



The Trade-Off Theory of Capital Structure

RECAP OF MODIGLIANI & MILLER

Modigliani and Miller laid the groundwork for modern corporate finance theory with their capital structure propositions.¹ They issued a steep challenge to the way that academics and practitioners thought about corporate finance. While they faced enormous skepticism and rebuttal initially, before long their invariance proposition became the cornerstone of corporate finance and set the stage for all future work. Modigliani and Miller debunked the prevailing notion that firms could arbitrage the spread between the cost of equity and the cost of debt, by showing that investors can accomplish the same outcome, thereby eliminating such arbitrage by corporations. Modigliani and Miller did not operate in a vacuum; they were quite mindful of the restrictive assumptions they incorporated in deriving their propositions. The objective of the next few lecture notes is to isolate each of these assumptions and demonstrate how these assumptions substantively impact capital structure through time and across corporations.

DEBT AND TAXES

The tax code of the United States imposes double taxation on corporations, with one tax at the corporate level via the corporate income tax, and a separate tax at the shareholder level via taxes on capital gains and dividends. Until the recent tax law of 2017, which decreased the federal corporate tax rate from 35% to 21%, the combined tax rate (federal and average state tax rate on corporations, and federal and average state tax rate on individuals) was 56.6% in the United States, the second highest in developed economies.² With the recent tax law change, the combined tax rate has declined to 42.6%.

¹ Interestingly, Merton Miller won the Nobel Prize for this contribution even though he was not the lead author of the paper. Generally, authorship is alphabetically ordered.

² France earns the distinction of having the highest combined tax rating by country.

Modigliani and Miller assume no corporate income taxes in their proof that the cost of capital remains the same regardless of the mix of debt and equity on the right-hand side of the balance sheet. However, the U.S. tax system favors debt financing, as the IRS handles interest to debtholders differently than it does dividends to shareholders. Interest is a taxable expense for accounting purposes and thus escapes corporate taxation entirely as the debtholder is taxed only once.³ As indicated above, corporate dividends are not a tax deductible expense for businesses. Many countries have integrated their corporate and individual tax codes to reduce the double tax on corporations via tax credits or exemptions on dividend income.

Consider the firm ALLEQUITY. Let's assume ALLEQUITY has zero debt, expects annual pre-tax profits of \$100 million in the current year, a perpetual growth rate of 4.5%, and a cost of capital of 12%.⁴ Assume a corporate tax rate of 25%, reflecting the current-day combined federal and average state taxes. ALLEQUITY has just paid a dividend of \$75 million, reflecting the previous year's after-tax profits. To simplify, assume the expected net income of \$75 million is also equal to the expected cash flows for this year.⁵ The value of ALLEQUITY is:

$$\boxed{\text{Eq. 1}} \quad V_{\text{ALLEQUITY}} = D_{\text{ALLEQUITY}} + E_{\text{ALLEQUITY}} = E_{\text{ALLEQUITY}}$$

or \$1 billion = \$0 + \$1 billion.⁶

Assume ALLEQUITY intends to issue \$300 million of perpetual new debt, which pays an annual coupon or interest rate of 6.0%. ALLEQUITY intends to repurchase shares with the proceeds from the new debt and will change its name to LEVER. Since management is embarking solely on a financial restructuring, there should be no impact on the left-hand side of the balance sheet; that is, the recapitalization should not impact the operating cash flows. The total firm value and equity value of LEVER is unknown:

$$\boxed{\text{Eq. 2}} \quad V_{\text{LEVER}} = D_{\text{LEVER}} + E_{\text{LEVER}}$$

or $V_{\text{LEVER}} = \$300 \text{ million} + E_{\text{LEVER}}$

In the lecture note, *Introduction to Capital Structure*, ALLEQUITY and LEVER have identical firm values in perfect capital markets. The equity value and firm value of LEVER are \$700 million and \$1 billion, respectively, in perfect capital markets. However, the presence of corporate taxes will result in higher cash flows to the combined debtholders and equity holders for a firm with debt, relative to a comparable all-equity firm, as shown in Table 1.

³ The deduction for corporate interest profits began in 1918 as a temporary measure to offset the negative effects of an excise profits tax to pay for World War I. And in 1921 when Congress repealed the excess profits tax, they chose to leave the interest expense deductibility in place.

