

Chapter 1

Capital Structure Policy and Leverage

1.1. The capital structure question

It is a question of how should a firm go about choosing its debt/equity ratio. Is there an optimum capital structure that maximizes firm's value?

Capital structure refers to how a company finances its assets. The two main sources of capital are debt financing and equity financing. A cost of capital exists because investors want a return equivalent to what they would receive on an investment with an equivalent risk to persuade them to let the company use their funds.

The capital structure combines financial instruments like shares (equity and preference), debentures, long-term loans, bonds, and retained earnings. These instruments help the company generate funds for its operations with the help of individuals and institutions.

1.2 Factors affecting the Capital Structure

Several factors affect a company's capital structure, and it also determines the composition of debt and equity portions within this structure. Some of these factors are as follows:

- **Business Size** – The size and scale of a business affect its ability to raise finance. Small-sized companies face difficulty in raising long-term borrowings. Creditors are hesitant to give them loans because of the scale of their business operations. Even if they do get these loans, they have to accept high-interest rates and stringent repayment conditions. It limits their ability to grow their business.
- **Earnings** – Firms with relatively stable revenues can afford a more significant amount of debt in their capital structure. On the other hand, companies that face higher fluctuations in their sales, like consumer goods, rely more on equity shares to finance their operations.
- **Competition**: If a company operates in a business environment with more competition, it should have more equity shares in its capital structure.
- **Stage of the life cycle**: A business in the early stage of its life cycle is more susceptible to failure. In that case, they should use a more significant proportion of ordinary share capital to finance their operations. Debt comes with a fixed interest rate, and it is more suitable for companies with stable growth prospects.
- **Creditworthiness**: Any company that has a reputation for paying back its loans on time will be able to raise funds on less stringent terms and at lower interest rates. It allows them to pay back their

loans on time. The opposite is true for firms that don't have a good credit standing in the market.

- **Risk Attitude of the Management:** The attitude of a company's management also affects the proportion of debt and equity in the capital structure. Some managers prefer to follow a low-risk strategy and opt for equity shares to raise finances. Other managers are confident of the company's ability to repay big loans, and they prefer to undertake a higher proportion of long term debt instruments.
- **Taxation Policy:** The government's monetary policies in terms of taxation on debt and equity instruments are also crucial. If a government levies more tax on gains from investing in the share market, investors may move out of equities. Similarly, if the interest rate on bonds and other long-term instruments is affected due to the government's policy, it will also influence companies' decisions.
- **Cost of Capital:** The cost of raising funds depends on the expected rate of return for the suppliers. This rate depends on the risk borne by investors. Ordinary shareholders face the maximum risk as they don't get a fixed rate of dividend. They get paid after preference shareholders receive their dividends. The company has to pay interest on debentures under all circumstances. It attracts more investors to opt for debentures and bonds.

1.3 Business and Financial risk

Business risk is the risk a firm common stockholder would face if the firm had no debt.

Business Risk is the probability of earning a comparatively low profit or even suffers losses because of changes in the market conditions, customer demands, government regulations and economic environment of business. Due to such risk, the firm will not generate enough profit to meet out its day to day expenses. The risk is unavoidable in nature.

Financial risk is the additional risk placed on the commonstockholders as a result of the firm's decision to use debt.

Leverage is that portion of the fixed costs which represents a risk to the firm. There are two kinds of leverage in finance: operating leverage and financial leverage

1.3.1 Operating leverage

Operating leverage the extent to which fixed costs are used in a firm's operations. Operating leverage refers to magnifying gains and losses in earnings before interest and taxes (EBIT) by changes that occur in sales. This magnification occurs because in employing assets the firm incurs certain fixed costs, costs unrelated to the sales volume created by the assets. Operating costs can be divided into variable and fixed costs. As sales changes, variable costs change proportionally.

