Financial Leverage and Capital Structure Policy

A) Introduction

The objective of the capital structure decision, like any corporate objective, should be to maximize the value of the firm's equity. In this chapter, we will assume that the firm's investment decision is already made. That is, the firm is choosing the appropriate capital structure to finance a given set of assets.

The relevant issues for capital structure decisions are: first, should stockholders be concerned about maximizing the value of the entire firm, rather than maximizing the value of the firm's equity, and, second, what is the ratio of debt to equity that maximizes shareholders's interests.

1) Firm value and stock value

We demonstrate that maximizing the value of the firm's equity is equivalent to maximizing the value of the firm

Consider an all-equity firm whose market value is $100,000. This means the firm's assets are valued at $100,000 (common stocks have market value of $100,000). The firm's management is considering a financial restructuring by borrowing $40,000 and then paying the proceeds of the loan to the shareholders in the form of dividends.

Under what circumstances do the shareholders benefit from the financial restructuring.

Assume that the restructuring does not affect the firm's value. Under these circumstances, the wealth of the shareholders is unaffected. Shareholders owned a firm whose value if $100,000 before the restructuring. After the change in financial structure, they own 60% of a firm worth $100,000, or $60,000, plus dividends totalling $40,000. Shareholders are indifferent to the restructuring if the value of the firm is unchanged.

Under what circumstances do shareholders benefit from a financial restructuring.

The answer is that they benefit only if the value of the firm increases. If, for example, the restructuring increases the value of the firm to $110,000, the shareholders now own equity in the firm worth ($110,000 - $40,000) = $70,000 plus dividends of $40,000 for a total of $110,000. In other words, the increase in firm value accrues to the stockholders. Consequently, maximizing the value of the firm is equivalent to maximizing the value of the shareholders's position.

In other words, if there is a capital structure which maximizes the value of the firm, the same capital structure also maximizes the value of the shareholders's position.

2) Capital Structure and the Cost of Capital

Remember that the WACC is the appropriate discount rate for establishing the value of a firm's cash flows. If capital structure decisions have an impact on the WACC, then these decisions affect the value of the firm; in this case, the capital structure which minimizes the WACC is the capital structure which maximizes the value of the firm.

B) The Effect Of Financial Leverage

Financial Leverage is the extent to which a firm uses debt, rather than equity, financing. We look at the relationship between financial leverage and the returns to the firm's stockholders.

1) The impact of financial leverage:

We discuss the impact of leverage on stockholders in terms of the effect on earnings per share (EPS) and return on equity (ROE). Ignoring the impact of taxes for now.

Start with an example: W.Reed & Company is an all-equity firm with 20,000 shares of common stock outstanding. The market value per share is $25, so the market value of the firm is ($25 $\times$ 20,000) = $500,000. The CFO has proposed a capital restructuring which would involve issuing $300,000 of debt in order to purchase ($300,000/$25)=12000 shares of the firm's outstanding stock; the interest rate on the debt is 10%. The restructuring would leave (20,000-12,000)=8000 shares outstanding. The current and proposed capital structures are summarized in the following:

	Current	Proposed
Assets	$500,000	$500,000
Debt	$0	$300,000
Equity	$500,000	$200,000
Debt/Equity ratio	0.0	1.5
Share price	$25	$25
Shares outstanding	20,000	8,000
Interest rate		10%

The following two tables illustrate the impact of the restructuring on ROE and EPS under each of three alternative scenarios (recession, expected, and expansion):

Current Capital Structure: No DEBT

	Recession	Expected	Expansion
EBIT	\$40,000	\$60,000	\$100,000
Interest	0	0	0
Net Income	\$40,000	\$60,000	\$100,000
ROE	8.00%	12.00%	20.00%
EPS	\$2.00	\$3.00	\$5.00

Current Capital Structure:Debt = \$300,000

	Recession	Expected	Expansion
EBIT	\$40,000	\$60,000	\$100,000
Interest	\$30,000	\$30,000	\$30,000
Net Income	\$10,000	\$30,000	\$70,000
ROE	5.00%	15.00%	35.00%
EPS	\$1.25	\$3.75	\$8.75

Since the current capital structure of the company is 100% equity, the net income is the same as earnings before interest and taxes (EBIT) for each of the three possible scenarios. ROE is equal to net income divided by total equity. For example, with the current capital structure, ROE is a recession would be (\$40,000/\$500,000) = 0.08 = 8%.