⁴ Assume for example that ALLEQUITY has an asset beta of 1.6, the risk-free rate (T-Bond) is 3% and the market risk premium is 5.6%. Assuming CAPM, the cost of capital is 12% based on these inputs.

⁵ In the examples provided in this lecture note, we focus exclusively on the tax benefits of debt financing and thus simply assume a certain amount of cash flows rather than derive them from the bottom up.

⁶ The perpetual growth valuation model was utilized to calculate this \$1 billion estimate of firm value.

Table 1

	ALLEQUITY	LEVER
Earnings Before Interest and Taxes	100.0	100.0
Interest Expense	0.0	18.0
Pretax Income	100.0	82.0
Corporate Taxes	25.0	20.5
Net Income to Shareholders	75.0	61.5
Total Income to All Investors	75.0	79.5
Interest Tax Shield		4.5

Due to the deductibility of interest from corporate taxes, LEVER pays \$20.5 million in taxes versus \$25.0 million in taxes for ALLEQUITY. While LEVER has a lower net income, due to the interest expense, of \$61.5 million, versus \$75.0 million of net income for ALLEQUITY, the total combined income available to equity holders and debt holders is \$79.5 million at LEVER, versus \$75.0 million to the equity holders at ALLEQUITY.

The additional \$4.5 million of income to the overall investors is due to the tax treatment of interest as an expense and is referred to as the *interest tax shield*. It is represented by the formula:

$$\boxed{\text{Eq. 3}} \quad \text{Interest Tax Shield} = T_C \times R_D \times D$$

where T_C is the corporate tax rate, R_D is the rate of interest and D is the level of debt. Thus, in the case above of LEVER, the formula looks like this:

$$\$4.5 \text{ million} = 0.25 \times 0.06 \times \$300 \text{ million}$$

Without any alterations to the business operations, management can increase the overall distribution of cash flows to the security holders -- the equity holders and debt holders -- by 6.0% on an annual basis via a reduction in corporate taxes paid.

As indicated above, the new debt is permanent. Assuming a constant interest and tax rate, the interest tax shield (PVTs) can be viewed in the context of a perpetuity formula to assess the impact on firm value.

$$\boxed{\text{Eq.4}} \quad \text{PV(Interest Tax Shield)} = \frac{T_C \times R_D \times D}{R_D}$$

$$= T_C \times D$$

With LEVER, the present value of the interest tax shields with fixed and permanent debt is \$75 million:

$$\$75 \text{ million} = 0.25 \times \$300 \text{ million}$$

Note the use of the interest rate as the discount rate, to calculate the present value of the expected interest tax shields in the formula above, assuming constant and perpetual debt. We should note that the tax shields are not risk-free, as LEVER could end up with insufficient operating income to make the interest payments, or even file for Chapter 11 bankruptcy. At the same time, the risk of receiving the tax shields is lower than that of the overall cost of capital. The firm receives the tax shields if it can continue in business. Thus, the interest rate is often used as the discount rate in the case of perpetual debt.

Reverting back to **Eq. 2**, the value of LEVER is equal to \$1.075 billion:

$$V_{\text{LEVER}} = \$1.075 \text{ billion} = \$300 \text{ million} + \$775 \text{ million}^7$$

That is, by recapitalizing the firm via a \$300 million issue of permanent debt, management has created additional shareholder wealth of \$75 million, on the right-hand side of the balance sheet. While it might at first seem that this wealth creation violates Proposition I, that is not the case. Rather, Modigliani and Miller assumed a world without taxes. By assuming corporate taxes, one can show how capital structure does matter, and moreover that the higher value of LEVER versus ALLEQUITY is because the U.S. taxing authorities allow corporations to treat interest as an expense. In effect, the U.S. government subsidizes the use of debt financing by corporations.

In this simplified Modigliani and Miller world where we have only relaxed the assumption of no corporate taxes, the recapitalization of ALLEQUITY into LEVER is relatively straightforward. To illustrate, assume that ALLEQUITY has 65 million shares outstanding, and thus the share price is \$15.38. Table 2 shows the mechanics of the recapitalization step by step.

