7 CAPITAL STRUCTURE AND FINANCIAL LEVERAGE

Capital structure refers to the way a corporation finances its assets through some combination of equity and debt. A firm's capital structure is then the composition or 'structure' of its liabilities. So far, we assume the firm’s capital structure as given. In the real world debt-equity ratios are the result of some kind optimizing. We need to find where the real capital structure do come from. Decisions about a firm’s debt-equity ratio are called as capital structure decisions.

Company can choose any capital structure that it wants and such activities that change the company’s existing capital structure are known as capital restructurings. Company could either issue some bonds and use the proceeds to buy back some stock (increasing the debt-equity ratio) or issue stock and use the money to pay off some debt (reducing the debt-equity ratio). Restructurings take place when the company’s substitutes one capital structure for another leaving the company’s total assets unchanged.

Capital restructuring does not directly affect assets of a firm, thus we can look at the capital structure altering separately from its business activities. In other words, capital budgeting decisions are not dependent on capital structure and hence restructuring decisions. So we can assume investment decisions as given and concentrate on capital structure issues (long-term financing).

Subject to several assumptions financing through debt rather than equity does not seem to make any difference to the wealth of the shareholders. Now we shall review the traditional view, that capital structure does have an effect on shareholders’ value.

7.1 Capital Structure

Weighted average cost of capital shows the firm’s overall cost of capital and should reflect the blended returns expected by the various providers of capital. A company's WACC
accounts for both the firm's cost of equity and its cost of debt, weighted according to the proportions of equity and debt in the company's capital structure.

When we defined the WACC, we assume the firm's capital structure as given. Now we need to find what happens to the cost of capital company increase the amount of debt financing, or the debt-equity ratio. Most important reason for studying WACC is that WACC is the rate investors use to discount cash flows.

A firm's WACC is the overall required return on the firm as a whole and, as such, it is often used internally by company directors to determine the economic feasibility of expansionary opportunities and mergers. It is the appropriate discount rate to use for cash flows with risk that is similar to that of the overall firm.

Thus, the value of the firm is changing when the WACC is changing. Values and discount rates alter in opposite directions, so minimizing the WACC will maximize the value of the firm’s cash flows. This optimal capital structure is also called the long-term targeted capital structure.


7.2 The effect of financial leverage

We found why the capital structure that produces the highest firm value (or the lowest cost of capital) is the one most beneficial to stockholders. In this section, we examine the impact of financial leverage (gearing, solvency) on the payoffs to stockholders. Financial leverage can be aptly described as the extent to which a business or investor is using the borrowed money.

Many firms raise part of their long-term financing requirements through borrowing, often by the issue of loan stocks or debentures. These give lenders contractual rights to receive interest, typically at a predetermined rate and on specified dates. Usually such loan stocks are redeemable; thus the contractual rights extend to the amount to be repaid and to the date of redemption. Loan finance could also be provided by a bank or similar institution, which would acquire similar contractual rights.

The central point about loan finance, in the present context, lies in the fact that neither interest nor redemption payments are matters of the borrowing firm’s discretion. Interest on
such loans amounts to an annual charge on profits. This must be satisfied before the equity shareholders, who in the typical firm provide the larger part of the finance, may participate. As we noticed, subject to several assumptions, that financing through debt rather than equity does not seem to make any difference in firm’s value. We shall now review the traditional view, that capital leverage does have an effect on firm’s value. After this we shall review the evidence and try to reach some conclusion on the matter. The more debt financing a firm uses in its capital structure, the more financial leverage it employs. As we describe, financial leverage can dramatically alter the payoffs to shareholders in the firm. Remarkably, however, financial leverage may not affect the overall cost of capital. If this is true, then a firm’s capital structure is irrelevant because changes in capital structure won’t affect the value of the firm. We will return to this issue a little later.

### 7.2.1 The Basics of Financial Leverage

We start by illustrating how financial leverage works. For now, we ignore the impact of taxes. Also, for ease of presentation, we describe the impact of leverage in terms of its effects on earnings per share, EPS, and return on equity, ROE. These are, of course, accounting numbers and, as such, are not our primary concern. Using cash flows instead of these accounting numbers would lead to precisely the same conclusions, but a little more work would be needed. We discuss the impact on market values in a subsequent section.

<table>
<thead>
<tr>
<th>Table 13</th>
<th>Capital structure A</th>
<th>Capital structure B</th>
<th>r_d=10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shares</td>
<td>1000</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Price per share</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Equity value</td>
<td>10000</td>
<td>5000</td>
<td></td>
</tr>
<tr>
<td>Debt value</td>
<td>0</td>
<td>5000</td>
<td></td>
</tr>
<tr>
<td>Asset value</td>
<td>10000</td>
<td>10000</td>
<td></td>
</tr>
</tbody>
</table>
Table 13 presents two capital structures. As shown, the firm’s assets have a market value of $10,000, and there are 1,000 shares outstanding. Because it is an all-equity firm, so the price per share is $10. The proposed debt issue would raise $5,000; the interest rate would be 10 percent.

Because the stock sells for $10 per share, the $5,000 in new debt would be used to purchase $5,000/10 = 500 shares, leaving 500. After the restructuring, this company would have a capital structure that was 50 percent debt, so the debt-equity ratio would be 1. Notice that, for now, we assume that the stock price will remain at $10. To investigate the impact of the proposed restructuring,

Table 14 compares the firm’s capital structure A and capital structure B under three scenarios. The scenarios reflect different assumptions about the firm’s EBIT. Under the expected scenario, the EBIT is $1,500.