This means the variable cost ratio to sales is constant. This is true over some relevant range of sales. Variable cost includes material, direct labor, repair and maintenance expenses. Fixed operating costs are independent of sales level in the short run and over the relevant sales range. In the long run all costs are variable. Fixed costs include depreciation, indirect labor cost, overhead costs.

Degree of Operating Leverage (DOL)

The degree of operating leverage (DOL) is the percentage change in a firm's operating profit (EBIT) resulting from a 1 percent change in output (sales). DOL is used to study the sensitivity of the variability in EBIT to the variability in sales.

Degree of operating leverage is computed as:

$$\begin{aligned} \text{DOL} &= \frac{\% \Delta \text{EBIT}}{\% \text{Output}} && \text{where, EBIT is earning before interest and tax} \\ &\text{Or} \\ &= 1 + \frac{F}{\text{EBIT}} && \text{where, F is fixed operating cost} \\ &\text{Or} \\ \text{DOL at base sales level } Q &= \frac{Q(P-V)}{Q(P-V)-F} && \text{where, Q is quantity, P is price,} \end{aligned}$$

Example

P= 10 birr

V= 4 birr

F= 30,000 birr

Level of out put (Q) is 8,000 and increase to 10,000 units.

Required:

Determine DOL?

Solution:

EBIT= Q(P-V)-F

$$= 8000(10-4) - 30,000 = 18,000$$

$$\text{EBIT} = 10,000(10-4) - 30,000 = 30,000$$

$$\text{Percentage change in EBIT} = (30,000 - 18,000) / 18,000 = 66.67\%$$

$$\text{Percentage change in out puts} = (10,000 - 8,000) / 8,000 = 25\%$$

DOL= $\frac{\% \Delta \text{EBIT}}{\% \text{Output}}$

$$66.67\% / 25\% = \underline{\underline{2.67}}$$

or

$$1 + \frac{F}{\text{EBIT}}$$

$$1 + 30,000 / 18,000 = \underline{\underline{2.67}}$$

or

$$= \frac{Q(P-V)}{Q(P-V)-F}$$

$$\begin{aligned}
 &Q(P-V)-F \\
 &= \frac{8,000(10-4)}{8,000(10-4)-30,000} \\
 &= \underline{\underline{2.67}}
 \end{aligned}$$

The coefficient of operating leverage of 2.67 is interpreted as a 1% change in output from the current base levels; there will be a 2.67% change in EBIT in the same direction as the output (sales) change. If output (sales) increase by 10%, EBIT will increase by 26.7% (10x 2.67%). Similarly, if output (sales) decrease by 10%, EBIT will decrease by 26.7%. Other things equal, the higher the fixed costs relative to variable costs, the higher the operating leverage.

1.3.2 Financial Leverage

Financial leverage is a measure of financial risk and arises from fixed financial costs or (sources of capital that have fixed costs). One way to measure financial leverage is to determine how earnings per share are affected by a change in EBIT (or operating income).

The major sources of fixed charges financing are debt (requiring interest payment) and preferred stock require dividend payment and leases which require lease payments. These financing fixed costs affect the firm's *earning per share (EPS)* in the same way that operating fixed costs affect EBIT. The more fixed charge financing the firm uses, the more financial leverage it will have.

Degree of Financial leverage:

The degree of financial leverage (DFL) is the percentage change in the firm's earnings per share (EPS) resulting from a 1 percent change in operating profit (EBIT). DFL is used to study the sensitivity of the variability in EPS to the variability in EBIT.

$$\begin{aligned}
 \text{DFL} &= \frac{\% \Delta \text{ in EPS}}{\% \Delta \text{ in EBIT}} \\
 &\text{Where, EPS is earning}
 \end{aligned}$$

$$\text{EPS} = \frac{(\text{EBIT} - I)(1 - T) - D}{N}$$

Where, N is number of common stock outstanding shares.