Table 2

	ALLEQUITY (pre-recap)	ALLEQUITY (announcement)	LEVER (debt issue)	LEVER (share repurchase)
Excess Cash	0.0	0.0	300.0	0.0
Operating Assets	1,000.0	1,000.0	1,000.0	1,000.0
PVTS	0.0	75.0	75.0	75.0
Total Assets	1,000.0	1,075.0	1,375.0	1,075.0
Debt	0.0	0.0	300.0	300.0
Equity	1,000.0	1,075.0	1,075.0	775.0
Total Debt & Equity	1,000.0	1,075.0	1,375.0	1,075.0
Shares Outstanding	65.0	65.0	65.0	46.9
Stock Price	\$15.38	\$16.54	\$16.54	\$16.54

⁷ It might not be immediately obvious that the computation of the \$775 million represents the value of the equity in LEVER. The subsequent discussion and Table 2 will illustrate.

As shown in Table 2, when ALLEQUITY announces the decision to borrow \$300 million and repurchase an equivalent amount of shares, the market value of ALLEQUITY immediately increases by the present value of the interest tax shields. Thus, the market value rises from \$1 billion to \$1.075 billion. The increase in equity value by the full amount of the value of the tax shields is predicated on three assumptions. First, the stock market does not anticipate ALLEQUITY is contemplating a recapitalization, and thus it is a complete surprise, (otherwise the value of ALLEQUITY would have previously incorporated some expectation of a recapitalization, in which case the value of ALLEQUITY would have been initially higher than \$1 billion). Second, when ALLEQUITY announces the recapitalization, the analysis assumes there is 100% certainty that management will implement the recapitalization; otherwise the value increase would be less than 100% to reflect the possibility that ALLEQUITY could fail to complete the recapitalization. Third, it assumes that the stock market does not expect the size of the debt issue, interest rate, or corporate tax rate to change over time.

In the third stage of the recapitalization, ALLEQUITY issues the new debt of \$300 million. Given we have only relaxed the assumption of no corporate taxes in a Modigliani and Miller world, there are no issuance or transactions costs associated with the \$300 million debt that has been raised. Commensurate with the increase in debt, ALLEQUITY changes its name to LEVER, and the new firm value is now \$1.375 billion.

LEVER repurchases \$300 million of stock in the fourth and final stage of the recapitalization. Specifically, LEVER repurchases 18.1 million shares at \$16.54, which reflects the entire present value of the interest tax shields.

THE IMPACT OF PERSONAL TAXES ON THE INTEREST TAX SHIELD

At first glance, the tax status of a firm's investor base does not appear to be of first-order importance to corporate management of publicly-traded corporations.⁸ Conceptually, however, management should attempt to minimize the value of all taxes, corporate and personal, paid by its investors.⁹ The issue is that interest income is taxed at a higher personal tax rate than dividends or capital gains, for taxable investors. Moreover, capital gains are taxed only when realized. That is, capital gains are not taxed mark-to-market (the value if it were sold by the corporation at that point in time) on an annual basis. Since the personal income tax on interest is considerably higher, at 40.8%, than the 23.8% tax rate on dividends and capital gains¹⁰, this suggests that the tax benefit of debt financing to investors is less than otherwise believed.

⁸ I have seen hundreds of corporate presentations and documents, and don't recall any which focused or even mentioned the personal tax status of its investors with a goal towards minimizing their total taxes.

⁹ This statement is partially true, that is, under the assumption that all investors face personal tax rates. But in the real world, corporations have investors with varying individual tax rates, many of them at a zero rate due to their tax-free status. Here, it is not obvious that management should attempt to minimize the tax hit to the investor with the highest marginal tax rate. Instead, investors can optimize on their own by deciding where to invest.

¹⁰ These tax rates include the 3.8% net investment income tax to partially fund the Affordable Care Act.

Merton Miller (1977) provides a formula to reflect the tax advantage of debt financing.¹¹ It is:

$$\boxed{\text{Eq. 5}} \quad \text{Tax Advantage of Debt} = \frac{1 - T_i}{[1 - T_E] \times [1 - T_c]}$$

In Eq. 5, T_i represents the tax rate on interest income, T_e represents the tax rate on equity income (capital gains and dividends) and T_c represents the corporate tax rate. Given the tax rates provided above, it seems there still is an advantage to debt financing for taxable investors, albeit it is lower perhaps than previously assumed. However, it is extremely difficult to know the exact tax advantage of debt financing for taxable investors because it requires knowledge of the marginal investor's tax rate, whether investors with personal tax rates have other reasons to prefer debt financing, and several other considerations.

