Capital Structure

7

The capital structure of a company is the founding stone for the daily development of its operation and for an adequate planning of the business. It says in fact how many resources are available and where they come from.

In the previous chapters, it has been pointed out how the corporate capital can be financed either through debit or equity and what are the main differences between the two sources of financing.

The purpose of the chapter is to give an insight into the rationale and meaning of capital structure in terms of costs and benefits for the company. Traditional and modern theories in fact have given different answers to the issue.

The aim is to answer the questions about what is the right mix of debt and equity for a corporation, how can the riskiness be balanced through choosing appropriate leverage, and many more.

Starting with the classical theory of capital structure, and since the 1950s, with the work of Modigliani and Miller, several scientists have tried to explain the reasons behind specific choices of capital structure.

Modern theories still rely on that work, which represents a milestone in the theory of corporate finance. The bottom line is that finding the right balance between debt, and equity is crucial for the profitability of the corporation.

After studying this chapter, you will be able to answer the following questions, among others:

- What do Modigliani and Miller claim about the relevance of capital structure for cost of capital calculation?
- What is the Weighted Average Cost of Capital and how does it change when considered in the case of a levered or unlevered firm?
- What is the role of taxation in the choice of the right level of debt?
- How does the payout policy of the company impact on the cost of capital?
- What are the other main theories of capital structure and how do they differ from the Modigliani–Miller theorems?

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The first section of the chapter focuses on the Modigliani–Miller theorems and their applicability to the calculation of the cost of capital. The second section is devoted to the payout policy and its impact on the capital structure of the firm. The final section is an introduction to the other most popular theories of capital structure.

7.1 The Modigliani–Miller Theorems

Learning Outcomes

- Describe the Modigliani–Miller theoretical framework.
- Explain the irrelevance of capital structure for the value of the company.
- Learn how to calculate and use the Weighted Average Cost of Capital.

7.1.1 The Irrelevance of Capital Structure

A company can raise funding from either equity or debt sources or combinations of both. The money represents the capital, raised from stockholders (its equity) and funds borrowed (its debt).

The left side of the balance sheet lists the firm's assets, and the right side describes the firm's capital. The relative proportions of debt, equity, and other securities that a firm has outstanding constitute its capital structure.

The work of Modigliani and Miller (MM) (1958, 1963), revised by Stiglitz in 1969, results in two propositions about optimal corporate capital structure. The first proposition relates to the invariance of firm value to its capital structure, and the other concerns its invariance to dividend policy.

They issued the first proposition as an answer to the classical theories of capital structure, which did not take into account the risk associated with differentiating the capital sources. After receiving criticism for it, they also issued the second proposition, in order to justify their findings in light of the received criticisms.

The first proposition states that the choice between debt and equity to finance some level of investments is not relevant. The value of the firm is not affected by the debt-equity mix, and there is no optimal leverage ratio.

In the second proposition, the authors state that under the same conditions as for the first proposition, the dividend policy is irrelevant in terms of the value of the firm, which is not affected.

It is clear that both theorems were acclaimed for carrying surprising results known in economics as irrelevance propositions. The MM theorems made a revolution in the theory of corporate finance.

Both propositions in fact state the irrelevance of capital structure choices that would at first glance sound very important for the value of the firm. Such a result is

important not just because it shows that the specified choice is truly irrelevant but also because it pushes to understand under what circumstances it is relevant.

The theorems stand as a benchmark for the capital structure choice. When concepts like optimal leverage and optimal payout ratio enter into play, it is always important to understand why in the specific case the MM theorems do not apply and detect the assumption or the set of assumptions that took us away from the benchmark case.

Merton Miller himself in the late 1980s said that the main message of MM theory is that "the view that capital structure is literally irrelevant or that 'nothing matters' in corporate finance, though still sometimes attributed to us (and tracing perhaps to the very provocative way we made our point), is far from what we ever actually said about the real world applications of our theoretical propositions.

Looking back now, perhaps we should have put more emphasis on the other, more upbeat side of the 'nothing matters' coin: showing how what doesn't matter can also show, by implication, what does."

In order to understand this point, one should recall that the MM result is obtained under very strict assumptions, like absence of taxes and liquidation costs, perfect financial markets, free of frictions, and information asymmetry.

The value of the company is given by the present value of its cash flows, where the discount rate is the required return for firms of the same "risk class." Therefore, the firm's value is determined by its cash flows and discount rate and totally independent from the composition of the liabilities used to finance those assets.

As a consequence of the theorem, the average cost of capital does not depend on the level of leverage and its structure. The return simply matches the equivalent demanded by investors for investments of the same risk class.

Debt is in fact cheaper than equity on average, in that it does not include the risk premium. However, the average cost of capital is not reduced because adding debt to the capital structure increases the risk, therefore increasing the cost of equity too and leaving the balance unchanged.

The separation theorem then comes into force, stating that the investment decision part can be totally separated from the financing issue. The investment decisions should aim at value maximization only.

The cost of capital to be used in rational investment decisions is its total cost, as measured by the required rate of return on fully equity-financed firms of the same risk level.

Starting from the MM work, the following decades have seen the focus of research on corporate finance switched on progressively relaxing the above assumptions. For example, it was straightforward to include taxation in the model, given that debt is normally treated preferentially compared to equity in terms of taxes.