Table 14

|                      | Capital structure A | Capital structure B | $r_d=10\%$
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Shares</td>
<td>1000</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Price per share</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Equity value</td>
<td>10,000</td>
<td>5,000</td>
<td></td>
</tr>
<tr>
<td>Debt value</td>
<td>0</td>
<td>5,000</td>
<td></td>
</tr>
<tr>
<td>Asset value</td>
<td>10,000</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>scenario</td>
<td>scenario</td>
<td></td>
</tr>
<tr>
<td>Operating results:</td>
<td>Increase /</td>
<td>Unchanged /</td>
<td>Decrease /</td>
</tr>
<tr>
<td></td>
<td>Increase /</td>
<td>Unchanged /</td>
<td>Decrease /</td>
</tr>
<tr>
<td>Net income before interest</td>
<td>500</td>
<td>1,500</td>
<td>2,000</td>
</tr>
<tr>
<td>Interest expense</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Net income</td>
<td>500</td>
<td>1,500</td>
<td>2,000</td>
</tr>
<tr>
<td>Earning per share</td>
<td>0.5</td>
<td>1.5</td>
<td>2</td>
</tr>
<tr>
<td>Return on equity</td>
<td>5%</td>
<td>15%</td>
<td>20%</td>
</tr>
</tbody>
</table>

In the recession scenario, EBIT falls to $500. In the expansion scenario, it rises to $2,000. To illustrate some of the calculations behind the figures in Table 14, consider the expansion case. EBIT is $2,000. With no debt (capital structure A) and no taxes, net income is also
$500. In this case, there are 1000 shares worth $10 000 total. EPS is therefore $2000/1000=2. Also, because accounting return on equity, ROE, is net income divided by total equity, ROE is $2000/10000=20%.

With $5000 in debt (capital structure B), things are somewhat different. Because the interest rate is 10 percent, the interest bill is $500. With EBIT of $2000, interest of $500, and no taxes, net income is $1500. Now there are only 500 shares worth $5000 total. EPS is therefore $1500/500 =3, versus the $2 that we calculated in the previous scenario. Furthermore, ROE is $1500/5000=30%. This is well above the 20 percent we calculated for the current capital structure.

### 7.2.2 EPS versus EBIT

The impact of leverage is evident when the effect of the restructuring on EPS and ROE is examined. In particular, the variability in both EPS and ROE is much larger under the proposed capital structure. This illustrates how financial leverage acts to magnify gains and losses to shareholders.

In Figure 7, we take a closer look at the effect of the capital restructuring. This figure plots earnings per share, EPS, against earnings before interest and taxes, EBIT, for both capital structures. The first line, labeled “No debt,” represents the case of no leverage. This line begins at the origin, indicating that EPS would be zero if EBIT were zero. From there, every increase in EBIT increases EPS. The second line represents the capital structure B. Here, EPS is negative if EBIT is zero. This follows because interest must be paid regardless of the firm’s profits., the EPS is negative as shown. Similarly, if EBIT were $500, EPS would be exactly zero.

The important thing to notice in Figure 7 is that the slope of the line in this second case is steeper. In fact, for every increase in EBIT, EPS rises faster, so the line is twice as steep. This tells us that EPS is twice as sensitive to changes in EBIT because of the financial leverage employed.
7.2.3 Corporate Borrowing and Homemade Leverage

We can then formulate a few conclusions:

- The effect of financial leverage depends on the company’s EBIT. When EBIT is relatively high, leverage is beneficial.
- Under the expected scenario, leverage increases the returns to shareholders, as measured by both ROE and EPS.
- Shareholders are exposed to more risk under the proposed capital structure because the EPS and ROE are much more sensitive to changes in EBIT in this case.
- Because of the impact that financial leverage has on both the expected return to stockholders and the riskiness of the stock, capital structure is an important consideration.
The first three of these conclusions are clearly correct. Does the last conclusion necessarily follow? Surprisingly, the answer is no. As we discuss next, the reason is that shareholders can adjust the amount of financial leverage by borrowing and lending on their own. This use of personal borrowing to alter the degree of financial leverage is called homemade leverage. Since the ordinary shares are contain priced when assumed returns are expected we may infer that investors regard 10 per cent as the appropriate return for such an investment. If the expected returns increase as debt engenders, this seems likely to push up the price of an ordinary share. This implies that, were the assets to be financed by an issue of equity, the value of each ordinary share would be higher, whereas if the assets were to be financed by loan stock, the firm’s ordinary shares would be worth more. In short, the shareholders’ wealth would be increased by debt instead of issuing equity.

To try to get to the point of this problem, let us look at the situation from the point of view of the suppliers of the loan finance. If there are higher returns to be made from direct investing in assets, why are they prepared to do so for less return from debt? Why do they not buy ordinary shares in this firm?

The difference between investing directly in company, through the purchase of shares, and lending money on a fixed rate of interest is the different level of risk. From expected profits from the new projects, only a specific part would be paid to the providers of the new finance. The other part goes to the equity holders, but with it goes all of the risk.