THE WEIGHTED AFTER COST OF CAPITAL (WITH TAXES)

In a Modigliani and Miller world, a firm's overall value remains the same regardless of changes in leverage, assuming no taxes, transactions costs, agency costs, etc. Leverage has no impact on the operating cash flows, and the firm's cost of capital, or the weighted average cost of capital (WACC), is also invariant – unchanged – because of changes to leverage.

$$\boxed{\text{Eq. 6}} \quad R_A = \text{WACC} = R_D \left[\frac{D}{(D + E)} \right] + R_E \left[\frac{E}{(D + E)} \right]$$

$$\boxed{\text{Eq. 7}} \quad R_E = R_A + [R_A - R_D] \frac{D}{E}$$

The cost of capital for the firm, as represented by R_A stays constant because as a firm tilts its capital structure toward debt, which has a lower expected return, this tilt increases the expected cost of equity as shown in **Eq. 7** of Proposition II.¹² Thus, when the proportions of debt and equity change, the riskiness of debt and equity change simultaneously, leaving the overall cost of capital unchanged. In the example of ALLEQUITY and LEVER above, the cost of capital for ALLEQUITY was 12%. If ALLEVER borrowed \$300 million at a rate of 6%, repurchased stock with the proceeds, and changed its name to LEVER, the cost of capital would not change. Rather, the cost of equity would increase, due to the increased risk to equity holders given the financial leverage.

$$\boxed{\text{Eq. 7a}} \quad R_E = 14.57\% = 12.0\% + \frac{300}{700} [12.0\% - 6.0\%]$$

¹¹ Merton Miller, "Debt and Taxes," *Journal of Finance* (1977).

¹² Note that these various expected returns (of debt and equity, etc) are derived from an asset pricing model such as the CAPM. We are omitting showing this expected return from the ground up so as to focus solely on the impact of the tax shields on corporate valuations.

$$\text{Eq. 6a} \quad \text{WACC} = 12.0\% = 6\% \left[\frac{300}{1,000} \right] + 14.57\% \left[\frac{700}{1,000} \right]$$

With corporate taxes, the WACC is modified to:

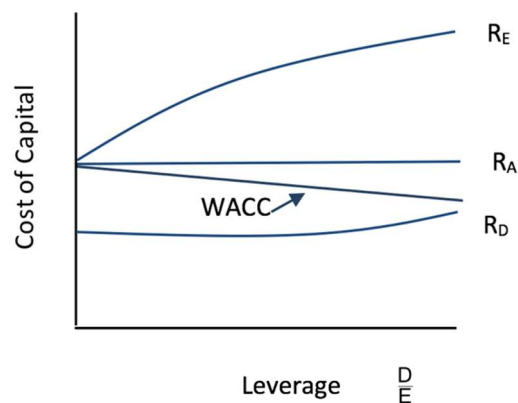
$$\text{Eq. 8} \quad R_A = \text{WACC} = R_D(1 - T_C) \left[\frac{D}{(D + E)} \right] + R_E \left[\frac{E}{(D + E)} \right]$$

Eq. 8 is the WACC formula, which is primarily used in practice -- for example, by investment bankers, equity analysts, corporate finance departments in corporations, private equity firms, etc. Here, the WACC formula uses the after-tax cost of debt to capture the tax shields.

The WACC For LEVER is 11.55%, given the current corporate tax rate of 25%, versus a 12.0% cost of capital for ALLEQUITY as shown here:

$$\text{Eq. 8a} \quad \text{WACC} = 11.55\% = 6\% (1 - 25\%) \left[\frac{300}{1,000} \right] + 14.57\% \left[\frac{700}{1,000} \right]$$

As illustrated, the WACC declines as leverage increases. This decline in the firm's cost of capital is not due to debt being cheaper than equity; rather it is because interest is treated as an expense and thus provides a tax shield to debt financing.



