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Introduction to Corporate Finance

"The greatest competitive advantage Panera had, the reason we produced these results we did, is because we could think long term …. And the reason I took our company private is I'm increasingly worried about our ability to do that in a public market …. What's driving today's shareholdings are traders on the market …. We had large shareholders like Capital Research & Management, Goldman Sachs, Baron Funds, but the reality is, they don't drive the price. What drives the price are the traders who are betting on next week's comp. And that affects the entire organization …. Do you think this is good economic growth?"[1]

PREVIEW

The Purpose of the Course Handouts

These handouts are intended to augment whatever corporate finance (and capital markets) book you use in this course (*Cases in Financial Management*). Think of these handouts as complementary to the various finance textbooks rather than as substitutes. I believe you will find them useful for case preparation and for class participation.

The Role of Corporate Finance

This course is about financial decisions made by corporate managers, often from the viewpoint of the chief financial officer (CFO). But these decisions could just as easily be made from the view of the CEO, a board member, an investment banker, a credit (and equity) research analyst, a strategy consultant, an

[1] December 6, 2017, Ron Shaich, CEO of Panera Breads, interview with Jim Cramer on CNBC's *Mad Money*. https://www.youtube.com/watch?v=8rS9XIV8ITE. Interestingly, Panera is planning to return to the public markets again via an IPO by the end of 2023.

investment manager, a proprietary trader, and many other roles that require financial knowledge. At times, the course will cross over into the study of capital markets due to the strong link in practice between corporate finance and capital markets. Many corporate finance decisions are heavily influenced by what is currently occurring in capital markets, and we will attempt to analyze the respective links when possible.

The course will focus on three primary areas in corporate finance:

1. Project valuation: which investments in real assets to accept or reject.
2. Financing the corporation and the projects it undertakes: the optimal decision on capital structure.
3. Distribution policy: returning cash to shareholders.

CFOs evaluate projects of all sorts, including new plant construction, marketing programs, R&D, joint ventures, mergers & acquisitions, and much more. CFOs look at these projects primarily from the viewpoint of whether they create value on behalf of the owners of the corporation: that is, do these projects maximize shareholder wealth?

Consider Square Inc., for example, which provides mobile payment solutions for small- and mid-sized businesses, as well as handling orders and inventory, employee management, and tools for analytics and reporting. We can think of Square Inc. as a highly sophisticated technology firm which builds tools for businesses. In July 2021, Square Inc. announced the creation of Square Banking, which provides checking and savings accounts for small businesses. Founded in 2010, Square had acquired a banking charter in March 2021, thus signaling intentions to move into banking products.

In some respects, Square's move into banking seems perfectly natural. Because Square was already providing various financial solutions to businesses, it might seem obvious to add banking products to the mix to give a complete financial management solution to businesses. But launching a new bank is a major proposition, even for a fintech entity such as Square that is already well immersed in financial services. During the period from 1980–2009, an average of 165 new bank charters were created in the United States on an annual basis. But in the period from 2010–2022, the average annual number of new bank charters plummeted to roughly five, largely in response to the Dodd–Frank Wall Street Reform and Consumer Protection Act enacted in 2010, which imposed steeper compliance and regulatory restrictions, as well as higher capital requirements on banks. One unintended impact of the Dodd–Frank Act is the protection from new financial entries for the large existing large banks such as J.P. Morgan Chase Bank. For years, Amazon has been rumored to have been hankering for the opportunity to create a bank. But the combination of regulatory forces and banking lobbyists have largely stymied Amazon's efforts.

I have no insight as to the level of financial analysis that Square management conducted prior to its announced banking launch. But irrespective of the financial analysis conducted by the finance team at Square, the stock market did its own analysis, albeit based on incomplete data, and adjusted the stock price accordingly. Intuitively, market participants, whether hedge funds, mutual funds, pension funds,

retail investors, etc., evaluated Square's announcement based on some expectation of the investment cost and the subsequent cash flows, all adjusted for the riskiness and timing of such cash flows.

This course will discuss how financial models and tools can be used to assist management in making investments in real assets that impact value, such as in the case of Square's entry into the banking sector. And we will analyze how firms such as Square intend to finance their investments; that is, whether to use existing cash on the balance sheet or instead go to the external capital markets and raise debt or equity capital.

In addition to deciding on the most efficient means to finance a particular investment, the CFO is also tasked with setting the firm's target capital structure (i.e. the optimal mix of debt and equity, as well as other types of securities such as convertible and preferred securities). We commonly think of most value as being driven by the left-hand side of the balance sheet, whereas decisions made on the right-hand side of the balance sheet are often made to support the value creation on the left-hand side. For example, a young company such as Lyft is financed largely with equity due to its large cash burn and no clear timetable to profitability. On the other hand, American Airlines has considerable debt in its capital structure due to the large amount of tangible assets on its balance sheet.

We think of financial markets as being more efficient than real asset markets, thus limiting value creation on the right-hand side of the balance sheet by CFOs. However, there is substantial evidence that CFOs can create value by optimizing debt levels to maximize interest-tax shields, repurchasing shares when stocks are undervalued, and responding to investor sentiment for certain types of security issues. Due to the efficiency of capital markets, these gains tend not to be extraordinary. Value destruction can also occur on the right-hand side of the balance due to financial decisions that impair the left-hand side, that is, financial decisions which are disruptive to the real operations of the corporation. And we will keep in mind that many CEOs and CFOs consider themselves as having the financial expertise to allow them to time markets, irrespective of whether or not there is strong empirical support of that.