As with all real investment, returns are not certain. Suppose that there were to be a recession in business, so that the profits would fell from new project. This would mean that shareholders can get nothing. From this it seems clear that loan stocks provide an apparently cheap source of finance, but they have a hidden cost to equity shareholders.

7.2.4 Business risk and financial risk

The inclusion of loan finance enhances returns on equity over those which could be earned in the all-equity structure. Where profit falls below breakeven point, however, the existence of loan finance weakens the ordinary shareholder’s position. In fact, below certain profit there would be insufficient profit to cover debt interest payments.
At virtually all levels of profit, the loan stockholders could view the situation philosophically. After all, not only do they have the legal right to enforce payment of their interest and repayment of their capital, they even have the assets as security. Only if major losses to the market value were to occur, would the loan stockholders’ position seriously be threatened.

Where leverage exists, the risk to which equity holders are exposed clearly is increased over that which they would bear in the all-equity firm. To business risk, the normal risk attached to investing in the real world, is added financial risk, the risk caused by being burdened with the obligation to meet fixed charges.

Figure 8 depicts the relationship between business and financial risk where operating returns fluctuate. The amount of business risk depends on the area of activity in which the firm is invested; financial risk depends on how the firm is finance.

**Figure 8 ROE for levered firm with fluctuations**

![Graph showing business and financial risk](image)

Intuition and modern portfolio theory both tell us that risk and return are related. Where investors perceive high risk they require high returns. Hence, while leverage will lift
expected dividend per share to ordinary shareholders, this will not necessarily increase the share price (and therefore the wealth of the shareholder). Accompanying the increased expected dividend is a wider range of possible outcomes.

Not all of the new possibilities which leverage brings to the returns to equity holders are bad news. For any profit above, certain ordinary share dividends would be enhanced. Most investors, however, are risk-averse, which means that the possibility that profit could be below assumed tends to be more significant to them than the possibility that profits could be greater.

Ordinary shareholders will only be better off through the introduction of leverage if the capital market, when it reassesses the situation, following the loan stock issue, prices the ordinary shares so that their expected yield increases. Before the firm’s expansion these ordinary shares had an expected yield. If, as a result of the higher risk level, after the expansion the market expected a higher return, the price per share would increase. If on the other hand capital market requirements for the level of risk, the price per share would become lower.

Put another way, will the introduction of leverage lower the weighted average cost of capital (WACC) and therefore make more valuable the investments in which the firm is involved, or not? Given the firm’s overall objective of maximization of shareholder wealth, how the capital market reacts, in terms of required returns, to the introduction of leverage is a very important matter. Leverage is presumably only undertaken with the objective of increasing equity shareholders’ wealth.

7.3 Capital structure and the cost of equity capital

We have seen that there is nothing special about corporate borrowing because investors can borrow or lend on their own. As a result, whichever capital structure company chooses, the stock price will be the same. Capital structure is thus irrelevant.
7.3.1 Traditional view

The traditional view seems to be that if the expected rate of return from equity investment, will not be greatly affected by the introduction of capital leverage, not at least up to moderate levels. This view of the effect of leverage on capital market expectations of returns from equities, loan stocks and WACC is depicted in. Figure 9 shows that, as leverage is increased, both equity investors and lenders perceive additional risk and require higher returns. At lower levels of leverage, however, neither group requires greatly increased returns to compensate for this risk, and WACC reduces. When leverage reaches higher levels, the risk issue becomes increasingly important to both groups, so required returns start to increase dramatically. Now WACC starts to rise steeply. Although the point at which each group’s required return starts this steep rise is not necessarily the same, there is a point (or a range of points) where, according to traditionalists, WACC is at a minimum. This is the optimal level of leverage. At this point the shareholders’ wealth is maximized, i.e. the price per share would be at its peak.
The rationale for the traditional view seems to be that it is felt that lenders would recognise that at high levels of leverage their security is substantially lost and would begin to demand successively higher levels of interest to compensate them. It seems also to be believed that, up to a certain level of leverage, equity shareholders would not see the increased risk to their returns as too significant.

After that point, however, they would start to demand major increases in returns for further increases in leverage. A traditionalist would argue that, with La Mer at 50 per cent loan financing there is still plenty of security in the value of the vessels for the interest and the capital repayment, even if market prices of yachts dropped considerably. However, if the level of loan financing increased to, say, 90 per cent, a drop of more than 10 per cent in the market value of the yachts would erode the security of lenders. At the same time La Mer’s equity holders would not see their position too badly threatened by the existence of moderate levels of loan finance and would not require returns great enough to negate the advantage of the apparently cheap loan finance. Broadly, the traditional conclusion was that leverage is a good thing, in terms of shareholder wealth maximisation, at least up to a certain level past which it would start to have an adverse effect on WACC and therefore on shareholder wealth.

During the 1950s some observers started to question the value of leverage, finding it difficult to reconcile the ‘something for nothing’ aspect of the traditional view with the rapidly growing belief that securities are efficiently and rationally priced.

7.3.2 The Miller & Modiguani view of leverage. M&M Proposition I

From previous discussion on Weighted Average Cost of Capital (WACC), we know that the best capital structure for a corporation is when the WACC is minimized. This is partly derived from two famous Nobel prize winners, Franco Modigliani and Merton Miller who developed the M&M Propositions I and II about Capital Structure of Corporations. One way to illustrate M&M Proposition I is to imagine two firms that are identical on the left-hand side of the balance sheet. think of 2 firms that have the same business operations, and same kind of assets. Thus, the left side of their Balance Sheets look exactly the same.
The only thing different between the 2 firms is the right side of the balance sheet, i.e. the liabilities and how they finance their business activities.

