who helped us write these notes. We would like to thank James Chou '22, Victoria Gin '22, Akshat Jain '22, Mairead King '21, Akash Lohumi '22, and other members of Promontory for their extensive comments, guidance, and help. This course would not have been possible without you.

We look forward to teaching you and hope you enjoy the course,
Nathan Nangia '21, Evan Xiang '21, and Mingda Zhang '21

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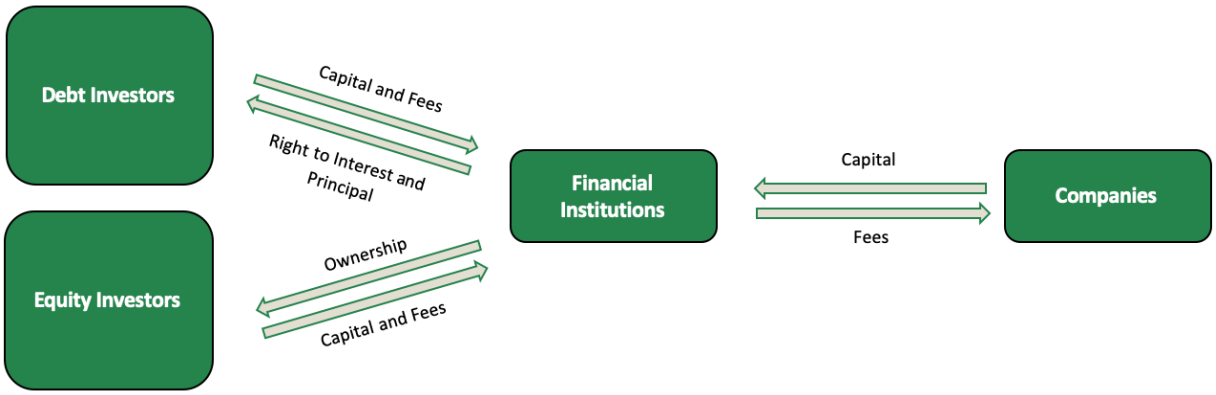
Module 1 — Overview of Financial Industry; Financial Accounting

Introduction to Finance —

The world of finance is made up of many different entities, from retail investors, commercial banks, and everyone's favorite Greenwich hedge funds to the US Treasury and Federal Reserve. However, on the most macro level, the financial sector exists due to the simple fact that individuals, businesses, and government entities require funding to operate.



Off the bat, the easiest way to understand the financial sector as an aspiring capitalist is by distinguishing between **buy-side** and **sell-side**. Sell-side refers primarily to financial institutions like Goldman Sachs and J.P. Morgan Chase that "sell" their investment banking services to help companies raise capital from investors, such as mutual funds, institutional investors, hedge funds, insurance companies, endowments, and pension funds. Buy-side refers to investors on the other side of the transaction, like Blackrock and Vanguard, who "buy" the securities. Overall, companies want funding for their projects, investors want to invest their capital into these companies, and financial institutions are mediating the transactions between companies and investors. So what exactly are these securities being issued and bought? Two types of funding: debt and equity.

A **bond** is a very commonly used debt security, an IOU where typically an investor pays an upfront sum of money to a company in exchange for a series of fixed coupon payments along with a fixed principal at the end of the bond's lifespan. There are three main types of bonds: corporate, municipal, and government bonds. Corporate bonds are debt securities issued by private and public corporations; municipal bonds ("munis") are debt securities issued by states, cities, counties and other government entities; and U.S. Treasuries are issued by the U.S. Treasury Department. While there is no such thing as risk-free, Treasury bonds are considered risk-free due to the stability of the US economy and the global prevalence of the US dollar; however, in general, bonds are differentiated by their yield to maturity (taking into consideration its face value, coupon rate, and maturity date relative to other bonds on the market and the general interest rate environment) and credit rating.

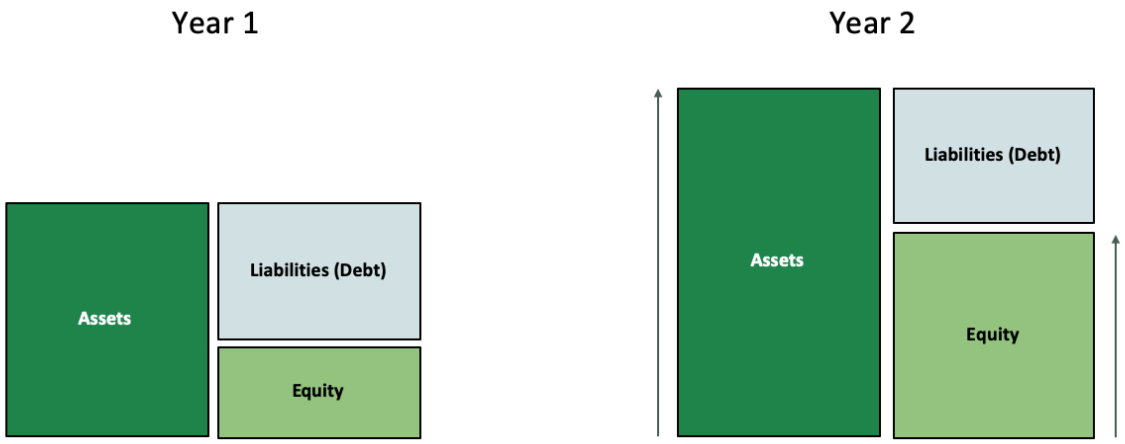
$$\text{Price of Bond} = \frac{\text{Year 1 Coupon}}{YTM} + \frac{\text{Year 2 Coupon}}{YTM^2} + \frac{\text{Year 3 Coupon + Principal}}{YTM^3}$$

Why issue / invest in bonds? On the issuer side (debtors), governments need to fund the construction of roads, schools, dams and other infrastructure. Companies need to buy property and equipment, fund mergers and acquisitions, and fund research and development. On the investor side (creditors), bonds provide a predictable income stream due to its reliability and can diversify an equity-heavy portfolio as bonds tend to do well when the stock market declines. The interest rates on bonds are also typically greater than the deposit rates paid by banks on savings accounts. However, as countries like Europe and Japan have implemented zero or negative interest rates in recent years, it has led to the creation of bonds that have sub-zero yields. Bond yields in negative territory mean that bonds return less money at maturity than the original purchase price and that creditors are losing money off their investment rather than generating a return. Investors are essentially paying bond issuers to issue bonds to them. While unintuitive, the rationale for investors still paying for these negative-return bonds include strict asset allocation requirements, the view of bonds as safe haven assets, and more speculatively, a hedge against deflation or the view that yields will continue to fall so the price on these relatively-not-as-negative yield bonds will rise. The Federal Reserve has yet to move America into negative territory and has verbally rejected sub-zero rates thus far, but the future is uncertain.

An **equity**, or a stock, is the ownership right to a portion of a company. Stocks are generally first issued by companies to select investors during an Initial Public Offering (IPO) in the primary market. Each share gives the holder the right to a certain percentage of the company's equity. Afterwards, stocks are traded between buyers and sellers in the secondary market on stock exchanges like NYSE and Nasdaq, and everyday supply and demand determines the company's ongoing stock price. Owners of stock are called stockholders (or shareholders or equity holders) and they are entitled to the entirety of a company's cash flows after all debt holders have been paid. Because of this, equity holders sit at the bottom of the capital structure. In the case of a bankruptcy, creditors who own company bonds usually get at least some of their money back, while shareholders often lose their entire investment.

Why issue / invest in equity? For companies, it's often the access to liquidity from the public markets. There is also less of a financial responsibility on the company's part to pay back its investors than what exists with bonds. For shareholders, through owning stock in a company there is the potential for **capital gains** (the share price

increases relative to the price it was bought at) as well as **dividends** (company pays shareholders for holding its stock). Over the last century, the S&P 500, an index of the 500 largest companies by market capitalization traded on the US stock exchanges, averaged an annual return of 10%, compared to bond returns of 5-6%. Public equities are generally very liquid, available to any and all retail investors to buy/sell daily on the stock exchanges through trading platforms like TD Ameritrade and Robinhood.



Most companies start out as private and become a public company through an IPO, but any public company can also sell out its public shares and go private. As a private company, there is more discretion by upper management and avoidance of certain reporting and regulatory requirements. Going public means immediate equity funding for the company, but the company is now beholden to these shareholders beyond management and the stress of quarterly performance. In the case where a private company seeks funding but does not want to go public, it can seek out private equity investors. **Private equity** is an alternative form of financing outside of the public markets in which funds and investors directly invest in companies or engage in company buyouts. Companies may favor private markets as an alternative access to liquidity removed from the heavy scrutiny of the public markets and due to the activist roles PE investors often take on to help the company grow. However, private markets are less liquid because there are no daily market flows driving supply and demand.

Taking a step back, when a company thinks about the **cost of equity** versus the **cost of debt** and what its capital structure should look like as a percentage of equity and debt, the question is really one of risk / return. As mentioned before, equity sits at the bottom of the company's capital structure in terms of receiving company cash flows. Equity is neither secured by any collateral nor legally promised anything besides ownership of a company while the company remains solvent. As an unsecured investment, equity carries higher risk than debt. Higher risk equals higher return — investors need to be compensated for holding a riskier security by receiving a higher return. Thus, the required rate of return for equity is higher than the required rate of return for debt. On an accounting level, debt is tax-deductible so companies are also rewarded for using debt by the tax relief they get. Interest payments to creditors are paid out from the company's pre-tax income while dividend payments to equity holders are paid out from its after-tax income. Because of its risk / return profile and tax-deductibility, the cost of equity for the company is often higher than the cost of debt. Lecture notes on the income statement below will revisit the concept of tax-deductibility, and Module 4 lecture notes will discuss more nuances of cost of debt and cost of equity.

Equity Research & Investing —

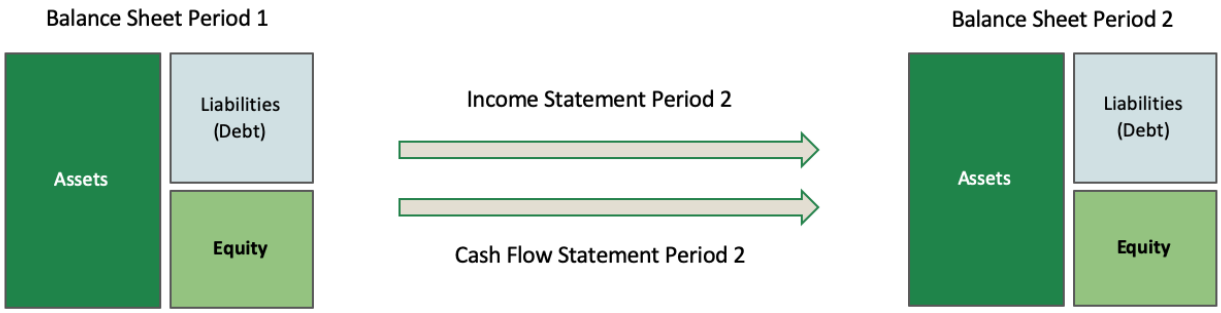
The price of a stock can fluctuate significantly over the course of a single day depending on supply and demand, and this market noise can be distracting. Many different approaches can be taken to understand and profit off the stock market, but Promontory focuses on fundamental research simply because it teaches the basic intuition of how to value any company. These types of investors, termed **value** (or fundamental) **investors**, will attempt to take a step back and estimate the **fair value of a stock**, or the present value of all the company's future cash flows, through qualitative assessments of a company's future prospects combined with quantitative models like the **Discounted Cash Flow (DCF) model**. If a stock trades below its assumed fair value, the investor will buy the stock. If it trades above fair value, the investor will sell the stock. What BFT will teach in these seven weeks is this fundamental approach to finding a company's "fair value." Famous value investors include *The Intelligent Investor* author Benjamin Graham, Berkshire Hathaway's Warren Buffett, and Baupost Group's Seth Klarman.

In the real world, both sell-side and buy-side firms produce equity research (ER) and do the same occupation of analyzing stocks and rating them a buy / hold / sell. Both sides tend to be industry-specific, but sell-side analysts generally cover more breadth and less depth while buy-side analysts cover fewer companies but cover them much more in depth — however the actual coverage and style of analysts varies from firm to firm. The main difference between buy-side and sell-side ER is that sell-side ER sells their research to clients while the buy-side uses their in-house research to actually invest their money in companies. Incentive-wise, the buy-side has more skin in the game as investors, but the buy-side will often buy sell-side research to compare their conclusions so high quality sell-side research is still very valuable even if no one is directly acting upon their recommendations.

Introduction to Financial Accounting —

The first step to understanding anything new is to understand its language; as cliché as it seems, accounting is the language of business. Every quarter, public US companies publish a quarterly report (**10-Q**) that includes a copy of their financial statements and a brief discussion of the business performance. Once a year, an annual report (**10-K**) is published with financial statements and an in-depth discussion of business performance. Most quarterly financial statements and all annual financial statements are audited, meaning that an independent third-party has verified the numbers. American financial statements are constructed according to the **Generally Accepted Accounting Principles (GAAP)** while international companies follow the International Financial Reporting Standards (IFRS). Many American companies record both GAAP- and non-GAAP measures when reporting financial results as there are instances in which GAAP reporting fails to accurately portray the operations of a business. However, it is important to be careful of non-GAAP metrics as they are developed by the company whose incentive is to present the best picture to investors.

There are three main financial statements: **balance sheet**, **income statement**, and **cash flow statement**. Each statement conveys different information, but as they all describe the same business, they are closely related. Understanding the statements individually is important, but mastering the relationships between the three statements is critical to understanding the full scope of a business. In practice, a **shareholders' equity statement** is included too as the fourth financial statement; however, it is relatively easy to understand after mastering the first three statements.



Income Statement —

The income statement, also known as the profit and loss statement (P&L), shows how the business makes money over a certain period of time. It starts with revenue, and then it highlights all the expenses a business has related to that revenue. For example, a lemonade stand makes money ("revenue") by selling lemonade but pays for the lemons, cups, sugar, tables, advertising, etc. as business-related costs.

Revenue is always the first line item on an income statement. According to GAAP, revenue is "booked" or accounted for in the period (quarter, year) when a good or service has been provided, not when cash is received. The timing discrepancy between cash received and revenue recorded is an important distinction between different accounting systems. The GAAP accounting system specifically falls under **accrual accounting** — in accrual accounting, if a cup of lemonade is sold today and the customer says that they will pay tomorrow (i.e IOU for the lemonade), it would still be counted as revenue today. If GAAP had operated under **cash accounting**, as opposed to accrual accounting, the revenue would be booked when the cash exchanges hands. With cash accounting, revenue would not be counted until the customer came back tomorrow and gave the money for the lemonade they took yesterday. However, GAAP uses accrual accounting and accrual accounting follows **the matching principle**, which says that revenues and expenses should be recognized in the same period. The costs to sell that cup of lemonade were spent today so the revenue should also be documented today, even if the actual payment has not been made yet. This potential timing difference is the motivation for the cash flow statement which would display more accurately how and when cash flows through the company.

The first subtraction from revenue is the **cost of goods sold (COGS) expenses**. COGS represent the costs directly associated with providing the goods or services. In the lemonade example, COGS refers to the cost of the cups, lemons, sugar, and anything else required to make the lemonade. Revenue minus COGS results in **gross profit.**

The second subtraction is the **selling, general, and administrative (SG&A) expenses**. Selling, general, and administrative expenses represent the costs associated with advertising, paying employees, paying rent, insurance, travel, etc; it is the costs required to make sales. In the lemonade example, it refers to the costs of making advertising banners, paying to use the table, etc. Gross profit minus SG&A results in **EBITDA or Earnings before Interest, Taxes, Depreciation & Amortization**.

The third subtraction is **depreciation and amortization (D&A) expenses**. Depreciation refers to the cost from tangible assets (factories, equipment), while amortization refers to the cost from intangible assets (patents, copyrights, trademarks, etc). Depreciation and amortization expenses are used to represent the declining value of

an asset as it is used. For example, a new car is worth $100,000. After driving off the lot, the car's value drops to $50,000. As the car continues to age, its value continues to decline. Eventually, the car will be worth nothing. Companies own assets that, like a car, lose value as they age (or are used). To correct for this, companies must mark the value of those assets accordingly and show that creating or providing the good or service meant that the value of their equipment declined because of it. Like SG&A, it is a cost indirectly associated with providing the goods or services. In the lemonade example, D&A expenses refer to the wear-and-tear of the culinary tools used to make the lemonade and the table upon which lemonade is sold. EBITDA minus D&A results in **EBIT**, **or Earnings before Interest and Taxes.** At this point, all expenses directly (COGS) or indirectly (SG&A, D&A) related to providing a good or service have been subtracted from revenue; thus, EBIT is typically referred to as **Operating Income.** There are slight philosophical differences between EBIT and operating income, but they are practically (and imprecisely) used interchangeably.

The fourth subtraction is interest expense. Interest expense refers to the costs associated with paying interest on outstanding debt. EBIT minus interest expense results in **EBT**, **or Earnings before Taxes**, also known as Pre-tax Income. Typically, this line item is shown as net interest expense, accounting for any interest income earned by the company. Any miscellaneous expenses or sources of income from a business's "side activities" may also be reflected here.

The last subtraction is taxes. Taxes are largely self-explanatory; they represent the government's claim on a business' earnings. As of August 2020, all US companies are taxed at 21%; in reality, companies typically pay less than that due to tax incentives and loopholes. However, there is one important concept to discuss: tax shields. A tax shield is technically any expense that reduces EBT or taxable income. Remembering the reasons mentioned before about why the cost of debt is generally cheaper than the cost of equity, the most common tax deductible expense is that of interest on debt, which creates an "interest tax shield." Given the tax deductible nature of interest, some companies might see raising more debt as a good way of increasing the cash flow of a business as long as the additional interest expense does not become too large of a burden on the business.

After taxes are removed from EBT, we reach the final line item on the income statement, **Net Income**. Net income is the income attributable to shareholders after all expenses are deducted from revenue, and is the key metric for determining the **Earnings per Share (EPS)** for each issued share in the business. While Net Income is an important metric for determining the profitability of a business after all expenses, it does not actually represent the true amount of cash going into or coming out of a business. As we will see, certain expenses do not result in actual movement of cash, and are non-cash expenses. These expenses must be added back (or subtracted from) to Net Income, and these expenses are reconciled in the next statement, the Cash Flow Statement.

The Income Statement

Sales (Revenue)

- Cost of Goods Sold (COGS)

Gross Profit

- SG&A, R&D, etc.

EBITDA

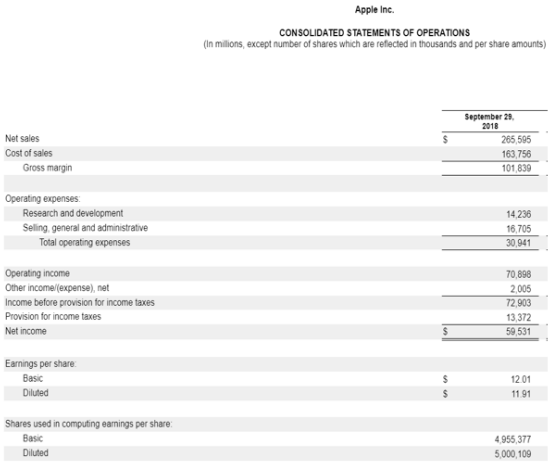
- D&A

Operating Income (EBIT)

- Interest Expense

- Tax

= Net Income



Apple Inc.

CONSOLIDATED STATEMENTS OF OPERATIONS

(In millions, except number of shares which are reflected in thousands and per share amounts)

	September 29, 2018
Net sales	$ 265,595
Cost of sales	163,756
Gross margin	101,839
Operating expenses:	
Research and development	14,236
Selling, general and administrative	16,705
Total operating expenses	30,941
Operating income	70,898
Other income/(expense), net	2,005
Income before provision for income taxes	72,903
Provision for income taxes	13,372
Net income	$ 59,531
Earnings per share:	
Basic	$ 12.01
Diluted	$ 11.91
Shares used in computing earnings per share:	
Basic	4,955,377
Diluted	5,000,109

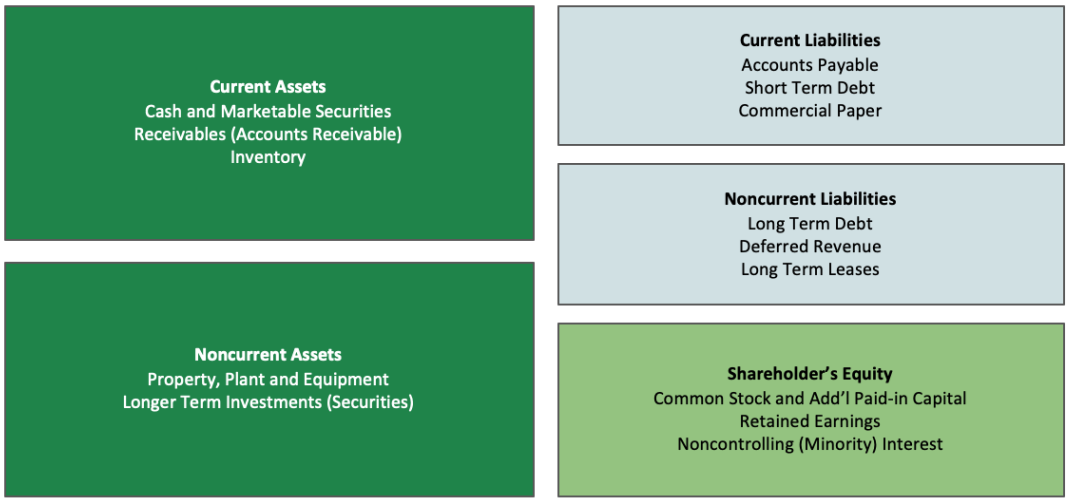
Balance Sheet —

The balance sheet highlights exactly what a company owns and owes at any given moment in time; it is a picture of the company. There are three general categories on the balance sheet: assets, liabilities, and shareholders equity. An **asset** is a resource owned by the business (or individual) that will provide a future benefit to the company. **Liabilities** are the debts and obligations of a company to outside parties; in other words, it is a future detriment of the company (and future benefit of a third party). **Shareholders' equity** represents the difference between assets and liabilities. Thus, we can create the following identity, known as the **balance sheet identity** or the fundamental accounting equation:

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

Intuitively, this identity just implies that everything the company owns must have been paid for—either through debt (liabilities) or equity. A visual representation is included below.

Balance Sheet: Visualized In Greater Detail



Assets can be broken further down into two more specific categories: current assets and non-current assets. **Current assets** are assets with a fixed useful life of less than a year (rolling twelve-month period). **Non-current assets** will provide a benefit beyond the one-year-mark. Liabilities can be broken down into similar categories: current liabilities and non-current liabilities. Current liabilities are obligations to be paid ("are due") within a year, and non-current liabilities are due later.

Some examples of **current assets** are cash, marketable securities (stocks, liquid investments), accounts receivable, prepaid expenses, and inventory. Cash and marketable securities are self-explanatory. Accounts receivable comes from sales on credit; Accounts receivable (AR) is the balance of money due to a business for goods or services delivered or used but not yet paid for by customers. Returning to the accrual accounting lemonade example, when a cup of lemonade is sold on credit (i.e customer gives IOU instead of paying instantly), an AR is created and left on the balance sheet until the cash payment is made. Functionally, AR represents an interest-free loan by the business to its customers; as a result, businesses typically want to collect on their accounts receivable as soon as possible. Prepaid expenses are recorded on the balance sheet when a business makes advanced payments for goods and services before they are actually received, and are expensed over time on the income statement. Prepaid expenses are an asset on the balance sheet because they represent a future cash benefit; when the expense is actually incurred and shows up on the income statement at some future point in time, it will reduce the company's taxable income (thereby reducing its tax burden) without costing the company anything extra in cash. Thus, prepaid expenses boost cash flow at a later point in time.