Or

$$\begin{aligned}
 \text{DFL} &= \frac{\text{EBIT}}{\text{EBIT} - I - L - D / (1 - T)} \\
 &\text{Where, I is interest payment} \\
 &\quad L \text{ is lease payment} \\
 &\quad D \text{ is dividend}
 \end{aligned}$$

Unlike interest and lease payments, preferred dividends are not tax deductible. Therefore, dividend payment has to be adjusted by dividing with (1-T) to make it on equivalent basis.

Example,

A firm has a base level of 500,000 units of sales and increase to 600,000 units. The sales price per unit is \$10.00 and variable costs per unit are \$6.50. Total annual operating fixed costs are \$1,250,000, and the annual interest expense is \$100,000. The firm paid 80,000 for preferred stock holders and has 60,000 outstanding shares of common stock. The firm tax rate is 40%.

1. What is the firm's earning per share?
2. What is the firm's degree of financial leverage (DFL)?

Solution:

$$1. \text{EPS} = \frac{(\text{EBIT}-I) (1-T)-D}{N}$$

$$\text{EBIT} = 500,000(10-6.50)-1,250,000=500,000$$

$$\text{EPS} = \frac{(500,000-100,000) (1-0.4)-80,000}{60,000}$$

$$=2.67$$

If sales increases from 500,000 to 600,000 units the resulting EBIT and EPS is:

$$\text{EBIT} = 600,000(10-6.50)-1,250,000=850,000$$

$$\text{EPS} = \frac{(850,000-100,000) (1-0.4)-80,000}{60,000}$$

$$=6.16$$

$$\text{DFL} = \frac{\% \Delta \text{ in EPS}}{\% \Delta \text{ in EBIT}}$$

$$= \frac{(6.16-2.67)/2.67}{(850,000-500,000)/500,000}$$

$$=1.307/0.7= 1.87$$

or

$$\text{DFL} = \frac{\text{EBIT}}{\text{EBIT}-I-L-D/(1-T)}$$

$$= \frac{500,000}{500,000-100,000- 80,000/(1-0.4)}$$

$$=1.87$$

1.3.3 Combined leverage

It is defined as the potential use of fixed costs, both operating and financial, to magnify the effect of changes in sales on the firm's earnings per shares (EPS). It is a combination of operating and financial leverage. Combined leverage measures the relationship between output and EPS.

$$\text{Degree of combined leverage (DCL)} = \frac{\% \Delta \text{ in EPS}}{\% \Delta \text{ in output}}$$

Or The DCL is the product of DOL times DFL. That is:

$$\text{DCL} = \text{DOL} \times \text{DFL}$$

or

$$\begin{aligned} \text{DCL} &= \text{DOL} \times \text{DFL} \\ &= \frac{Q(P-V)}{Q(P-V)-F} \times \frac{\text{EBIT}}{\text{EBIT}-I-L-D/(1-T)} \\ &= \frac{Q(P-V)}{Q(P-V)-F-I-L-D/(1-T)} \end{aligned}$$

Example

A firm has a base level of 15,000 units of sales and increase to 16,500 units. The sales price per unit is \$50.00 and variable costs per unit are \$30. Total annual operating fixed costs are \$150,000, and the annual interest expense is \$40,000. The firm paid 20,000 for preferred stock holders and has 10,000 outstanding shares of common stock. The firm tax rate is 40%.

1. What is the firm's earning per share at an output level of 15,000 and 16,500 units?
2. What is the firm's EBIT, Degree of operating leverage (DOL) and degree of financial leverage at output level of 15,000 (DFL)?
3. What is the firm's Degree of combined leverage (DCL)?