In the first diagram, stocks make up 70% of the capital structure while bonds (debt) make up for 30%. In the second diagram, it is the exact opposite. This is the case because the assets of both capital structures are the exactly same.

Figure 10 Capital structure

![Diagram showing capital structure with 70% stocks and 30% bonds in the first firm, and 30% stocks and 70% bonds in the second firm.]

Securities (indeed, any economic assets) are valued by reference only to their expected return and risk. Both structures offer identical risk/return expectations.

M&M Proposition I states that the value of a firm does NOT depend on its capital structure. A switch from the present to the alternative debt/equity ratio would result in the same expected return with the same risk.

It would seem illogical for firms to be able to increase the wealth of their shareholders merely by packaging the firm’s income in a particular way. This is made especially illogical by the fact that individual shareholders can adjust the packaging to their own convenience, merely by borrowing and/or lending homemade leverage. Income of similar risk and expected return should be similarly priced in a rational market, irrespective of the packaging.

The Simple balance sheet, with all entries expressed as current market value:
Table 15

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value of cash flow from the firm’s real</td>
<td>Market value of debt</td>
</tr>
<tr>
<td>assets and operations</td>
<td>Market value of equity</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Value of firm</td>
<td>Value of firm</td>
</tr>
</tbody>
</table>

The right- and left-hand sides of balance sheet are always equal. Therefore if you add up the market values of all the firm’s debt and equity security, you can calculate the value of the future cash flows from the real assets and operations.

M&M Proposition 1 therefore says how the debt and equity is structured in a corporation is irrelevant. The value of the firm is determined by Real Assets and not its capital structure. If the value of the firm is not affected by the financing method, therefore the cost of capital is not reduced (or affected at all) by the introduction of leverage. The only matters on which the value of the firm and its WACC depend are:
(a) the cash flows which the firm’s investments are expected to generate, and
(b) their risk (i.e. their business risk).
This is another phenomenon following the same pattern as Fisher separation theorem\(^3\).

M&M were in effect saying that management should concentrate all its efforts on finding and managing investment opportunities, leaving the financing arrangements for individual shareholders to decide for themselves.

### 7.3.3 Cost of Equity and Financial Leverage: M&M Proposition II

Although changing the capital structure of the firm does not change the firm’s total value, it does cause important changes in the firm’s debt and equity. We now examine what happens

---

\(^3\) Fisher’s separation theorem states that in a perfect capital market, it is possible to separate the firm’s investment decisions from the owners’ consumption decisions.
to a firm financed with debt and equity when the debt-equity ratio is changed. To simplify our analysis, we will continue to ignore taxes.

M&M Proposition II states that the value of the firm depends on three things:
1) Required rate of return on the firm’s assets ($r_A$)
2) Cost of debt of the firm ($r_D$)
3) Debt/Equity ratio of the firm (D/E)

If you recall the Weighted Average Cost of Capital (WACC), if we ignore taxes, the weighted average cost of capital the formula for WACC (no-tax) is:

$$\text{WACC} = \frac{E}{D+E} r_e + \frac{D}{D+E} r_d$$

We also saw that one way of interpreting the WACC is as the required return on the firm’s overall assets. To remind us of this, we will use the symbol $R_A$ to stand for the WACC and write The WACC formula can be manipulated and written in another form:

$$r_A = \frac{E}{D+E} r_e + \frac{D}{D+E} r_d$$

The above formula can also be rewritten as:

$$r_e = r_A + (r_A - r_D) \frac{D}{E}$$

This formula is what M&M Proposition II is all about. This is the famous M&M Proposition II, which tells us that 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 ratio, D/E.

Figure 11 summarizes our discussion thus far by plotting the cost of equity capital, $r_E$, against the debt-equity ratio. As shown, M&M Proposition II indicates that the cost of equity, $r_E$, is given by a straight line with a slope of $(r_A - r_D)$. The y-intercept corresponds to a firm with a debt-equity ratio of zero. Figure 11 shows that, as the firm raises its debt-equity ratio, the increase in leverage raises the risk of the equity and therefore the required return or cost of equity ($r_E$).

Analysis of M&M Proposition II
- The above graph tells us that the Required Rate of Return on the firm ($r_E$) is a linear straight line with a slope of $(r_A - r_D)$
- Why is $r_E$ linear curved and upwards sloping? This is because as a company borrows more debt (and increases its Debt/Equity ratio), the risk of bankruptcy is even more higher. Since adding more debt is risky, the shareholders demand a higher rate of return ($r_E$) from the firm's business operations. This is why $r_E$ is upwards sloping:
- As Debt/Equity Ratio Increases $r_E$ will Increase (upwards sloping).
- Notice that the Weighted Average Cost of Capital (WACC) in the graph is a straight line with no slope. It therefore does not have any relationship with the Debt/Equity ratio. This is the basic identity of M&M Proposition I and II, that the capital structure of the firm does not affect its total value.
- WACC therefore remains the same even if the company borrows more debt (and increases its Debt/Equity ratio).