Inventory is the value of all the items a company can sell. Inventory is booked at cost; that is, the value of a unit of inventory equals the costs required to produce that unit. Recall that COGS represent the costs required to produce a unit. Thus, by definition, the net change in inventory equals COGS.

Some examples of **non-current assets** include plants, property, and equipment (PP&E), and longer-term investments. PP&E represents factories, land, equipment, and other resources required to manufacture or

provide goods and services that have fixed useful lives of greater than one year. As discussed during the section on depreciation, PP&E declines in value over time. Thus, only PP&E, net of depreciation and amortization, is relevant. Longer-term investments refer to investments not liquid within a year; for example, private equity investments are typically not liquid assets.

Some examples of **current liabilities** are accounts payable, short-term debt, and commercial paper. Accounts payable refers to the balance of money due to a third party for goods or services delivered or used but not yet paid for by the company; that is, one company's accounts payable is another's accounts receivable. For example, buying goods from suppliers on credit will result in an accounts payable. Short-term debt is debt due ("maturing") within a year; commercial paper is essentially the same as short-term debt. Some examples of **non-current liabilities** are long-term debt, deferred revenue, and long-term leases. Long-term debt is debt not due within a year. Deferred revenue represents goods or services that the company has booked as revenue but not yet provided. Deferred revenue, contrary to what the word "revenue" might suggest, is counted as a liability as it represents a future cash cost. When the corresponding revenue can actually be recognized, it will show up on the income statement and increase the company's tax burden, meaning that the company will have to pay higher taxes without receiving any cash (as they have already received that cash when the deferred revenue was initially booked. Deferred revenue is common for software-as-a-service (SaaS) businesses and subscriptions services (customers pay in advance for service received later). Long-term leases are long-standing commitments to pay rent for a property, plant or equipment.

Finally, we turn to shareholders equity. Shareholders' equity acts as the "plug" between assets and liabilities. There are three important components to it: retained earnings, additional paid-in capital (APIC) and common stocks, and minority interest. First, retained earnings represents the cumulative net income of a firm minus cumulative dividends paid; that is, retained earnings of the company's net income minus the total amount of dividends paid for the company's entire history. Second, when a company issues stock, the value of that issuance naturally flows into shareholders equity as both common stock and APIC, with the stock's par value flowing into common stock and the remainder flowing into APIC. For example, if a company issues stock at $10/share with a par value of $1 / share, $1 would flow into common stock and the remaining $9 would flow into APIC. Finally, minority interest represents equity that stakeholders have in the company's subsidiaries. Anecdotally, GAAP requires companies to consolidate financial statements if one company owns a majority (>50%) interest in another company.

Cash Flow Statement —

As Net Income does not represent the true cash that goes into or out of a business, adjustments need to be made to better reflect this cash change. Businesses use cash in three different ways, including their 1) operations, 2) investments, and 3) financings. Naturally, the Cash Flow Statement makes adjustments to Net Income that reflect these three sources/uses of cash.

The first source / use of cash is **Cash Flow from Operations (CFO)**, which reconciles non-cash expenses and also recognizes the true change in cash during the day-to-day operations of a business. Non-cash expenses comprise items such as depreciation and amortization which do not result in direct cash inflows or outflows. Amortization can also apply to things such as leases, which do not result in cash outflows but are nevertheless counted as expenses recognized over the lifetime of a lease. Other non-cash expenses can include goodwill

impairment, deferred income taxes, and share based compensation. Non-cash expenses are added back to Net Income as they do not reflect a change in cash but are still counted as an expense in the income statement.

The more complicated portion of Cash Flow from Operations stems from cash inflows and outflows that are required for the daily operations of a business, or **Changes to Working Capital**. For the day to day operations of a business to be carried out, it will have to maintain inventory and keep accounting of items purchased from suppliers on credit (accounts payable) and items sold to customers on credit (account receivables). Remember that under the GAAP accrual accounting system, the cash does not actually have to be exchanged for a transaction to be recorded, so any IOUs from customers to the company can be found in accounts receivables (AR).These financial items can be grouped as short-term assets (Inventory, AR) or short-term liabilities (AP), and the change in these items results in cash entering or leaving the business. The cash flow statement recognizes this by subtracting increases to short-term assets from Net Income (cash is leaving the business to pay for these assets) and adding increases in short-term liabilities to Net Income (company receives assets / cash without paying for it); the reverse is also true.

Take inventory and accounts payable for example: when a company receives inventory, cash leaves the business as payment for the inventory, and when the inventory is sold, the company receives cash in exchange for the items sold. When a company buys something on credit (accounts payable), it receives a cash asset without having to pay for it, and loses cash when it pays the account back. This assumption works for all short-term assets and liabilities, and, as such, all changes in assets or liabilities are added to or subtracted from Net Income. Some additional items that can show up in CFO are gains/losses on sale, debt extinguishment, etc. The principle of subtracting gains and adding losses is also true here, as these gains and losses are also recognized later on in the cash flow statement in the investments and financing sections.

The second source / use of cash is in **Cash Flow from Investing (CFI)**, where investments in long-term assets required for the business are accounted for. Note that long-term generally defines assets with fixed useful lives of greater than one year. Some common items here are purchases and disposals of plant, property, and equipment (PP&E). In this section, purchases of these investments are cash outflows and thus subtracted, while disposals of these investments are cash inflows and thus added back. This also ties into the gains / losses from sales in CFO. Gains / losses previously show up in the income statement and CFO, as these two items will cancel each other out. This is because these gains / losses are not part of the day-to-day operations of the business, and come from occasional investment activities. Hence, these gains / losses are better represented in CFI as Proceeds / Losses from disposal of plant, property, and equipment.

The final source / use of cash is in **Cash Flow from Financing (CFF)**, where changes in financing from debt and equity are accounted for. Items such as increases / decreases in long-term debt, dividends distributed, and share issuances / repurchases are applied to the cash position of the business. The inflow / outflow nature of this section is more straightforward — any financing that gives the company cash (new debt, new equity) is added. Any financing that requires the company to pay cash (such as dividend distributions, share repurchases, and stock option exercises) will be subtracted.

After Net Income is adjusted by CFO, CFI, and CFF, we arrive at the bottom of the cash flow statement, the **Net Change in Cash**, or the true cash inflow / outflow of a business over a given period of time. This number flows directly into the top of the balance sheet, increasing or decreasing the Cash line item.

The Cash Flow Statement

1. **Operating Activities**
   i. Cash generated from business operations
2. **Investing Activities**
   i. Cash invested into property, plant, and equipment (PPE)
   ii. Proceeds from sale and PPE
3. **Financing Activities**
   i. Cash raised through raising debt or equity
   ii. Cash used to buy back shares, pay down debt, and distribute dividends

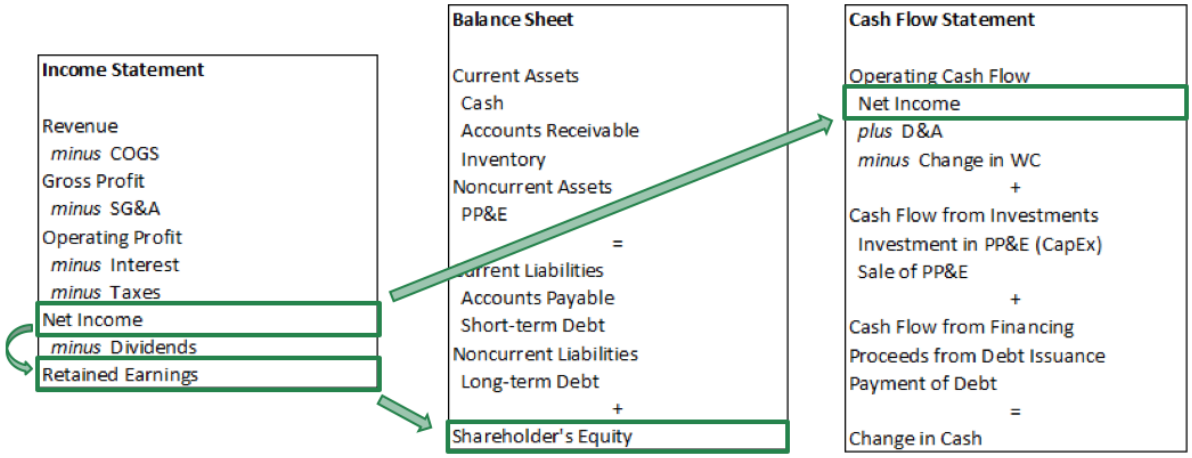
	Years ended		
	September 29, 2018	September 30, 2017	September 24, 2016
Cash and cash equivalents, beginning of the year	$ 20,289	$ 20,484	$ 21,120
Operating activities:			
Net income	59,531	48,351	45,687
Adjustments to reconcile net income to cash generated by operating activities:			
Depreciation and amortization	10,903	10,157	10,505
Share-based compensation expense	5,340	4,840	4,210
Deferred income tax expense/(benefit)	(32,590)	5,966	4,938
Other	(444)	(166)	486
Changes in operating assets and liabilities:			
Accounts receivable, net	(5,322)	(2,093)	527
Inventories	828	(2,723)	217
Vendor non-trade receivables	(8,010)	(4,254)	(51)
Other current and non-current assets	(423)	(5,318)	1,055
Accounts payable	9,175	8,966	2,117
Deferred revenue	(44)	(626)	(1,554)
Other current and non-current liabilities	38,490	1,125	(1,906)
Cash generated by operating activities	77,434	64,225	65,231
Investing activities:			
Purchases of marketable securities	(71,356)	(159,486)	(142,428)
Proceeds from maturities of marketable securities	55,881	31,775	21,258
Proceeds from sales of marketable securities	47,838	94,564	90,536
Payments for acquisition of property, plant and equipment	(13,313)	(12,451)	(12,734)
Payments made in connection with business acquisitions, net	(721)	(329)	(297)
Purchases of non-marketable securities	(1,871)	(521)	(1,388)
Proceeds from non-marketable securities	353	126	—
Other	(746)	(124)	(924)
Cash generated by/(used in) investing activities	16,066	(46,446)	(45,977)
Financing activities:			
Proceeds from issuance of common stock	669	555	495
Payments for taxes related to net share settlement of equity awards	(2,527)	(1,874)	(1,570)
Payments for dividends and dividend equivalents	(13,712)	(12,769)	(12,150)
Repurchases of common stock	(72,738)	(32,900)	(29,722)
Proceeds from issuance of term debt, net	6,969	28,662	24,954
Repayments of term debt	(6,500)	(3,500)	(2,500)
Change in commercial paper, net	(37)	3,852	(397)
Cash used in financing activities	(87,876)	(17,974)	(20,890)
Increase/(Decrease) in cash and cash equivalents	5,624	(195)	(636)
Cash and cash equivalents, end of the year	$ 25,913	$ 20,289	$ 20,484

The Relationships —

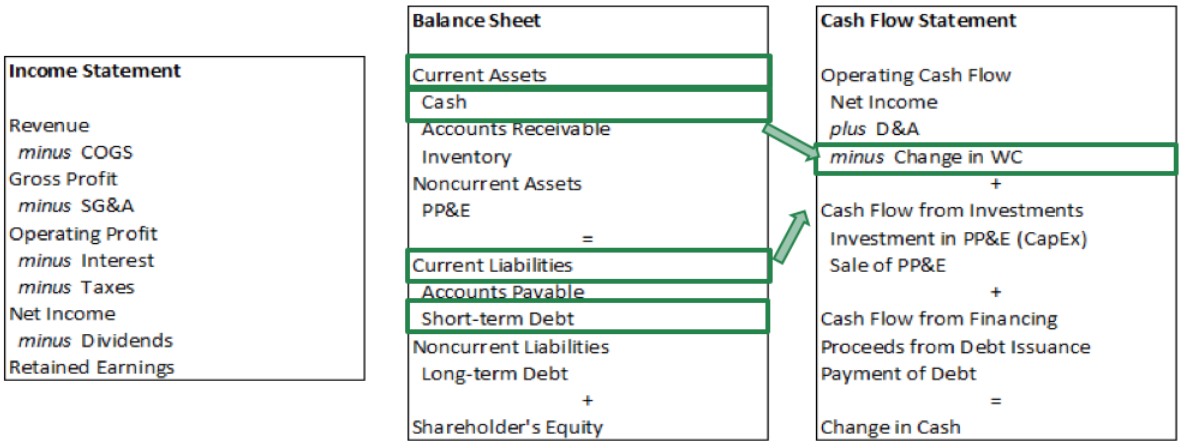
In isolation, understanding the three statements is a game of memorization; combining them is a game of application. This section will outline some key relationships and an approach to technical three-statement accounting questions.

First comes the income statement. COGS is the net change in inventory, yielding gross profit. Depreciation ties to decreases in PP&E less disposals of PP&E and amortization relates to the decline in intangibles less impairments. Depreciation and amortization are also adjustments under cash flow from operations. Interest expense and taxes have no relation to the other statements.

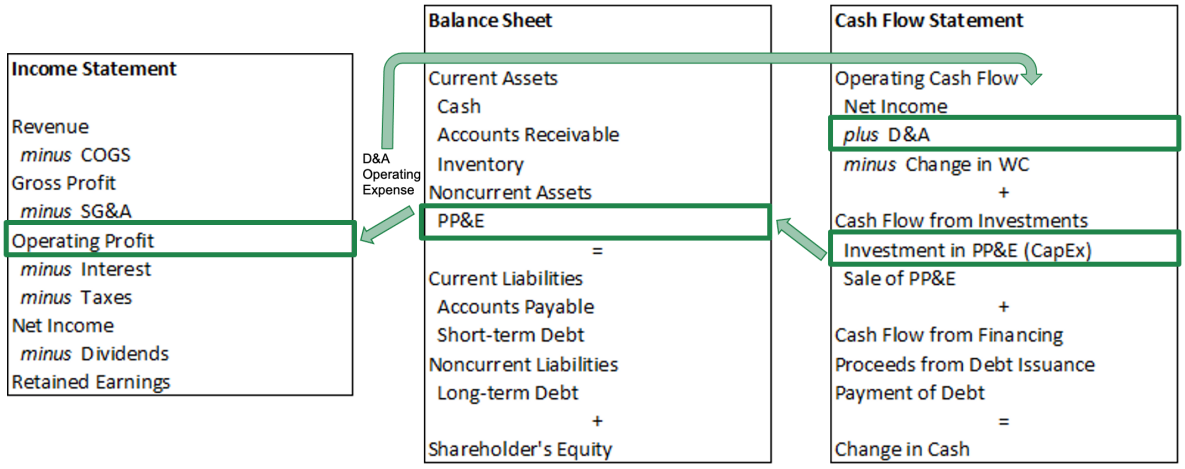
Second, the cash flow statement. Net income from the income statement flows directly to the top of the cash flow statement as the first line item.



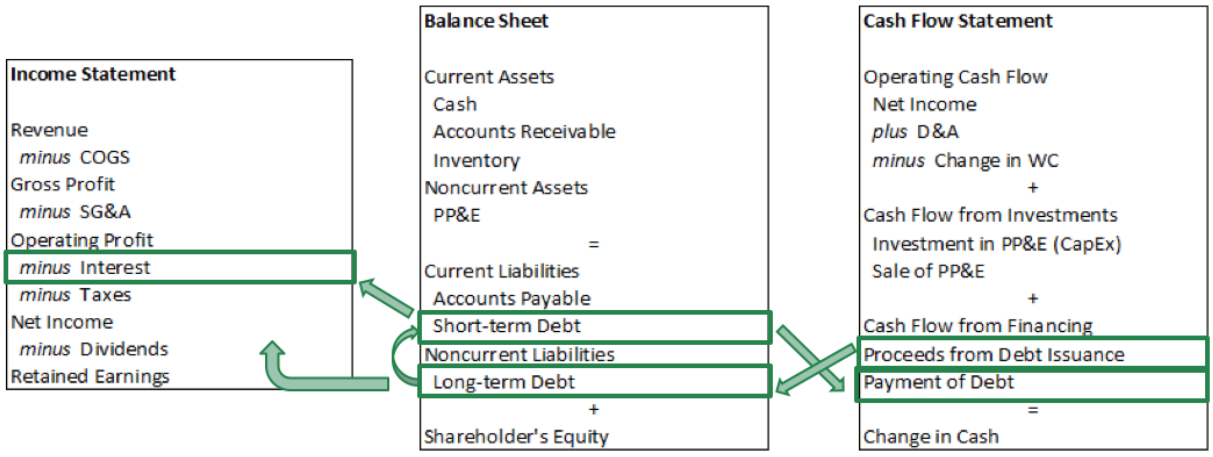
Under CFO, any non-cash items from the income statement are essentially "reversed" (D&A added, Stock Based Compensation added, Losses added, Gains are subtracted). The remainder of the changes for CFO are due to working capital changes from the balance sheet (subtract increases in current assets, add increases in current liabilities).



Under CFI, increases to PP&E relate to capital expenditures (CapEx). Increases to long-term investments (on the balance sheet) also appear here.



Under CFF, issuances and repayment of debt (liabilities on balance sheet) appear. Similarly, dividends paid (retained earnings on the balance sheet) and equity issuances or repurchases (common stock and APIC) appear.



Finally, Change in Cash on the cash flow statement flows into cash on the balance sheet. The examples discussed for the income and cash flow statements apply to the balance sheet too, making it redundant to discuss it explicitly. However, it is important to understand one crucial link between the balance sheet and the cash flow statement: a change in any one line item on the balance sheet is always directly tied to a change in one line item on the cash flow statement. For example, PP&E or AR changes on the balance sheet are tied to capex (CFI) and working capital changes (CFO), respectively.

When faced with a technical accounting question, it is best practice to start with the low hanging fruit. If revenue, COGs, etc. are given, create the income statement first, then work through the balance sheet and cash flow statement. If changes in assets are given, start with the balance sheet and move to the cash flow statement then income statement. It is important to remember that the cash flow statement can be created directly from the balance sheet and income statement. Thus, as a rule of thumb, prepare the balance sheet (excluding cash) before the cash flow statement. (This method will also allow you to check your cash flow statement because the net change in cash is already known.) However, different questions may require different approaches. In practice, there are many accounts and fluctuations which prevent accounts from linking up exactly as shown. However, understanding the theoretical relationships is crucial for modeling businesses' financial statements into the future (and thus, valuing a company).

Module 2 — Quantitative Analysis: Relative Valuation

Introduction to Value —

A very simple definition of value is the "worth" of some object. A slightly more complicated definition is that the value of any object is the sum of utility that that object can provide adjusted for time ("when the utility is provided") and the probability of it ("how likely it is"). While this overall isn't a very illuminating description for value, the ambiguity of this definition serves as an effective metaphor for how difficult it is to pin down value. Value in and of itself is subjective, and different people, motivations, and models will produce different values for the same asset. For instance, someone looking to sell their business will most likely place a high value on said business, while Warren Buffett will view the value of the same business depending on its ability to generate consistent returns and quality growth over a long period of time. Given how subjective value can be, valuations will be highly variable. As such, there are some important things to consider when conducting a valuation.

First, valuation is neither a science nor an art. While formulas and models exist to help derive value, deciding what inputs to place into those models takes skill and intuition, which are developed through repeated practice. Second, valuing and pricing an asset are different, as valuing depends on intrinsic aspects of a business's operations, and pricing depends on how much others will be willing to pay for said asset. There usually exists a gap between value and price, and that gap is especially important to value investors seeking to make effective investment decisions. Third, a good valuation has both a strong story and good numbers. Many times, people become overly reliant on calculations, believing that more complexity, more inputs, and more numbers inherently means a better valuation. However, complexity does not equal more accuracy, and there is no objectivity in valuing a business. Quantitative approaches have created models so complex and sophisticated, they have become "black boxes" (neural networks and machine learning!) that, given inputs, just spit out outputs to be used that very few people have any actual idea where they came from. Such methods can be highly profitable but also highly dangerous if data isn't properly understood. On the other hand, those who approach valuation with a set story will be unable to avoid their biases, consciously or unconsciously manipulating their assumptions to fit a predetermined narrative. Both extremes create valuations that stray from reality, and it is only through a combination of both that good valuations can be created. Finally, valuations are only as strong as the conviction one holds in that valuation. No two people will conduct a valuation in the exact same way, and it is inevitable that you will create a valuation that is different from others. Valuations will always have room for doubt, and no matter how long one spends on a valuation, only time will tell if their valuation was correct.

Valuation boils down to comparing an asset's current value with its implied value to determine if that asset is undervalued or overvalued. Overall, there are two ways to reach a company's current value and two other ways to understand its implied value . A company's current value can be measured by its Market Value or its Book Value and reflects what it is currently worth. A company's implied value can be measured by its intrinsic value or its relative value and reflects what the company is perceived to be worth by an individual or the market.

The **Market Value** of something is the value that the market places on that object. For stocks, market values are determined by stock prices on the exchange. Oil, gold, bonds, real estate, and just about every asset have comparable markets. The **Book Value** is the value of an asset as shown on the financial statements. Market Value and Book Value often differ significantly because the financial statements must be conservative. Thus, most assets are valued at cost on financial statements. If the asset costs $10 to create, the balance sheet reflects that the asset is worth $10 even if it can be sold for $20 today. Intangible assets, such as branding, are an excellent example of this: Coke's logo has been called the most recognizable in the world, yet its financial statements cannot indicate that because the "value" of a logo is far too subjective. Perceived high-growth companies tend to have a much higher Market Value than their Book Value — Tesla's BVPS (Book Value per share) in early 2020 was around $47, while its Market Value per share was $2,200. Some assets are "marked-to-market," bridging the Market-Book Value gap when a clear and defensible value of the asset can be obtained; the notes on the financial statements will indicate what assets are marked-to-market.

The Book Value of a company's equity is simply the Shareholders' Equity listed on the balance sheet. There are a few terms used to describe Market Value. Firstly, market capitalization (or market cap) refers to the Market Value of equity of a business. It is calculated by multiplying the number of shares outstanding by the current share price of that business. Secondly, Enterprise Value (EV) refers to the value of the total business; it is the price required to buy the entire business. The formula is below:

$$\text{Equity Market Value} = \text{Market Cap} = \text{Shares Outstanding} * \text{Per-Share Price}$$

$$EV = \text{Market Cap} + \text{Market Value of Debt} - \text{Cash} + \text{Minority Interest}$$

The second pairing to reflect what the company is perceived to be worth, intrinsic vs relative value, is discussed later in valuation.

Accounting as the Language of Business —

The next step in understanding a business is comparing it to other businesses; a "good" company is "better" than its competitors. Thanks to GAAP and regularly audited statements, accounting provides an excellent framework for comparison. However, comparing raw numbers is not productive—larger businesses will generate more cash, more profit, and seem better regardless of performance so a frame of reference is required. As a result, ratios are used. Ratios compare two line items that can be easily found in a company's financial statements. In this section, common ratios and their significance will be discussed.

There are a few different types of ratios that are important to note. **Liquidity** and **leverage ratios** are focused on fulfilling obligations, used to determine how well a company can meet its short-term liabilities using its short-term assets and how readily a firm can pay off its debt and interest obligations, respectively. Examples of useful liquidity ratios include:

Current Ratio	$\frac{Current\ Assets}{Current\ Liabilities}$	Recalling that current assets are assets expected to be sold and converted into cash within one year and current liabilities are liabilities due within a year's time, the **Current Ratio** measures a company's ability to pay short-term obligations due within one year with its short-term assets. The higher the Current Ratio is, the better the company's liquidity and short-term financial health — vice versa, the lower the ratio is, the worse the company's liquidity and short-term financial health.
Quick Ratio	$\frac{Current\ Assets\ -\ Inventory}{Current\ Liabilities}$	The implication of the **Quick Ratio** is very similar to that of the Current Ratio, the only difference being the subtraction of inventory from Current Assets in the numerator due to wanting to understand how instantly a company can pay off its obligations.
Cash Ratio	$\frac{Cash\ +\ Marketable\ Securities}{Current\ Liabilities}$	The **Cash Ratio** takes it one step further and only wants to know a company's ability to repay its

		short-term debt with cash or near-cash resources.