EPS is equal to net income divided by the number of shares outstanding. In a recession, EPS would be (\$40,000/20,000) = \$2.00.

For the proposed capital structure (with interest payments of \$30,000), in a recession we get:

ROE = \$10,000/\$200,000 = 0.05 = 5%

and EPS = \$10,000/8,000 = \$1.25.

Notice that for each capital structure, both ROE and EPS change as EBIT changes. In general, leverage has a beneficial impact on stockholders when EBIT is high and a detrimental impact when EBIT is low. This is due to the fixed interest cost associated with debt financing. When EBIT is low, the fixed obligation to creditors consumes a substantial portion of the firm's earnings, so the return to stockholders is relatively low. However, at higher levels of EBIT, the return to creditors remains constant, while the stockholders derive a proportionately larger benefit from the increased earnings.

2) Degree of Financial Leverage

Financial Leverage measures how much earnings per share (and ROE) respond to changes in EBIT. The degree of financial leverage (DFL) can be computed with the following formula

DFL = Percentage change in EPS/Percentage change in EBIT

If there is debt in the capital structure, the DFL varies for different ranges of EPS and EBIT. For example, given the current capital structure, the DFL for Reed company for an EBIT of $40,000 is:

DFL $=[(\$3.00 - \$2.00)/\$2.00]$ / $[(\$60,000 - \$40,000)/\$40,000] = 1$

For an EBIT of $60,000, the DFL will remain the same since there is no debt in capital structure:

DFL $=[(\$5.00 - \$3.00)/\$3.00]$ / $[(\$100,000 - \$60,000)/\$60,000] = 1$

However, for the proposed capital structure, the DFL changes as EBIT increases from $40,000 to $60,000:

DFL $= =[(\$3.75 - \$1.25)/\$1.25]$ / $[(\$60,000 - \$40,000)/\$40,000] = 2.0/0.50 = 4.0$

And for EBIT level of $60,000

DFL $= =[(\$8.75 - \$3.75)/\$3.75]$ / $[(\$100,000 - \$60,000)/\$60,000] = 1.33/0.67 = 2.0$

Many analysts use a convenient alternative formula for DFL:

DFL = EBIT/(EBIT - Interest)

For our example, we calculate the DFL for the proposed capital structure when EBIT is $40,000 and when it increases to $60,000, we get :

DFL = $40,000/($40,000 - $30,000) =4/1 = 4.

For EBIT = $60,000

DFL = 6/2 = 2.0

The importance of calculating DFL is apparent when this result is used in the context of changes in EBIT and net income. For example, under the proposed capital structure, the EBIT increased by 67 percent (from $60,000 to $100,000). Since the DFL at EBIT of $60,000 is 2.0 we can conclude that Net Income will increase by 134 percent (67% times 2). In other words, given a DFL the analyst can predict the impact on net income, given his forecast of changes in EBIT. If EBIT was to decrease by a given percentage, net income would decrease by that given percentage times the DFL factor.

3) Indifferent EBIT

The results in the above table for the Reed company imply that, at a level of EBIT between $40,000 and $60,000, EPS will be the same for either capital structure. In order to determine the break-even level of EBIT (also known as the "indifference EBIT"), note that for the current capital structure, EPS is equal to (EBIT/20,000). For the proposed capital structure, EPS is equal to:

(EBIT - \$30,000) /8,000

If we equate both expressions:

(EBIT/20,000) = (EBIT - \$30,000) /8,000

we get: EBIT=\$50,000

When EBIT is \$50,000, EPS is equal to \$2.50 for either capital structure.

Look at the graph too:

Clearly, if the analyst is forecasting higher levels of EBIT (above \$50,000), this favors debt financing since EPS will be maximized.

4) Homemade Leverage

The above discussion seems to suggest that the firm's capital structure is important to stockholders. However, in a world of perfect capital markets, this is incorrect. Shareholders can adjust the amount of leverage in their position by borrowing or lending on their own, thereby creating **homemade leverage**.

We use again the following example:

Say an investor who owns 100 shares of Reed company. The tables below illustrates what happens under the assumption that the firm adopts the proposed restructuring.