The board of directors is directly involved with certain corporate finance decisions: for example, the choice to acquire another company or to be purchased itself. And the board has full authority to hire and terminate the CEO, decisions which can be viewed from the context of corporate finance just like any other corporate decision. This is not to say that the board of directors is not involved in other corporate finance decisions. But it tends to do so more indirectly via member's interactions with corporate management, rather than via their own analyses. At times though, a special committee of the board may hire a different outside investment bank to scrutinize a deal than rely solely on the investment bank working on behalf of management. The board is always thinking about the strategic direction of the corporation, which requires a good understanding of the financial tools covered in this course.

Throughout this course, we will assume shareholder wealth maximization is a top priority of corporate management. However, we will discuss many decisions in which management does not maximize shareholder wealth. Failure to maximize shareholder wealth can result due to managerial malfeasance, referred to as agency costs, where there is a divergence of interest between management and

shareholders. Or it can just due to a world in which imperfect information prevails and management makes decisions they believe will maximize wealth, but which turn out to be failures after the fact. There are many institutional rigidities and market imperfections that result in decisions that do not maximize profits. Indeed, these real-world imperfections are what makes corporate finance so interesting. In a world with perfect capital markets and complete information, corporate finance is straightforward and involves little subjective judgment. Management simply moves forward accepting projects which maximize shareholder wealth because there are zero frictions to address. Here, financing decisions are straightforward and unambiguous. However, understanding financial decisions in this perfect world can significantly enhance our understanding of financial decisions made in a world full of imperfections. This is not just useful for corporate finance but also for most financial decisions, including the personal finance decisions we make every day.

Alternatively, we can assume corporate management attempts to maximize overall stakeholder wealth rather than focusing solely on shareholder wealth. Proponents of stakeholder governance push for corporate chieftains to explicitly account for the interest of employees, customers, communities, and suppliers in the decisions they make. In many instances, maximizing shareholder wealth already accounts for the effects on other stakeholders. For example, if Tesla batteries exhibit an excess number of design flaws, resulting in battery explosions, consumer demand for new Tesla vehicles will likely plummet. Do competitive product markets, for instance, force Tesla to adopt the same kinds of safety measures under a model of stakeholder wealth maximization versus shareholder wealth maximization?

Going back to Adam Smith and the classic *Wealth of Nations* (1776), the standard argument in favor of the promotion of self-interest, and likewise shareholder wealth, is that it also benefits and promotes the public interest, by providing new jobs, better products, and additional tax revenues. There are, however, exceptions, such as in the case of pollution, where the polluting firm does not internalize the cost of its pollution of the air or water, since there is often no direct harm to its customers, employees, or suppliers.

A famous essay by Nobel Prize winning economist Milton Friedman in the *New York Times Magazine* (1970), entitled "The Social Responsibility of Business Is to Increase Its Profits" makes a similar point to that of Adam Smith. Friedman argues that to make sustainable profits, firms must look out for the interests of other stakeholders; otherwise, its cost of production will rise too high, thereby extinguishing the desired level of profits. Friedman suggests that a stakeholder model of corporate governance gives free rein to managers to waste resources and pursue their own personal interests. Friedman is not dismissive of the various stakeholder issues. Rather, he claims that the manager works for the shareholders and not for society, per se: it is the role of the government to decide the optimal spending of resources for various social interests.

In today's world, stakeholder governance is front and center in terms of corporate governance, pushing hard against the views of economists like Smith and Friedman. Indeed, the Business Roundtable, which consists of CEOs of large corporations, issued the *Statement on the Purpose of the Corporation* in 2019 which stated that corporations should move beyond Novond, a model of shareholder wealth maximization, and instead deliver value for all stakeholders. So far, however, researchers are not finding

that corporate behavior has changed a great deal, outside of more diversity on corporate boards, for instance.

Notably, Blackrock, the enormous asset manager, has spent the past few years pushing in favor of the environmental, social, and governance (ESG) movement which is largely aligned with the stakeholder model of corporate governance. In its push for ESG, Blackrock has been successful in building new funds which focus on sustainability and thus are attractive to many investors. However, other investors of Blackrock funds have become concerned that the push for sustainability may come at the expense of reduced shareholder returns and as a result have moved their investments to other funds. In many ways, Blackrock has gotten caught in the middle by taking a strong stand on hot political issues.

In this course, we will primarily assume that managers act on behalf of shareholders. Yet we remain mindful of the impact of decisions on other stakeholders, as well. Moreover, we consider how a more explicit model of stakeholder governance will alter the decisions we observe relative to maximizing shareholder wealth. The concept of stakeholder governance is just starting to appear in the mainstream corporate finance textbooks.

Incorporating Human Behavior into Corporate Finance

Traditional corporate finance textbooks tend to assume that markets behave rationally, , and likewise that corporate managers behave rationally, even in a world with market imperfections and agency costs. That is, corporate managers can mostly assume that markets are generally efficient, and that prices adhere closely to fundamental values. Similarly, investors can assume that managers act rationally and pursue their company's self-interest, subject to monitoring, auditing, and various incentives designed to ensure that managers maximize shareholder wealth.

Recent academic work during the past 20–30 years, however, has produced empirical evidence and theoretical arguments that are inconsistent with rational markets and market efficiency. Many commentators, including academics, view the dot-com boom and subsequent bust during the late 1990s and early 2000s as prima facie evidence of irrational markets.

The initial behavioral finance research during the 1990s primarily focused on investors and markets. Behavioral finance suggests investor irrationality can lead to stock prices that materially deviate from fundamental values. If arbitrageurs are not able to correct such mispricings, then corporate managers could act to arbitrage the mispricings themselves.[2] For example, suppose that irrational investors undervalue certain firms. Rational corporate managers of these firms could exploit this mispricing by repurchasing their shares at a discount compared to their fundamental value, thereby benefiting the remaining shareholders via arbitrage.