Out of the three liquidity ratios, the Cash Ratio provides the most conservative outlook as it indicates a company's state of liquidity in the worst-case scenario, followed by the Quick Ratio, and finally the Current Ratio as the most optimistic.

Leverage ratios, as stated before, measure how readily a firm can pay off its debt and interest obligations. Examples of useful leverage ratios include:

Debt Ratio	$\frac{Total\ Debt}{Total\ Assets}$	A **Debt Ratio** greater than 1 simply indicates that a company has more liabilities than assets, but this does not necessarily mean companies with a high Debt Ratio are worse than companies with a low Debt Ratio. The Debt Ratio across industries varies widely, with high capital intensive industries like oil production (Exxon), transportation (Delta, United), and telecommunications (AT&T, Verizon) that require a lot of PP&E and high fixed costs having a lot more debt than low capital intensive industries like services (Facebook, Google, Shopify).
Debt-to-Equity Ratio	$\frac{Total\ Liabilities}{Shareholders\ Equity}$	The **Debt-to-Equity Ratio** reflects a company's ability to cover outstanding debt with shareholders' equity.
Interest Coverage Ratio	$\frac{EBIT}{Interest\ Expense}$	Recalling that EBIT is Earnings Before Interest and Taxes, the **Interest Coverage Ratio** indicates how easily a company can pay off its ongoing debt-related interest payments with its earnings. Interest coverage shows how many times a period's interest payments can be fulfilled.
		The fourth ratio introduces a new concept: Net Debt. Net Debt is total debt less cash and cash equivalents. Thus, the **Net-Debt-to-EBITDA**

Net-Debt-to-EBITDA Ratio	$\frac{Net\ Debt}{EBITDA}$	**Ratio** indicates how many years' worth of debt the company has assuming the company already paid off debt with cash and EBITDA remains constant. Because cash is subtracted from the numerator, the ratio can be negative.
Total-Debt-to-EBITDA Ratio	$\frac{Total\ Debt}{EBITDA}$	**Total-Debt-to-EBITDA Ratio** measures how many years of debt the company has assuming constant EBITDA.

Beyond ratios that solely focus on a company's ability to fulfill outstanding obligations, **profitability** and **return ratios** measure a firm's ability to generate returns and retain them as profit. The denominator in a profitability ratio is *always* revenue, and the numerator is *always* a form of profit (gross profit, EBITDA, operating income, etc.). Useful profitability ratios include:

Gross Profit Margin	$\frac{Gross\ Profit}{Revenue}$
Operating Profit Margin	$\frac{Operating\ Profit}{Revenue}$
Net Profit Margin	$\frac{Net\ Income}{Revenue}$

Profitability ratios, or margins, are useful for understanding how cost-efficient a business is and comparing businesses to each other. Margins are not (technically) representative of how effective a business is at creating cash (not profit) because of accrual accounting, but they are an easy and widely accepted proxy.

Useful return ratios include:

Return on Equity (ROE)	$\frac{Net\ Income}{Total\ Shareholders\ Equity}$
Return on Assets (ROA)	$\frac{Net\ Income\ +\ Interest\ Expense}{Total\ Assets}$

Return on Invested Capital (ROIC)	$\frac{EBIT * (1 - tax)}{Invested\ Capital}$

It should be obvious how to calculate ROE, ROA from the above formulas. However, ROIC is slightly more nuanced—both in theory and practice. ROIC seeks to measure how efficiently a business can utilize invested capital ("what investors have put in"), into operating income available to the investors ("EBIT less taxes"); in a short phrase, ROIC measures how good a business is for all stakeholders (excluding the government). As a result the denominator will be as follows:

$$Invested\ Capital = Book\ Value\ of\ Net\ Debt + Book\ Value\ of\ Equity$$

However, sometimes businesses don't use everything that investors put in (non-operating capital); that is, just because capital is invested in the business does not mean it is being used. If a business has a substantial amount of capital that is invested but not being used (non-operating capital), it could artificially deflate the ROIC and give investors a false sense of how good the business is. Thus, some investors chose to employ a similar metric called **Return on Capital Employed (ROCE)** which uses capital employed or operating capital in the denominator. ROIC and ROCE are typically very similar.

$$\begin{aligned} Operating\ Capital &= Fixed\ Assets\ +\ Current\ Assets\ -\ Current\ Liabilities - Cash \\ &= Total\ Assets - Current\ Liabilities - Non\ operating\ Assets - Cash \end{aligned}$$

Accounting returns are simply a measure of the performance of a business. Thus, the return on equity focuses on the growth of the shareholders equity of a business, the return on assets, the asset growth of the business, and the return on capital (or ROIC) the performance of the business. However, there are some flaws and points of note for all of these metrics. To begin, the return on equity can be decomposed by the DuPont identity:

$$ROE = \frac{Net\ Income}{Revenue} * \frac{Revenue}{Average\ Total\ Assets} * \frac{Average\ Total\ Assets}{Average\ Shareholders\ Equity}$$

The first fraction should be familiar: net margin. The second fraction is a measure of asset turnover, how effectively assets are utilized. The final fraction is the equity multiplier: a leverage ratio. From the DuPont identity, the drivers of the return on equity are clear: margins, efficiency, and leverage. As a result of leverage, the return on equity is "capital structure sensitive," meaning a company with more leverage (higher assets / equity ratio) will have a higher ROE all else equal. Practically, ROE represents the accounting return, not market return, for an equity investment. Market returns will be discussed at length in Module 5. Return on equity is most relevant when looking at banks.

Secondly, return on assets is an indicator of how effective a company is at using its assets to generate income. As shown by the identity above, ROA and ROE are closely related; functionally, ROA is just the net margin and asset turnover portions of ROE. (Technically, ROA includes interest expense in the numerator, but the relationship approximately holds.) Thus, ROA has adjusted ROE for leverage. However, ROA is still a somewhat flawed metric because it is asset-load sensitive. Companies that require many assets (ex. manufacturing) will have lower ROAs than asset-light businesses (ex. Facebook). Thus, ROA cannot be used across industries. Further, because both ROA and ROE rely on net income, they are easily manipulated by one-time events. (According to GAAP, one-time income or expenses are marked above net income.) Finally, because ROA and ROE are sensitive to cash balances, sometimes non-cash return on equity is used for comparison. Non-cash returns on equity and assets simply subtract cash from the denominator.

Finally, ROIC is a widely used and incredibly important metric. ROIC is essentially a blended accounting return for both equity and debt investors; ROIC can be thought of as the weighted average between the ROE and the (fictional) return on debt. Thus, it is an excellent measure of how the business performs for all investors because it is leverage-agnostic and partially asset-load agnostic. As a result, ROIC can be used (with discretion and caution) across industries; even within industries, the metric is far more useful than ROA because it is less sensitive to asset load and focuses more on profits generated given investment in the firm. (As a rule of thumb, it is not good to compare ROICs across industries, but the ROIC metric is far more agnostic and sound than using ROE / ROAA.) Further, because it uses after-tax EBIT, it is less exposed to one-time events. However, there are flaws in ROIC like its sensitivity to depreciation practices and more. (These flaws will not be discussed in BFT simply because the accounting is too complex at this point in time.) There are other relationships and implications of the returns which will be discussed in Module 3.

When constructing a multiple or ratio, it is crucial to remember who has a claim on that line item. For example, debt holders have no claim on net income, so an Enterprise Value / Net Income multiple does not make sense. Similarly, Price / EBITDA and Price / Sales do not compare apples-to-apples, as Price corresponds to equity holders while EBITDA and Sales are attributable to all investor groups. An excellent example of this is ROA. ROA includes interest expense in the numerator to ensure that the numerator and denominator are claimed by the same parties.

Lastly, the final type of ratios to be covered in this module are **Cash Conversion Ratios**. As the saying goes, cash is king and the importance of understanding how quickly cash moves in and out of a company cannot be understated.

Days Sales Outstanding (DSO)	$\frac{Accounts\ Receivable}{\frac{Annual\ Revenue}{365\ days}}$	DSO measures the average number of days for a sale to be converted into cash.
Days Payable Outstanding (DPO)	$\frac{Accounts\ Payable}{\frac{Annual\ COGS}{365\ days}}$	DPO measures the average number of days before paying for a purchase.
Days Inventory Outstanding (DIO)	$\frac{Average\ Inventory}{\frac{Annual\ COGS}{365\ days}}$	DIO measures the average number of days inventory is held before being sold.

Cash Conversion Cycle (CCC)	$DIO + DSO - DPO$	CCC measures the average number of days it takes for a company to convert inventory into cash.

Across all these different ratios listed above, the most important nuance is to always consider the context in which the ratio and its components (the dividend and divisor) are calculated. Concluding anything from a single ratio is dangerous, as each ratio is biased. In equity research, ratios are used in support of qualitative arguments, but they should not be the sole driver of any argument.

Introduction to Relative Valuation —

Stepping away from a purely accounting perspective, two other ways to think about company valuation are intrinsic versus relative value. Intrinsic valuation has to do with finding the inherent value of a company as perceived by an investor through a method like discounted cash flows, which will be discussed in the next module. In contrast, relative valuation ignores inherent value and determines a company's value solely by comparing it against others through the use of financial ratios and multiples, or how much the market would pay. Some cons to using relative valuation are mentioned at the end, but the reality is that most valuations in the real world are relative: the price tags on people's houses, education, cars, etc. People always call goods "cheap" and "expensive" in relation to other goods — a prospective house buyer decides how much to pay for a house by looking at the prices paid for similar houses in the neighborhood. A ratio is just a mathematical term describing how many times one number contains another and is used to understand companies as illustrated above, but in this next section the lecture notes will focus on understanding how to reach a company's relative valuation through using particular ratios known as valuation multiples.

A **multiple** is a more specific type of ratio that uses the market's current perspective to value similar companies using the same financial ratio. Valuation multiples will in most cases be a ratio of Equity or Enterprise Value in the numerator to some earnings metric (or a proxy for earnings) in the denominator. All else equal, a higher multiple than the median implies that the asset is overvalued. As a result, multiples involve less comparing a company's ratios over time and more comparing company ratios to other firms' ratios at any given point in time. The logic is that similar assets deserve to trade at similar multiples; an apple should cost the same as another apple. Some useful multiples include:

PE Multiple	$\frac{Price}{Earnings}$	The first three multiples all have Price as the numerator, and as such, represent Equity Value (Price is only attributable to equity in a business). As such, the denominators of the first three multiples are all earnings metrics specifically attributable to equity holders.
PB Multiple	$\frac{Price}{Book}$	
PEG Multiple	$\frac{Price}{Earnings\ Growth}$	

EV / EBITDA Multiple	$\frac{Enterprise\ Value}{EBITDA}$	The last three multiples all have Enterprise Value as the numerator, with earnings metrics attributable to all investors in the denominator.
EV / Rev Multiple	$\frac{Enterprise\ Value}{Sales}$	
EV / FCF Multiple	$\frac{Enterprise\ Value}{unlevered\ FCF}$	

It is important to maintain this "consistency" in the numerator and denominator to ensure coherent valuation multiples. A common example of an inconsistent valuation multiple is Price / Sales (termed **P / S**), which uses an equity value numerator and a firm earnings metric denominator. To understand why this is inconsistent, consider two companies with the exact same market capitalization and sales, but one has debt financing and the other does not. Assuming each company has the same margins, all free cash would go to equity investors in the company with no debt, while a large portion of that free cash would have to be paid to debt holders in the form of interest, amortization, and principal in the company with debt. P / S is commonly seen for tech companies, who in many cases rely entirely on equity financing. However, even though tech companies have similar capitalization, there are still more appropriate multiples like EV / Sales that would avoid misrepresenting the occasional tech business that has significant debt financing.

Yields are typically the inverse of multiples—some cash flow value is in the numerator and price or enterprise value is in the denominator. Yield, particularly FCF and dividend yields, are considered measures of return. Just like a bond's yield to maturity is an approximation of the bond's total return, an equity's dividend yield is a projection of its income return and levered FCF yield a projection of its capital return. Similar logic can be applied to earnings yield.

Dividend Yield	$\frac{Dividend\ per\ share}{Price\ per\ share}$	The three yields are very common and have cash flows in the numerator and values in the bottom.
Levered FCF Yield	$\frac{Levered\ FCF\ per\ Share}{Price\ per\ share}$	
Earnings Yield	$\frac{Net\ Income\ Per\ Share}{Price\ per\ share}$	

Dividend Payout Ratio	$\frac{Dividend\ per\ share}{Earnings\ per\ share}$	Payout ratio measures how much of a company's net income is paid out in dividends. (An equivalent definition writes the payout ratio as total dividends/net income.)

Some industry specific multiples include:

Retail, Airlines	$\frac{EV}{EBITDAR}$
Oil & Gas	$\frac{EV}{Reserves}$
Industrials	$\frac{EV}{EBITDA - Cap\ Ex}$

Financial ratios and multiples help investors quickly understand the overall economic condition of a company by comparing one firm with others in the same industry, sector, etc. However, ratios are merely quantitative metrics and do not in isolation explain anything about the firm's qualitative situation. One firm may look much better / worse than another due to reasons that don't get reflected in numbers alone. Competitors are often distinct from each other, and a major argument against the use of relative valuation is that such a comparison is to compare apples and oranges. Additionally, relative valuation assumes that, on average, the market prices companies correctly. Entire industries however could be severely under / overvalued intrinsically, but relative valuation would lead to the conclusion that any company in the space should also be priced similarly. In the late 1990s, irrationally exuberant investors hyped technology companies up, causing the Nasdaq Composite stock market index to rise 400% between 1995 and 2000. By 2002, these companies were drastically over-valued, which resulted in the dot-com crash. Many companies like Pets.com, WorldCom, and Cisco lost 85%+ of their market value in months or shut down. Finally, past performance does not reflect future performance, and these ratios / multiples rely entirely on historical data.

Module 3 — DCF: Intrinsic Valuation

Introduction to Intrinsic Value —

In the next few modules, the lecture notes will delve into intrinsic value, the NPV framework, and the DCF model. The NPV (or net present value) framework can be broken down into two main processes: the projection of future "cash flows" and the "discounting" of these cash flows back to present day value. Module 3 will concentrate on an introduction to the framework, the importance of cash as the foundation of intrinsic value, and the process of projecting out future cash flows. Week 4 will focus on the components that create WACC, the cash flows' discount rate, and Week 5 will translate the NPV framework into the DCF (or discounted cash flow) model.

Ultimately, the mechanics of the DCF model require some accounting knowledge, a few relatively straightforward mathematical operations, and an understanding of the time value of money. However, the nuance of the DCF lies within the assumptions investors must make themselves. These assumptions are where people end up with different implied share prices because it not only requires a deep understanding of the company's current business model and competitive strategy but also a stance on where one believes the company

is headed in the next few years. Grounding one's assumptions is the final important step to building a strong DCF model and will be covered in the qualitative analysis section in Module 6.

Fundamental Concept of Valuation: An Analogy —

In Module 2, value was defined as the sum of time-adjusted utilities. A more general definition of value is the sum of risk-adjusted utilities. In this section, the intuition of the general definition will be discussed assuming that utility is represented by cash. Thus, to develop intuition on the definition, consider an unusual but insightful example.

Imagine a casino that only offers one game and charges players a fixed fee per play. The rules of this game are as follows:

1. Flip a fair coin.
2. If the coin is heads, you win! The prize money for winning is $1. If it is tails, you lose. You don't get anything.

Assuming that the casino is intelligent but not-profit seeking, the fee should be $0.50. For those with a background in mathematical statistics (and expected value), the following explanation will be very straightforward. For those without that background, the second explanation should be intuitive. (We encourage you to understand both arguments.)

The statistical explanation is as follows. Assume that a variable X is distributed according to the Bernoulli distribution; that is, Xtakes value 1 with probability p, and 0 with probability $1 - p$. Clearly, Xrepresents the outcome of one game with $p = 0.5$. Thus, the long-run average value ("expected value") of X, $E[X]$, should be the value that the casino charges. If the casino charges more than $E[X]$, then nobody will ever net a profit from playing the game over the long run. That is, the casino will end up earning money, violating the "not-profit seeking" caveat. If the casino charges less than$E[X]$, then the casino will lose money over the long run, violating the "intelligence" caveat. The expected value of a Bernoulli random variable is p (from statistics), or $0.50 in this case. Thus, they charge $0.50.

The alternative explanation is simpler (and technically relies on "non-arbitrage" arguments). Assume the casino charges $1 to play the game. The casino's competitor, hypothesizing that it can offer the same game for less and still net a profit, charges $0.99. After a while, the casino recognizes that their competitor is successfully undercutting them and retaliates by lowering their price to $0.98. This cycle repeats until the price is less than $0.50. At this point, both the casino and its competitors realize that they are losing money by offering the game and begin increasing their prices. They continue increasing the price until it converges to $0.50, the point at which neither can undercut each other. This argument does not make any assumptions about the intelligence or "profit-seeking" nature of the casinos but instead assumes a fair market (i.e no collusion between the casinos).

In both explanations, the casino is adjusting their fee to account for risk. In the first, the casino is charging more if the probability of them losing the game (the player winning) increases, and charges less if the probability of them losing the game (the player winning) decreases. Functionally, they are adjusting their cash flows (the fee) according to the risk of the game (probability of them winning/losing). In the second explanation, the casino is adjusting their fee with respect to their competitors actions; it is adjusting the fee to reflect the market environment and competitive risk. It is also important to note that the fee the casino charges equals the value of

one play of the game. (If the casino charged more than the value of the game, nobody would play and vice versa). Valuing a company is essentially acting as the casino. Investors (those valuing the business) are projecting the cash flows of the business and adjusting those cash flows according to the risk. The idea that the value of any asset equals the risk-adjusted cash flows of the asset is a central idea of finance and valuation.

Building Blocks of Value —

The downsides mentioned in last week's module indicate that while it is quick and easy, relative valuation may not be the best way to value a company. For value investors specifically, they understand these drawbacks and while comparables are still very useful to them, they also seek to understand the fundamental value of a company. Here's where intrinsic valuation, which values an asset based on its fundamental characteristics, becomes relevant.

Previously, value was defined as the sum of all future utilities of an asset (business or otherwise) adjusted for time. The utility for a business is simple: cash. All of a business's attributes can be exemplified in cash. A business with strong branding will generate more revenue and likely more cash; a business with strong management will enter markets wisely and generate more cash in the long-run; a business with a talented workforce will produce high quality products that increase margins and cash flow. For any business or business-related asset, **cash is king.**

Therefore, for any business asset to have intrinsic value, it has to generate positive cash flows at some point in its lifetime. This claim follows directly from the definition of value. In the worst case—the business generates no cash by operations (note: not necessarily CFO)—the business will shut down and the assets of the business will be sold for cash. Thus, the intrinsic value of a business is a function of its expected cash flows over its lifetime adjusted for time.

The function in question is quite well-defined (and intuitive to piece together) and is shown below where CF represents the cash flow and n represents the lifetime of the business.

$$Value = \frac{CF_t}{*} + \frac{CF_{t+1}}{*} + \ldots + \frac{CF_{t+n}}{*}$$

In the above equation, the asterisk represents what was previously called the time-adjustment. However, more specificity is required now. As motivated before, this time adjustment is actually just two types of risk compounding over time. The first is **forecasting risk**; because the asset is being valued based on its future output, there is a possibility that the future output is not as projected. Equivalently, the risk is the **probability of failure** (to generate the projected cash). (This understanding of risk aligns with the first explanation in the gambling analogy.) The second is **opportunity cost**. By funneling cash into one task, it cannot be directed to another. This opportunity cost is also called the **time value of money.** The time value of money is dependent on what other investment opportunities are available—more attractive investment opportunities directly implies a higher opportunity cost. Thus, this opportunity cost is a **required rate of return**; if return on the investment does not exceed the opportunity cost, the investment should not be undertaken. (There is a special case of the NPV framework called internal rate of return (IRR) that focuses on calculating this opportunity cost for this exact reason. IRR and its implications will not be discussed, but it is a useful metric to understand.) Opportunity cost aligns with the second explanation in the gambling example.

The following equation reflects that analysis where $r$is the probability of failure or time value of money. There are other ways of understanding r, but they will not be discussed.

$$Value = \frac{CF_t}{(1+r)^t} + \frac{CF_{t+1}}{(1+r)^{t+1}} + ... + \frac{CF_{t+n}}{(1+r)^{t+n}}$$

In the above equation, the risk is constant and compounded on annually, as per probability norms (if the probability of an event is x, the probability of that event independently happening twice in a row is x^2 and so on. For more explanation, try making a tree-diagram). However, risk should not be constant; probabilities and opportunity costs change! A more accurate, but impractical equation, is as follows.

$$Value = \frac{CF_t}{(1+r_1)} + \frac{CF_{t+1}}{(1+r_1)(1+r_2)} + ... + \frac{CF_{t+n}}{(1+r_1)(1+r_2) * ... * (1+r_n)}$$

The denominator in this equation is known as the discount rate. The equations and philosophy described are known as the **Net Present Value (NPV).** The last equation (non-constant risk) is (practically) never used because projecting changes in risk is incredibly difficult and will not provide enough benefit; in BFT, only the NPV equation that assumes constant risk per year will be used. It is also important to note that none of the projected cash flows have to be positive—negative cash flow companies can still be valuable so long as they generate cash flow at some point. Similarly, a negative NPV implies that the investment (or asset) will not add value (or colloquially is "worthless.") NPV is a central part of finance and valuation, but it has applications and implications across disciplines. (We challenge you to apply the ideas of NPV valuation to other aspects of your life.)

There are a couple key observations based on this framework. First, it is mathematically and intuitively clear from the NPV formula that assets that generate cash earlier tend to be more valuable than assets that generate cash later due to cash flows having higher and higher discount rates into the future. Assets generating cash later can be more valuable if they generate a significant amount of cash later and grow rapidly. Second, if something does not affect either an asset's cash flows or the riskiness of those cash flows, then it has no effect on value. However, as discussed when highlighting the importance of cash, most activities will affect cash flows, risk, or both. Third, as stated above, an asset has to generate positive cash flows at some point in its life for it to have value. Finally, to increase value a firm must grow its cash flows faster than its discount rate (or risk). Each of these should seem obvious, but many times investors or banking professionals will subconsciously ignore these facts. Take for instance how many companies might tout their "brand" in an industry where brand loyalty is entirely irrelevant. If the brand does not meaningfully contribute to cash flow generation or reduce risk, it has no significant value.

In summary, the value of any asset is equal to the sum of its time-compounded risk-adjusted cash flows into perpetuity.

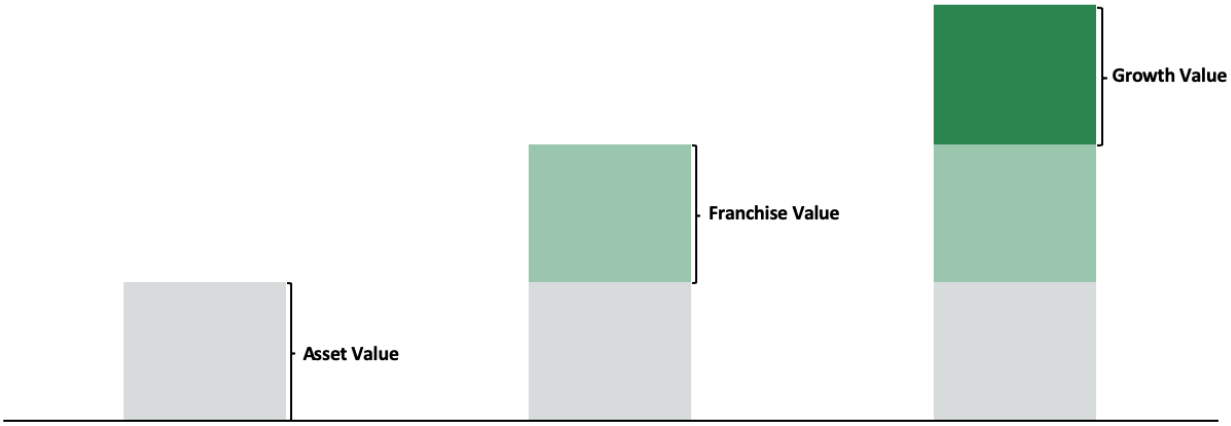
Note: The DCF model is essentially just an NPV calculation for a business. It takes the future free cash flows to the firm (FCFF) and discounts it to generate a value for the entire business, or **enterprise value (EV)**. Free cash flow to equity (FCFE) values the equity portion of the business. These terms have not been defined yet, but included here for context. FCFF and FCFE are discussed below.