Solution:

$$\text{EPS} = \frac{(\text{EBIT}-I)(1-T)-D}{N}$$

$$\text{EBIT} = 15,000(50-30)-150,000=150,000$$

$$\begin{aligned} \text{EPS} &= \frac{(150,000-40,000)(1-0.4)-20,000}{10,000} \\ &= 4.6 \end{aligned}$$

If output increased to 16,500 units, EPS increase to:

$$\text{EPS} = \frac{(\text{EBIT}-I)(1-T)-D}{N}$$

$$\text{EBIT} = 16,500(50-30)-150,000=180,000$$

$$\begin{aligned} \text{EPS} &= \frac{(180,000-40,000)(1-0.4)-20,000}{10,000} \\ &= 6.4 \end{aligned}$$

$$\text{DCL} = \frac{\% \Delta \text{ in EPS}}{\% \Delta \text{ in output}}$$

$$\begin{aligned} &= \frac{(6.4-4.6)/4.6}{(16,500-15,000)/15,000} \\ &= 3.91 \end{aligned}$$

$$\text{DOL} = 1 + \frac{F}{\text{EBIT}} = 1 + \frac{150,000}{150,000}$$
$$1+1= 2$$

$$\begin{aligned} \text{DFL} &= \frac{\text{EBIT}}{\text{EBIT}-I-L-D/(1-T)} \\ &= \frac{150,000}{150,000-40,000-20,000/(1-0.4)} \\ &= 1.957 \end{aligned}$$

Therefore, DCL = DOL X DFL

$$=2 \times 1.957$$

$$=\underline{3.91}$$

1.4 Determining the optimal capital structure

Optimal capital structure is the capital structure that minimizes the firm's weighted average cost of capital and maximizes the value of the firm to its investors. If the firm currently has an optimal capital structure, it will finance new investments by a financing mix approximately like the current mix. If the current capital structure is not optimal, the firm should finance new asset in such a manner that the capital structure will be moved toward the optimal position.

EBIT-EPS ANALYSIS

The use of financial leverage has two effects on the earnings that go to the firm's common stockholders: (1) an increased risk in earnings per share (EPS) due to the use of fixed financial obligations, and (2) a change in the level of EPS at a given EBIT associated with a specific capital structure.

The first effect is measured by the degree of financial leverage previously discussed. The second effect is analyzed by means of *EBIT-EPS* analysis. This analysis is a practical tool that enables the financial manager to evaluate alternative financing plans by investigating their effect on EPS over a range of EBIT levels. Its primary objective is to determine the EBIT break-even, or indifference, points among the various alternative financing plans. The indifference points between any two methods of financing can be determined by solving for EBIT in the following equality:

Illustration

A Ltd. Has a share capital of Rs .1, 00,000 divided into share of Rs. 10 each. It has a major expansion program requiring an investment of another Rs. 50,000. The Management is considering the following alternatives for raising this amount:

1. Issue of 5,000 equity shares of Rs. 10 each
2. Issue of 5000, 12% preference shares of Rs. 10 each
3. Issue of 10% debentures of Rs. 50,000

The company's present Earning Before Interest and Tax (EBIT) are Rs. 40,000 per annum subject to tax @ 50%. You are required to calculate the effect of the above financial plan on the earnings per share presming:

- (a) EBIT continues to be the same even after expansion
- (b) EBIT increases by Rs. 10,000

Solution

(a) When EBIT is Rs. 40,000 Per Annum
Projected earnings per share

	PLAN I	PLAN II	PLAN
III			
EBIT	Rs.40000	Rs.40,000	Rs.
40,000			
-Interest	-----		-----
5,000			
Profit before Tax	40,000		40,000
35,000			
-Tax @ 50%	20,000		20,000
17,000			
Profit for Tax	20,000		20,000
17,000			
-Pref. Dividend	-----		6,000

Profit for Equity	20,000		14,000
17,000			
Number of Equity shares	15,000		10,000
10,000			
EPS	(Rs) 1.33		1.40
1.75			

So, under both assumptions of EBIT, the EPS would be highest in Plan III.