More recently, academic researchers have begun to focus on cases in which corporate managers tend to react in predictable ways which are counter to rationality. Real-world managers appear to have strong

[2] In this course, we will frequently discuss the concepts of arbitrage and limited arbitrage.

psychological biases that can either be overly conservative or overly optimistic. In either case, they can result in decisions which deviate from the standard norm of shareholder wealth maximization. The crux here is that the manager believes he or she is indeed maximizing shareholder wealth. These managers don't suffer from agency costs; they are not slacking off, shirking, or otherwise pursuing projects which maximize their utility functions at the expense of shareholder wealth. For example, suppose that a group of managers are too confident in their abilities to create value. In effect, they may rule out the extreme downside, because their prior decisions mostly turned out to be profitable. By ruling out the downside, these managers assume a higher expected value for projects, and thus have an incentive to overinvest, perhaps even to the point of investing in projects that lose money and reduce shareholder wealth.

In this course, we will assume, at least in most cases, that rationality prevails on the part of markets, investors, and managers. Nonetheless, we will discuss multiple instances of mispricings and address whether corporate managers are equipped to engage in arbitrage. We will also note cases in which managers seem to act in ways not predicted by basic rational models and analyze the resulting implications.

CORPORATE FINANCE IN A WORLD OF CERTAINTY AND PERFECT CAPITAL MARKETS[3]

Corporate finance is a difficult subject, and mastery is impossible to attain in a single course. To fully understand corporate finance, one first needs a good basic command of accounting, asset pricing (capital markets and investments), microeconomics, and statistics. And one needs the breadth of knowledge to appreciate a combination of theory, empirical evidence from both small- and large-sample studies, as well as anecdotes and experiences from practice in the real world. Corporate finance requires a healthy mix of both academic theory and practical experience because the two are often intertwined.

One frustrating feature of corporate finance is that there are multiple alternative theories, as well as complimentary ones. The empirical evidence is rarely clean, and the interpretation of the empirical evidence is often subjective. And the practice of corporate finance by senior executives and board members is frequently at odds at what professors teach in economics departments and at business schools, which can lead to confusion and uncertainty in learning the material.

I have found from my experience, whether doing research and teaching, or in practice as a board member and as an arbitrageur, that to understand corporate finance it is useful to start from a base case in which capital markets are perfect. This base case is clearly unrealistic and at odds with the real world, but you will find that by understanding corporate finance in a world with perfect capital markets, you have a far

[3] See Chapters 1–2 (pp. 1–107) of *The Theory of Finance* (1972) by Eugene Fama and Merton Miller for an expansive discussion of corporate finance in a world of certainty and perfect capital markets. These chapters are not required or even suggested readings; rather, I wanted just to indicate them as thoughtful source material. Their book can be accessed on Fama's personal webpage (http://faculty.chicagobooth.edu/eugene.fama/research/index.htm).

better chance at understanding corporate finance in the real world with its requisite frictions, rigidities, etc. Otherwise, it can get overly complicated very quickly.

The assumption of perfect capital markets requires the following conditions:

1. All investors have access to the same information. That is, information asymmetry does not exist.
2. Investors and traders have no impact on stock prices.
3. There are no taxes or transactions costs.
4. Agency costs do not exist; there are no conflicts between management and investors.
5. Investors and managers are entirely rational.

During the course, we will relax these assumptions and gauge their impact on managerial decisions. The relaxation of these assumptions is what makes corporate finance interesting. We start not only by assuming perfect capital markets but also by assuming cash flows are certain, ex ante, a condition which doesn't hold in the real world. Even short-term U.S. Treasuries aren't certain, though we can make the rough assumption that they are certain, given they are nearly certain.[4]

To provide a brief illustration of corporate finance in a world with perfect capital markets and certain cash flows, I'll use the fictional company PCM&C (Perfect Capital Markets & Certainty) Corporation. PCM&C has $100 million of cash (or marketable securities) on hand and has made a prior investment which will generate a cash flow of $200 million at the end of the period. None of the existing $100 million in cash on hand is required to generate the future cash flow of $200 million. Think of this as a one-period model with the period equal to one year. To account for the difference in the time value of the cash flows (that is, we prefer receiving positive cash flows sooner rather than later), assume a rate of interest of 5%. Given the stated condition of certainty, the 5% rate of interest is equivalent to the prevailing risk-free rate.

Formulaically, the value today of PCM&C is given as:

Eq. 1
$$V_{PCM\&C} = C_0 + \frac{CF_1}{[1+r_f]}$$

Eq. 1a
$$V_{PCM\&C} = \$100 \text{ million} + \frac{\$200 \text{ million}}{[1+.05]}$$

$$V_{PCM\&C} = \$290.48 \text{ million}$$

where V = wealth (or value), C_0 = cash today, CF_1 = cash flow one year from today, and r_f = risk-free rate of interest.[5] The term $\frac{1}{[1+r_f]}$ can be referred to as the discount factor because it indicates what price we can purchase future cash at today. Conversely, the term $[1 + r_f]$ is the future value factor because it indicates

[4] Other countries are sometimes less fortunate. Consider Venezuela, a country in default, with its short-term government paper trading at only 10 cents on the dollar in 2023.