Figure 11 M&M Proposition II

Notice in Figure 11 that the WACC doesn’t depend on the debt-equity ratio; it’s the same no matter what the debt-equity ratio is. This is another way of stating M&M Proposition I: the
firm’s overall cost of capital is unaffected by its capital structure. As illustrated, the fact that the cost of debt is lower than the cost of equity is exactly offset by the increase in the cost of equity from borrowing. In other words, the change in the capital structure weights E/(D+E) and D/(D+E) is exactly offset by the change in the cost of equity (r_E), so the WACC stays the same.

M&M’s disagreement with the traditionalists was that M&M saw the capital market’s return expectations increasing as soon as leverage is introduced, and increasing in proportion to the amount of leverage. The traditionalists felt that this would not occur at lower levels of leverage.

Table 16

<table>
<thead>
<tr>
<th>Operating results</th>
<th>Capital structure A</th>
<th>Capital structure B</th>
<th>rD= 10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shares</td>
<td>1000</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Price per share</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Equity value</td>
<td>10000</td>
<td>5000</td>
<td></td>
</tr>
<tr>
<td>Debt value</td>
<td>0</td>
<td>5000</td>
<td></td>
</tr>
<tr>
<td>Asset value</td>
<td>10000</td>
<td>10000</td>
<td></td>
</tr>
<tr>
<td>Operating results</td>
<td>senarios</td>
<td>senarios</td>
<td></td>
</tr>
<tr>
<td>Net income before interest</td>
<td>500 1500 2000</td>
<td>500 1500 2000</td>
<td></td>
</tr>
<tr>
<td>Interest expense</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Net income</td>
<td>500 1500 2000</td>
<td>0 1000 1500</td>
<td></td>
</tr>
<tr>
<td>Earning per share</td>
<td>0.5 1.5 2</td>
<td>0.0 2.0 3.0</td>
<td></td>
</tr>
<tr>
<td>Return on equity</td>
<td>5% 15% 20%</td>
<td>0% 20% 30%</td>
<td></td>
</tr>
<tr>
<td>r_A</td>
<td>15%</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td>r_D</td>
<td>10%</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>r_E</td>
<td>15%</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>WACC</td>
<td>15%</td>
<td>15%</td>
<td></td>
</tr>
</tbody>
</table>

7.3.4 M&M Assumptions

This is obviously unrealistic: brokers’ commissions and other costs are involved with trading in shares. It is doubtful, however, whether the weakness of this assumption seriously
undermines the proposition. It might mean that investors would be unable to make a profit by exploiting minor instances of mispricing of shares of geared firms, relative to those of unlevered firms. The larger ones could be exploited despite the existence of dealing charges. The evidence seems to show that they are efficient, for practical purposes, in the weak- and semi-strong form. This implies that investors would see through the financial packaging and realise that income of a particular risk class is equally valuable irrespective of how it is wrapped. It seems that this assumption is reasonable. Clearly this is invalid. In particular, there is usually a difference between the rates at which individuals and firms can borrow. Large firms, in particular, can often offer good security, can borrow large amounts, and can exploit borrowing opportunities not open to most individuals, e.g. borrowing overseas. The importance of this assumption lies in the question of homemade leverage, where the investor borrows on his or her own account and buys shares in the unlevered firm.

There is no reason, however, why the investor who exploits any mispricing of shares need be an individual; it could be a large firm, e.g. a large unit or investment trust. After all, most investment in securities is undertaken by the institutions rather than by individuals. Nor is it necessary that every investor in the economy seeks to exploit any mispricing in order to correct it. The action of a couple of investors, well placed to exploit the situation, would be sufficient. Probably the weakness of this assumption is not sufficient to call the M&M proposition too seriously into question.

M&M also made the implicit assumption that the corporate cost of borrowing does not increase with the level of leverage. This seems less plausible, a point to which we shall return later in the chapter.

This assumption suggests that if a firm were to be liquidated the shareholders would receive, in exchange for their shares, the equivalent of their market value immediately before the liquidation. This assumption envisages a situation where, as a result of a firm defaulting on interest and/or capital repayment, it is liquidated at the instigation of loan stock holders. This sort of action would obviously be more likely with very highly geared firms. The assumption is invalid since dealing costs would be involved in the disposal of the firm’s assets, legal costs would arise in formally bringing about the demise of the firm and, perhaps most importantly, the market for real assets is not generally efficient in the same way that capital markets seem to be. This last point implies that a machine worth 1000 to firm A does
not necessarily have that same value to firm B, because firm B, for some reason, may not be able to use it as effectively as firm A. Before the liquidation, firm A’s equity value may have been based partially on a 1000 value for the machine, but when the machine comes to be sold it may only fetch 500. Furthermore, there are costs of administering a potentially bankrupt firm, even if it is saved.

This assumption’s lack of validity undermines the M&M proposition in its broad form. It is doubtful, however, whether the assumption is a very important one where leverage levels are moderate, which appears typically to be the case in practice. On the other hand the existence of bankruptcy costs may well be the reason for the modest leverage levels which we tend to see in real life.