Growth and Reinvestment —

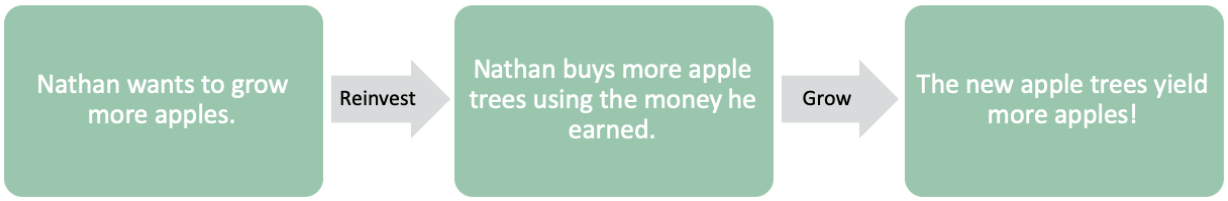
Mathematically, the value of an asset is easy to calculate if all the cash flows are equal. To compute that, the NPV formula above would simplify to the following by the geometric series:

$$Value = \frac{CF}{r}$$

(For the mathematically inclined, the derivation is quite easy and we encourage you to attempt it. It is omitted for the sake of simplicity.) This special case (all future cash flows are equal) is called the **franchise value** of an asset (or business). It assumes that the business will not grow or change and instead values it strictly on its capabilities today. The franchise value is generally a conservative valuation. However, in most cases, growth (i.e non-equal future cash flows) is sought after and inevitable to a degree (inflation). Thus, it is important to understand what drives growth and its implications.



Consider an ambitious gardener tending to their apple orchard. The value of that orchard, by the NPV framework, would equal the sum of all the future cash flows from the apples discounted for the probability that the orchard fails to bear fruit (literally). Now imagine the selling-price for an apple of a specific quality is fixed into perpetuity. That is, the prices of apples do not change; the cash flows of the orchard into perpetuity will remain the same unless the quality or quantity of apples changes. Now imagine that the gardener, being ambitious and intelligent, wishes to increase the quantity and quality of the orchards output to generate more cash. To do so, the gardener could intuitively do two things: plant more trees and / or take better care of each tree. Thus, the gardener would use cash flows from the orchard to purchase better fertilizer, more water, better equipment, and more trees. The gardener would essentially reinvest cash flows from the orchard in order to generate future cash flow growth.



This simple analogy extends elegantly to finance. All growth must be funded by reinvestment. This statement is also a direct consequence of the balance-sheet identity; all asset growth must be paid for (with cash) as the identity implies. However, more reinvestment does not automatically imply more growth; if the gardener buys products designed specifically for orange trees, they will not make the apple orchard better no matter how much the gardener reinvests. Thus, reinvestment *and* returns on reinvested capital drive growth. Mathematically, the growth rate of a company can be described as a function of the amount of cash reinvested into it and the rate of return on that reinvestment. That is, growth follows the following equation:

$$\text{Growth Rate} = \text{ROIIC} * \text{Reinvestment Rate}$$

Note that in the equation above, **ROIIC** is used instead of ROIC. ROIIC is the return on incremental invested capital. Essentially, ROIIC is the ROIC for future investments (or reinvested capital); it is a difficult number to calculate practically, but theory requires ROIIC in place of ROIC. ROIIC is typically assumed with ROIC providing context. Further, the reinvestment rate is used instead of gross reinvestment to calculate the growth *rate;* using gross reinvestment would result in an imbalance, but the relationship is still the same. (Mathematically, rates are essentially derivatives with respect to time. Broadly, what holds for the rates, holds for the gross numbers and vice versa.)

Free Cash Flow: Derivations and Implications —

Throughout this module, the concept of "cash is king" has been stressed. However, for businesses, one specific type of cash flow is used: **free cash flow (FCF)**, which measures a company's ability to generate cash beyond what is needed to support its operations and capital expenditures**.** Mechanically, FCF is easy to understand. Unlevered FCF (FCFF) and levered FCF (FCFE) are simple accounting formulas.

$$FCFF = EBIT * (1 - t) + DA - Capex - \Delta NWC$$

$$FCFE = FCFF - InterestExpense * (1 - t)$$

$$= NI + DA - \Delta NWC - CapEx + NetBorrowings$$

There should only be one new concept in the above formulas: **Net Working Capital (NWC)**. Working capital represents the cash required to run a business. A coffee shop, for example, needs to have cash in its drawers, cash to buy supplies, cash to pay employees in the near-term. Net working capital adjusts working capital for the liquid capital that a business already has. The formula for net working capital is as follows:

$$\text{NWC} = (\text{Current Assets} - \text{Cash}) - (\text{Current Liabilities} - \text{ST Debt})$$

Why does the above formula equate to the cash required to run a business? The intuition behind this formula lies in the definitions of current assets and liabilities. Current assets and liabilities are liquid. The difference between the two represents the cash on hand which is presumably used to run the business. Likewise, cash and ST debt are subtracted because they are not operating assets, but rather financial ones. The **change in working capital** is actually not a new concept, but rather a new name for a familiar relationship. Change in working capital simplifies to the following (assuming no change in cash and ST debt):

$$\text{NWC}_{t+1} - \text{NWC}_t = (\text{CA}_{t+1} - \text{CA}_t) - (\text{CL}_{t+1} - \text{CL}_t)$$

If this equation does not seem familiar, revisit the discussion on the cash flow statement and its relationship to the balance sheet. (Hint: Short-term debt is a financing activity!) By applying this relationship, we can actually simplify the FCFE equation to the following:

$$\text{FCFE} = \text{CFO} - \text{CapEx} + \text{Net Borrowings}$$

(Deriving this simplification is highly encouraged for all to confirm mastery of accounting concepts.) FCFF has many important relationships. First, FCF (both FCFF and FCFE) is closely related to the reinvestment rate and growth. Intuitively, this relationship should be clear; (cash flow) growth is driven by reinvestment and ROIIC, and thus free cash flow will be driven by reinvestment and ROIC. (Mathematically, we are essentially taking the integral of cash flow growth because growth is the derivative with respect to time. In this representation, we defined growth as a continuous function rather than a discrete function for mathematical simplicity; the discrete and continuous cases are intuitively identical.) To formalize the relationship mathematically, a reinvestment formula must first be explained.

By definition, reinvestment will directly relate to capital expenditures and depreciation. Confirming this, those line items represent the tangible (hard) assets in CFI and CFO. Capital expenditures can actually be defined more specifically: **maintenance capex** and **growth capex**. Maintenance capex is the capex required to maintain the business's assets; growth capex is used to grow the business. Maintenance capex is a cost; growth capex is an investment. Thus, reinvestment is growth capex. However, growth capex cannot be easily defined from the line item. Thus, for a definition, net capital expenditure is used as a proxy. Net capital expenditure is defined as follows:

$$\text{Net Capital Expenditure} = \text{Capital Expenditures} - \text{Depreciation}$$

Reinvestment does not just equal net capital expenditure; it also includes increases in working capital. Increases in working capital imply that cash is being funneled into the business operations. Thus, it is being reinvested back in the shorter term. Thus, the formula for reinvestment is the sum of net capital expenditure and increases in working capital. The reinvestment rate is reinvestment as a percentage of after-tax operating income or **net operating profit after taxes (NOPAT)**.

$$\text{Reinvestment Rate} = \frac{\text{Net Capital Expenditure} + \Delta\text{NWC}}{NOPAT}$$

NOPAT is, yet again, another name for a familiar concept. The formula for NOPAT is as follows:

$$\text{NOPAT} = \text{EBIT} * (1 - t)$$

From the formula for reinvestment rate and ROIC, the free cash flow formula can be derived:

$$\text{FCF} = \text{NOPAT} * (1 - \text{Reinvestment Rate}) = \text{NOPAT} * (1 - \frac{\text{g}}{\text{ROIC}})$$

Thus, the relationship between FCF, ROIC, and the reinvestment rate is clear.

(While writing this section, we momentarily forgot the derivation. Thus, for once, the derivation is included.)

FCF-Reinvestment

Note: Net Reinvestment is represented by Γ and the reinvestment rate is represented by γ.

$$\begin{aligned}
\text{FCF} &= \text{EBIT} * (1 - t) + \text{DA} - \text{CapEx} - \Delta\text{NWC} \\
&= \text{EBIT}(1 - t) - \Gamma \\
&= \text{NOPAT} - \Gamma \\
&= \text{NOPAT} - \text{NOPAT} * \gamma \\
&= \text{NOPAT} * (1 - \gamma)
\end{aligned}$$

Intuitively, FCFF represents all the cash that is available to stakeholders in the firm; that is, it is the profit generated by the operating assets of the firm after reinvestment requirements are met. FCFE represents the equity holders' claims on cash generated by the firm; that is, it is the cash generated by the operating assets of the firm minus debt holders claims. FCFF and FCFE differ from EBITDA, NOPAT, and EBIT because they take into account *reinvestment*, tax liabilities, and (for FCFE) debt liabilities. Showing where each one differs is left as an exercise.

However, these statements should not be taken just as fact; explaining why and how FCFF, FCFE, EBITDA, and EBIT differ in valuation (what each one values and what it implies) is critical to mastery of the material. The above sections are central to understanding their differences.

Finally, to connect the discussion of reinvestment to ROE, ROIC:

$$\text{Operating Income} = \text{Reinvestment Rate} * ROIC$$

Thus, the relationship between ROIC and reinvestment is clear. For ROE, a different reinvestment rate must be defined: the equity reinvestment rate. The equity reinvestment rate measures how much a company reinvests without additional debt.

$$\text{Equity Reinvestment Rate} = \frac{\text{Net CapEx} + \Delta NWC - \Delta\text{Debt}}{\text{Net Income}}$$

From this,

$$\text{Net Income} = \text{Equity Reinvestment Rate} * \text{Non-cash Return on Equity}$$

NPV, Growth, and Multiples: Connecting the Dots —

The last concept discussed in this module is actually not new, but rather a synthesis of the concepts discussed this module and last module. Returning to multiples, the numerator of a valuation multiple represents what investors are buying, and the denominator represents what is received in exchange. Thus, intuitively multiples and NPV should be related—they both attempt to value an asset. However, up to this point, that relationship has been glossed over. In this section, the relationship between the three concepts will be mathematically and intuitively illustrated. The EV / EBITDA multiple will be used to highlight the mathematical relationship, but similar relationships can be shown for all other multiples.

By substituting the formula for enterprise value into the numerator, the multiple becomes the following. Note that the formula for enterprise value equals the NPV of the business' cash flows, as discussed above.

$$\frac{\text{EV}}{EBITDA} = \frac{\Sigma_t \frac{FCFF}{(1+W)^t}}{EBITDA}$$

Next, significant algebraic magic is required. With (minor) loss of generality, the summation can be simplified by the geometric series. Generality is lost because constant growth FCFF is now assumed; however, this assumption is irrelevant to understanding multiple drivers.

$$= \frac{\frac{FCFF*(1+g)}{W-g}}{EBITDA} = \frac{\frac{(EBITDA(1-t)+DA-CapEx-\Delta NWC)(1+g)}{(W-g)}}{EBITDA}$$

By simplifying further (simple algebra), the multiple drivers are at last illuminated.

$$\frac{(1-t)}{W-g}+\frac{\frac{DA}{EBITDA}}{W-g}-\frac{\frac{Capex}{EBITDA}}{W-g}-\frac{\frac{\Delta NWC}{EBITDA}}{W-g}$$

Recalling the discussion on reinvestment rate, it is clear that the EV / EBITDA multiple is dependent on the tax rate, *t*; cost of capital, *W*; expected growth rate, *g*; and reinvestment rate. Generally, these drivers hold for most multiples. Multiples are functions of growth, reinvestment rate (or capital requirements), and risk. Certain multiples exhibit different relationships, but all will be related in some way to at least two of the three. Further, some multiples may be sensitive to other factors; the EBITDA multiple, for example, is sensitive to tax rate. Intuitively, these drivers should make sense. Multiples seek to value a business in context, as do intrinsic valuation methods. Thus, multiples and the NPV formula should have the same drivers.

Let's now take a closer look at equity valuation multiples. The numerator for all equity valuation multiples is that of Price, and or the value of the equity in a business. There are two discounted free cash flow models (based on NPV) that directly give the value of equity: the FCFE model, which give the free cash attributable to shareholders, and the dividend discount model, or DDM, which values equity off of the direct cash flows an investor receives from dividend income. Using a company in its stable (terminal / franchise) growth phase, this relation appears:

$$P=\frac{Dividend\ per\ Share_1}{r-g_n}$$

$$P=\frac{FCFE_1}{r-g_n}$$

Dividing price by the denominator of EPS (earnings per share) to create a P / E multiple, the following relation is created:

$$\frac{P}{EPS}=PE=\frac{Payout\ Ratio\times\left(1+g_n\right)}{r-g_n}$$

$$\frac{P}{EPS}=PE=\frac{\frac{FCFE}{Earnings}\times\left(1+g_n\right)}{r-g_n}$$

$$Payout\ Ratio=1-\frac{g_n}{ROE}$$

If we substitute the Payout Ratio into the PE ratio, it becomes clear how the same drivers of valuation in a DCF—growth, reinvestment, and risk—are represented in the Equity Valuation multiples. All valuation multiples are grounded in fundamental value, and by understanding the relationship, it will be easier to determine if a company's multiples are in line with its fundamental value.

Module 4 — DCF: Cost of Capital

Introduction to Cost of Capital —

The second part of the DCF model is the discounting process, and an accurate discount rate is needed to get an accurate final implied valuation. In this module, the lecture notes will focus on the academic theories and practical implications underlying the two costs of capital, equity and debt, which play a crucial part in this part of the DCF puzzle. Module 1 lecture notes briefly covered cost of equity and cost of debt when a company is considering optimizing its capital structure, but these concepts will become much more fleshed out here and will be linked together at the end with the concept of **WACC**, the DCF discount rate.

The Efficient Market Hypothesis —

Before diving in, it's important to first review the **Efficient Market Hypothesis (EMH)**, which, exactly how it sounds, posits that markets are efficient. As UChicago Nobel Laureate Eugene Fama proposed in 1970, there are three potential levels of market efficiency:

1. Weak Form: All past information about the market is factored into the market price
2. Semi-Strong Form: All past and present public information is factored into the market price
3. Strong Form: All information, public and private, are factored into the market price

One reason why EMH is highly relevant is because, depending on the level of market efficiency one believes exists, one might question whether value investing in its entirety has validity. In the strongly efficient or semi-strongly efficient market, the market prices everything in, and it is impossible to beat the market consistently on a risk-adjusted basis since market prices should only react to new information. Value investors have no way of finding under- or over-priced assets. In a weakly efficient market however, value investing does have validity since the market has only priced in past performance, and these investors believe that stocks may be mispriced due to broader reasons that have not been factored in.

Ultimately, EMH lays the groundwork of desiring some kind of asset pricing model because if there is market rationality abound in the markets, there should also be a way to model it out. This train of thought has led finance academics to theorize the Capital Asset Pricing Model (or CAPM), which will be discussed in the next section and which acts as the cost of equity formula used in the standard DCF model.

An important caveat that isn't often taught is that EMH has not been proven. Why it is near impossible to prove has to do with the Joint Hypothesis Problem, or testing two hypotheses at the same time. With EMH, the two hypotheses being tested are 1) markets are efficient and 2) efficient markets look like XXX. If tests show that markets don't look like XXX, no one knows whether markets are not efficient or the description of what an efficient market looks like is inaccurate/incomplete. If tests show that markets look like XXX, that still does not confirm that this market is an efficient market. In the end, EMH's value lies not in the ability to prove or disprove it but rather in its usefulness as a potential lens through which it can be better understood why the market behaves the way it does.

The next section specifically discusses the Capital Asset Pricing Model (CAPM), which, in this context, is akin to assuming the asset pricing model XXX under EMH is CAPM. Nowadays, a lot of academics think CAPM is wrong due to its many limiting assumptions and empirical evidence but that EMH still is true (though no one

knows for sure). However, for the standard DCF model, it is important to understand that CAPM is still the cost of equity portion of the discount rate that future cash flows are being discounted by. Module 7 lecture notes will also discuss other investing philosophies that don't require this assumption of CAPM.

Introducing the Capital Asset Pricing Model and Cost of Equity —

Without getting too deep into Modern Portfolio Theory, the **Capital Asset Pricing Model or CAPM** is a theory of risk versus return, believing that investors should be compensated for the extra risk they take. More specifically, CAPM focuses on market risk versus return, arguing that any company-specific risk (termed **idiosyncratic risk**) can be diversified away while market risk (**systematic risk**) such as economic cycles cannot. Thus, investors who diversify should still be concerned with market risk, and in turn they require compensation only for this market risk they cannot diversify away. The importance of idiosyncratic risk diversification is another big takeaway from Modern Portfolio Theory aside from CAPM, but for now the focus is solely on understanding CAPM.

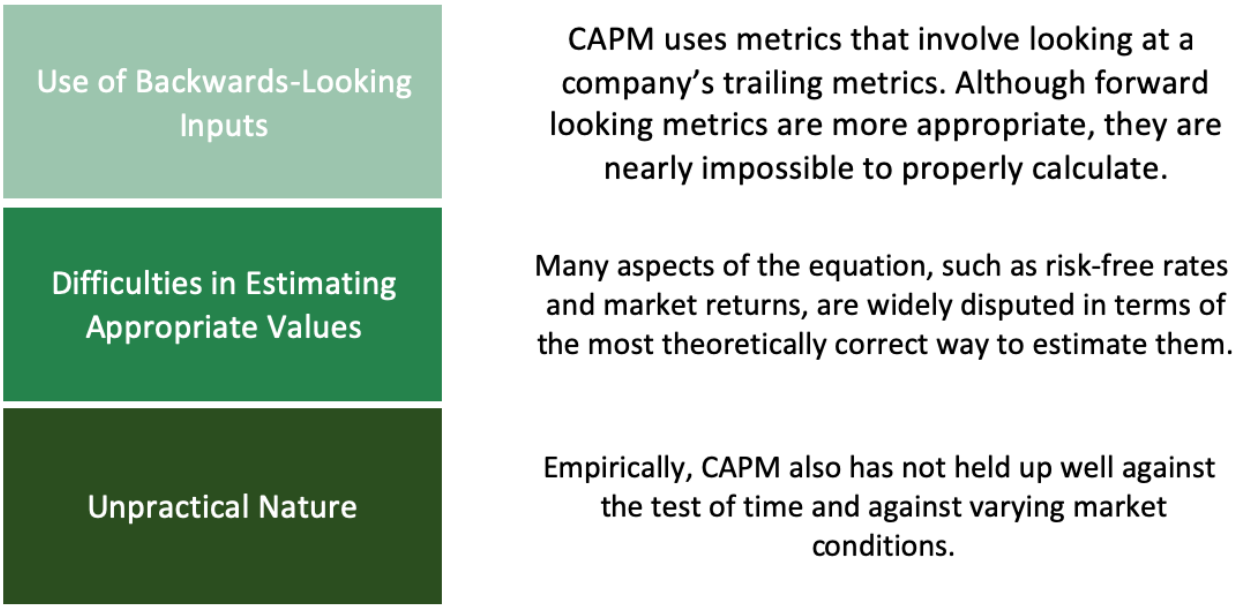
When comparing two different securities, they may offer the same return, but what's more important to note as an investor is the risk-adjusted return. The **Sharpe ratio** demonstrates this risk-adjusted return concept exactly as a measure of an asset's performance adjusted for risk compared to a risk-free asset:

$$Sharpe\ ratio\ =\ \frac{E[r_a] - E[r_f]}{\sigma_a}\ \ where\ \sigma_a\ = standard\ deviation\ of\ security\ A's\ excess\ return$$

The Sharpe ratio weighs the excess return of security A against the volatility of security A in a fractional form. The higher the Sharpe ratio of a security, the higher the excess return versus its risk and thus the better the security's returns have been relative to the risk involved. In a similar vein, CAPM seeks to understand the expected return of a stock on a risk-adjusted return basis. In the next few sections, the lecture notes will break down each of the three components to the CAPM equation (the risk-free rate, the beta value, and the equity risk premium) and how one would derive them.

$$Cost\ of\ \ Equity\ = r_f + \beta_L\left(r_m - r_f\right)$$

Overall, the cost of equity is the most difficult component of the entire DCF discount rate to estimate. We traditionally use the CAPM model as a proxy for the cost of equity; after all, the CAPM should theoretically indicate the return required on an asset for investors to be comfortable with its risk profile. However, as mentioned before, traditional CAPM has many limitations, from limitations inherent to regression betas, to backward as opposed to forward looking inputs, to challenges in choosing good risk-free rates and market return rates. Empirically, CAPM also has not held up well against the test of time. While the CAPM has its limitations, it has grounded many significant breakthroughs in modern finance, and a proper application of CAPM can still be a useful calculation for cost of equity.



Using a Proper Risk-Free Rate —

The first part of CAPM is choosing a proper risk-free rate, and that begs the question as to what securities are truly risk-free. The short answer is that risk-free assets do not exist, but remembering the Module 1 discussion on types of bonds, it can be said that generally US Treasuries are viewed as risk-free. However, there are different maturities of Treasury bonds. These include 3-month, 1-year, 10-year, 30-year, etc length maturities. If a company is being valued into perpetuity as one often assumes in the DCF model, then it makes sense to choose a risk-free rate that also has a long time horizon. Does that mean that the 30YR T-bond rate is the best option? No, and in most cases, the 10YR Treasury bond rate is used as the risk-free rate. This is for two main reasons. First, the 30YR T-bond has a unique supply-demand structure that causes it to be very illiquid, which leads to markets not pricing in information on a timely basis. On the other hand, the 10YR Treasury rate is set Monday of each week and has a very liquid market. Secondly, it is important to stay consistent in terms of time horizon for each part of CAPM, and more broadly, each part of the Cost of Capital. Later, when we are calculating things such as Cost of Debt or forward market risk premia, it will be much easier to find things such as default spreads on 10YR corporate bonds than 30YR corporates. As such, the 10YRUS T-bond rate is generally used as the risk-free rate.

However, in the scenario where we want to value an international company, let's say a Japanese company, what risk-free rate would be most applicable? In this case, it depends on what currency you as an investor will invest with. If you happen to be a Japanese investor investing with Japanese Yen, then your risk-free rate will most likely be the 10YR Japanese Treasury rate. If you plan on investing in USD, then the 10 year US T-bond rate would make the most sense. In most cases, as American investors, we will use the 10 year US T-bond rate, and as will be shown below, this issue of "country risk" or where a business is domiciled / makes its revenues will come into play later.

Using a Proper Equity Risk Premium —

As stated above, the equity risk premium is the excess return of the stock market over the risk-free rate. Definitionally, this seems simple; however, the complexity lies in the time period we choose for "stock market returns." Many people will immediately default to using the historical or "trailing" return of the market, somewhere in the ballpark of 7-8%. However, in valuation, cost of equity is used to discount future cash flows, and this is where a problem emerges. Using a trailing return implies that the return of the market in the future will be the exact same as the market return from the last X years. Let's say that you're an investor in 2008, and it's the end of the year. The market has crashed, and you want to calculate the trailing equity risk premium for the last 5 years. When one adds the market return data from 2008 (-33.8%) to the past 5 years, would that increase or decrease the market return? Oddly enough, it would decrease the market return and thus decrease the cost of equity, even though the market has obviously become more risky. This is the issue with trailing data — it can be a poor representation of the future. As a result, forward-looking equity risk premiums are much more relevant to investors looking at market risk in the future, and while deriving the forward equity risk premium is done in a similar way to creating a DCF (you back out the risk in a present value function for future expected cash flows from the stock market), it is many times easier to search for the forward-implied equity risk premium online, with a good source being NYU Stern Professor Aswath Damodaran's website.