[5] Note the nomenclature difference between C_0 and CF_1. In the former, we are referring to a stock of cash on hand and in the latter, a cash flow which will occur in the future. This is largely a matter of personal preference.

how much a current amount is worth at the end of the period. This concept of moving dollars across time, while intuitive and easy to compute, is one of the most fundamental concepts in finance.[6] In this example, the cash is invested to earn a rate of 5% -- that is, the prevailing interest rate.

Another useful way to display the value of a company is via a market-value balance sheet representation as shown below.

PCM&C Market-Value Balance Sheet (millions)

Cash	100.00	Equity	290.48
Assets-in-Place	190.48		
Total Assets	290.48	Total Debt & Equity	290.48

Here, we can think of PCM&C as having two assets, namely the $100 million of cash (or marketable securities) on hand and the investment, worth $190.48 million in current dollars. We refer to the investment as assets-in-place. Initially, we can assume that PCM&C has no debt in its capital structure and the financing is 100% equity. Thus, the equity market capitalization of PCM&C is $290.48 million, which is equal to the value of the assets on the left-hand side of the balance sheet. It is important to recognize that the balance sheet as constructed is based on market values, rather than on book values, as in the case of typical balance sheets found in financial statements for accounting purposes.

This course focuses on three primary decisions by corporate management: 1) which investments in real projects to make on the left-hand side of the balance sheet; 2) the optimal capital structure on the right-hand side of the balance sheet; 3) and the distribution of cash to shareholders. For now, we can provide a brief preview of these financial decisions using PCM&C as our example. To start, assume that PCM&C has $50.00 million of debt in its capital structure, as opposed to just being an all-equity firm. Everything else remains the same. If so, we can represent the balance sheet as below.

PCM&C Market-Value Balance Sheet (millions)

Cash	100.00	Debt	50.00
Assets-in-Place	190.48	Equity	240.48
Total Assets	290.48	Total Debt & Equity	290.48

Given the value of the debt is $50 million, the equity value is $240.48 million -- that is, the total firm value of $290.48 million minus the $50 million of debt. Obviously, the equity value is the residual value of the total firm value less the value of the debt. But less obvious is that the swap of $50 million debt was for an equal amount of equity. That is, we made the underlying assumption that the total firm value didn't change with this adjustment to the capital structure. Under certain restrictive conditions, which don't hold in the real world, firm value is invariant to changes in the capital structure, a proof that generated Nobel Prizes for economists Merton Miller (formerly a very influential figure at Chicago Booth) and Franco

[6] It is just like converting currencies, that is, 1 Japanese yen equals 0.00635 British pound or 1 British pound equals 157.57 Japanese yen. Indeed, the concept of finance boils down to estimating cash flows on a timeline and converting the cash flows to a value as of a specified period, often the current period, and hence the notion of present value.

Modigliani. Rather, firm value is driven by the value of all the assets on the left-hand side of the balance sheet—in this case, cash and the present value of the investment project. In other words, alterations to the mix of debt and equity don't have any impact on the value of these assets, at least in a world with perfect capital markets.

As described so far, PCM&C has two assets on its balance sheet: the $100 million cash, and the existing assets-in-place, which have a current market value of $190.48 million. We next illustrate how management should evaluate a new investment project, which we label as PROJECT to distinguish it from the existing assets-in-place. Assume that PROJECT can be undertaken under several different levels of investment as shown in Table 1.

Table 1: PCM&C Investment in PROJECT (millions)

Investment	Future cash flow	Present value	Net present value	Return
50.00	60.00	57.14	7.14	20.00%
75.00	89.00	84.76	9.76	18.67%
100.00	117.00	111.43	11.43	17.00%
125.00	144.00	137.14	12.14	15.20%
150.00	169.00	160.95	10.95	12.67%
175.00	190.00	180.95	5.95	8.57%
200.00	209.00	199.05	−0.95	4.50%

Management of PCM&C has the option to invest between $50 million and $200 million in PROJECT. The investment occurs today, and the payoff is at the end of the year. For each level of investment in PROJECT, Table 1 displays the corresponding payoff or cash flow at the end of the period; the present value of each cash flow; the net project value associated with each level of investment; and the return on the investment. For example, an investment level of $50 million in PROJECT generates a future cash flow of $60 million. With a discount rate (or cost of capital) of 5.0%, this future cash flow has a present value of $57.14 million. The net present value (or NPV) is the summation of all cash flows discounted to the present and is equal to $7.14 million. The NPV is shown formulaically for this one-period model as follows:[7]

Eq. 2

$$NPV = -CF_0 + \frac{CF_1}{[1+r_f]}$$

Eq. 2a

$$NPV = \$7.14 = -50 + \frac{60}{[1+.05]}$$

In effect, if management chooses to invest $50 million in PROJECT, the result is an increase in firm value of $7.14 million, namely the NPV of PROJECT. Given our assumption of perfect capital markets and certain cash flows, the entire NPV accrues to the equity holder; the market value of equity increases by $7.14

[7] Note that here we are using CF – cash flow -- at time 0 rather than C, or cash, for the level of cash on the balance sheet. This is because the cash will be expended rather than simply sitting as a stock on the balance sheet.

million. Stated differently, the decision by management to invest $50 million in PROJECT yields an immediate increase in equity value of $7.14 million. This increase in value is because the return on the $50 million investment in PROJECT is higher than the return on $50 million at an interest rate of 5%. That is, with the $60 million cash flow at the end of the year, the return on investing in PROJECT is 20%, far higher than investing in equivalent-risk securities that generate a 5% return.