This assumption is most unlikely strictly to be true. It seems not to be an important impediment to the validity of M&M’s proposition. CAPM, and modern portfolio theory in general, suggest that business risk can explicitly be dealt with so that it is possible to relate two firms of different risk. That is, there is an established mechanism for pricing risk which enables returns for one firm’s shares to be reconciled with those of another firm. But even if CAPM, etc., is questioned, M&M were really referring to one firm and making the point that if there were two firms identical except only for their financing method they would be equally valued. Stiglitz in 1974 showed that it is not necessary for two such firms actually to exist in order for the proposition to be valid. This is clearly invalid. M&M were much criticized for this fact and were forced to reconsider their proposition because of it.

7.4 Taxation, financial distress and bankruptcy cost

Debt has two distinguishing features that we have not taken into proper account. First, as we have mentioned in a number of places, interest paid on debt is tax deductible. This is good for the firm, and it may be an added benefit of debt financing. 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 called cost of financial distress. Since we haven’t explicitly considered either of these two features of debt, we realize that we may get a different answer about capital structure once we do.
We can start by considering what happens to M&M Propositions I and II when we consider the effect of corporate taxes. To do this, we will examine 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.

### 7.4.1 The Interest Tax Shield

To simplify things, we will assume that depreciation is zero. We will also assume that capital spending is zero and that there are no changes in NWC. Cash flows from Capital structure A (Unlevered) and Capital structure B (Levered) are not the same even though the two firms have identical assets.

**Table 17**

<table>
<thead>
<tr>
<th></th>
<th>Capital structure A</th>
<th>Capital structure B</th>
<th>rD= 10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shares</td>
<td>1000</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Price per share</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Equity value</td>
<td>10000</td>
<td>5000</td>
<td></td>
</tr>
<tr>
<td>Debt value</td>
<td>0</td>
<td>5000</td>
<td></td>
</tr>
<tr>
<td>Asset value</td>
<td>10000</td>
<td>10000</td>
<td></td>
</tr>
<tr>
<td>Operating results</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net income before interest</td>
<td>1500</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>Interest expense</td>
<td>0</td>
<td>500</td>
<td>flow</td>
</tr>
<tr>
<td>Taxable income</td>
<td>1500</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>Income tax</td>
<td>525</td>
<td>350</td>
<td>-175 tax bill less</td>
</tr>
<tr>
<td>Net income</td>
<td>975 flow</td>
<td>650 flow</td>
<td></td>
</tr>
</tbody>
</table>

**Value of Tax Shield**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>rD</td>
<td>10.0%</td>
</tr>
<tr>
<td>t</td>
<td>35%</td>
</tr>
<tr>
<td>D</td>
<td>5000</td>
</tr>
<tr>
<td>TS</td>
<td>175</td>
</tr>
<tr>
<td>PV(TS)</td>
<td>1750</td>
</tr>
</tbody>
</table>
Total cash flow to Levered firm is 175 more. This occurs because L’s tax bill levered (which is a cash outflow) is 175 less. The fact that interest is deductible for tax purposes has generated a tax saving equal to the interest payment 500 multiplied by the corporate tax rate 35%:

\[ \$500 \times 35\% = \$175. \]

We call this tax saving the interest tax shield.

### 7.4.2 Taxes and M&M Proposition I

Because the debt is perpetual, the same 175 shield will be generated every year forever. The after tax cash flow to Levered firm will thus be the same 975 that UnLevered Firm earns plus the 175 tax shield. Because Levered firm’s cash flow is always $175 greater, Levered Firm is worth more than UnLevered Firm, the difference being the value of this 175 perpetuity.

Because the tax shield is generated by paying interest, it has the same risk as the debt, and 10 percent (the cost of debt) is therefore the appropriate discount rate. The value of the tax shield is thus:

\[
PV(TS) = \sum_{t=1}^{n} \frac{(5000 \times 0.1 \times 0.35)}{(1 + 0.1)^n} = \frac{(5000 \times 0.1 \times 0.35)}{0.1} = 1750
\]

We have now come up with another famous result, M&M Proposition I with corporate taxes. The revised after-tax version asserts that market forces must cause

\[ V_{\text{levered}} = V_{\text{unlevered}} + t \, D \]

where D is the value of the firm’s debt and t is the relevant Corporation Tax rate, at which loan stock interest will be relieved.

The effect of borrowing in this case is illustrated in Figure 12. We have plotted the value of the levered firm, \( V_L \), against the amount of debt, D. M&M Proposition I with corporate taxes
implies that the relationship is given by a straight line with a slope of $T_C$ and a $y$-intercept of $V_U$.

In , we have also drawn a horizontal line representing $V_U$. As indicated, the distance between the two lines is $T_C \times D$, the present value of the tax shield.