[MORE ADVANCED] Going back to the issue of "country risk," sometimes one might be looking to invest in a foreign company, for instance, in Brazil. For this scenario, would it be better to use the market return of Brazil? However, the Brazilian markets tend to exhibit more instability and volatility. In some cases, entire foreign equity markets can crash due to risk related to a country that the business operates in. Given the general instability and unreliability of some foreign markets, it might be a better idea to peg the equity risk premium to a mature market, like the US stock market. We can adjust this using a "country equity risk premium" which would be

$$Country\ Equity\ Risk\ Premia = Default\ Spread\ on\ the\ Country\ Bond \times \frac{\sigma_{Country\ Equity\ Market}}{\sigma_{Country\ Bond}}$$

The Country Equity Risk Premium equation is derived from the correlation between the equity markets and bond markets, then adjusting the market risk with the overall default risk of a country. We can then adjust to get the total Brazilian Equity Risk Premium as:

$$Brazil\ ERP = US(or\ mature\ market)\ \ Premium + Country\ Risk\ Premium$$

By pegging the equity risk premium of a foreign country to a mature market like the US, we alleviate issues of market instability. In most cases, this will be unnecessary for valuation, but serves as a good illustration of how to think about risk outside of US markets.

Using a Proper Beta —

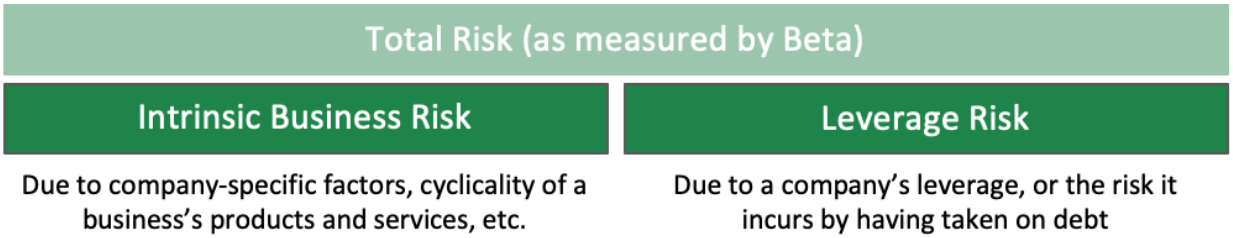
The final part of the Cost of Equity / CAPM equation is the β we choose. This section will first briefly cover the theoretical interpretation of β from CAPM before explaining how equity research analysts actually calculate it. Theoretically, the β value in CAPM is the covariance of the return of an asset with the return of the benchmark (the market) divided by the variance of the market return. In layman terms, that just means β is a measure of

volatility that seeks to understand how much the stock moved relative to how the market moved. If a stock has a β greater than 1.0, then it moves more than the market; if its β is less than 1.0, then the stock moves less than the market.

$$\beta = \frac{covariance(market, stock)}{variance(market)}$$

Yet, the CAPM equation is a single-variable regression. While regressions can be effective, they many times suffer from limitations inherent in regression statistics, including insufficient data points, autocorrelation, wide standard deviations, low r-squared values or violation of a regression's statistical assumptions. As such, running a regression on a single company and set of data can be extremely inaccurate, noisy, and at times even completely nonsensical. Regressions generally increase in precision with a larger dataset (larger sample size), and, as such, regressions of entire industries or markets have much more statistical significance than those of singular companies. Consequently, ER analysts generally build their beta from an "industry unlevered" beta ($\beta_{Unlevered}$ or more simply β_U), meaning an aggregate beta of the industry a company is in, adjusted for the different amounts of indebtedness across businesses in the industry.

Taking a step back, one should consider what factors may play into the β of a business, and how we can properly include them into the calculation. These can primarily be divided into three categories. Firstly, the cyclicality of the products and services a business offers will affect its overall riskiness / volatility. Consumer discretionary and luxury goods perform well during good times, poorly during bad times, and thus exhibit higher beta. Secondly, the operating leverage of a business, or the ratio of fixed to variable costs of a business, can affect profitability during strong and weak markets. Companies that have mostly fixed costs can scale their businesses quickly during market booms, while companies with more variable costs can scale down their business during bad times. While it is possible to derive an "adjusted" beta off of these two metrics, we generally assume that the business nature and operating leverage of businesses in the same industry is relatively consistent. However, the third factor, leverage / indebtedness, can vary wildly by business and plays an important role in the riskiness of a business.



To create a beta that accounts for the risk inherent in more levered/indebted businesses, we "lever" our industry unlevered betas to account for the different capital structures of a business, deriving a "levered" beta (β_L). To do this, we use the following equation:

$$\beta_L = \beta_U \left(1 + (1 - taxes) \times \frac{Debt}{Equity}\right)$$

Putting Everything Together —

If we put everything together, we reach a cost of equity based off the CAPM that looks something like this:

$$Cost\ of\ \ Equity\ = r_f + \beta_L\left(r_m - r_f \right)$$

If we simplify $r_m - r_f$ as Equity Risk Premium (ERP), we get:

$$Cost\ of\ Equity = r_f\ +\ \beta_L(ERP)$$

We can also use Total Country Risk Premium for companies that face significant exposure to foreign markets. Through creating a cost of equity in this manner, we manage to improve upon the backward looking regression model and turn the cost of equity into a forward looking measure of equity risk, something more suitable for discounting future cash flows into perpetuity.

Implying a Cost of Debt: YTM Method —

Compared to Cost of Equity, Cost of Debt is simpler to estimate, but there still remain a few nuances to estimating an accurate Cost of Debt. Theoretically, Cost of Debt is the rate at which the company can borrow at currently, reflecting both the company's credit risk as well as the current level of interest rates in the market. For investment-grade companies (rated AAA to BBB) that lack a significant credit risk, one can estimate Cost of Debt by taking the **Yield To Maturity (YTM)** of the company's long-term, option-free bonds. YTM is a percentage that measures the total return anticipated on a bond if the bond is held to maturity. For example, if a 10YR bond with face value of $100 is priced at 5% annual YTM:

$$Market\ Value = \frac{Face\ Value}{(1+YTM)^n}\ =\ \frac{100}{(1.05)^{10}}\ =\ 61.39$$

That means its present-day market value is $61.39 and after ten years the value of this $61 bond will reach its face value of $100, with an annualized return of 5%. Alternatively if you knew everything except YTM and wanted to isolate for YTM on one side of the equation, it would be:

$$YTM = \sqrt[n]{\frac{Face\ Value}{Market\ Value}} - 1\ =\ \sqrt[10]{\frac{100}{61.39}} - 1\ =\ 5\%$$

It is important to remember that unlike many other characteristics of bonds, YTM is a dynamic value, changing according to market conditions. If prevailing interest rates change, the coupon rate, maturity date, and principal of the bond remain the same as at issuance. The market value of the bond, or current price, however changes and looking back at the YTM equation above, it is clear that YTM changes as well. If interest rates go down, this 10YR bond with its relatively high coupon rate of 5% would be more attractive than any new bonds issued at the lower rates. Thus the market price of the 10YR bond will increase, which would decrease YTM. As a result,

YTM reflects the attractiveness of a company's bonds against the current interest rate environment and is a really important concept in bond pricing as many fixed income investors use it to drive their investment strategies.

YTM is technically only a proxy for expected return, because the yield is only a promised rate of return on a company's debt if all coupon payments and principal are paid. In reality, expected free cash flows should be discounted by an expected return instead of a promised yield, but because investment grade companies have very low probability of defaulting, such a discrepancy is relatively trivial.

Implying a Cost of Debt: CDS Spread Method —

While using YTM is suitable in most situations, specifically with investment grade companies with liquid bond markets, one alternative method of calculating (using the interest rate on a bond) is never a good idea. The logic behind this is simple — any company can issue a "safe" bond or loan if enough provisions are in place to ensure the lender or bondholder will be compensated for their debt issuance. In recent years, a market for high-yield bonds and loans has developed rapidly, and continues to develop even during the COVID-19 crisis. Due to a high demand for fixed income investments, many companies that have poor credit ratings have managed to secure bonds or loans at extremely low rates, which likely do not reflect the rates at which the companies can borrow at today. This issue can also extend to YTM for high-yield instruments having enough collateral or seniority in the capital structure of a business. YTM may also be skewed for companies that have very illiquid markets for their debt securities, which can often lead to pricing inefficiencies. In fact, most companies do not have a vibrant market for the bonds and loans, and as such might have YTMs that do not price in current credit risk. As such, for businesses that have high levels of credit risk or illiquid credit markets, implying a cost of debt will likely be a more robust method determining a company's current cost of debt.

The approach for implying a cost of debt will first involve determining the credit rating of a company, which will commonly be issued by firms such as Moody's or S&P (credit ratings are based on probability of default; the higher the credit rating, the lower the probability of default). However, doing so can be challenging for companies that have numerous different ratings for each of their debt issuances, or companies that aren't rated at all. In the case of companies with numerous different ratings, the median rating should suffice as a measure of a company's overall creditworthiness. For companies that do not have any rating, one can imply a rating through determining interest coverage ratio:

$$Interest\ Coverage\ Ratio = \frac{EBIT}{Total\ Interest\ Expense}$$

This works as many credit rating agencies use the Interest Coverage Ratio as a primary way to determine the credit rating of the overall company, and as such, it is easy to imply a credit rating once the interest coverage ratio is known. There are many resources available online that group company credit ratings by interest coverage ratio, and once a credit rating is known, find the corresponding **Credit Default Swap (CDS)** spread for similarly rated bonds of a 10 year maturity. CDS spreads can be found on resources such as Factiva, S&P CapIQ or Net Advantage, or Factset, and there are some websites online that aggregate information for CDS spreads by rating. CDS spreads serve as an accurate measure of creditworthiness as they are directly pinned to the credit risk of companies in a certain credit rating. After obtaining the CDS spread, add the CDS spread to the risk-free rate to determine the cost of debt:

$$Cost\ of\ \ Debt\ =\ r_f\ +\ \ CDS\ Spread$$

[MORE ADVANCED] In some cases, it may be necessary to factor in the credit risk of the countries a company operates in. In this case, a similar "country risk" method as that described in the equity risk premia section should be used above. Just like companies, countries are also rated by major credit rating agencies for their creditworthiness, and in a world of rising sovereign debt, factoring the credit risk of countries has become even more important. For a company that has 2 / 3rds of its operations in Argentina (which has a B- rating from S&P as of writing), we may want to take 2 / 3rds of the CDS spread of Argentine sovereign debt and add that to our cost of debt:

$$Cost\ of\ \ Debt\ =\ r_f + \frac{2}{3} \times (\ Argentina\ \ CDS\ \ Spread)\ \ +\ \ Company\ \ CDS\ \ Spread$$

Note that this is only necessary for companies with significant exposure to countries with lower credit health, and is not needed for businesses that mostly do business in the US or other countries with good credit health.

WACC and the WACC Curve —

Now that all the relevant puzzle pieces have been laid on the metaphorical table, it's time to put everything together through the concept of **WACC**. WACC stands for the **Weighted Average Cost of Capital**, and it relates everything taught in this module together into one nice equation. It is, as it sounds, a weighted average of the two costs of capital (equity and debt) and also represents the *r* value in the (1+r) denominator portion of the NPV equation, ie. the discount rate that all future cash flows should be discounted by. The WACC equation is as follows:

$$WACC = \%Debt * Cost\ of\ \ Debt * (1 - t) + \%Equity * Cost\ of\ \ Equity$$

This equation can be expanded out to:

$$WACC\ =\ \frac{Total\ \ Debt}{Market\ \ Cap\ \ +\ \ Total\ \ Debt} * Cost\ of\ \ Debt * (1-t) + \frac{Market\ \ Cap}{Market\ \ Cap\ \ +\ \ Total\ \ Debt} * Cost\ of\ \ Equity$$

Cost of Debt and Cost of Equity are derived per previous discussions. Percentage of equity is derived from taking Market Cap as a percent of Market Cap + Total Debt, and percentage of debt is conversely taking Total Debt as a percent of Market Cap + Total Debt. As mentioned before, the (1-*t*) component in the debt portion comes from the fact that debt is tax-deductible. The WACC formula takes into account the corporate tax shield effect: the net cost of a company's debt is the amount of interest being paid less the amount saved in taxes as a result of tax-deductible interest payments.

While we have derived Cost of Debt and Equity thoroughly in the previous sections, it is also good to elaborate on the *t* for taxes in (1-*t*). For the tax rate, there can be an argument made for both effective and marginal tax rates, but under different circumstances. A quick glance of business income statements across different

industries reveals that the effective tax rate, or the taxes paid over taxable income (EBT), varies. This can be due to reasons that pertain to a company's operations and how they take advantage of different deductions or tax credits. However, over time, as a company matures, these deductions and credits will wear off, and into perpetuity, a company's tax rate will reach a steady state that approaches the marginal tax rate (which is 21% as of the date of this writing). For the purposes of Cost of Debt and Equity, a marginal tax rate would make more sense for a WACC that is assumed into perpetuity, however, there is an argument to be made for the effective tax rate if a valuation has varying WACCs over the projection period. However, for the purposes of most valuations, WACCs stay constant and the marginal tax rate should be used in these calculations.

An additional area of complexity can be what is considered as "debt." While on the balance sheet, there are certain line items explicitly called debt, companies will commonly have "debt-like" liabilities. While some companies will disclose exactly what these "debt-like" liabilities are, some may choose not to elaborate. In this case, it is up to the best judgement of the investors to determine what liabilities can also be considered debt. A common rule of thumb is that debt-like liabilities are liabilities that are interest bearing (which excludes things like accounts payables), are tax deductible, and must be paid or risk significant business disruption. Common examples of "debt-like" liabilities included operating leases, finance leases, and underfunded pension liabilities. If these "debt-like" liabilities are significant, then they should be included as part of Total Debt. However, if these "debt-like" liabilities are included in Total Debt, they must also be included in all other places where Total Debt is used, for example, in the levering process for β.

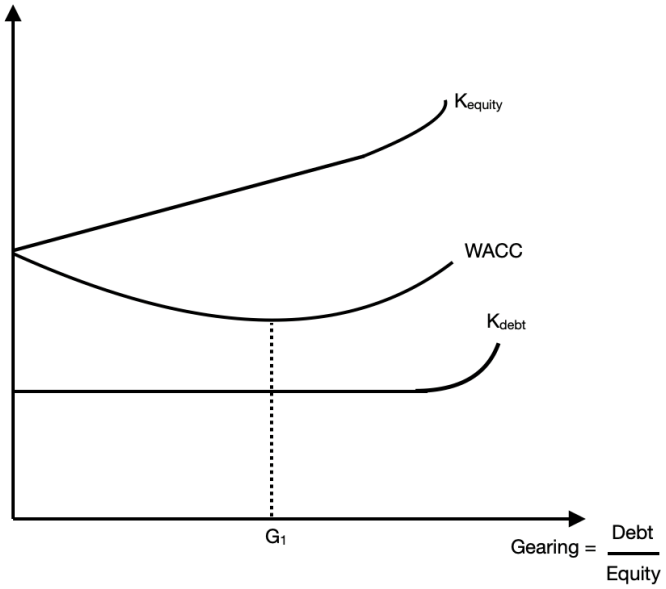
WACC is the rate of return that investors expect to earn from investing in the company and therefore the appropriate discount rate for the free cash flows. Another way to think of WACC is as a portfolio of assets, a weighted bucket of equity and debt securities that exactly match the company's characteristics and capital structure. This portfolio of assets is expected to make a certain amount of return against the market, so in order to acknowledge that opportunity cost, the company has to guarantee a required rate of return to investors that exactly matches the expected return of this portfolio of assets. Otherwise the investors would rather just synthetically create this portfolio themselves and garner a higher return than what the company is offering.

One might ask: from the company's perspective, is there an optimal capital structure? The answer lies in the WACC. Revisiting the cash flow equation, it's important to note that a company seeking to maximize its value ultimately wants to minimize its WACC (lower WACC = smaller denominator = higher discounted cash flows):

$$Value = \frac{CF_t}{(1+r)^t} + \frac{CF_{t+1}}{(1+r)^{t+1}} + ... + \frac{CF_{t+n}}{(1+r)^{t+n}}$$

As a result, the search for optimizing capital structure is the search for reaching the lowest WACC. Instinctually, the answer is to weigh heavily in favor of the cheaper cost of capital (debt) than the more expensive cost of capital (equity). In Module 1, the lecture notes established that the cost of debt is cheaper than the cost of equity due to tax-deductibility and the equity risk premium. However, when optimizing WACC, there are two opposing forces at play and the question is which has the greater effect: the decrease in WACC caused by using relatively cheaper debt over equity or the increase in WACC due to the higher financial risk on both cost of equity and cost of debt as leverage accumulates. For debt holders, the possibility of bankruptcy risk increases with added debt so they need to be compensated. Similarly, for equity holders, more interest is being paid out of profits to debt holders before equity holders get their dividends so the added volatility needs to be compensated.

Altogether, as the company leverages up, both debt and equity holders have to be compensated for the higher risk. This is how the **WACC curve** is created:



At first, the WACC will fall because the benefits of having more cheaper debt outweigh the increase in cost of debt and equity as a result of higher financial risk. It will continue to fall until it reaches its minimum value, ie. the optimal capital structure represented by the point G_1 on the graph above, before starting to increase due to the high financial risk of leverage dominating the impact on WACC.

Module 5 — DCF: The Discounted Cash Flow Model

A Mechanical Understanding of DCF —

At this point, all the key concepts of a DCF have been explained, but they have not been connected. As mentioned earlier, a DCF is an NPV calculation on a business. By applying the NPV formula with FCFF as CF, the DCF valuation should be as follows:

$$EV = \frac{FCFF_t}{(1+r)^t} + \frac{FCFF_{t+1}}{(1+r)^{t+1}} + \ldots + \frac{FCFF_{t+n}}{(1+r)^{t+n}}$$

However, as discussed in the last module, WACC is used to discount. Thus, r will be replaced with W, where $W = WACC$, to create the following formula.

$$EV = \frac{FCFF_t}{(1+W)^t} + \frac{FCFF_{t+1}}{(1+W)^{t+1}} + \ldots + \frac{FCFF_{t+n}}{(1+W)^{t+n}}$$

The above formula is a complete and theoretically accurate DCF formula. However, it has a major practical issue: investors cannot reasonably predict FCFF too far into the future. Thus, the formula must be simplified. Mathematically, it is easy to simplify the formula—use the franchise value (or geometric series simplification)! Thus, project the short-term (5-10-15 years), then add the franchise value of the firm at that time (5-10-15 years in the future) instead of continuing to discount cashflows. The franchise value must be discounted because it is

the value at some point in the future. Mathematically, these methods are equivalent because the franchise value is directly derived from the NPV formula. (To demonstrate mastery, proving equivalence is encouraged.)

$$EV = \frac{FCFF_t}{(1+W)^t} + \frac{FCFF_{t+1}}{(1+W)^{t+1}} + ... + \frac{FCFF_{t+5}}{(1+W)^{t+5}} + \frac{FCFF_{t+5}}{(W)(1+W)^{t+5}}$$

However, as before, the franchise value is a conservative valuation that assumes constant cash flows. Thus, it is potentially a bad system. To improve the equation while maintaining simplicity, a constant growth rate can be applied to the franchise value. Thus, we create the following formula where g is the constant "terminal" growth rate.

$$EV = \frac{FCFF_t}{(1+W)^t} + \frac{FCFF_{t+1}}{(1+W)^{t+1}} + ... + \frac{FCFF_{t+5}}{(1+W)^{t+5}} + \frac{FCFF_{t+5}(1+g)}{(W-g)(1+W)^{t+5}}$$

Practically, the above formula is a DCF. The first portion, where FCFF is projected, are called the near-term cash flows and the end portion where the franchise value is discounted is called **the terminal value.** The method shown for calculating "terminal value" is the **Gordon Growth Method (GGM).** More explicitly, the Gordon Growth formula (a direct extension of the franchise value formula with constant growth) calculates the terminal value as follows:

$$\text{Terminal Value} = \frac{CF_{t+n}(1+g)}{W-g}$$

The Gordon Growth terminal value is discounted before adding it to the near-term cash flows for mathematical consistency. Intuitively, it is discounted because Gordon Growth is a franchise value of the firm assuming a standard growth rate at a future date; thus, it is a simple value of a point in the future which must be discounted to the present. Equivalently, the terminal value shows the NPV of cash flows at a future date or is theoretically the selling price of the business at a future date. As investors, it is therefore the future cash flow from the business sale and should be discounted accordingly.

$$\text{EV} = \text{Present Value of Near-Term Cash Flows+Discounted Terminal Value}$$

The application of a DCF can be simplified into two categories: predicting near-term cash flows and the terminal value and then discounting them accordingly. To make these predictions, many intermediate steps are required. First, it is crucial to decide when the terminal value should be applied, that is how many years of near-term cash flows are being predicted. The cash flows should only be simplified (terminal value applied) once the business has reached a "steady state" and will not change significantly. Second, the discount rate must be determined (WACC). Next, the near-term cash flows must be projected and discounted appropriately. Finally, the **terminal growth rate (TGR)** must be determined and the terminal value calculated. Generally, TGRs are bounded below by inflation and above by GDP growth. These bounds should make intrinsic sense for anyone who understands geometric growth. If a company grows at less than the inflation rate into perpetuity, the "real" value of the business will eventually go to 0. On the other hand, if a business grows at greater than the GDP growth rate into perpetuity, then eventually the value of the business will exceed the total value of the nation's

GDP. Once all these numbers are plugged into the formula, an enterprise value is derived. Typically, as equity investors, a share price is more relevant so the enterprise value must be adjusted accordingly to first reach the equity value and then the implied share price.

Once the implied Enterprise Value of the business is determined, to determine the value of the business to equity investors, a few additional steps must be taken. First, all investors' claims that must be paid off before the equity claims should be subtracted from the implied Enterprise Value. This includes items such as debt, minority interest in the firm, preferred stock, underfunded pension liabilities, etc. Additionally, cash and cash equivalents should be added to Enterprise Value, as these can be used to pay off more senior claims or go directly to equity holders. Subtracting and adding these items to Enterprise Value results in **Equity Value**, or the remaining value in the business that is attributable to equity investors. To find the implied share price, or the fair value per share in the business, the equity value should be divided by shares outstandings. Usually, the shares outstanding value used is the **diluted shares outstanding value**, or the total number of shares if employee stock options and warrants given to employees or management are all exercised. Using diluted is advised because if one were to use the undiluted number of shares outstanding, it would not show the worst case scenario of what the company's stock would look like if the company had to immediately issue every share it had promised. There are other ways to model the effect of stock options on the equity value attributable to the business, but these involve a knowledge of options pricing.

Formula Summary

- CAPM = Cost of Equity $= rf + \beta\,(rm - rf) = rf + \beta$ (Equity Risk Prem.)
- Cost of Debt—CDS: $= r_f +$ CDS Spread
- Cost of Debt—YTM: $= -1 + \sqrt[n]{\frac{\text{Face Value}}{\text{Market Value}}}$
- FCFF = EBIT $*\,(1-t)$ + D&A − CapEx − ΔNWC
- WACC = % of Debt $*$ Cost of Debt $*\,(1-t)$ + % of Equity $*$ Cost of Equity $= \frac{Debt}{Debt+Market\ Cap} * CoD * (1-t) + \frac{Market\ Cap}{Debt+Market\ Cap} * CoE$
- Market Cap = Shares Outstanding $*$ Current Share Price
- Discounting nth year cash flow: $\frac{Cash\ Flow_n}{(1+\ Discount\ Rate)^n}$
- DCF: Enterprise Value $= \sum_{n=0}^{\infty} \frac{FCF_n}{(1+WACC)^n}$
- Enterprise Value = Equity Value + Net Debt

A Crucial Assumption: Growth —

While it is easy to determine what the free cash flow of a business is for the current year, often the hardest part about valuation is creating good projections for the future. Growth generally is a good thing, driving up Revenues and usually Operating Incomes. However, just as was stated above, all growth is funded by reinvestment, and in some cases where reinvestment becomes more costly than the growth it creates, growth can become a double edged sword.