1.5 The theory of capital structure

The theory of capital structure is closely related to the firm's cost of capital. Capital structure is the mix of the long-term sources of funds used by the firm. The primary objective of capital structure decisions is to maximize the market value of the firm through an appropriate mix of long term sources of funds. This mix, called the *optimal capital structure*, will minimize the firm's overall cost of capital. However, there are arguments about whether an optimal capital structure actually exists. The arguments center on whether a firm can, in reality, affect its valuation and its cost of capital by varying the mixture of the funds used. There are four different approaches to the theory of capital structure:

1. Net income (NI) approach
2. Net operating income (NOI) approach
3. Traditional approach
4. Modigliani-Miller (MM) approach

Net income (NI) approach

According to this approach capital structure decision is relevant to the value of the firm. An increase in financial leverage will lead to decline in WACC. While the value the firm as well as market price of ordinary share will increase.

Net operating income (NOI) approach

NOI means EBIT. According to this approach capital structure decisions of the firm are irrelevant. Any change in leverage will not lead to any change in total value of the firm and market price of shares.

Traditional approach

The cost of capital is dependent on capital structure and there is an optimal capital structure which minimizes cost of capital. Optimal capital structure occurs at the point where value the firm is highest and cost of capital is lowest.

Modigliani and Miller (M&M) Propositions I and II with no taxes

It is a famous argument advanced by two Nobel laureates, Franco Modigliani and Merton Miller, whom we will hence forth call M&M.

A) M&M Proposition I: The Pie Model

Proposition I states that the value of the firm is independent of its capital structure. In perfect capital market where there is no transaction cost and no tax, the value and cost of capital of accompany remain unchanged irrespective of change in the capital structure

$$\text{Value of levered firm} = \text{Value of unlevered firm}$$

B) M&M Proposition II: The Cost of Equity and Financial Leverage.

Although changing the capital structure of the firm may not change the firm's *total value*, it does cause important changes in the firm's debt and equity. Notice that the WACC doesn't depend on the debt/equity ratio; it's the same no matter what the debt/equity ratio is. The firm's overall cost of capital is unaffected by its capital structure. Let us see what happens to a firm financed with debt and equity when the debt/equity ratio is changed.

M&M proposition II stated that weighted average cost of capital, WACC, is:

$$\begin{aligned} \text{WACC} &= E/V \times R_E + D/V \times R_D \\ \text{Where } V &= E + D \\ E &= \text{equity} \\ D &= \text{debt} \\ R_E &= \text{cost of equity} \\ R_D &= \text{cost of debt} \end{aligned}$$

WACC is the required return on the firm's overall assets and it is also labeled as R_A

$R_A = E/V \times R_E + D/V \times R_D$, if we arrange this to solve for the cost of equity capital (R_E):

$$R_E = R_A + (R_A - R_D) \times$$

M&M proposition stated that a firm's cost of equity capital is a positive linear function of its capital structure. The cost of equity depends on three things: the required rate of return on the firm's assets, R_A , the firm's cost of debt, R_D , and the firm's debt/equity ration, D/E

Example,

The RRR Corporation has a weighted average cost of capital (unadjusted) of 12 percent. It can borrow at 8 percent. Assume that RRR has a target capital structure of 80 percent equity and 20 percent debt.

Required:

1. What is its cost of equity?
2. What is the cost of equity if the target capital structure is 50 percent equity?
3. Calculate the unadjusted WACC using your answers to verify that it is the same

Solution:

$$\begin{aligned}
 1. \text{ According to M\&M proposition II,} \\
 R_E &= R_A + (R_A - R_D) \times (D/E) \\
 &= 12\% + (12\% - 8\%) \times (0.2/0.8)
 \end{aligned}$$

=13%

$$\begin{aligned}
 2. \quad R_E &= R_A + (R_A - R_D) \times (D/E) \\
 &= 12\% + (12\% - 8\%) \times (0.5/0.5)
 \end{aligned}$$

=16%

3. The unadjusted WACC assuming that the percentage of equity financing is 80% and the cost of equity is 13%:

$$\begin{aligned}
 WACC &= E/V \times R_E + D/V \times R_D \\
 &= 0.8 \times 13\% + 0.2 \times 8\%
 \end{aligned}$$

=12%

As we calculated, the WACC is 12 percent in both cases.