We refer to the 20% return calculated previously as the internal rate of return (or IRR). As we illustrate in the NPV lecture note, the IRR can be virtually impossible to calculate manually for multiperiod cash flows, but it is easy to calculate for a single period, as assumed here. Formulaically, the IRR for the one-period model is

Eq. 3

$$0 = -CF_0 + \frac{CF_1}{\left[1+IRR\right]}$$

Conceptually, the IRR is the equation that sets the NPV equal to 0. Solving for IRR yields

Eq. 3a

$$IRR = \frac{CF_1}{CF_0} - 1$$

$$IRR = \frac{60}{50} - 1 = 20.00\%$$

While the $50 million investment in PROJECT yields +NPV to PCM&C Corporation and thus increases shareholder wealth relative to not investing in PROJECT, larger levels of investment will yield even greater value. To maximize shareholder wealth, let's assume management chooses to invest $125 million in PROJECT, which yields an NPV of $12.14 million, the maximum NPV across the various levels of investments. While the investment level of $125 million generates the maximum NPV, the resulting IRR is 15.20%, considerably smaller than the 20.0% IRR associated with the $50 million investment level. If the objective is to maximize the internal rate of return, the optimal investment level is $50 million.

When choosing among mutually exclusive projects or projects with different investment levels, the general rule to maximize shareholder wealth is to accept the project that generates the highest NPV. In many cases, selecting the project with the highest IRR yields the same recommendation as NPV, but not always. It can produce a misleading answer, as in the example above. To use the IRR rule correctly, one needs to consider the IRR on the incremental investment. For example, the additional investment is $75 million ($125 million – $50 million) which generates incremental cash flows of $84 million ($144 million – $60 million), yielding an incremental IRR of 12.0%. Because the incremental IRR exceeds the 5% discount rate, the modified IRR rule recommends the investment level of $125 million. The point here is not that IRR can't be revised to yield a conclusion that is identical to NPV, but rather that it is more straightforward to just solve for the investment level that maximizes the NPV, and simply report the associated IRR.

The recommended investment level of $125 million exceeds the $100 million of cash available on PCM&C's balance sheet that can be used to fund projects. Thus, an additional $25 million would need to come from external sources. For this discussion, we assume that either debt or equity can fund the $25 million gap, although later in the course I discuss other potential forms of financing, such as convertible

securities. First, let's assume management chooses to issue new equity to finance the funding gap for PROJECT. Given that we are assuming perfect capital markets, it is not necessary to hire a team of investment bankers, build new pitch books and presentations, file prospectuses with the Securities & Exchange Commission, and embark on a road show to convince investors to purchase shares of PCM&C.[8]

At what price can PCM&C sell new shares to raise the $25 million? Let's assume there are a total of 15 million shares outstanding. Again, the equity value of PCM&C is $290.48 million, giving us a stock price of $19.37, as shown in Table 2.

Table 2: PCM&C Equity Market Capitalization

Investment	Issue shares	Issue shares (PROJECT)
Pre-issue equity market value	$290.48 million	$290.48 million
Pre-issue shares outstanding	15 million	15 million
Pre-issue stock price	$19.37	$19.37
New issue amount	$25 million	$25 million
New issue price	$19.37	$20.17
Share issue	1.29 million	1.24 million
Post-issue equity market value	$315.48 million	$327.62 million
Post-issue stock price	$19.37	$20.17
Post-issue shares outstanding	16.29 million	16.24 million

Let's suppose PCM&C raises $25 million of new equity and then invests the proceeds in risk-free securities yielding 5%. In this scenario, PCM&C issues the new shares at the current price of $19.37, raising a total of 1.29 million shares, as shown in the first column above. The resulting firm value is $315.48 million -- that is, the original firm value of $290.48 million plus the new equity of $25 million. The number of shares increases from 15 million to 16.29 million, and the stock price remains constant at $19.37.

However, PCM&C can also issue the new $25 million of equity at a higher price to finance PROJECT, if it is not merely using the funds to invest in risk-free securities. Let's say management announces the new investment in PROJECT; the stock price of PCM&C will immediately reflect the new information about the +NPV of $12.14 million, resulting in an increase of equity value, from $290.48 million to $302.62 million (not shown in Table 2). Correspondingly, the stock price of PCM&C will increase from $19.37 to $20.17, as shown in the second column. Because we assume perfect capital markets, there are no delays concerning the stock price in fully incorporating the new information regarding PROJECT. And since management is issuing the new shares at a higher price, PCM&C only needs to raise 1.24 million shares, as opposed to 1.29 million shares. Finally, and as we will discuss in more detail during the course, there is no dilution of

[8] The total direct and indirect costs of underwriting an equity issue can reach 5%–7%, especially for smaller corporations. But given we are operating under perfect capital markets in this exercise, there are no transactions costs and thus no underwriting fees for new security offerings.

the equity issue resulting in a decreased stock price because PCM&C issued the stock at its fundamental value, reflecting the +NPV resulting from PROJECT.

Alternatively, management could raise additional debt of $25 million. The debt matures at the end of the period and carries an interest rate of 5% given the certainty of cash flows. Note the interest rate on the debt is identical to the discount rate for PROJECT. In a world in which cash flows are certain, there is only one discount rate, which happens to be the risk-free rate. The resulting stock price is $20.17, the same as if equity finances PROJECT. Management is indifferent to using debt or equity to finance the funding gap with PROJECT because the value implications are identical due to the assumption of perfect capital markets. Obviously, in the real world debt and equity issues can have different value implications due to various real-world frictions such as taxes and information asymmetry.