To begin, there are a couple ways investors might estimate the growth of a company. The first way is to look at the historical growth of a business to imply a future growth rate in the business. This method would involve using an arithmetic or geometric, or some form of regression model (single vs multivariate), and using the historical growth rate(s) as a flat growth rate to be used over the cash flow projection period. There are a couple of considerations for this method, which include whether to look at Revenue or Operating Income growth and what period of estimation (start and end points) should historical growth be calculated with. However, it can be difficult to calculate the historical growth rate of a company if the company has negative earnings or scales up extremely quickly through acquisitions. In these cases, growth will either be extremely high or extremely low due to outliers in growth caused by these two issues. One final issue, and perhaps the most important one, is the risks of extrapolation. Past performance does not represent future performance. Especially in the age of high-growth high-tech companies, growth rates can be astonishingly large, with some companies doubling or tripling in size in the span of a couple of years. In the case of these companies, using these trailing growth rates can be very unrealistic as all businesses will reach a certain point at which they mature, running out of new customers to acquire, or burning more money in reinvestment than they gain through profit. Most companies (around 95% of all publicly traded companies) stop growing more than their peers by year 10 of their "growth stage," and as such, it often makes no sense to project high growth far into the future.

Another way to estimate growth is through relying on sell-side analyst estimates, and in many situations, sell side analysts are pretty good at predicting growth in the short term. Many analysts have information that the average investor will not have access to, for instance, a relationship with senior company management. They might also have a much deeper familiarity with the industry that a company sits in, and such has a better idea of how structural changes to said industry might affect a company's earnings. On the other hand, analysts can be completely off the mark for a couple of reasons.

First, while industry specialization can be a good thing, it may also lead to overconfidence and a lack of bigger picture awareness of the market. Analysts who spend their entire lives looking at biotech companies may be at risk of buying into industry trends or enthusiasm when in relation to the broader stock market, biotech companies are overpriced or show signs of structural weakness. Second, there is a strong motivation to "follow the crowd" and avoid deviating too far from what the rest of the market thinks of a company. This can simply be attributed to a fear of being wrong, more specifically, a fear of being the only analyst who's wrong. Third, analysts might develop "Stockholm Syndrome" identifying with the companies they are supposed to cover. In many earnings calls, it sometimes becomes apparent that certain analysts ask "dumb" or "lowball" questions, and these cases might be as a result of them becoming biased in favor of the company. Another facet of this can be analysts simply buying into the "stories" that companies present while ignoring the numbers.

Finally, and perhaps most insidious, is the fact that sell side analysts usually work at large investment banks that also conduct business with the businesses an analyst might cover. While a major breach of ethics, many times equity research departments may be inclined to be uncritical of companies that the investment banking divisions work closely with, or might even have their hands tied by upper level management. In some cases, analysts have been fired for producing equity research critical of an investment bank's client. While these are all possible risks with following equity research projections, they aren't just limited to sell-side analysts. The fundamentals, and more specifically the relationship between reinvestment and growth. As stated earlier, growth is defined as:

$$Growth\ Rate = Reinvestment\ Rate \times ROIIC$$

The first step in using this association is what "growth rate" is being projected / measured. This growth rate can be Revenue, Operating Income, Net Income, or any income metric, as long as the reinvestment rate and ROIIC are defined in terms of the "income" metric. Generally speaking, Revenue and Operating Income are the easiest to project growth for, and have the most direct applicability to a FCFF projection. Once an "income metric" is decided, reinvestment rates need to be calculated based off of that "income metric." When looking at the FCFF equation, the reinvestment portion of the formula should be relatively clear:

$$Reinvestment = Net\ Capital\ Expenditures + \Delta NWC$$

With the reinvestment rate as:

$$Reinvestment\ Rate\ for\ EBIT = \frac{Net\ Capital\ Expenditures + \Delta NWC}{EBIT \times (1 - t)}$$

$$Reinvestment\ Rate\ for\ Sales = \frac{Net\ Capital\ Expenditures + \Delta NWC}{Sales}$$

This should be a review of previous modules. While reinvestment can sometimes be easily defined, it is hard to define "incremental" return on invested capital, or ROIIC. In many cases, it is hard to separate invested capital (equity or debt) that is no longer contributing to the growth of a business, and how much return is being generated from incremental investment. While it would be preferable to find the incremental return on invested, doing so usually requires information that is seldom disclosed publicly. As such, a ROIC or return on (all) invested capital metric can be used as a proxy. Assuming a flat ROIC for a business (which is generous given businesses will gradually see less efficiency in their investments as they mature), a simple forward growth rate can be estimated for either Revenue or EBIT. While for EBIT the traditional definition of ROIC can be used as a return metric, for Revenue, a sales to capital ratio would be preferable, defined as:

$$Sales\ to\ Capital\ Ratio = \frac{Sales}{Total\ Invested\ Capital}$$

Multiple Method —

Multiples were discussed at great length earlier, but their direct relationship to valuation was not illuminated; this section will outline the link and apply multiples to value a business. There are three steps to valuing a business with multiples: finding the multiples, finding comps, applying the appropriate industry multiple.

First, normalized, forward multiples must be obtained. All multiples have earnings in their denominator, and thus they can fluctuate greatly. Thus, earnings must be "normalized" or made to look like they would in a typical year. A company in a cyclical trough may trade at high current multiples (because this year's earnings are low) but on a normalized basis, it is fairly valued. Next, because multiples are being used to calculate a future value of the business, forward earnings must be used.

Second, comparable companies must be identified. In general, multiples are only useful for comparing businesses with other similar businesses. Thus, when finding a comparable company, market capitalization, industry, location, business model, competitive dynamics etc. should be matched. Once the comparable companies have been obtained, the industry multiples should be calculated by taking the mean and median of the comparable companies normalized, forward multiples.

Finally, equipped with the industry multiples, multiply the industry multiple by the company's normalized earnings. If the multiple was an equity multiple (P / E, etc.), the equity value has been calculated; if the multiple was an enterprise value (EV / EBITDA, etc.), the enterprise value has been calculated. Discounting is not required. Multiples valuation merely computes the price the company should sell for in the very near future, given today's adjusted earnings.

An example is included below:
Company A earns $10,000 in EBITDA every year. It's competitors trade at a forward EV / EBITDA of 5x. Company A therefore has an enterprise value of $50,000.

Multiple Method for Terminal Value —

Another way of calculating the terminal value is through multiples. As explained above, the terminal value is essentially the value of the business at a future date; a valuation within a valuation in essence. Thus, relative valuation techniques can apply. A common way of calculating terminal value is applying a multiple, called a **terminal multiple**, on some future earnings. Using the EV / EBITDA multiple as an example, the discounted terminal value would look something like:

$$Terminal\ Value = \frac{EV}{EBITDA} \times EBITDA_n \times \frac{1}{(1+WACC)^n}$$

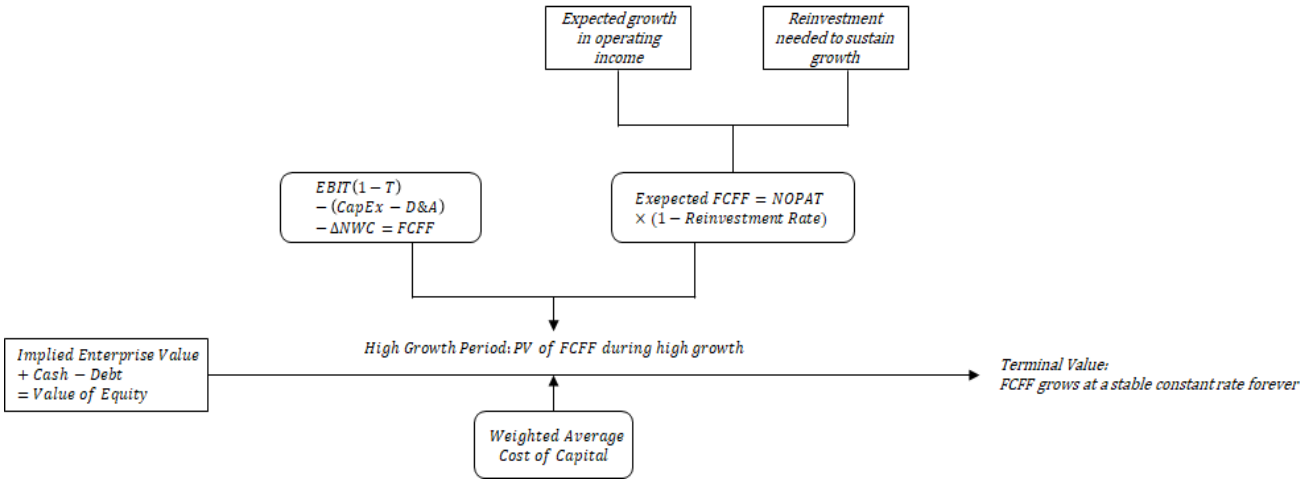
Keep in mind that the EV / EBITDA multiple chosen should reflect a mature business, one that has already passed its stage of rapid growth. As such, it usually makes the most sense to choose an industry average multiple (either present or future, if possible). Additionally, an argument can be made for other valuation multiples, such as a EV / FCF or EV / EBIT multiple. The most important limitation is that the multiple must be consistent with the type of valuation that is being conducted. If cash flows to the entire firm (which includes debtholders and equityholders) are being projected, the denominator of the valuation multiple must be attributable to all investors. If a cash flow to equity valuation is being conducted, then a valuation multiple attributable to equity holders (like P / E) must be used.

Final Notes/Summary of DCF and Cash Flow Valuations —

In summary, the general steps are as follows:

1. Determine the discount rate(s) rate that will be used in the valuation [WACC]
2. Estimate the future cash flows from the firm during the "growth" period [near-term cash flows]
3. Estimate company value into perpetuity once "stable" growth is reached [Terminal Value]
4. Discount each of these cash flows by the previously determined discount rate [Enterprise Value]
5. Add cash and subtract debt from Enterprise Value [Equity Value]
6. Divide Equity Value by diluted shares outstanding [Implied Share Price]

Below is a visual representation of the different steps in a standard FCFF DCF:



While there are many mechanical steps behind Cash Flow Valuations and minutiae within each step of a valuation, it's important to keep in mind the big picture. In the end, what makes a good valuation is not the number of steps taken to come to a final value, but the assumptions and reasonings behind the choices and inputs made. For some businesses, there might be a need to carefully consider inputs for WACC, and in other businesses, a valuation can be as simple as assuming stable growth from the get go and projecting franchise value. While the steps and mechanics laid out above give a good framework to approaching valuation, they are in no way the be-all and end-all to how one should conduct their own valuations. The way in which the valuation framework is applied and the story / narrative that a valuation tells will ultimately determine whether a valuation was worthwhile or not.

Module 6 — Qualitative Analysis: Competitive Strategy

Introduction to Competitive Strategy —

Over the last few modules, the concepts of understanding risk and finding value have been discussed at length and with (hopefully) great rigor. However, valuation is only half of the picture; understanding the business—drivers, competitive dynamics, and qualitative risks—is the other half. Not only do these philosophies inform the assumptions of the valuation, but they also provide a framework for understanding the implications of a valuation. As Lemony Snicket said, "Making assumptions simply means believing things are a certain way with little or no evidence that shows you are correct, and you can see at once how this can lead to terrible trouble." The primary goal of qualitative analysis and competitive strategy analysis is to justify and support our quantitative assumptions to avoid this terrible trouble.

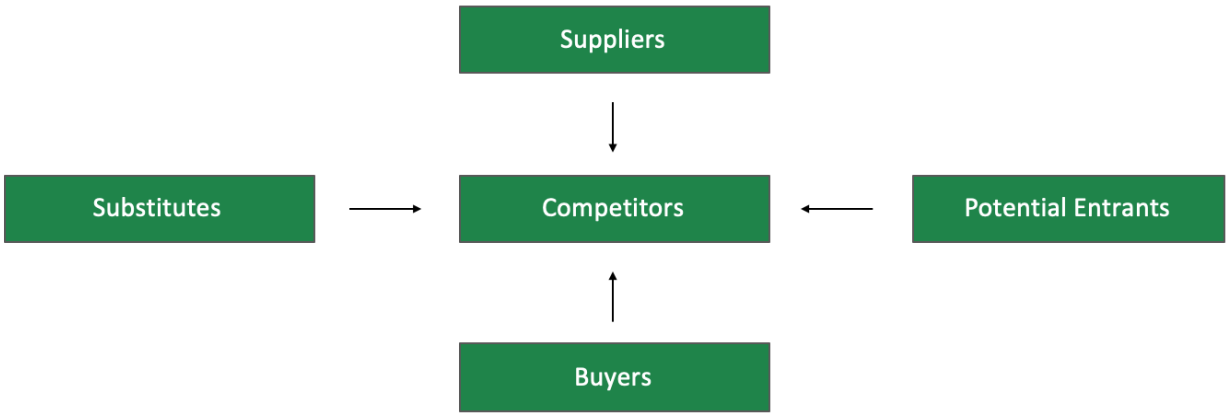
This section will be more cursory, because the ideas behind competitive strategy are quite well-explained by others and through case studies.

Porter's Five Forces and Economic Moats —

A **competitive advantage** is an advantage that allows a company to generate returns on capital greater than the returns on capital of its competitors and its cost of capital. As discussed earlier, high ROICs create value and

thus "competitive advantage" is quite important. Some examples of competitive advantages may be optimized supply chains, better technology, great management, etc. However, in that example, many of the advantages are not permanent. For example, a great manager will eventually die or retire, leaving the company without that advantage. Similarly, competitors will develop comparable technologies and optimize supply chains in time. Thus, these "advantages" are not sustainable; they have no reason to exist into perpetuity. Thus, as investors, sustainable competitive advantages or **economic moats** are far more important. An economic moat is a competitive advantage, indicating it is currently hard to imitate, but specifically one that will "stand the test of time." Examples of moats include high barriers to entry, branding, high switching costs, and other intangibles.

There are many ways of understanding competitive advantages, but an easy and commonly used framework is **Porter's Five Forces**. Each of the forces is defined below; the supplementary reading for this module will give more color on each.



1. **Competitive Rivalry (Competitors)**: This assesses how competitive the industry is overall among existing competitors. High competition reduces profitability across the board, often due to numerous equally balanced competitors, slow industry growth and high fixed costs. When competitive rivalry is low, a company has greater power to charge higher prices. Examples include most banks and fast-food chains.

What determines the intensity of ongoing rivalry in the industry on a more granular level is 1) product differentiation, 2) capacity constraints, 3) collusion, and 4) number of firms. A company's product differentiation stems from real and / or perceived differences in products and transaction costs that include switching costs (costs for consumers associated with changing brands) and search costs (costs for consumers related to searching for a better product or service). Capacity constraints are constraints that prevent a business from achieving more output and may include capital, design, and resource limitations or bottlenecks. Collusion, whether explicit or implicit, is a secret and sometimes illegal agreement between rivals which attempts to artificially move away from the market's equilibrium. And finally, the number of firms is the most intuitive to understand: the more firms in the industry, the more competitive the market is.

2. **Threat of New Entrants / Barriers to Entry (Potential Entrants)**: This measures how easy / hard it is to break into the industry as a new entrant. If entrepreneurs and companies can enter a new industry easily then companies already operating in this industry (incumbents) risk a significant threat of new entrants, so an

industry with high barriers to entry is generally preferred from the incumbent's perspective. Examples of companies with high barriers to entry include Boeing / Airbus, Oracle, and Facebook.

There are three types of barriers to entry:

- Resource Constraints ("they can't get the resources they need to imitate my competitive position")
    - This may be due to literal scarcity (ie. diamond mines, oil fields) or legal restrictions (patents, trademarks, licenses) or privileged access to customers / suppliers (retail shelf space, long-term contracts, lock-in from network effects)
- Efficient Scale ("they can imitate my competitive position, but it wouldn't be profitable for them")
    - Economies of scale, switching costs, and high costs of starting up a large enterprise may indicate to the entrant that the costs may be too high for a profitable entry
- Time ("by the time they imitate my position, I will have moved to a superior one")
    - Reasons why initial advantages may deepen over time include learning by doing / experience curve on the cost side, product track records / reputation on the demand side, and continuing R&D and innovation in technologically-intensive industries

Barriers to entry is one of the most important of Porter's Five Forces to understand in the current era of industry disruption and is further complicated when considering incumbents who can react strategically to the threat of new entrants. For example, predatory pricing is defined as companies pricing lower than would be profit maximizing in order to (possibly) drive a competitor out of the market, and while predatory pricing is illegal, it is hard to distinguish that from a competitive response. Supposing that an incumbent's price goes down with the entry of a new player, it could be due to legitimate reasons such as a duopolistic price being lower than a monopolistic price. Furthermore, even if the incumbent's price is lower than their marginal cost of production, this can be due to it being a loss leader (milk at the store or Costco's $5 rotisserie chicken) or a complementary good (printer paper and ink). Ultimately, the incumbent aims to convince the entrant that post-entry profits will not cover the cost of entry and it will often sacrifice profits in hope of avoiding future competition. Thus from an entrant's perspective, it must be financed enough to survive prolonged periods of low profits.

This battle between incumbent and entrant often becomes a game theory situation, but one potential approach for the entrant is to target a smaller audience because it won't be as big of a threat to the incumbent and it is less likely to result in a price war. Airborne versus FedEx / UPS and Ryanair versus British Airways / Aer Lingus are great examples of smaller players successfully carving their own niche. With cost-cutting initiatives like owning and operating an entire airport to serve as its major hub (to avoid paying extra costs like landing fees) and having a fifth of the planes but operating at a higher utilization rate (running its cargo planes at 80% full compared to competitors at 65-70%) , Airborne was able to carve out its own mail delivery niche. Similarly, against much larger airline competitors, Ryanair remained profitable by operating in the niche market of the Dublin-London round-trip route and took advantage of the fact that size advantage can play both ways, large and small.

3. **Threat of Substitutes (Substitutes)**: Substitutes are similar to new entrants in the sense that they both take away demand from a company. Substitutes are products with similar functions that limit pricing power to some extent, but they are not in direct competition such as tea versus coffee. Examples of a company with high threats of substitutes are WeWork and Starbucks; because WeWork caters to freelancers and SMEs, its customers are often willing to try different work environments like libraries, coffee shops, or WFH. Starbucks meanwhile as mainly a coffeehouse chain has a high number of substitute goods like tea, juice, and carbonated water.

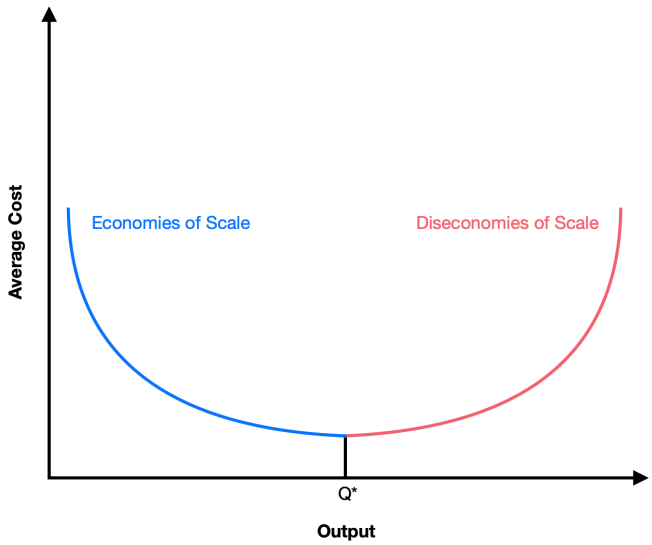
Evaluating substitutes includes analyzing a buyer's switching costs, the number of substitute products, and substandard products. Economically, the threat of substitution is a question of price elasticity of demand. Remembering that price elasticity of demand is equal to %change in quantity demanded / %change in price, if demand elasticity is low, that means that with a small change in price, there's a small change in quantity demanded. Thus the product demand is quite inelastic to price and substitutions are unlikely due to pricing changes. However if price elasticity of demand is high, that means that with a small change in price, there is a large change in quantity demanded. Thus the product demand is quite elastic and the threat of substitutes is more likely. Generally, the more discretionary a purchase is, the more its quantity will fall in response to price rises, and the more price elastic the product is. Exceptions include luxury goods and addictive (sin) goods like alcohol and tobacco.

4. **Buyer Power (Buyers)**: Strong buyers have significant influence over industry players and can distort profitability. Important to note for both Buyer Power (4) and Supplier Power (5) is whose perspective each is being understood from, whether it's as a consumer, the company, a competitor, or the company's suppliers. Buyer power is strong when 1) the buyers are few and large, 2) products aren't differentiated from the buyer's perspective, 3) there are low switching costs for the buyer, and 4) information about the suppliers' costs are highly transparent to the buyer. For example if a company is reliant on a single customer, it makes sense that the customer has a lot of control over the pricing they are quoted by the company, unless the company is also the only supplier. Again, a lot is captured by the price elasticity of demand — the company can set the price if it is much larger than buyers, but large buyers can respond with a counteroffer. Examples of a company with high buyer power include Apple and Costco. Many of Apple's suppliers, for example, face significant bargaining power from Apple because Apple's contracts control the majority of their revenue.

5. **Supplier Power (Suppliers)**: Similar to buyer power, suppliers have the potential to disrupt a company's supply chain and cost of production. Supplier power is strong when 1) suppliers are few and large, 2) products are differentiated from the buyers' perspective (a consumer's perspective of a company or a company's perspective of its suppliers), 3) there are high switching costs for the buyer, and 4) information about the supplier's costs are highly opaque to the buyer. Generally, supplier power is just the opposite of buyer power. Examples of a company with high supplier power include Qualcomm which supplies specific chips to Apple that other chip manufacturers like Intel can't reproduce.

Economies of Scale & Economics of Scope —

Porter's five forces hints at but does not explicitly mention economies of scale and economies of scope. Both and the difference between the two are also important to highlight when understanding how to compare firms in terms of cost efficiency and product synergies. Simply stated, a large incumbent is often more efficiently run than a small start-up because it exhibits economies of scale and scope. **Economies of scale** is when a company gains a cost advantage due to an increased level of production of a single good. Mathematically, production exhibits economies of scale if average cost per unit is declining, and production exhibits diseconomies of scale if the average cost per unit is increasing. By spreading fixed costs over larger output, adopting more automated technology, or exploiting the division of labor, companies can minimize their average cost. However, it is important to realize there is an optimal point of efficiency and if that is taken too far, it creates diseconomies of scale. By stretching resources to their limits, spreading fixed assets or talent too thin, and complicating HR and organizational overhead, a company can push itself into less cost-efficient territory.



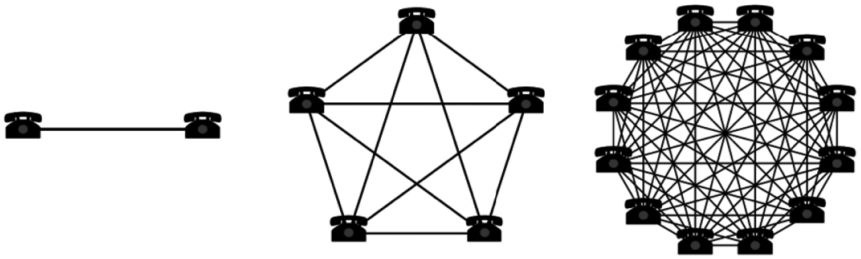
Turning to scope now, while economies of scale focuses on the volume of goods sold, **economies of scope** focuses on the variety of goods and services sold. Economies of scope states that producing a variety of different products together should reduce costs. A combined company with its various products and services must create more value than the sum of its individual companies. Economies of scope can result from goods that are co-products or complements in production, goods that have complementary production processes, or goods that share inputs to production. However, two bad but common arguments for integration between product X and Y is that if product X segment was becoming unattractive or if product Y segment was becoming more attractive. Neither argument implies that the combined company creates more value together than by keeping them separate.