**Figure 12 M&M Proposition I with corporate taxes**

7.4.3 *Taxes, the WACC*

The after-tax proposition implies that the value of the geared firm is greater than the value of the all-equity one; also that the greater the level of leverage, the greater the value of the firm. The inevitable conclusion is that the value of the firm is highest and WACC lowest, when leverage is at 100 per cent, i.e. all finance is provided by loan stock holders. That, once we consider the effect of taxes, the WACC is:

\[
WACC = \frac{E}{D+E}r_E + \frac{D}{D+E}r_D(1-t)
\]
To calculate this WACC, we need to know the cost of equity. M&M Proposition II with corporate taxes states that the cost of equity is:

\[ r_E = r_M + \left( r_M - r_D \right) \frac{D}{E} (1 - t) \]

Table 18 illustrates some examples of WACC with taxes. Let us assume that we have $60 debt, so that Firm Levered firm is worth $124 total. Because the debt is worth $60, the equity must be worth $124 - $60 = $64. For this Firm, the cost of equity is thus:

\[ r_E = 0.16 + (0.16 - 0.10) \times \frac{60}{64} \times (1 - 0.40) = 19.4\% \]

The weighted average cost of capital is:

\[
WACC = \frac{60}{124} \times 19.4\% + \frac{64}{124} \times 10\% \times (1 - 0.40) = 12.9\%
\]

Without debt, the WACC is over 16 percent, and, with debt, it is 12.9 percent. Therefore, the firm is better off with debt.

\begin{table}[h]
\begin{tabular}{|c|c|c|c|c|c|}
\hline
Assumptions & Beta & 1.50 & \\
\hline
Risk-free rate & 10.0\% & \\
\hline
Equity risk premium & 4.0\% & \\
\hline
Cost of unlevered & 16.0\% & \\
\hline
Long Term Borrowing Rate & 10.0\% & \\
\hline
Tax rate & 40\% & \\
\hline
\hline
Assets=Equity+TaxShield & 100 & 108 & 116 & 124 & 132 & 140 \\
\hline
Equity & 100 & 88 & 76 & 64 & 52 & 40 \\
\hline
Debt & 0 & 20 & 40 & 60 & 80 & 100 \\
\hline
Debt-to-Equity ratio & 0\% & 23\% & 53\% & 94\% & 154\% & 250\% \\
\hline
Debt-to-Assets ratio & 0\% & 19\% & 34\% & 48\% & 61\% & 71\% \\
\hline
\( r_E \) & 16.0\% & 16.8\% & 17.9\% & 19.4\% & 21.5\% & 25.0\% \\
\hline
\hline
WACC no tax & 16.0\% & 16.0\% & 16.0\% & 16.0\% & 16.0\% & 16.0\% \\
\hline
WACC & 16.0\% & 14.8\% & 13.8\% & 12.9\% & 12.1\% & 11.4\% \\
\hline
\end{tabular}
\caption{Table 18}
\end{table}
Figure 13 shows the M&M after-tax view of capital leverage. There is a contrast with the pre-tax position. In the after-tax case the cost of debt is low enough (due to higher tax relief on loan interest) for increasing amounts of loan finance to reduce WACC at a greater rate than the increasing demands of equity holders are raising it. Thus the WACC line slopes downward.

It is doubtful if this 100 per cent loan finance conclusion is tenable in practical terms, however. At very high levels of leverage the loan stock holders would recognize that their security had been substantially eroded and that while they might be lenders in name, as risk takers they are equity holders in reality. They would therefore seek a level of return which would compensate them for this risk, a level of return similar to that which the equity holders seek. This would mean that at very high levels of leverage, both in the pre-tax and in the more important post-tax propositions, the cost of loans would rise significantly.

In order for M&M conclusions to hold, this requires that the rate of increase in the cost of equity starts to fall. In Figure 13, if the cost of loans line is going to start turning upwards at some high level of leverage, the WACC line can only continue its downward path if the cost of equity line becomes less steep (Remember that the WACC line is the average of the other two.)

**Figure 13. M&M after-tax view of capital gearing (leverage)**
7.5 Financial distress and bankruptcy cost

The idea of the rate of increase in the cost of equity, as leverage is increased, suddenly starting to reduce at high leverage levels seems to defy logic. Why should investors start to behave contrary to all the theories and evidence of investor reaction to increasing risk? This suggests a weakness in the M&M analysis which perhaps means that their conclusion in the after-tax case is not all that logical.

Interests from Debt increases fixed costs and when a firm has higher fixed costs then The chance of financial distress increases It rises the condition where a company cannot meet or has difficulty paying off its financial obligations to its creditors.

7.5.1 Cost of capital in practice

If financial distress cannot be relieved, it can lead to bankruptcy. Financial distress is usually associated with some costs to the company; these are known as costs of financial distress. A common example of a cost of financial distress are bankruptcy costs. These direct costs include auditors' fees, legal fees, management fees and other payments. Cost of financial distress can occur even if bankruptcy is avoided (indirect costs). If a state of financial distressed occurs indirect costs of financial distress are higher costs of capital as usually banks increase the interest rates

Financial distress in companies requires management attention and might lead to reduced attention on the operations of the company.

Existence of high levels of loan finance exposes the firm to the risk that it will not be able to meet its payment obligations to lenders, not at least out of its operating cash flows, if the firm should experience a particularly adverse period of trading. Even as it is equally true that the all-equity firm might have difficulty paying dividends in similar economic circumstances, there is an important difference.

Lenders have a contractual right to receive interest and capital repayment on the due dates. If they do not receive these, they have the legal power to enforce payment. The exercise of such power can in practice lead to the liquidation of all of the firm’s assets and its winding
up. For the reasons we have already discussed (principally through an apparently inefficient market in real assets), this will usually disadvantage the ordinary shareholder to a significant extent. By contrast, neither in a levered, nor in an unlevered, firm do ordinary shareholders have any rights to enforce the declaration and payment of a dividend.

This bankruptcy risk is probably insignificant at low levels of leverage, if only because any shortage of cash for interest payments could be borrowed from some other source – a possibility probably not so readily available to highly geared firms in distress.