The Separation of the Investment Decision from the Consumption Decision

As described previously, management of PCM&C maximizes shareholder wealth by accepting all +NPV projects and rejecting all –NPV projects. But shareholders have different utility functions in that some shareholders prefer to consume cash flows today more so than other shareholders who might have lower personal discount rates. That is, to the extent that shareholders have different discount rates, those shareholders who have a higher preference for consuming cash flows today will have higher discount rates than shareholders who are willing to consume cash flows in later periods. The question is whether managers need to take account of the consumption patterns desired by their shareholders when contemplating which projects to invest in.

Many CEOs, legal academics, judges, and various business reporters hold strong views that shareholders are incredibly myopic and are willing to sacrifice profitable long-term projects for short-term earnings (see Panera CEO Ron Shaich's interview on CNBC's *Mad Money* referenced at the beginning of this lecture note). As quoted in the October 16, 2017 *Wall Street Journal* article, "Silicon Valley vs. Wall Street: Can the New Long-Term Stock Exchange Disrupt Capitalism?"[9] Margit Wennmachers of Andreessen Horowitz, a well-known venture capital firm in Silicon Valley, stated,

> "The only thing that matters is what did you tell the Street and what does it make? ... They don't care about virtual reality or autonomous driving or what your long-term strategy is."

To combat this perception, Andreessen Horowitz and other Silicon Valley venture capitalists are funding a new stock exchange, The Long-Term Stock Exchange, created by Eric Ries, as described in his book *The Lean Startup,* which will provide greater voting power to shareholders with longer tenure, link management incentives to long-term goals, encourage strategy discussions in the boardroom, etc.[10]

[9] Osipovich, Alexander, and Dennis K. Berman, "Silicon Valley vs. Wall Street: Can the New Long-Term Stock Exchange Disrupt Capitalism?" *The Wall Street Journal*, Oct. 16, 2017.
[10] The exchange went live in September 2020, but as of July 2023 it only has two listings and thus not a promising start.

Survey studies of CEOs document that managers feel pressured by shareholders to bypass value-enhancing projects to hit current earnings.[11]

It is useful to address this issue in the setting of perfect capital markets. Consider a shareholder, OWNER, of PCM&C who has three assets in her portfolio: $100,000 cash, a $3 million bond that matures at the end of the period and pays a 5% rate of interest, and 300,000 shares (2% ownership) of PCM&C stock. Given the $19.37 stock price of PCM&C, OWNER has $5.81 million in PCM&C stock, as displayed in OWNER's personal market-value balance sheet.

OWNER Personal Market-Value Balance Sheet (millions)

Cash	0.10	OWNER Wealth	8.91
Bond	3.00		
PCM&C Stock	5.81		
Total Assets	8.91	Total Debt & Wealth	8.91

As shown on OWNER's balance sheet, her current wealth is $8.91 million. Assume that OWNER is restricted from selling the bond and from selling her shares in PCM&C stock before the end of the year.[12] At the end of the period, OWNER will have $9.36 million in wealth with each of her assets increasing at a rate of 5% over the duration of the period. Alternatively, OWNER could raise $8.91 million in cash today by borrowing $8.81 million, by using her bond position and ownership in PCM&C stock as collateral, using the $8.81 million from borrowed funds and the $100,000 cash on hand. Given perfect capital markets and certainty, OWNER is not subject to a haircut on the loan, which is subject to only the time value of money. With certainty, we know that OWNER will receive the cash flows. And because of the perfect capital markets conditions, we know that OWNER will pay no taxes on the proceeds, will not pay any transactions costs on receiving the funds, and will not engage in nefarious behavior—that is, she will not divert the $9.36 million elsewhere upon the realization of that amount. Consequently, OWNER will be able to borrow against the full amount without the need to account for a possible loan default.

Capital markets facilitate the transfer of financial assets through time and allow OWNER to separate how she spends her money from the timing of cash flows. Of course, there are market imperfections in the real world, which deter the seamless flow of financial assets through time. But even so, these cash flows can occur reasonably efficiently.

The next step is to understand the relation between the investment decision by PCM&C, and the consumption preferences or habits of OWNER. What if OWNER prefers to spend all her wealth today, versus at the end of the period?[13] How will OWNER view PCM&C's decision to invest in PROJECT?

[11] Graham, John, Campbell Harvey, and Shiva Rajgopal, "The Economic Implications of Corporate Financial Reporting," *Journal of Accounting and Economics*, vol. 40 (2005), pp. 3–73.

[12] We are making this restriction in order to make the point about transferring cash flows through time.

[13] Granted, we are making the extreme point of consuming her entire wealth today, whereas in actuality, OWNER would consume some of her wealth at the beginning of the period and some of her wealth at the end of the period.

Moreover, assume that PCM&C has decided to raise the entire $25 million of the funding from its existing shareholders on a pro rata basis, such that OWNER will need to contribute to the capital raise. Since OWNER has a 2% stake in PCM&C, she will need to invest an additional $500,000 in PCM&C as part of the $25 million effort to raise capital. While OWNER has only $100,000 of cash on hand and is unable to sell part of her bonds to raise additional funds, she will still have no problem borrowing the additional $400,000 to purchase necessary shares in PCM&C to maintain her 2% ownership. OWNER's balance sheet, which reflects the acceptance and financing of PROJECT by PCM&C is:

OWNER Personal Market-Value Balance Sheet (millions)

Cash	0.00	Debt	0.40
Bond	3.00	OWNER Wealth	9.15
PCM&C Stock	6.55		
Total Assets	9.55	Total Debt & Wealth	9.55

OWNER's cash on hand drops to zero, because she used the $100,000 in cash she had on hand to provide some of the funds for the additional $500,000 investment in PCM&C shares. The balance sheet displays the Debt of $400,000, which accounts for the rest of the financing for the investment. The value of OWNER's stake in PCM&C stock increases from $5.81 million to $6.55 million, an increase of roughly $740,000, reflecting the $500,000 additional shares purchased plus the +NPV resulting from PROJECT allocated to her shares.