Proposed Capital Structure

	Recession	Expected	Expansion
EPS	\$1.25	\$3.75	\$8.75
Earnings for 100 shares	\$125.00	\$375.00	\$875.00
Net cost = (\$25×100) = \$2500			

Original Capital Structure and Homemade Leverage

	Recession	Expected	Expansion
EPS	\$2.00	\$3.00	\$5.00
Earnings for 250 shares	\$500.00	\$750.00	\$1250.00
Less: Interest on \$3750 = $at 10\%$	\$375.00	\$375.00	\$375.00
Net Earnings	\$125.00	\$375.00	\$875.00
Net Cost = (\$25×250)− borrowed = \$6250 - \$3750			

The homemade leverage in the second section duplicates the leverage proposed by the company. It has a debt/equity ratio of 1.50. The shareholder can create the same financial leverage by **borrowing** an amount equal to 1.50 times the equity in the 100 share position, and investing this amount in additional shares. That is, borrow (1.50 $\times$\$2500) = \$3,750 and then purchase (\$3,750/\$25) = 150 additional shares of stock. The total number of shares owned is then (100 + 150) = 250 shares.

In the event of recession, for example, earnings for 250 shares is \$500, interest paid on \$3750 is \$375, then net earnings would be \$125, exactly like under the proposed capital structure.

If the firm adopts the proposed capital structure, the shareholder can **"unlever"** the position by lending an amount sufficient to duplicate the earnings the shareholder would receive under the capital structure. Say if a shareholder were to sell 60 shares, for a total of (\$25 $\times$60) = \$1500, and then lend this \$1500 at a 10% interest rate.

Original Capital Structure

	Recession	Expected	Expansion
EPS	\$2.00	\$3.00	\$5.00
Earnings for 100 shares	\$200.00	\$300.00	\$500.00
Net cost = (\$25$\times$100) = \$2500			

Proposed Capital Structure and Homemade Leverage

	Recession	Expected	Expansion
EPS	\$1.25	\$3.75	\$8.75
Earnings for 40 shares	\$50.00	\$150.00	\$350.00
Plus: Interest on \$1500 at10%	\$150.00	\$150.00	\$150.00
Net Earnings	\$200.00	\$200.00	\$200.00
Net Cost = (\$25$\times$40)+ amount loaned = \$1000+\$1500			

Thus, an investor is indifferent to the capital structure decisions of the firm since the shareholder can duplicate the preferred capital structure, regardless of the firm's actual capital structure, by borrowing of lending.

C) Capital Structure and The Cost of Equity Capital

The previous discussion (and under certain circumstances) indicates that the price of a firm's common stock is not dependent on the firm's capital structure. This conclusion was initially derived by **Modigliani and Miller (M&M) in 1958**; hence, we refer to this result as **M&M proposition I**.

Their derivation of this result is based on the following two assumptions: first, there are no taxes, and second, investors can borrow on their own account at the same rate that the firm pays on its debt.

a) M&M Proposition I: The Pie Model

Recall that V = E + D. The value of the firm can be viewed as a pie, and the firm's capital structure is represented by the way in which the pie is sliced. **This is the pie Model.** The slices are the equity portion and the debt portion. M&M Proposition I states that the size of the pie is not affected by the manner in which the pie is sliced; that is, the total value of the firm's assets is not affected by the manner in which the financing is obtained. It is the assets of a firm that generate cash flow. The firm's capital structure is a way of packaging those cash flows and selling them in financial markets.

Proposition I is expressed in the following manner:

$$V_u = EBIT/R_{E^u} = V_L = E_L + D_L \tag{0.1}$$

where:

V_u = Value of the unlevered firm

V_L = Value of the levered firm

$EBIT$ = Perpetual operating income

R_{E^u} = Equity required return for the unlevered firm

E_L = Market value of equity

D_L = Market value of debt

Example: AA international is an all-equity firm that generates EBIT of \$3 million per year. The required rate of return, $R_{E^u} = 15\%$. If proposition I holds, how would the market value of AA international change if it issued \$4 million in debt, where the proceeds were used to retire equity.?