With the 11.55% estimate for LEVER's WACC, we can compute the firm value as:

$$V_{\text{LEVER}} = \$1.064 \text{ billion} = \frac{\$75 \text{ million}}{0.1155 - 0.045}$$

It is important to recognize what is driving the difference in the value of LEVER via the WACC estimate of \$1.064 billion, versus the prior method that resulted in an estimate of \$1.075 billion. As described earlier when we illustrate the debt raise of \$300 million, the assumption is that the level of debt will remain constant and perpetual at \$300 million. Here, we value the interest tax shields separate from the unlevered valuation of the firm's operating assets. This approach is known as *adjusted present value* (APV).¹³ In essence, APV estimates the value of an all-equity firm as the base case, first, and then subsequently accounts for various financing side effects such as the interest tax shields.

With WACC, there is an explicit interaction between the investment and the financing decision. Whereas the APV approach calculates the present value of the interest expense tax shield as a standalone factor to account for the tax benefits of debt financing, the WACC approach captures the value of the interest tax shields by using the after-tax cost of debt in the WACC equation. The APV approach is flexible in valuing the interest expense tax shields for any level of debt (it can change through time) and for any period (we assumed a perpetual timeframe, above, but it could also be assumed for a finite life). In contrast, the WACC approach assumes that the D/E ratio is constant on a forward-looking basis. That is, the WACC approach assumes management dynamically rebalances the capital structure, e.g., the mix of debt and equity, every period to maintain a constant leverage ratio. Given the WACC is calculated for the firm as a whole and assumes constant leverage, it should only be used as a discount rate for projects which have the same risk as the overall firm and which don't alter the leverage ratio of the firm. Given that projects within firms have varying discount rates, and also that many projects alter the capital structure of the firm, using WACC as the discount rate for individual projects is often problematic (despite being commonly done).

While the value of LEVER is roughly similar under the two approaches, \$1.075 billion (APV) and \$1.064 billion (WACC), there are offsetting factors which drive the similarity. Recall that for the APV approach utilized in the example above, we assumed that for a relatively modest leverage ratio, the appropriate discount rate to use in discounting the expected interest tax shields is the cost of debt, since the realization of the tax shields occur if the interest payments can be made in full -- that is, where the firm is profitable and can make its payments. In contrast, the interest tax shields are discounted in the WACC approach, rather than at the cost of debt. As noted above, the operating assets and leverage benefits are comingled in the WACC approach, and the same cost of capital is used to discount all cash-flow streams. Here, by assuming a constant D/E, or debt to equity, ratio, the debt is expected to increase through time for a firm with expected future growth of cash flows, and is thus the realization of the interest tax shields is dependent on the overall risk of the firm.

¹³ Stewart Myers developed the APV in 1974 ("Interactions of Corporate Financing and Investment Decisions – Implications for Capital Budgeting," *Journal of Finance*. As in the case of most finance academic articles, there is a lot of math.

COST OF FINANCIAL DISTRESS¹⁴

Since the presence of corporate taxes encourages debt financing, the implication is that firms should maximize their use of leverage, as the WACC continually decreases as leverage increases. However, increased leverage results in higher financial risk, per Proposition II of Modigliani and Miller. Thus, there is a higher likelihood of financial distress and eventually bankruptcy.

While the Modigliani and Miller's propositions allow for greater financial risk and bankruptcy, it is important to note that bankruptcy to a firm is not costly, given their assumption of perfect capital markets. If a firm is unable to make its interest and principal repayments when due, the equityholders will turn the keys over to the bondholders. Instantly, the firm reverts from a highly levered firm unable to make interest payments to an all-equity firm where the bondholders are suddenly the new equity holders. Bankruptcy is not costly because there are no direct transactions costs (legal and advisory fees concerning a bankruptcy filing) in a Modigliani and Miller world. Likewise, there are no agency costs or imperfect information in a Modigliani and Miller world, and thus there are no indirect costs of bankruptcy, such as customers or suppliers refusing to do business with a firm in the midst of bankruptcy.

In the real world, the direct cost of financial distress can be steep. A case in point is that of Lehman Brothers, formerly the fourth largest investment bank in the world, which filed for Chapter 11 protection on September 15, 2008, during the financial crisis. Lehman did not emerge from Chapter 11 until March of 2012. It has already paid roughly \$8 billion to its legal and financial advisors, as of December of 2022, for their work during the financial restructuring process. While Lehman technically is out of bankruptcy, the advisors are still (in 2023) working through various creditor claims and legal disputes, which are likely to go on for the next few years.