Operating Leverage and Network Effects —

There are two increasingly important factors ignored in Porter's Five Forces: operating leverage and network effects. Both of these factors apply directly to internet-based businesses like Amazon, Google, or Facebook. Thus, Facebook will be used as an example.

First, **operating leverage** is simply the ratio of fixed costs to variable costs. Thus, it describes how effectively a business can scale. Facebook has very high fixed costs—it spends billions of dollars on building and maintaining data centers. However, because of the data centers, the cost of each additional user is negligible. Thus, the business can scale quickly and efficiently. Operating leverage is naturally a double edged sword. High operating leverage is great for quick expansion, but if a business cannot scale it will be saddled with high fixed costs.

Second, network effects. There are two types of network effects: direct and indirect. A **direct network effect** is when each additional user improves the platform. The classic example is a telephone. A telephone network is useless with one person (because there is nobody to call), but the number of people to call grows exponentially with the number of phones added and so does the value of the platform. A more modern example is direct messaging platforms (iMessage, Messenger, WhatsApp, etc.).



An **indirect network effect** is when each additional user, attracts an additional supplier which attracts an additional user. A great example of this is Uber. Each additional user of Uber (customer), attracts additional drivers, which attract more customers (because it's easier to get a car), etc. Other examples include EBay, Amazon, and Zillow.

Network effects are very common in platform-based businesses, especially SaaS (software as a service) businesses, and are extraordinarily powerful. However, network effects can exist in other markets; as investors, it's important to make sure that the economic-reasoning is clear and the term is not abused.

Unit Economics —

Unit economics are a very simple but important concept. **Unit economics** simply refers to breaking down the income statement by unit. For example, for the lemonade stand, a unit economic analysis would show the revenue per cup sold and the operating costs per cup sold. Unit economics is quite useful for understanding the long-term viability of a business model and its long-term margin profile (at scale, the non-operating expenses will approach zero, making the margin profile of the operations the margin profile of the business). Unit economics can be used to analyze just about every business and is extremely useful in justifying assumptions and making predictions.

Unit economics are a proxy for ROIC because unit economics represent the company's ability to convert investment (customer acquisition costs) into value as essentially unit economics are un-discounted, multi-period ROIC calculations. As a result, they can be very useful in understanding why a business will be valuable in the long-term. However there are a few flaws in using unit economics analysis, with the three biggest flaws being the lack of fixed costs, the fact that units are not created equal, and upselling and cross-selling. Firstly, unit economics focuses on marginal costs of developing or "getting" a unit and ignores the fixed costs associated with units. Companies with high operating leverage (remember that means fixed costs >> variable costs) will have high customer acquisition costs. However, high operating leverage can act as a barrier to entry and act as a barrier to entry. Operating leverage is hard to gauge (how fixed are "fixed costs"?) so considering operating leverage along with unit economic analysis is beneficial. Secondly, units are not created equal, with the example being flagship stores performing very differently from local stores. Every unit is not the same — every engine, store, ship, customer acts differently so it is practically impossible to model out the differences in each individual customer and their different behaviors. This can either understate or overstate the value of individual units. Finally, with upselling (upgrading from the current product to a higher end one) and cross-selling (selling a complementary product) unit economics might not present the most accurate portrayal of how successful a business actually is.

Value Creation & Value Capture —

When talking about value more abstractly in a competitive analysis way, it's still important to keep it grounded to what is actually tangible. Specifically, this section underscores the point that a company could create a lot of value without becoming very valuable itself. A business creates X dollars and captures Y% of $X as profit, but X and Y are independent of each other. Just because a business is large, does not mean that it is profitable. Conversely, very high-quality small companies can capture huge percentages of their revenue. As an example, Google brought in $50bn in 2012 (vs $195bn for the entire airlines industry), but Google kept 21% of those revenues as profits, nearly 100x the airline industry's profit margin that year.

Value creation is when a company creates a product or service that customers are willing to pay for and on the income statement is just the revenue at the top line. However not all of that is captured by the company in the end — **value capture** is what the company receives as profit. From the Google example, it seems that value capture sounds like it should be the main focus of any company (who wouldn't want to be generating high profits?) but it depends. For early stage businesses like start-ups, their concern is not with value capture; they are actually burning all their cash at hand while focused on continuing to provide value to customers (top-line growth) and to capture market share. As sustainable value is created and solidified through high switching costs, network effects, and brand loyalty, revenue stabilizes and attention then can be turned to monetization and capturing that value for the company itself.

A business's ability to capture value is easily tested with one simple question: can you raise prices without losing customers? This is the question of pricing power and with sustainable value and a good business model, the answer should be yes. However social media companies for example often struggle with this step. Twitter created enormous value by rapidly building a large user base, but they have struggled to capture the value through monetization. Businesses often entirely focus on value creation and regard value capture as the obvious result of value creating, but without a good value capture strategy, companies are essentially leaving money at the table.

Applying Qualitative Analysis —

Qualitative analysis is, at the end of the day, just a frame of reference. It's a very important part of justifying assumptions. As a result, investors must be careful how they are using the concepts and clearly link the qualitative and quantitative analysis. When actually modeling a business, assumptions must be justified using qualitative evidence, and qualitative analysis must be justified by the numbers. While this relationship seems obvious (any good argument must consider all evidence), implementing it is far more difficult.

An excellent example of a relationship between qualitative and quantitative analysis is ROIC. ROIC, as discussed previously, is an excellent measure of a business' ability to generate solid returns on its investment for a long period of time. Therefore, a business with a high ROIC should also be in an excellent competitive position. How else could the firm maintain high returns on invested capital? (If the firm generated high ROIC but was in a poor competitive environment, competitors would have eroded ROIC over time. Thus, high ROIC could be indicative of a moat.) Thus, arguing that a business is in a strong competitive position often requires quantitative evidence in the form of high ROIC. However, ROIC is a historical metric (which will eventually converge to ROIIC). A high historical ROIC does not imply a high ROIIC. Qualitative analysis can help inform assessments of the competitive dynamic moving forward and thus imply future ROIICs. Similar logic applies to arguments about bargaining power (cash conversion cycle multiples), efficiency (margins), and more.

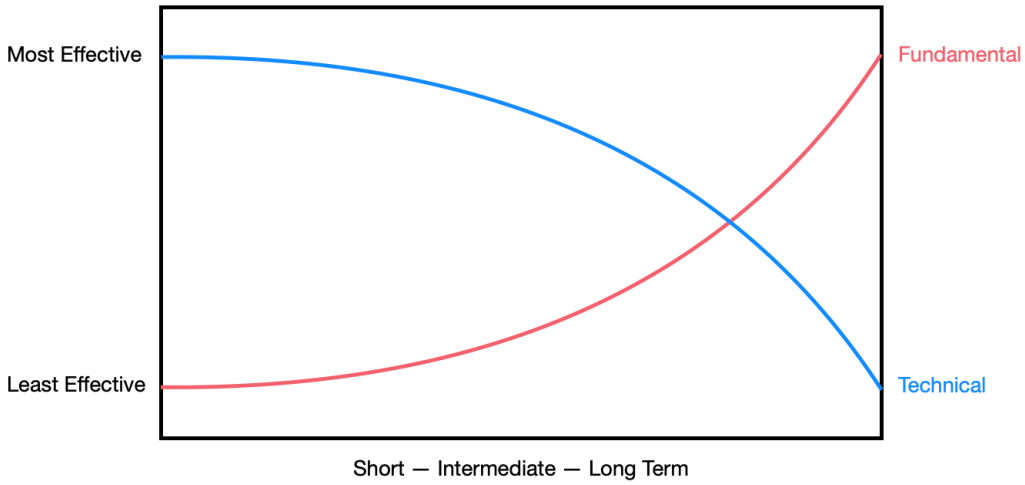
Module 7 — Misc Topics; Final Review; Personal Finance

Other Investing Philosophies —

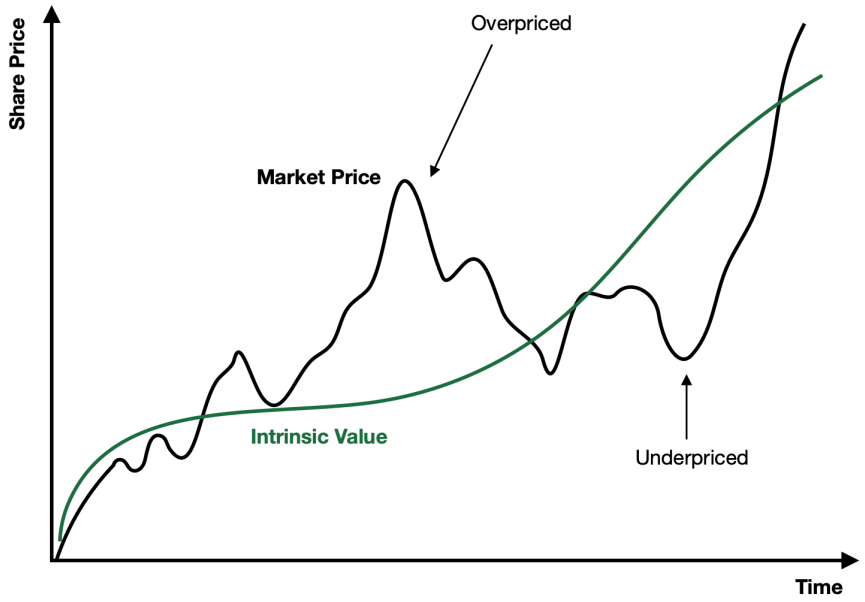
What these 50-some pages in the BFT textbook have covered is only the tip of the iceberg to investing. Among the many strategies beyond fundamental analysis (which is what BFT teaches) are single-style, multi-style, global macro, emerging market debt, long-short equities, risk parity, arbitrage funds, managed futures, distressed debt, and benchmark. There are so many ways to look at companies and the market and even more ways to try profiting off a viewpoint. In this section, the lecture notes will focus on introducing technical analysis (fundamentals' commonly compared counterpart) as well as factor-based strategies, before taking a further step back and discussing the ongoing debate of active versus passive management. All the content in Module 7 is not required to know in order to write equity research reports, but it is meant to hopefully give context and a sense of perspective around the more granular learning done in previous modules.

Fundamental analysis and technical analysis are two major schools of thought when it comes to approaching the markets. The main difference between the two is that fundamental analysis tells you what to buy / sell while technical analysis tells you when to buy / sell.

Technical analysis is driven by pattern recognition and statistical analysis and is the study of price action within the market as opposed to studying the innate qualities of the asset. A critique of fundamental analysis by technicians is that fundamental indicators are often removed from the market itself by assuming causality between external events and market movements. As the famous quote goes, markets can stay irrational longer than one can stay solvent. Technical analysis meanwhile assumes that all known fundamentals are factored into the price and there is no need to pay close attention to fundamentals — instead daily price and volume matter more. In this sense, technical analysis accepts the Efficient Market Hypothesis. The theoretical groundwork for technical analysis first came from Charles Dow (inventor of the Dow Jones Industrial Average) in the late 19th century. **Dow Theory** has multiple components to it, but most importantly it says that 1) the market prices everything, 2) price moves in trends, and 3) history tends to repeat itself. Some popular forms of technical analysis are moving averages, support and resistance, flags, and trend lines which follow from the tenets of Dow Theory. Compared to fundamental analysis, technical analysis is only used on liquid publicly traded securities, commodities, and derivatives. Successful technical analysts are not often known to the general public, but some include John Murphy, Robert Edwards, Ed Seykota, Jessie Livermore, and Larry Williams. Overall, technical analysis is most effective for exploiting shorter term market fluctuations, while fundamental analysis tends to be most effective when assets have time to revert back to their fundamental value.



In contrast with technical analysis, fundamental analysis attempts to measure the intrinsic value of a stock through studying the fundamentals of a company and can be used to value publicly traded and privately held assets. From this way of analysis comes **value investing**, one of the most popular and important investment philosophies in existence. Pioneered by Benjamin Graham in the early 20th century, popular value investors today include Baupost Group's Seth Klarman, Berkshire Hathaway's Warren Buffett, Oakmark's Bill Nygren, and more. The central concept of value investing is simple: buy undervalued stocks. As mentioned before, BFT teaches the value investor approach through calculating a company's fair value by oneself and comparing it against its current market price. Value investors search for market mispricings and look to exploit them. However, not all mispricings are satisfactory. A mispricing has to have a **margin of safety.** In essence, the margin of safety is a substantial discount between intrinsic and current market value to give investors a "buffer." Value investors ask: "If projections are wrong, will the investment still generate a satisfactory risk-adjusted return? Is the gap between market and intrinsic value enough to ensure adequate compensation?" There are many forms of value-investing (Buffet alone modified his investment style three times), but there are two of note. The first is **cigar-butt or "deep-value" investing**. Cigar-butt investing searches for poor businesses that trade at ludicrous discounts to value. They buy "bad businesses at great prices." Cigar butt investing is an excellent strategy and continues to be employed today. However, it is quite easy to fall into a "value trap," where the business trades at low multiples with reason — it is awful. The second form of value investing is **long-term compounders.** As discussed throughout BFT, good reinvestment opportunities are excellent creators of value. Thus, buying a business that seems to trade at reasonable prices but with excellent reinvestment opportunities and competitive positioning can still be a great investment. That is, it argues for "buying good businesses at not-so-good prices." Warren Buffet's most recent investment strategy aligns with this view. Buffet tends to buy high-quality businesses that trade at reasonable (if not high) prices. (Notably, Buffett's first phase is more closely aligned with deep-value, and his shift over the years is a fascinating philosophical discussion itself.)



Factor-based investing is one of the newer investing styles that asset managers like Blackrock and AQR have implemented, and as proud UChicago students, we want to emphasize how important Chicago scholars have been to advancing this approach. In the 1990s, longtime Booth School of Business professor Eugene Fama, who coined the term Efficient Markets Hypothesis in support of CAPM in the 1970s, wrote a groundbreaking paper with Kenneth French (who was at the time also at Booth) that casted doubt on the validity of CAPM and formulated a new equity risk premium model that consisted of not one, but three beta values to represent three different risks: market risk (ie. what CAPM captures), size of firm (small versus big), and "value" (the BV / MV ratio). Remember that CAPM has suggested that the only risk to drive stock returns to be higher than the risk-free rate was the asset's sensitivity to the market ie. beta or the market risk. The Fama–French three-factor model expanded on that and empirically, it explains over 90% of the diversified portfolios returns, compared with the average 70% given by the CAPM. Fama and French later added two more factors: profitability, which measures the difference between the returns of firms with robust (high) and weak (low) operating profitability, and investment, which marks the difference between the returns of firms that invest conservatively and firms that invest aggressively, for a total of five factors. As the investing sphere absorbed this new way of thinking, other investors tacked on their own factors. Cliff Asness of AQR for example added momentum, the tendency for rising asset prices to rise further and falling prices to keep falling. Over the last fifty years, academic research has identified hundreds of other factors that impact stock returns, but for many, it's unclear whether these actually have a significant impact on stock return.

Finally this section ends with a short discussion about **active management versus passive management**. One hot topic in the asset management space the past few decades has been the rise of passive funds (ETFs, passive mutual funds, index funds) and the success of passive investing in comparison to that of active investing (hedge funds, institutional portfolio managers). Passive managers generally believe it is difficult to outperform the market, so they try to match market or sector performance — buying a share of the SPDR ETF fund that tracks the S&P 500 would be an example of passive-style investing. Since the introduction of index funds in the 1970s and ETFs in the 1990s, it has become increasingly easy for retail investors to earn the market return of 7-8% with zero or low fees and overall simplicity. Meanwhile active managers have struggled to beat the 7-8% market return

and client fees are steep due to transaction costs associated with active buying / selling and the efforts of the ER teams researching equity picks, so buy side clients are increasingly seeing active managers as not worth the extra money. Empirical data show that very few actively managed portfolios beat their passive benchmarks, especially after taxes and fees are accounted for; in a 1997 paper, Sharpe showed that the average active fund (after fees) will underperform the market mathematically.

By reading the above, it is hard to understand why fundamentals continue to exist. If markets are efficient, why do fundamental investors exist? Why do active managers exist? In short, active managers have more tools to create value for their clients than passive managers. For example, a 2005 and 2007 paper showed that active managers correctly timed the market, allowing them to generate higher returns. A 2000 paper showed that certain stocks outperform the market allowing for active management to benchmarks. Finally, 2017 and 2018 papers showed that oversight and tax management services create value. There is strong academic literature supporting the skill or "alpha" of active managers. Finally, from an educational standpoint, fundamental knowledge is required to develop most quantitative (or more complicated) strategies. However, the jury on active management is still out.

At the end of the day, passive investing is restricted to a predetermined set of investments that will pretty much never beat the market (and sometimes they are the "market"). If too many investors lean passive, that may actually present a great opportunity for active managers because the market becomes less efficient with fewer eyes on it and with everyone else tied to the market benchmark. Active managers can buy / sell whatever they want which is great when analysts are right, but it is difficult to be consistently right.

Sourcing Ideas —

One of the most difficult, yet most important concepts in all of investing is idea generation. There is no clear cut formula for sourcing an idea, but there are a few good sources to start. First and foremost, the news. Following business news is critical to understanding what is happening and potentially spotting a mispricing, IPO, or potential hurdle. For example, in the week following the 2017 Equifax breach, their stock fell ~35%. One year later, the stock was trading at ~$140 / share, roughly equivalent to pre-breach levels. Three years later, the stock is up 77% (trough-peak) to ~$167. An aware investor could capitalize on scandals or other newsworthy events as catalysts for investment. News is easy to access from free subscriptions to sources like Matt Levine's Money Stuff newsletters, Morning Brew, and Finimize that will condense everything important into a 2-minute daily read or paid subscriptions to the Wall Street Journal, Bloomberg, Financial Times, etc. Second, blogs and filings (Evan: I **love** Money Stuff). All managed funds are required by the SEC to disclose their holdings quarterly in a 13-F filing, information which you can find aggregated on https://whalewisdom.com. Reading investor letters and looking at what hedge funds are holding can be a great source of information. The subreddit r/securityanalysis compiles an excellent list of investor letters and holdings every quarter. Similarly, the internet is ripe with write-ups on stocks and investment ideas. Some noteworthy blogs include https://valueinvestorsclub.com, https://netosnotes.blogspot.com, https://yetanothervalueblog.com, https://seekingalpha.com, and more. Finally, if you're interested in seeing whether company insiders are buying or selling the stock, you can use http://openinsider.com.

The third key source is screening. Screeners are simple, easy filters on the stock market. However, stocks that screen well (seem cheap, etc.) often deserve to be cheap. Thus, it is not the most efficient method of idea generation, but it is still quite useful. Some great screeners are https://www.magicformulainvesting.com and

https://finviz.com. (Magic formula investing strictly screens for high ROIC and earnings yield.) There are ways in which screeners can be used effectively, namely by understanding the fundamental relationships between multiples. As discussed at the end of Module 3, both equity and firm valuation multiples are driven by fundamentals. As we saw with P / E for instance, the multiple should be driven by ROE and growth, with high ROE and growth supposedly resulting in a higher multiple. As such, screening for companies with high ROE, high growth, and low P / E might give companies that are mispriced. Such screens can give a general list of businesses that are not performing in line with their fundamentals, but still require further research to determine whether they are an investment opportunity or not.

General Review & Equity Report Formulation —

Everything covered in Modules 1-6 should encapsulate enough knowledge for anyone to write a full equity research report. In this section, the lecture notes will outline exactly how a full equity research report should look and how to think about future events and ongoing risks that will impact price.

1. Investment Thesis
    a. Price Target — State implied share price; recommend a BUY / HOLD / SELL
    b. Thesis — Briefly outline three thesis points
2. Company Overview
    a. Company History — Give a brief overview of company history
    b. Business Segments — Explain the company's business model and sources of revenue
    c. Recent Mergers and Acquisitions — Include if relevant
3. Industry Overview
    a. Competitive Landscape — Use Porter's Five Forces to detail nature of industry
    b. Value Drivers — Explain how companies in the industry differentiate themselves
4. Thesis Point #1
5. Thesis Point #2
6. Thesis Point #3
7. Investment Risks — Explain biggest risks and their mitigants
8. Valuation
    a. DCF model / DDM model / NAV model / Sum of Parts model
        i. Highlight all assumptions being made
        ii. (More Advanced) Include a bear, base, and bull case
        iii. (More Advanced) Include a WACC sensitivity analysis
    b. Comparables

A large part of writing an equity research report involves building a narrative out of all the separate components. When building this narrative, it's important to consider **investment catalysts**, the future events and developments that will affect the market price. As the market price reflects consensus expectations, the question is will the company beat market expectations, and if so, when and what will cause the company to beat expectations?

Potential catalysts include future higher revenue, higher margins, lower interest expense, share buybacks, improved competitive advantages, and rising or falling market trends. An example could be a remodeling project where the company will be taking on a 2-year long facility remodeling project in order to increase manufacturing

efficiency, a project that is slightly harmful to short-term cash flows but will bolster longer-term performance by boosting top-line metrics. Another catalyst example would be price changes — if microprocessor prices are expected to rise 10% within the next year, this might seriously harm a company reliant on microprocessors in its supply chain.

Another example of a catalyst would be a company initiating a cost-cutting program and restructuring. Pulled from General Electric's 2017 10K, *"Restructuring and other charges relate primarily to workforce reductions, facility exit costs associated with the consolidation of sales, service and manufacturing facilities, the integration of recent acquisitions, including Alstom, the Baker Hughes transaction, and other asset write-downs. We continue to closely monitor the economic environment and may undertake further restructuring actions to more closely align our cost structure with earnings and cost reduction goals."*

The final example of a catalyst is M&A activity. If Company Reg acquired Company Mansueto in a billion-dollar acquisition, this could lead to significant changes in stock price for both companies. When one company acquires another, the stock price of the acquiring company tends to drop while the stock price of the target company tends to rise. Company Reg's share price might drop because it will likely pay a premium for Company Mansueto, while conversely Company Mansueto's share price will rise because the purchase price is often greater than the company's current value. Post-merger, the combined Reg-Mansueto company typically exceeds the value of each company during the pre-merger stage as often the point of such a transaction is for one company to create more value than two separate companies could.

When considering and addressing **investment risks**, it's really important to acknowledge why people might be bearish on the stock and not to be biased toward one's thesis. What in the investment thesis could go wrong? How badly would this affect the stock? Risk factors on 10K / 10Q are often not a good place to look because 10K / 10Q risks are to cover liability. As a result, it is often too broad. There are four types of risk to think about from a micro- to macro- scale —

- Firm-wide risk: Failing initiatives, change of management, expiration of product / patent, segment concentration
- Industry risk: Greater competition, shrinking industry, loss of market share, demand shift in product and service preferences
- Macroeconomic risk: Rise in raw material prices, rise in inflation, fall in spending, politics, currency risk, interest rate fluctuations
- Regulatory risk: SEC, FDA, government regulation, international regulation

Introduction to Personal Finance —

Wrapping up BFT, it's important to take a step back and think about ourselves. Just as we want companies to have a healthy balance sheet and stable cash flows, each of you should be managing your finances responsibly to remain financially healthy. To put things into perspective, nearly four out of every five U.S. workers live paycheck to paycheck and almost 75% are in some form of debt. Most assume they always will be in debt. These financial dangers we hope you will never have to experience, but the only thing we can do on our end to help you is to equip you with relevant knowledge. In the final section of the textbook, the lecture notes will cover some basic financial literacy concepts that you may or may not have known to help you as you begin to make money from internships and part-time jobs. It is important to note that the following is not financial advice, and the

authors of this document are not liable for any actions taken with this information in mind. It is a simplification of information and advice we have gathered over the years.