Currently the market value of the firm is equal to the market value of equity, since there is no debt: $V_u = EBIT/R_{E^u} = \$3,000,000/0.15 = \$20,000,000$

After issuing debt, and according to Proposition I, we have $V_u = V_L$. In other words $V_L = E_L + D_L = \$16,000,000 + \$4,000,000 = \$20,000,000$.

b) The cost of Equity and Financial Leverage: M&M Proposition II

M&M Proposition II addresses the relationship between the firm's **debt/equity ratio** (the capital structure) and the firm's **cost of equity capital**. Specifically, M&M proposition II establishes a positive relationship between leverage and the expected return on equity; that is, the risk of a firm's equity increases as the degree of leverage increases.

To derive the proposition, we start with WACC:

$$WACC = R_A = (E/V)R_E + (D/V)R_D \tag{0.2}$$

we have introduced the notation R_A for the weighted average cost of capital to reflect the fact that the WACC is interpreted as the required return on the firm's overall assets.

Solving for the R_E

$$R_E = R_A + (R_A - R_D)(D/E) \tag{0.3}$$

That indicates that the required return on equity is a linear function of the debt/equity ratio. We know from Proposition I that the value of the firm is not affected by changes in the debt/equity ratio, so that it must be true that the firm's overall cost of capital R_A does not change with changes in the firm's financial structure. Also, if R_A is greater than R_D, the R_E increases with the debt/equity ratio. Intuitively, this last conclusion results from the fact that additional debt increases the risk of the firm's equity, and consequently increases the required return on equity. These results are demonstrated graphically:

The y-intercept indicates that $R_E = R_A$ for a firm with no debt. As the debt/equity ratio increases, the cost of equity R_E rises in a linear fashion, but the increased cost of equity is exactly offset by the increased use of cheaper debt. The overall cost of capital R_A is the same regardless of the value of the debt/equity ratio. Since R_A never changes, and the firm's cash flows do not change, the value of the firm is unaffected by changes in the capital structure.

Example: Reconsider AA International by assuming that the new issue of debt could cost the firm 8 percent. What is the required equity return for the levered firm and its overall weighted average cost of capital.

The debt to equity ratio is 25%. ($4 m/16m). Using Proposition II, the equity required return for the levered firm is $R_E = 15\% + (15\% - 8\%)(0.25) = 16.75\%$.

Then WACC = 0.1675(0.80)+0.08(0.2)=15%

c) The SML and Proposition II

We know from SML that the required rate of return on the firm's assets :

$R_A = R_f + \beta_A(R_M - R_f)$.

β_A is called the asset beta, and measures the systematic risk of the firm's assets. If we combine the above equation with the cost of equity from the SML $R_E = R_f + \beta_E(R_M - R_f)$. it is easy to show the relationship between the equity beta, β_E and the asset beta β_A :where $\beta_E = \beta_A \times (1 + D/E)$.

The result is that the risk premium on the firm equity is equal to the risk premium on the firm's assets times the equity multiplier. Or to say:

$\beta_E = \beta_A \times (1 + D/E) = \beta_A + \beta_A \times (D/E)$

β_A is a measure of the riskiness of the firm's assets. It measures the **business risk** of the firm. The second component $\beta_A \times (D/E)$ depends on the firm's financial policy or called the **financial risk** of the equity.

So the cost of equity rises when the firm increases its use of financial leverage (debt) because the financial risk of the stock increases.

D) M&M Propositions I and II With Corporate Taxes

It is necessary to assess the validity of the M&M conclusions under more realistic assumptions. Specifically, we consider how the introduction of corporate taxes affects the M&M propositions.

Remember that interest payments on debt are tax deductible. Therefore, if corporate income is taxed, the tax subsidy of debt increases the attractiveness of debt in the firm's capital structure.

Compare two firms, Firm U and Firm L. Earnings before interest and taxes (EBIT) will be $1000 for both firms. Suppose that Firm L has issued perpetual bonds in the amount of $500, on which it pays 12% interest, and that the corporate tax rate if 30%. Firm U has 100% equity. We can summarize this information as follows:

	Firm U	Firm L
EBIT	$1000	$1000
Interest	$0	$60
Taxable Income	$1000	$940
Taxes (30%)	$300	$282
Net Income	$700	$658

Since depreciation, capital spending and changes in net working capital are all zero, the cash flow from each firm's assets is equal to (EBIT- Taxes), as indicated below