1.5.1 ⁹ Modigliani and Miller (M&M) Propositions I and II with taxes

Debt has two features. First, interest paid on debt is tax deductible. This is good for the firm. Second, failure to meet debt obligations can result in bankruptcy. This is not good for the firm, and it may be an added cost of debt financing. To see the effect of tax on M&M Propositions let us consider two firms, Firm U (unlevered) and Firm L (levered). These two firms are identical on the left hand side of the balance sheet, so their assets and operations are the same. Assume that EBIT is expected to be birr 1000 every year forever for both firms. The difference between them is that firm L has issued birr 1000 worth of perpetual bonds on which it pays 8 percent interest each year. Also assume that the corporation tax rate is 30%.

	Firm U	Firm
<u>L</u>		
EBIT	Br 1,000	Br
1,000		
Interest (8% x 1000)		<u>0</u>
<u>80</u>		
EBT		1,000
920		

Tax (30%)
276
NI
644

300

700

The interest tax shield

To simplify things, assume that depreciation is zero and that there is no additional capital expenditure and net working capital. In this case, cash flow from assets is equal to EBIT- Taxes. For firms U and L the cash flow from assets would be birr (1000-300=700) and (1000-276=724), respectively. See that the capital structure is now having some effect because the cash flows from U and L are not the same even though the two firms have identical assets. The total cash flow to L is birr 24 more. This is because an interest deductible for tax purposes has generated a tax saving equal to the interest payment multiplied by the tax rate: $80 \times 30\% = \text{birr } 24$. This is interest tax shield, a tax saving attained by a firm from interest expense.

A. Taxes and M&M Proposition I

M&M Proposition I with taxes states that the value of levered firm (V_L) exceeds the value of unlevered firm (V_U) by the present value of the interest tax shield; $T_c \times D$.

The present value of the interest tax shield can be written as:

$$PV = \frac{(T_c \times R_D \times D)}{R_D}$$

PV = $T_c \times D$
Where, T_c is tax rate, R_D is cost of debt
and D is debt

M&M Proposition I with taxes therefore states that:

$$V_L = V_U + T_c \times D$$

Suppose that the cost of the capital for the firm U is 10 percent (unlevered cost of capital, $R_U = 10\%$). This is the cost of capital that the firm would have if it had no debt. Firm U's cash flow is birr 700 every year forever. The value of the unlevered firm, V_U , is:

$$V_U = \frac{EBIT \times (1-T_c)}{R_U}$$

$$\begin{aligned} V_U &= \frac{1000 \times (1-0.3)}{0.10} \\ &= \underline{7,000} \end{aligned}$$

The value of the levered firm, V_L , is:

$$\begin{aligned} V_L &= V_U + T_c \times D \\ &= 7,000 + 0.3 \times 1,000 \\ &= \underline{7,300} \end{aligned}$$

The value of the firm goes up by birr 0.30 for every 1 birr in debt.

B. Taxes, the WACC, and Proposition II

The conclusion that the best capital structure is 100 percent debt also can be seen by examining the weighted average cost of capital (WACC). If tax is considered, the WACC is computed as:

$$\text{WACC} = E/V \times R_E + D/V \times R_D \times (1 - T_c)$$

Where $V = D + E$

To calculate WACC, we need to know the cost of equity. M&M Proposition II with corporate taxes states that the cost of equity is:

$$R_E = R_U + (R_U - R_D) \times (D/E) \times (1 - T_c)$$

To illustrate, recall that firm L is worth birr 7,300 total (total asset of the firm). Since the debt is worth birr 1,000, the equity must be worth 7,300 - 1,000 = 6,300 birr. For firm L, the cost of equity is thus:

$$\begin{aligned} R_E &= R_U + (R_U - R_D) \times (D/E) \times (1 - T_c) \\ &= 10\% + (0.1 - 0.08) \times (1,000/6,300) \times (1 - 0.30) \\ &= \underline{10.22\%} \end{aligned}$$