At very low levels of leverage the position of lenders is one of great security, with the value of their loan probably covered many times by the value of the firm’s assets. As leverage increases, this position erodes until at very high levels lenders, because they provide most of the finance, bear most of the risk.

Suppose that the unexpanded firm were financed 90 per cent by equity shares and 10 per cent by loan stock. Here the value of assets would have to fall by 90 per cent before the security of the lenders would be threatened. Even if the equity/loan ratio moved to 80:20, the lenders’ security, while in theory slightly weakened, is not less in practical terms than had they only supplied 10 per cent of the finance. If however the ratio moved to 10:90, only a small drop (10 per cent) in the value of would leave the lenders bearing all the risk.

Naturally enough, lenders would demand high returns to induce them to buy loan stocks in such a highly levered firm, presumably something like the returns expected by equity shareholders.

Logically, the loan stock holders would not see risk (and required return) increasing significantly with increases in leverage at the lower end. After all, unless the asset on which security rests is extremely volatile in its value, an asset value/loan ratio of 5:1 is probably as good as 10:1; the lenders only need to be paid once. If this ratio increases to nearer 1:1, lenders would no doubt start to see things differently.

It is notable that neither of these two ‘weak’ assumptions of M&M significantly affect the position at lower levels of leverage. At higher levels, however, they start to loom very large.

In the light of this and taking account of the evidence which we briefly discussed, we may perhaps draw a tentative conclusion.

Up to sensible levels of leverage the tax advantages of loan finance will cause the WACC to decrease as more leverage is introduced. Beyond sensible levels, bankruptcy risk (to equity shareholders) and the introduction of real risk to lenders will push up the returns required by
each group, making WACC a very high figure at high leverage levels. It is more likely that, in real life, sensible is not a fixed point for any particular firm; it is rather a range below which M&M’s proposition holds, but above which it clearly does not. Of course the vital question is what does ‘sensible’ mean? The problem is that it is likely to be difficult to define and, as such, a matter of judgment of financial management. It must be the point at which the balance is struck between the tax advantage on the one hand and bankruptcy cost and rising cost of borrowing on the other. This will vary from industry to industry and will to some extent depend upon the business risk of the investments in which the particular firm is engaged. It is more likely that, in real life, sensible is not a fixed point for any particular firm; it is rather a range below which M&M’s proposition holds, but above which it clearly does not. Of course the vital question is what does sensible mean? The problem is that it is likely to be difficult to define and, as such, a matter of judgment of financial management. It must be the point at which the balance is struck between the tax advantage on the one hand and bankruptcy cost and rising cost of borrowing on the other. This will vary from industry to industry and will to some extent depend upon the business risk of the investments in which the particular firm is engaged.

**Figure 14 Cost of capital in practice**
Figure 14 depicts this conclusion with $k_E$, WACC, and $k_D$ all following the same pattern as M&M post-tax up to a sensible level of leverage and then all starting to take off to very high levels as further leverage is introduced.

It is more likely that, in real life, sensible is not a fixed point for any particular firm; it is rather a range below which M&M’s proposition holds, but above which it clearly does not. Of course the vital question is what does ‘sensible’ mean? The problem is that it is likely to be difficult to define and, as such, a matter of judgment of financial management. It must be the point at which the balance is struck between the tax advantage on the one hand and bankruptcy cost and rising cost of borrowing on the other. This will vary from industry to industry and will to some extent depend upon the business risk of the investments in which the particular firm is engaged.

More formally the relationship between the value of the levered and unlevered firms can be expressed as:

$$V_{\text{levered}} = V_{\text{unlevered}} + t D – \text{Present value of the expected cost of bankruptcy}$$

As leverage increases, the value of the tax shield (TL) increases but so does the expected cost of bankruptcy.

7.5.2 The Static Theory of Capital Structure

The theory of capital structure that we have outlined is called the static theory of capital structure. It says that firms borrow up to the point where the tax benefit from an extra dollar in debt is exactly equal to the cost that comes from the increased probability of financial distress. We call this the static theory because it assumes that the firm is fixed in terms of its assets and operations and it only considers possible changes in the debt-equity ratio. The static theory is illustrated in Figure 15, which plots the value of the firm, $V_L$, against the amount of debt, D. In Figure 15, we have drawn lines corresponding to three different stories. The first represents M&M Proposition I with no taxes. This is the horizontal line extending from $V_U$, and it indicates that the value of the firm is unaffected by its capital
structure. The second case, M&M Proposition I with corporate taxes, is represented by the upward-sloping straight line.

The third case in Figure 15 illustrates our discussion: the value of the firm rises to a maximum and then declines beyond that point. This is the picture that we get from our static theory. The maximum value of the firm, $V_L^*$, is reached at $D^*$, so this point represents the optimal amount of borrowing. Put another way, the firm’s optima capital structure is composed of $D^*/V_L^*$ in debt and $(1 - D^*/V_L^*)$ in equity.

The final thing to notice in Figure 15 is that the difference between the value of the firm in our static theory and the M&M value of the firm with taxes is the loss in value from the possibility of financial distress. Also, the difference between the static theory value of the firm and the M&M value with no taxes is the gain from leverage, net of distress costs.

**Figure 15 Optimal Capital Structure**