The impact of PCM&C's investment in PROJECT to OWNER is an increase in wealth from $8.91 million to $9.15 million. The wealth difference is equivalent to the amount of the +NPV allocated to OWNER. Thus, despite spending all available cash, as well as borrowing $400,000 in funds to finance her additional purchase of PCM&C shares, OWNER has more wealth – more consumption power -- at the end of the period.

Capital markets allow not only the transfer of financial assets through time, as we saw earlier, but also the separation of the decision to spend money – the consumption decision -- from the investment decision. This is an important concept and the bedrock of corporate finance, as we will discuss throughout the course. In a perfect world, both savers and spenders agree that the optimal investment level is $125 million. And that level is not influenced by the spending habits and utility functions of investors. Dividend policy is irrelevant in this perfect world setting. And the notion of forsaking valuable long-term profits for the benefit of less valuable short-term profits does not exist. Of course, as we will show, market frictions and imperfections result in deviations from optimal investment policy and thus capital structure policy becomes relevant.

One fundamental question is why shareholders would ever prefer short-run cash flows over higher risk-adjusted long-term cash flows. That is, a primary principle of economics is that individuals prefer more to less; thus, the logic is that a shareholder would prefer a long-term cash flow distribution, which has a present value of $21 million, over a short-term cash flow distribution with a present value of $20 million.

Indeed, this is the underlying argument behind the separation of the investment decision from the consumption decision. And it is the reason that both spenders and savers will vote the same way concerning project selection, at least assuming perfect capital markets.

The preponderance of the empirical evidence in the academic finance journals shows that shareholders want managers to maximize shareholder wealth, irrespective of whether the projects are long- or short-term. When CEOs announce long-term projects, the stock prices of their respective firms increase on average in support of their project selection. For example, when public firms announce new CAPX and R&D announcements, the stock market generally approves. However, in the real world, exceptions can occur, and it is the belief of many CEOs, such as Ron Shaich, that today's shareholders are far too myopic and focused on short-term earnings at the expense of long-term shareholder wealth maximization.

Part of the issue may be that CEOs, legal jurists, reporters, etc., think more in terms of anecdotes, rather than thinking in terms of the entire distribution of possible outcomes, and thus may have biased views, often based on their recent experience. On a personal level, I have witnessed pushes for short-term profits over long-term profits, sometimes even from private-equity managers, who one would think such a conflict wouldn't exist. But this doesn't necessarily mean that, on average, corporations sacrifice long-term profits for short-term profits.[14]

MULTIPERIOD CASH FLOWS

In the PCM&C exercise, again, capital markets are perfect, and certainty prevails. Given all cash flows are known with certainty, the discount rate reflects only the time value of money, because there is no underlying risk. In the real world, we consider the short-term U.S. Treasury Bill as somewhat risk-free. While in a subsequent lecture note I will focus on established asset-pricing models to compute discount rates in practice, for now, we will assume, rather than estimate, a discount rate and consider it to reflect the time value of money, plus some risk premium. That is, we will assume uncertain cash flows, but will continue to maintain the assumption of perfect capital markets. We will also assume multiple time horizons as opposed to the single-period exercise with PCM&C.

In a multiperiod world, the formula for NPV is given by:

Eq. 4

$$NPV = -CF_0 + \frac{E[CF_1]}{[1+r]} + \frac{E[CF_2]}{[1+r]^2} + \frac{E[CF_3]}{[1+r]^3} + \ldots \frac{E[CF_T]}{[1+r]^T}$$

where r = Risk-free rate + Risk premium.

[14] The concept of the separation of the investment decision from the consumption decision is such an important and obvious tenet of finance that it is often taken as a given in the basic corporate finance textbooks. But it is important to address and recognize the conflicts that exist today in the real world. Macroeconomic textbooks cover the separation of the investment decision from the consumption decision near the end of the book when it interacts macroeconomics and finance.

Given the future cash flows are not known with certainty, the "E" in front of the "CF" reflects the case that the cash flows are expected. Note that there is no "E" in front of the cash outflow in Time 0 because it is a certain expenditure that is happening immediately.

When valuing long-lived assets, corporate finance practitioners often produce detailed cash flow estimates over a forecast period, e.g., 5–10 years, and then assume perpetual cash flows thereafter for ease of calculation. If we assume a stream of constant cash flows commencing at the end of the year and continuing indefinitely into the future with annual payments, the formula to value the stream of perpetual cash flows is:

Eq. 5

$$V = \frac{E[CF]}{[1+r]} + \frac{E[CF]}{[1+r]^2} + \frac{E[CF]}{[1+r]^3} + \ldots \frac{E[CF]}{[1+r]^{\infty}}$$

Using a few mathematical steps, this series converts to a geometric progression, the sum of which has the following finite solution:

Eq. 5a

$$V = \frac{E[CF]}{r}$$

which is our well-known perpetuity formula. Note that the value is as of today (Time = 0), if we assume the first cash flow occurs one year from today. For example, a stream of expected constant cash flows of $100 million per year commencing at the end of the year yields a value of $1.25 billion using a discount rate of 8%.

$$\$1.25 \text{ billion} = \frac{\$100 \text{ million}}{.08}$$

And more generally, we can allow the perpetuity to show positive or negative growth at a constant rate, rather than merely assuming the cash flows are constant through time.