Therefore, the weighted average cost of capital is:

$$\begin{aligned} \text{WACC} &= E/V \times R_E + D/V \times R_D \times (1 - T_c) \\ &= 6,300/7,300 \times 10.22\% + 1,000/7,300 \times 8\% \times (1 - 0.3) \\ &= \underline{9.6\%} \end{aligned}$$

Therefore Without debt, the WACC is 10 percent, and, with debt, it is 9.6 percent. Therefore, the firm is better off with debt. *As the WACC decrease the value of the firm increase.*

Example,

You are given the following information for FAF Corporation:

EBIT = birr 151.52

$T_c = 34\%$

$D = \text{birr } 500$

$R_U = 20\%$. The cost of debt capital is 10 percent. What is the value of FAF's equity? What is the cost of equity capital for FAF? What is the WACC?

Solution:

Remember that all the cash flows are perpetuities. The value of the firm if it had no debt, V_U , is:

$$\begin{aligned} V_U &= \frac{\text{EBIT} \times (1 - T_c)}{R_U} \\ &= \frac{151.52 (1 - 0.34)}{0.20} \\ &= \underline{\text{birr } 500} \end{aligned}$$

From M&M Proposition I with taxes, we know that the value of the firm with debt is:

$$\begin{aligned}
 V_L &= V_U + T_C \times D \\
 &= 500 + 0.34 \times 500 \\
 &= \underline{\text{birr 670}}
 \end{aligned}$$

Since the firm is worth birr 670 total and the debt is worth birr 500, the equity is worth birr 170:

$$\begin{aligned}
 E &= V_L - D \\
 &= 670 - 500 = \underline{170}
 \end{aligned}$$

Thus, from M&M Proposition II with taxes, the cost of equity is:

$$\begin{aligned}
 R_E &= R_U + (R_U - R_D) \times (D/E) \times (1 - T_C) \\
 &= 0.20 + (0.20 - 0.10) \times (500/170) \times (1 - 0.34) \\
 &= \underline{39.4\%}
 \end{aligned}$$

Finally, the WACC is:

$$\begin{aligned}
 \text{WACC} &= E/V \times R_E + D/V \times R_D \times (1 - T_C) \\
 &= (170/670) \times 39.4\% + (500/670) \times 10\% \times (1 - 0.34) \\
 &= \underline{14.92\%}
 \end{aligned}$$

Notice that this is substantially lower than the cost of capital for the firm with no debt ($R_U = 20\%$), so *debt financing is highly advantageous*.

Modigliani and Miller Summary

I. The No tax case

A. Proposition I: The value of the firm levered (VL) is equal to the value of the firm unlevered(VU):

$$V_L = V_U$$

Implication of Proposition I:

1. a firm's capital structure is irrelevant
2. a firm's weighted average cost of capital(WACC) is the same no matter what mixture of debt and equity is used to finance the firm

B. Proposition II: The cost of equity, RE, is:

$$R_E = R_A + (R_A - R_D) \times D/E$$

Where R_A is the WACC, R_D is the cost of debt, and D/E is the debt/equity Ratio.

Implication of Proposition II:

1. the cost of equity rises as the firm increases its use of debt financing
2. the risk of the equity depends on two things: the riskiness of the firm's operations (business risk) and the degree of financial leverage (financial risk)

II. The tax case

A. Proposition I with taxes: The value of the firm levered (VL) is equal to the value of the firm unlevered(VU) plus the present value of the interest tax shield:

$$V_L = V_U + T_c \times D$$

Where T_c is the corporate tax rate and D is the amount of debt.