Earning & Spending —

At the end of the day, financial discipline is mostly behavior and habit. Budgeting is essential to make sure you do not overspend. Just like companies record all their expenses and reconcile that with their income (salary), individuals should too. A common rule of thumb is to spend no more than 50% of a paycheck on essentials (mortgage / rent, food, insurance, etc.), 30% on niceties (Netflix, eating out, etc.), and save the remaining 20% at minimum. Putting money away for retirement (as far away as it may seem), a rainy day, big purchases (car, house down-payment), or emergencies is crucial. There are other breakdowns, but if the breakdown is substantially different it might be worthwhile to reconsider your spending.

Why is it so important to save? In a word, compounding. Saving money over time allows it to compound and rapidly grow. Throughout BFT, compounding has been implicitly discussed (high ROIIC and reinvestment creates growth), but the concepts extend to personal finance. Reinvesting (saving) at good rates of return (investment returns / interest rates) results in growth (more money). The power of compounding is also often glanced over. The chart below shows how a single payment of $1,200 grows over 40 years:

How a single $1,200 investment grows over time with compound interest

	Savings Account (0.1%)	Money market Fund (1%)	Certificate of Deposit (2%)	Stock Market (9%*)
Initial Investment	$1,200	$1,200	$1,200	$1,200
5 years	$1,206	$1,261	$1,325	$1,846
10 years	$1,212	$1,326	$1,463	$2,841
15 years	$1,218	$1,393	$1,615	$4,371
25 years	$1,230	$1,539	$1,969	$10,348
30 years	$1,237	$1,617	$2,174	$15,921
35 years	$1,243	$1,700	$2,400	$24,497
40 years	$1,249	$1,787	$2,650	$37,691

The next chart shows how a yearly investment of $1,200 grows, with the difference exceeding 10x. This person has $0.5mm, the other not even $50k. Both people however have much more than the person who did not to save anything.

How a yearly $1,200 investment grows over time with compound interest				
	Savings Account (0.1%)	Money market Fund (1%)	Certificate of Deposit (2%)	Stock Market (9%*)
Initial Investment	$1,200	$1,200	$1,200	$1,200
5 years	$7,224	$7,444	$7,695	$9,674
10 years	$13,278	$14,006	$14,865	$22,713
15 years	$19,363	$20,903	$22,782	$42,775
25 years	$31,624	$35,770	$41,174	$121,136
30 years	$37,800	$43,777	$51,829	$194,211
35 years	$44,007	$52,192	$63,593	$306,646
40 years	$50,246	$61,037	$76,582	$479,642

Finally, it is important to note that credit card spending counts as much as regular spending. As easy as it may seem, overspending a credit card should be avoided at all costs; once again tying this to the corporate world, when a company "overspends a credit card" (defaults on a revolving line of credit), it is typically in default which could lead to bankruptcy.

We have also attached a model that allows you to model savings as a function of time and return.

Saving & Investing —

As mentioned before, saving is crucial. But, where and how should one save? There are many ways to save and ultimately the best option depends on your long-term goals.

The first and easiest way to save is a bank account. Savings accounts, in the current interest rate environment, do not generate any real income (~0% interest rates); that is, unlike other forms of saving, they will not grow the savings. However, it is the most liquid. Thus, it is a great place to put money for an emergency fund or other sudden events. The second method is a certificate of deposit. A certificate of deposit (or CD) is essentially a long-term deposit, meaning that the money cannot be withdrawn for a period of time. As a result of committing the money for a longer period of time, CDs earn a higher interest rate. In the current interest rate environment, a 1-year CD (meaning the money will be locked up for a year) earns ~0.85% rate.

The third method is investing in stocks or other assets. Managing a personal stock account (called a brokerage account) is a great way to grow savings. A simple index fund earning 9% annually (~S&P 500 return) will turn $1,000 into $31,409 in 40 years (up to $158,429 if the markets do well) and after 55 years (retiring at ~75) $114,408.26 (up to $1,058,699). However, not included in this assessment is the capital gains tax; as of 2020, capital gains tax ranges from 10-37% depending on income. Capital gains tax is a tax on the income earned from investing; thus, in 55 years if you earned ~$114,408 that would be taxed at the appropriate capital gains rate (at worst, dropping the ~114,408 to ~72k). Robinhood, TD Ameritrade, Charles Schwab, and eTrade are popular

places to create a brokerage account — in the past, platforms besides Robinhood charged commission fees for each trade you make but nowadays all major trading platforms are free to use.

To incentivize retirement savings, the IRS created several special types of accounts that have various benefits. The first and one of the more popular ways to invest in stocks / bonds (with IRS tax benefits) is through a **401(k)** run by an employer. (Pronounced as "Four-O-One-K" or "Four-O-wonk" if you are Phoebe Buffay.) The biggest benefit for a 401(k) is that employers will match a portion of employees contributions to a 401(k) plan. If feasible, you want to reach the limit that your employer will match (anything less is functionally "leaving money on the table"); employer contributions are "free money." As part of the 401(k) plan, the employer will give their employee a selection of funds (stocks / bonds / etc.) to invest in, but the employee is responsible for picking which funds to invest in. Individual contributions to a 401(k) are tax-deductible; meaning, any income put into a 401(k) reduces the taxable income for that year. (Contributions are limited to ~$19,000.) Further, any taxes on income generated in that account is deferred until the money is withdrawn. When making a withdrawal, owners must be at least age 59½—or meet other IRS criteria such as being totally and permanently disabled— otherwise there is an additional 10% early-distribution penalty tax. (Note: no penalty if older or criteria met.) In retirement, a 401(k) is slowly paid out like a paycheck.

Another common way to save for retirement is the **Individual Retirement Account (IRA)**. An IRA is an individual account (meaning not tied to your employer) that can be invested in most mutual funds or other investment funds. Contributions to an IRA, like a 401(k) are, tax deductible. However, both contributions and income are taxable upon withdrawal. Contributions to an IRA are limited to ~$6,000 per year. There is a special type of IRA called a **Roth IRA.** In a Roth IRA, contributions are not tax deductible (meaning you still pay taxes on the amount you contribute), but withdrawals (contributions and income) are not taxable**.** Contributions to a Roth IRA are capped to $6,000 as well. Because income is tax-free (meaning no capital gains tax), a Roth IRA is typically better than a traditional IRA in the long-run.

Borrowing & Protecting —

In the biggest departure from the corporate world, personal debt is generally not beneficial. For companies, debt is commonly used because it reduces the cost of capital and can create value (albeit through financial trickery), but for the individual debt is a burden. However, sometimes debt is inevitable—college tuition, home mortgage, and others—are all completely reasonable. However, certain debt, like credit card debt, is incredibly expensive (~20% interest rates or APR) and will *demolish* anybody's financial stability if maintained. Other debts, like a low-interest fixed rate mortgage (loan for a home), are not always worth paying off early. When considering what to prepay or not, it is critical to consider the opportunity cost of those cash flows; what returns have been forgiven by prepaying debt. Credit card debt, because of its high APR, will almost certainly be beneficial to pay off, but a very low interest rate mortgage could likely be beaten in the markets (retirement accounts); balance repayment efforts with savings and retirement goals.

Regardless of prepayment, it is absolutely *critical* to make all payments on time — failure to do so will decrease your credit score (in corporate jargon, lower your credit rating) and make any future debt more expensive (decrease access to capital markets). Your credit score is extremely important because few things follow you in life as your credit score does. Having a good credit score (700+) can unlock many savings and benefits for you including access to loans and credit cards with the most favorable terms, but if you don't take care of your score, it can really hurt you later on when you aren't offered favorable financial options when you do need them. A

credit rating, once it's damaged, can take years and years before it's built up again. Contact the debt-issuer (banks) immediately if payments are difficult; it is in both parties' interest to negotiate an effective and reasonable payment program. Similarly, a high debt-income ratio (a personal leverage ratio) will restrict access to credit. Finally further stressing the importance of savings, savings reduce the need for future debt. For example, paying for home improvements through debt could be far most costly than paying for the improvements through a "big purchase savings" pool.

Finally, it is important to note how to use credit cards wisely. Credit cards are lines of credit that must be paid back by the end of each month. Most good credit cards give rewards for using them that make it value-creative to use them; cards give cash back (ranging from 1.5-6% per transaction!), flight miles, restaurant bookings, etc. that make normal life better. However, credit cards become an issue when the bill due at the end of the month has not been paid back (becoming credit card debt). It is absolutely crucial that a credit card is not overspent; to avoid this, a credit card should be thought of as a debit card—if the money is not in the bank, do not spend it. Also, be careful with juggling too many credit cards. Whenever you add a new credit account, it can cause your credit score to drop a few points, first when the creditor makes an inquiry on your credit report and then when the account is actually opened. Canceling a credit card also has the potential to reduce your score. In the beginning, it's good to focus on building a credit history with one or two credit cards and paying off your balance in full each month and slowly add in new credit cards for specific benefits. One way to start building a credit score history before you have your own credit card is to be added as an authorized user to a parent's card. Authorized users get all the benefits of a credit card without having to qualify for the card and without the responsibility of repayment.

Finally, insurance is important to avoid financial distress in the event of an emergency. Insurance is hopefully never utilized, but in the cases where it is required, it is incredibly useful in protecting financial health.

The BFT Epilogue —

If you made it this far, congratulations on finishing BFT! In seven short weeks, you have learned everything needed to put together a full-length equity research report. Past reports done by our Research Analysts that you likely saw on our website or in print, which might have looked daunting at first glance, are now ones you can recreate. That fact alone is truly amazing and you should seriously give yourself a pat on the back. Firms pay good money for quality equity reports — in that sense, you have now learned enough to be monetized!

As mentioned before, this is only the tip of the iceberg and there are still many layers to pretty much everything discussed in this textbook. This fact is not unique to you; finance is a deep, diverse, dynamic, and complicated field. In academia, finance is a relatively new field and in industry, even senior buy side portfolio managers thirty years into their investing careers will tell you that they are still constantly learning new things. We hope that as an RA, you will continue learning and expanding your financial skillset. However, if you have a strong grasp of all these concepts to the extent they are written about here, you should feel confident in your ability to write your first equity report and to claim your spot as an RA in Promontory.

There is also no shame in constantly revisiting this textbook past this point — our hope is that contrary to the weekly face-to-face lectures, this textbook will serve as a lasting resource after graduating to RA status. The idea to write this textbook actually emerged from hearing about one particular New Recruit who would record Nathan's lectures, and that extra step of being able to go back and re-listen to the lecture drastically improved

their level of comprehension and overall performance in BFT. Instead of encouraging more people to record lectures, we thought it'd be more effective to just write a whole textbook!

We sincerely hope that this textbook helped you understand the material covered over the past seven weeks. If you have any suggestions or critiques on how this textbook can improve, please reach out to anyone on Board. This was our first attempt at creating such a comprehensive piece of education and like all textbooks, we expect changes will need to be made and that the text will gradually improve over the years. In all honesty, this is also simply a compilation of our four years of finance education at UChicago: from academic materials definitely but also from our own 1st and 2nd year bootcamps, internships, case competitions, conferences and speaker talks, and Booth classes. We have dumped everything we learned ourselves that we felt was important to pass on, but as Promontory continues to grow, we hope that the club continues to add to this BFT curriculum.

Good luck with your first equity report! We are all rooting for you and are here to help you succeed. Lastly, feel free to reach out to any of us three specifically even after we have long graduated. Promontory was a real highlight of our college careers, and we would be more than happy to meet any member of the club.

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Glossary of Key Terms

Below is a list of all the bolded key terms and quick definitions, ordered by module.

MODULE	TERM	MEANING
1	**Sell-side**	❖ Sell-side refers primarily to financial institutions like Goldman Sachs and J.P. Morgan Chase that "sell" their investment banking services to help companies raise capital from investors
	Buy-side	❖ Buy-side refers to investors on the other side of the transaction, like Blackrock and Vanguard, who "buy" the securities
	Bond	❖ An IOU where an investor typically pays an upfront sum of money in exchange for a series of fixed coupon payments and principal at the bond's maturity
	Equity	❖ An equity, or a stock, is the ownership right to a portion of a company. Stocks are generally first issued by companies to select investors during an Initial Public Offering (IPO) in the primary market
	Capital Gains	❖ Share price increases relative to the price it was bought at
	Dividends	❖ Company pays shareholders for holding its stock
	Private Equity	❖ An alternative form of financing outside of the public markets in which funds and investors directly invest in companies or engage in company buyouts
	Cost of Equity	❖ Equity is neither secured by any collateral nor legally promised anything besides ownership of a company while the company remains solvent
	Cost of Debt	❖ Interest payments to creditors are paid out from the company's pre-tax income while dividend payments to equity holders are paid out from its after-tax income
	Value Investors	❖ Famous value investors include The Intelligent Investor author Benjamin Graham, Berkshire Hathaway's Warren Buffett, and Baupost Group's Seth Klarman

Fair Value of a Stock	❖ The fair value of a stock, or the present value of all the company's future cash flows, through qualitative assessments of a company's future prospects combined with quantitative models
Discounted Cash Flow (DCF) Model	❖ A quantitative model to estimate the present value of the company's future cash flows
10-Q	❖ A quarterly copy of a company's financial statements and a brief discussion of the business performance
10-K	❖ An annual report published with financial statements and an in-depth discussion of business performance
Generally Accepted Accounting Principles (GAAP)	❖ American financial statements are constructed according to the Generally Accepted Accounting Principles (GAAP) while international companies follow the International Financial Reporting Standards (IFRS)
Balance Sheet	❖ The balance sheet highlights exactly what a company owns and owes at any given moment in time; it is a picture of the company
Income Statement	❖ The income statement, also known as the profit and loss statement (P&L), shows how the business makes money over a certain period of time
Cash Flow Statement	❖ The Cash Flow Statement shows how businesses use cash in three different ways, including their 1) operations, 2) investments, and 3) financings
Shareholders' Equity Statement	❖ The fourth financial statement, easy to understand after mastering the first three statements
Accrual Accounting	❖ In accrual accounting, if a cup of lemonade is sold today and the customer says that they will pay tomorrow
Cash Accounting	❖ The revenue would be booked when the cash exchanges hands
The Matching Principle	❖ Revenues and expenses should be recognized in the same period
Cost of Goods Sold (COGS)	❖ COGS represent the costs directly associated with providing the goods or services

Gross Profit	❖ Revenue minus COGS results in gross profit
SG&A	❖ Selling, general, and administrative expenses represent the costs associated with advertising, paying employees, paying rent, insurance, travel, etc; it is the costs required to make sales
EBITDA	❖ Gross profit minus SG&A results in EBITDA or Earnings before Interest, Taxes, Depreciation & Amortization
Depreciation & Amortization	❖ Depreciation and amortization expenses are used to represent the declining value of an asset as it is used
EBIT	❖ EBITDA minus D&A results in EBIT, or Earnings before Interest and Taxes
Operating Income	❖ There are slight philosophical differences between EBIT and operating income, but they are practically (and imprecisely) used interchangeably
EBT	❖ EBIT minus interest expense results in EBT, or Earnings before Taxes, also known as Pre-tax Income
Net Income	❖ Net income is the income attributable to shareholders after all expenses are deducted from revenue
Earnings Per Share (EPS)	❖ The monetary value of earnings per outstanding share of common stock for a company, calculated by the company's profit divided by shares outstanding
Cash Flow from Operations	❖ Reconciles non-cash expenses and also recognizes the true change in cash during the day-to-day operations of a business
Changes to Working Capital	❖ Cash inflows and outflows that are required for the daily operations of a business
Cash Flow from Investing (CFI)	❖ Where investments in long-term assets required for the business are accounted for
Cash Flow from Financing (CFF)	❖ Where changes in financing from debt and equity are accounted for
Net Change in Cash	❖ The true cash inflow / outflow of a business over a given period of time

	Asset	❖ A resource owned by the business (or individual) that will provide a future benefit to the company
	Liability	❖ The debts and obligations of a company to outside parties; in other words, it is a future detriment of the company (and future benefit of a third party)
	Shareholders' Equity	❖ Represents the difference between assets and liabilities
	Balance Sheet Identity	❖ This identity just implies that everything the company owns must have been paid for—either through debt (liabilities) or equity
	Current Assets	❖ Assets with a fixed useful life of less than a year (rolling twelve-month period)
	Non-current Asset	❖ Assets which provide a benefit beyond the one-year-mark
	Current Liabilities	❖ Obligations to be paid ("are due") within a year
	Non-current Liabilities	❖ Obligations that are due later a year
2	**Market Value**	❖ The price the market places on an asset
	Book Value	❖ The value of an asset as indicated on the financial statements.
	Liquidity Ratios	❖ Ratios measuring how capable a company is of meeting short-term obligations
	Leverage Ratios	❖ Ratios measuring how much debt a company has
	Current Ratio	❖ Ratio of current assets, liabilities
	Quick Ratio	❖ Adjusted current ratio
	Cash Ratio	❖ Ratio of cash to current liabilities
	Debt Ratio	❖ Ratio of debt to assets
	Debt-to-Equity Ratio	❖ Ratio of debt to liabilities
	Interest Coverage Ratio	❖ Measures how many times a company can fulfill interest obligations given current earnings
	Profitability Ratios	❖ Measure profitability

	Return Ratios	❖ Measure company's ability to generate returns for stakeholders
	Gross Profit Margin	❖ Gross profit as % of revenue
	Operating Profit Margin	❖ Operating profit as % of revenue
	Net Profit Margin	❖ Net income as % of revenue
	Return on Equity (ROE)	❖ Net income to shareholders' equity
	Return on Asset (ROA)	❖ Net income to total assets
	Return on Invested Capital (ROIC)	❖ Operating income as % of invested capital
	Cash Conversion Ratios	❖ Ratios used to determine the ratio of the cash flows of a company to its net profit
	Days Sales Outstanding (DSO)	❖ How many days worth of receivables a company has
	Days Payable Outstanding (DPO)	❖ How many days of payables a company has
	Days Inventory Outstanding (DIO)	❖ How days of inventory a company has
	Cash Conversion Cycle (CCC)	❖ Measure how many days it takes a company to generate cash
	Multiple	❖ A ratio of value to earnings
	PE	❖ Price to earnings ratio
	PB	❖ Price to book value per share ratio
	PEG	❖ Price to earnings growth ratio
	EV/EBITDA	❖ Enterprise value to EBITDA ratio
	EV/Rev	❖ Enterprise value to revenue ratio
	EV/FCF	❖ Enterprise value to FCFF ratio
	P/S	❖ Price to sales
3	**"Cash is king."**	❖ Cash is the driving force of a business
	Forecasting Risk	❖ Probability that future projections will be incorrect
	Probability of Failure	❖ A rephrasing of forecasting risk
	Opportunity Cost	❖ The loss of a potential gain from other alternatives when one is chosen
	Time Value of Money	❖ A dollar today is worth more than a dollar tomorrow

	Net Present Value (NPV)	❖ The process of adjusting the future cash of a business to calculate its current value
	Enterprise Value (EV)	❖ The total value of a company
	Franchise Value	❖ The value of a company assuming no growth
	ROIIC	❖ ROIC for future investments
	Free Cash Flow (FCF)	❖ A measure of profitability that is adjusted for non-cash expenses
	Net Working Capital (NWC)	❖ The amount of money tied up in business operations
	Net Capital Expenditure	❖ Difference between capital expenditure and depreciation
	NOPAT	❖ Net Operating Profit After Taxes. Functionally, EBIT * (1-t)
4	**WACC**	❖ Weighted average cost of capital. The cost of capital for a firm given their current capital structure
	Efficient Market Hypothesis (EMH)	❖ The theory that markets correctly price assets
	CAPM	❖ Capital Asset Pricing Model; used to calculate cost of equity
	Idiosyncratic Risk	❖ Risks related to investing in certain assets, mitigated through diversification
	Systematic Risk	❖ Non-market or non-diversifiable risk. Risk of unexpected events or the general risk of investing
	Sharpe Ratio	❖ Measures expected return with respect to risk
	Yield to Maturity (YTM)	❖ Total return on a bond assuming no coupon reinvestment
	Credit Default Swap (CDS)	❖ An insurance policy on the default of a bond
	WACC Curve	❖ Models the change in WACC as a function of capital structure
5	**Terminal Value**	❖ The value of a business in its mature "growth into perpetuity" phase
	Gordon Growth Method (GGM)	❖ A method of calculating Terminal Value that assumes a standard growth rate into perpetuity

	Terminal Growth Rate (TGR)	❖ A standard rate at which a mature company grows into perpetuity; used with the Gordon Growth Method
	Equity Value	❖ The value of the equity claims in a business; used in contrast with Enterprise Value
	Diluted Shares Outstanding	❖ The total number of common shares in a business if dilutive securities (RSO, Stock Based Compensation) were exercised
	Terminal Multiple	❖ A method of calculating the Terminal Value using the multiples of similar businesses; assumes a mature business will revert to the market-mean multiples
6	**Competitive Advantage**	❖ An advantage that allows a company to generate returns on capital greater than the returns on capital of its competitors and its cost of capital
	Sustainable Competitive Advantage / Economic Moats	❖ A competitive advantage that will "stand the test of time" ie. high barriers to entry, branding, high switching costs, and other intangibles
	Porter's Five Forces	❖ A commonly used framework to understand an industry's competitiveness
	Competitive Rivalry	❖ This assesses how competitive the industry is overall among existing competitors
	Barriers to Entry	❖ This measures how easy / hard it is to break into the industry as a new entrant
	Threat of Substitutes	❖ This measures the threat of substitutes which are products with similar functions that limit pricing power to some extent
	Buyer Power	❖ This measures the power of buyers. Strong buyers have significant influence over industry players and can distort profitability
	Supplier Power	❖ Similar to buyer power, suppliers have the potential to disrupt a company's supply chain and cost of production
	Economies of Scale	❖ When a company gains a cost advantage due to an increased level of production of a single good
	Economies of Scope	❖ Economies of scope focuses on the variety of goods and services sold
	Operating Leverage	❖ The ratio of fixed costs to variable costs

	Direct Network Effect	❖ Network effect when each additional user improves the platform
	Indirect Network Effect	❖ Network effect when each additional user, attracts an additional supplier which attracts an additional user
	Unit Economics	❖ An analytical tool to break down the income statement by unit
	Value Creation	❖ When a company creates a product or service that customers are willing to pay for
	Value Capture	❖ What the company actually receives as profit
7	**Technical Analysis**	❖ Theory that predicts short-term price movements based on near-term price movements
	Dow Theory	❖ The Dow Theory is a technical framework that predicts the market is in an upward trend if one of its averages advances above a previous important high, accompanied or followed by a similar advance in the other average
	Factor-Based Investing	❖ Advanced statistical methods of predicting and analyzing market movements. Introduced by Fama and French
	Value Investing	❖ Fundamental investing style that focuses on buying businesses with a substantial margin of safety. Famous value investors include Buffet, Graham, Dodd, and Klarman
	Margin of Safety	❖ A substantial buffer between a company's intrinsic valuation and market valuation that is supported by clear and defensible assumptions
	Cigar-butt Investing	❖ A sub-sector of value investing that looks for a larger margin of safety and focuses less on competitive analysis. "Buy bad businesses for cheap"
	Long-term Compounders	❖ A style of investing that focuses on buying excellent businesses with great reinvestment opportunities for an attractive price. "Buy great businesses for a fair amount"
	Active Management VS Passive Management	❖ An ongoing debate
	Magic Formula Investing	❖ A stock-screener popularized by Joel Greenblatt. Screens for ROIC and earnings yield

	Investment Catalysts	❖ A near-term event that will help an investment realize its' intrinsic valuation
	Investment Risks	❖ Plausible risks to an investment thesis that show real thought
	401(k)	❖ A retirement account that includes employee contributions
	Individual Retirement Account (IRA)	❖ A tax-advantaged retirement account not tied to an employer. Contributions are tax-deductible
	Roth IRA	❖ A special type of IRA. Contributions are not tax-deductible, but withdrawals are tax-free