The direct costs of financial distress, e.g., the fees to the financial, restructuring and legal advisors, are relatively easy to estimate. On the other hand, there are indirect bankruptcy or financial distress costs which are difficult to estimate either before bankruptcy or after. These indirect costs can affect a wide variety of stakeholders. For example, some customers may shift their loyalty and business elsewhere; suppliers may cut back on shipments; creditors may refuse to lend additional funds; employees may become less engaged, reducing their efforts at work through the increased use of sick days, spending work time searching for alternative jobs, and theft; and management may rationally decide to take on – NPV projects. Such indirect costs of financial distress tend to far exceed the direct costs of financial distress.

¹⁴ For the purposes of this lecture note, we take a high level approach to the cost of financial distress, primarily to show that it should be accounted for with respect to choosing the optimal capital structure. A subsequent lecture note expands deeper into this area.

Conceptually, it is straightforward to calculate the cost of financial distress, which involves three basic factors:

- (1) the probability of financial distress
- (2) the actual (direct and indirect) cost once the firm is in distress
- (3) and the discount rate associated with the distress costs.

In practice, these three factors are challenging to estimate and are subject to measurement error due to modeling issues, limited data, and subjective judgment for many of the inputs. Nonetheless, it is important to have a framework by which to think about the expected costs of financial distress.¹⁵

To illustrate, consider a firm such as Xerox, which has a BB debt rating. Assume that the expected annual probability of default for XEROX is 0.75%, the discount rate is 5%, and the expected cost of financial distress, if it occurs, is 20%. The firm value (\$4.4 billion debt + \$5.4 billion equity) of Xerox is \$9.8 billion. Given these assumptions, what is the present value today of the cost of financial distress for Xerox? We know debt financing creates valuable tax shields for Xerox, but is there a point at which leverage is too high to maximize shareholder wealth?

The first step is to calculate the present value of financial distress if it occurs within the next year. Multiply the cost of financial distress by the probability of distress (p) and then discount at the one-year rate:

$$\boxed{\text{Eq. 9}} \quad \text{PVFD} = p \left[\frac{\text{CFD}}{1+r} \right]$$

where PVFD is the present value of the cost of financial distress and CFD is the cost of financial distress when it occurs. The present value of the cost of financial distress occurring in one year is:

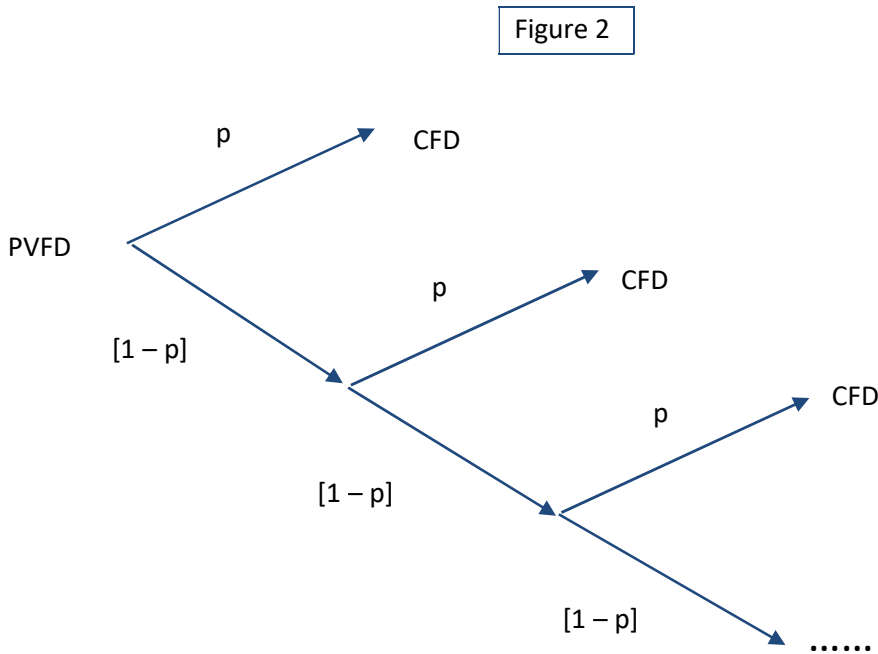
$$\text{\$14.0 million} = 0.0075 \left[\frac{\text{\$9.8 billion (0.20)}}{(1+.05)} \right]$$