Implication of Proposition I:

1. Debt financing is highly advantageous, and, in the extreme, a firm's optimal capital structure is 100 percent debt.

2. a firm's weighted average cost of capital (WACC) decreases as the firm relies more heavily on debt financing

B. Proposition II with taxes: the cost of equity, RE , is

$$RE = RU + (RU - RD) \times D/E \times (1 - T_c)$$

Where RU is the unlevered cost of capital, that is, the cost of capital for the firm if it had no debt. Unlike Proposition I, the general implications

Bankruptcy Costs

One limit to the amount of debt a firm might use comes in the form of *bankruptcy costs*. As the debt/equity ratio rises, so too does the probability that the firm will be unable to pay its bondholders what was promised to them. When this happens, ownership of the firm's assets is ultimately transferred from the stockholders to the bondholders.

In principle, a firm is bankrupt when the value of its assets equals the value of its debt. When this occurs, the value of equity is zero and the stockholders turn over control of the firm to the bondholders

Bankruptcy cost can be: direct bankruptcy cost and indirect bankruptcy costs.

Direct bankruptcy costs:

The costs that are directly associated with bankruptcy, such as legal and administrative expense is called direct bankruptcy cost. These direct bankruptcy costs are a disincentive to debt financing. If a firm goes bankrupt, then, suddenly, a piece of the firm disappears.

Indirect bankruptcy costs:

The costs of avoiding a bankruptcy filing incurred by a financially distressed firm are called indirect bankruptcy costs. The direct and indirect costs associated with going bankrupt or experiencing financial distress is called financial distress costs.

Example, the value of the firm lose value because management is busy trying to avoid bankruptcy instead of running the business, normal operations are disrupted, and sales are lost, valuable employees leave, potential fruitful programs are dropped to preserve cash

1.5.2 The Trade-off theory

The trade of theory of capital structure **refers** to the idea that the company chooses how much debt finance and how much equity finance to use by balancing the costs and benefits. Trade-off theory suggests that capital structure reflects a trade-off between the tax benefits of debt and the expected costs of bankruptcy. An important purpose of the trade of theory of capital structure is to explain the fact that corporations usually are financed partly with debt and partly with equity. It states that there is advantageous to financing with debt the tax benefits of debt and there is a cost of financing with debt, the costs of financial distress including

bankruptcy costs of debt and non-bankruptcy cost (e.g staff leaving, suppliers demanding disadvantageous payment term etc).

The trade-off theory states that the optimal capital structure is a trade-off between interest tax shields and cost of financial distress.

Value of firm = Value if all-equity financed + PV (tax shield) - PV (cost of financial distress)

1.5.3 Signaling theory

Managers may not be able to disclose their information to the firm's stockholders for a variety of reasons:

- ✓ The information may be valuable to the firm's competitors.
- ✓ Managers may prefer not to disclose unfavorable information.
- ✓ The information may be difficult to quantify or substantiate.

An action taken by a firm's management that provides clues to investors about how management views the firm's prospects.

Assumed that investors have the same information about a firm's prospects as its managers—this is called **symmetric information**. However, in fact managers often have better information than outside investors. This is called **asymmetric information**, and it has an important effect on the optimal capital structure.

This information revealing decision is called **signals**. In many instances, an indirect signal can provide more credible information than a direct disclosure. As it is often said, "Action speaks louder than words."

1.5.5 Using debt financing to constrain managers

The managers of firms typically act as *agents* of the owners. The owners hire the managers and give them the authority to manage the firm for the owners' benefit. The agency problem created by this relationship is also extending by owners and creditors.

When a lender provides funds to a firm, the interest rate charged is based on the lender's assessment of the firm's risk. The lender - borrower relationship, therefore depends on the lenders expectations for the firm's subsequent behavior. If unconstrained, this arrangement creates incentives for the firm without increasing current borrowing costs.