Cash flow from assets	Firm U	Firm L
EBIT	$1000	$1000
-Taxes	$300	$282
Total	$700	$718

We can compute the total cash flow to both stockholders and bondholders:

Cash flow	Firm U	Firm L
To Stockholders	$1000	$658
To Bondholders	$0	$60
Total	$700	$718

The total cash flow for Firm L is $18 greater than the cash flow for Firm U. This occurs because Firm L's tax bill, which is a cash outflow, is $18 less. The interest expense has generated a tax saving equal to the interest payment ($60) multiplied by the corporate tax rate (30%). This tax saving is called the **interest tax shield.**

a) Taxes and M&M Proposition I

Since the debt is perpetual, this same interest tax shield will be generated every year forever. The after tax cash flow to Firm L will be the same $700 that accrues to Firm U, plus the $18 tax shield. Because the tax shield is generated by paying interest, it has the same risk as the firm's debt, so that 12% is the appropriate discount rate for valuing the tax shield. The value of the tax shield is thus:

$$PV = \$18/0.12 = (.30 \times .12 \times \$500)/.12 = .30 \times \$500 = \$150 \tag{0.4}$$

Usually, tax shield is calculated as:

Value of the interest tax shield:

$$= (T_c \times R_D \times D)/R_D = T_c \times D \tag{0.5}$$

The after -tax cash flow to the stockholders of the unlevered firm is $EBIT(1 - T_c)$. If we assume that all cash flows are perpetual and constant, then the value of the firm becomes:

$$V_u = EBIT(1 - T_c)/\rho \tag{0.6}$$

where ρ is the unlevered cost of capital; this means that ρ is the cost of capital the firm would have it had no debt. Suppose that the cost of capital for Firm U is 20%, that is ($\rho = 20\%$), then, the value of the Firm U is:

$$V_u = EBIT(1 - T_c)/\rho = \$1000(1 - 0.3)/0.20 = \$3500 \tag{0.7}$$

M&M Proposition I (with corporate taxes) states that the value of a levered firm V_L, is equal to the value of the unlevered firm plus the value of the interest tax shield:

$$V_L = EBIT(1 - T_c)/\rho + (T_c \times R_D \times D)/R_D \tag{0.8}$$

For Firm L:

$$V_L = V_u + (T_c \times D) = \$3500 + \$150 = \$3650 \tag{0.9}$$

These results demonstrate that, in a world with corporate taxes, the firm has an incentive to increase its debt/equity ratio. A higher debt/equity ratio lowers taxes and increases the total value of the firm. In fact, the above results indicate that a firm should move as close as possible to an all-debt capital structure. Clearly, this conclusion is inconsistent with reality, since firms do not choose capital structure which virtually all debt; it is important to keep in mind here that this conclusion is derived under the assumption that there are no bankruptcy costs.

b) Taxes , the WACC and Proposition II

Recall:

$$R_E = R_A + (R_A - R_D)(D/E) \tag{0.10}$$

M&M demonstrates that, in a world with corporate taxes, the following describes the cost of equity capital:

$$R_E = \rho + (\rho - R_D)(D/E) \times (1 - T_c) \qquad (0.11)$$

That indicates a positive relationship between expected return on equity and the debt/equity ratio; it also implies that the firm's overall cost of capital decreases as the amount of debt increase, which leads to the conclusion that a capital structure of 100% debt is optimal.

This implication is demonstrated by computing WACC for Firm L of the above example:

Since V_L = \$3650 and the firm's debt has a value of D =\$500, then the equity for Firm L has a value of E =\$3650 − \$500 = \$3150. The cost of equity for Firm L is:

$$R_E = \rho + (\rho - R_D)(D/E) \times (1 - T_c) = 0.20 + (0.20 - 0.12)(\$500/\$3150) \times (1 - 0.30) = .20889 \qquad (0.12)$$

The cost of equity capital is 20.889%. The weighted average cost of capital is:

$WACC = (E/V) \times R_E + (D/V) \times R_D(1 - T_c) = (\$3150/\$3650).20889 + (\$500/\$3650)0.12 \times (1 - 0.3) =$ 0.19178

Therefore, the weighted average cost of capital for an unlevered firm is 20%, while the WACC for Firm L is 19.178%. Since the cash flows are the same for the two firms, the firm with the lower WACC (firm L) has a greater value.