The calculation for the present value today of financial distress occurring in the second year will reflect the probability of financial distress occurring in the first year. Since p is the probability of financial distress in each year, then 1-p is the probability of success in each year. As of today, the probability of Xerox experiencing financial distress by the end of the second year is equal to p + (1-p)p, that is, 1.49%. Thus, the present value of the cost of financial discuss for Xerox in the next two years is \$27.2 million, as given by the following formula:

$$\text{\$27.2 million} = 0.0075 \left[\frac{\text{\$9.8 billion (0.20)}}{(1+.05)} \right] + 0.0075(1 - 0.0075) \left[\frac{\text{\$9.8 billion(0.20)}}{(1+.05)^2} \right]$$

¹⁵ Conceptually, the estimation of the present value of financial distress costs is just like pretty much everything else we do in finance, that is, estimate expected future cash flows on a timeline and discount accordingly.

A useful way to illustrate the present value of financial distress is via a tree analysis, as shown below in Figure 2.



As displayed in Figure 2, financial distress will occur in Year 1 with probability p and survival will occur with probability of $1-p$. If distress occurs, then the firm realizes the CFD, and the valuation tree ends at this point. If instead, the firm survives with probability $1-p$, then the conditional probability of it realizing financial distress in Year 2 is also p . Thus, if the annual probability of Xerox failing is 0.75%, then the probability of Xerox not surviving beyond Year 2 is equal to $p + (1-p)p = 1.49\%$ as indicated earlier, and so forth.

In a multi-period model, the present value of financial distress is given by:

Eq. 10
$$PVFD = p \left[\frac{CFD}{(1+r)} \right] + (1-p)p \left[\frac{CFD}{(1+r)^2} \right] + (1-p)^2 p \left[\frac{CFD}{(1+r)^3} \right] + \dots + (1-p)^{\infty-1} p \left[\frac{CFD}{(1+r)^{\infty}} \right]$$

That is, the PVFD as of today is equal to the sum of the expected discounted cost of financial distress if it occurs in Year 1, Year 2, Year 3, etc. Expanding via a geometric series (comparable to the perpetuity formula), Eq. 10 can be solved to yield:

Eq. 11
$$PVFD = \frac{p}{p+r} [CFD]$$

Applying **Eq. 11** to Xerox yields

$$\$255.7 \text{ million} = \frac{0.0075}{[.0075 + .05]} [\$9.8 \text{ billion } (0.20)]$$

Thus, by these rough calculations, the PVFD at Xerox is \$256 million and is 2.6% of its total enterprise value of \$9.8 billion. The message is that even for a well-known firm like Xerox, the cost of the expected likelihood of future financial distress is factored in the valuation of the underlying firm and should be weighed against the tax benefits of debt financing.

THE TRADE-OFF THEORY OF CAPITAL STRUCTURE

The trade-off theory of capital structure weighs the benefits of debt financing in shielding cash flows from taxes against the cost of direct and indirect financial distress. Using the Adjusted Present Value approach to estimating a firm's value:

Eq. 12 $V_{\text{LEVER}} = V_{\text{ALLEQUITY}} + \text{PVTS} - \text{PVFD}$

The trade-off theory of capital structure indicates there is an optimal leverage ratio for corporations. In contrast, recall that the Modigliani and Miller propositions prove capital structure does not matter in a perfect world and thus can vary randomly across firms and industries. However, capital structure often varies predictably in the real world. For example, utility firms such as Duke Energy, with stable and strong cash flows, tend to have high leverage ratios compared to a biotechnology firm such as Momena Pharmaceuticals, which has negative cash flows and no tangible assets.

The trade-off theory cleanly builds on the Modigliani and Miller theory of capital structure and advances our fundamental understanding. While the trade-off theory can explain many differences in capital structure across certain industries, it is unable to explain why there are many large successful firms which have a small amount of debt relative to the market capitalization of the firm's equity. Microsoft, for example, has an equity market capitalization of \$2.6 trillion as of July 2023, versus only \$80 billion of debt. Indeed, Microsoft has negative net debt since it has cash and equivalents of \$100 billion. With forecasted EBITDA more than \$100 billion, Microsoft could easily handle considerably more debt burden and still maintain investment grade debt (currently AAA debt). Nonetheless, there are numerous large profitable and financial stable firms carrying large amounts of "excess cash."