Eq. 6

$$V = \frac{E[CF]}{[1+r]} + \frac{E[CF][1+g]}{[1+r]^2} + \frac{E[CF][1+g]^2}{[1+r]^3} + \ldots \frac{E[CF][1+g]^{\infty-1}}{[1+r]^{\infty}}$$

Accounting for growth, we can simplify to the following final solution:

Eq. 6a

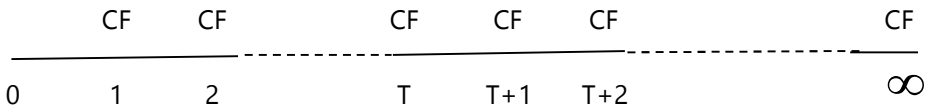
$$V = \frac{E[CF]}{[r-g]}$$

where g is growth, which can be zero (as in the standard perpetuity formula), positive, or negative. As we will note from time to time in the course, the estimates of value in the growing perpetuity formula are extremely sensitive to the nonlinearity in the equation, driven by the difference between r and g in the

denominator.[15] If the expected cash flows in the preceding example are expected to grow at 3% rather than remain constant, the resulting value is $2 billion rather than $1.25 billion.

$$\$2 \text{ billion} = \frac{\$100 \text{ million}}{0.08 - 0.03}$$

In some cases, the cash flows are fixed for a finite number of periods, such as years, a series which is referred to as an annuity. An annuity can be shown on a timeline as follows:



As shown on the preceding timeline, an annuity consisting of T years is equal to the value of a perpetuity with cash flows beginning one year from today minus the value of a perpetuity with cash flows beginning at the end of Year T+1. And for the perpetuity with cash flows starting in Year T+1, the value is of the perpetuity is as of Year T. Thus, the annuity formula is

Eq. 7

$$V = \frac{E[CF]}{r} - \frac{E[CF]}{r[1+r]^{t}}$$

Using the preceding inputs, Eq. 7 yields the following:

$$671.01 = \frac{100}{0.08} - \frac{100}{0.08[1.08]^{10}}$$

The first term is equal to $1.25 billion and is merely the value of the perpetuity. The second term is also the value of a perpetuity, but one which begins generating cash flows eleven years later. It also has a value of $1.25 billion, but as of the end of the tenth year, and thus needs to be further discounted by the term 1.08^{10}. With the discounting over the ten years, the second perpetuity has a value of $578.99 million as of today. Thus, the difference between the value of the two perpetuities is simply the ten-year annuity with a value of $671.01 million. Alternatively, one can resort to a present value annuity table, which indicates a value of 6.7101 corresponding to 10 years and an interest rate of 8%, thus indicating the same value of $671.01 million. Likewise, one can also discount the ten payments of $100 million and sum the discounted cash flows as shown in Table 3.

[15] Depending on the size of r and g, small changes in r and g can result in very large changes in value, or V. Indeed, opposing analyses between acquirer firm investment bankers and target firm investment bankers can yield substantially different valuation with inputs which don't appear to be that different.

Table 3: Annuity and Growing Annuity Valuations

Year	Cash Flow (no growth)	Future Value Factor	Discounted Cash Flow (no growth)	Cash Flow (3% growth)	Discounted Cash Flow (3% growth)
1	100.00	1.08	92.59	100.00	92.59
2	100.00	1.17	85.73	103.00	88.31
3	100.00	1.26	79.38	106.09	84.22
4	100.00	1.36	73.50	109.27	80.32
5	100.00	1.47	68.06	112.55	76.60
6	100.00	1.59	63.02	115.93	73.05
7	100.00	1.71	58.35	119.41	69.67
8	100.00	1.85	54.03	122.99	66.45
9	100.00	2.00	50.02	126.68	63.37
10	100.00	2.16	46.32	130.48	60.44
		Present value	$671.01	Present value	$755.01

Last, the value of a growing annuity follows the same logic; namely, it is a growing perpetuity minus a growing perpetuity beginning in a subsequent period, and the formula is

Eq. 8

$$V = \frac{E[CF]}{[r-g]} \times \left[1 - \frac{(1+g)^t}{(1+r)^t}\right]$$

With a starting cash flow of $100 in one year, growing 3% annually, and a discount rate of 8%, the growing annuity has a value of $755.01 million per the preceding formula. Alternatively, as shown in Table 3, the summation of the discounted cash flows growing 3% annually generates the same value of $755.01 million. Intuitively, just as the growing perpetuity had a higher value than the constant perpetuity, the growing annuity also has a higher value than a constant annuity with the same discount rate and number of years.

CONCLUDING THOUGHTS

Corporate finance can get complicated much more quickly than we often think. It can get messy with lots of details and nuances. This is especially true in the real world where agency costs and information asymmetry are prevalent, when lots of players are involved, and when markets are in turmoil. We will cover messy cases in this class, as well; I have picked cases which are realistic yet allow you to apply what you have learned in finance courses to settings you will experience down the road.

To get the maximum benefit out of this course, it is crucial that you do not attack the cases in isolation. Instead, you should read the relevant lecture notes, as they will assist you in the case preparation and likewise in the class discussion. Moreover, reading the lecture notes should decrease the time you need to spend preparing your answers, as you will have a better framework to tackle the cases. These notes are written with that in mind. Think of them as refresher notes to your corporate finance and capital markets textbooks. Last, if you happen to get stuck on a particular issue in the subsequent lecture notes, it is generally advantageous to revert to a world of perfect capital markets, as we stress in this introductory lecture. Without knowing the value implications of decisions and events in perfect capital markets, it is virtually impossible to master financial management in the real world.