The so-called tax shield is the benefit to the debt holder coming from holding a large amount of debt, due to tax advantages. The relief is given by a shield giving benefits to the payer of interests on a loan.

The first adjustments to the theory were done by the authors themselves, by refining the basic foundation and finding a path for inclusion of the issues related to taxation, market imperfections, and transaction costs.

The conclusions of MM have been therefore revised and opposed in the last years, especially due to the empirical evidence of the high growth potential of American firms, due to higher leverage.

Some other scientists worked specifically on relaxing the taxation assumption by introducing the cost of bankruptcy as a downturn of high leverage, therefore offsetting the benefits of the tax shield.

The modern theory of debt states that the benefits of the tax shield are balanced by the presence of bankruptcy costs. The curve generated by the balance of the two has an interior optimum.

The optimal point represents the amount of leverage that maximizes the value of the firm, corresponding to the point where the marginal benefit from tax shield equates the marginal cost from the increased likelihood of bankruptcy.

The last assumption to be relaxed has been the third one, related to the frictions in the market, that are assumed to be absent in the MM framework. The most widely analyzed friction comes from asymmetric information in the form of adverse selection and moral hazard between investors and company managers.

The introduction of asymmetric information into the bunch of realistic assumptions has been crucial and the focus of most corporate finance research in the last decades, at both the theoretical and empirical level.

In relationship to that, there has also been a huge work on clarifying the issues related to the different incentive properties of the various financial instruments that firms can issue to finance their investment.

The first MM theorem states that, if the firm's total return is not affected by the corporate financial decisions, and borrowing terms are the same for investors and companies, then in equilibrium the firm's debt-equity ratio does not affect the corporate value.

The proof of just a statement relies on the cash flows analysis. Consider two firms, A and B, both having earnings represented by a random variable \$. Define:

- V_A: Total value of firm A
- V_B: Total value of firm B
- E_A: Market value of equity in firm A
- E_B: Market value of equity in firm B
- D_A: Market value of bonds in firm A
- D_B: Market value of bonds in firm B
- r_D: Interest rate paid to the debt holders by firm B

Assume that company A is fully equity financed. The first obvious relationship is that the total value of each firm is equal to the sum of debt and equity capital, as defined by

$$V_A = E_A$$

and

$$V_B = E_B + D_B$$

Assuming all profits I are distributed to shareholders, the investors in company A get a total payment of

$$I_A = I$$

and the shareholders of company B get

$$I_B = I - r_D D_B$$

where:

$r_D D_B$ is the part of income that goes to repay the debt.

In order to prove the theorem, consider the case of a deviation from it, with levered firm B having a higher value, so that $V_B > V_A$. If an investor initially owns a share α of firm B, the return from such an investment is

$$\alpha(I - r_D D_B)$$

Assume the investor holding the above portfolio decides to borrow an amount αD_B and uses the proceedings to buy a fraction of equity of firm A equal to

$$\frac{\alpha(E_B + D_B)}{E_A}$$

Such a new portfolio generates a cash flow equal to

$$\frac{\alpha(E_B + D_B)}{E_A} I - \alpha r_D D_B = \alpha\left(\frac{V_B}{V_A} I - r_D D_B\right) > \alpha(I - r_D D_B)$$

The result is obviously a contradiction.

In order to complete the proof, the opposite case of $V_A > V_B$ must also be analyzed. Starting from an investor owning a fraction α of the equity of firm A, the cost of the portfolio is

$$\alpha V_A$$

and the return is

$$\alpha I$$

The investor can leverage his position by buying a fraction

$$\frac{\alpha V_B E_B}{V_A}$$

of firm B, and a quantity

$$\frac{\alpha V_A D_B}{V_B}$$

of bonds. This replicates the capital structure of a leveraged firm and costs

$$\frac{\alpha V_A E_B}{V_B} + \frac{\alpha V_A D_B}{V_B} = \frac{\alpha V_A V_B}{V_B} = \alpha V_A$$

The return guaranteed by the newly formed portfolio is

$$\frac{\alpha V_A}{V_B}(I - r_D D_B) + \frac{\alpha V_A r_D D_B}{V_B} = \frac{\alpha V_A I}{V_B} > \alpha I$$

The comparison of cost and return shows that the investor is able to make a higher return at the same cost, by choosing to leverage his position. This is again a contradiction which proves the MM theorem 1.

After issuing the proposition together with Modigliani, Miller later argued that debate on the theorem was controversial, given the lack of understanding of the limitations and validity of the model.

In order to make the model more realistic, Modigliani and Miller (1963) later modified their model by relaxing one of the assumptions. According to them, taxation was the primary reason for the capital structure to actually matter in reality.

They support this deviation from their own theory claiming that leverage does matter because interests on debt may be deducted from the firm's income and thereby reduce the net taxable earnings.

The tax savings represent an advantage in using debt capital instead of equity capital, reducing the overall cost of capital to the firm. The effect of taxation can be graphically illustrated as in Fig. 7.1.

7.1.2 The Weighted Average Cost of Capital

Calculation of a discount rate can be usually done in several ways. When it comes to the cost of capital, a common strategy is to use the method of Weighted Average Cost of Capital (WACC).

The WACC equation gives an average discount rate for the cash flows of the firm. It can be expressed as the weighted average of the cost of equity and the cost of debt based on the proportion of debt and equity in the company's capital structure

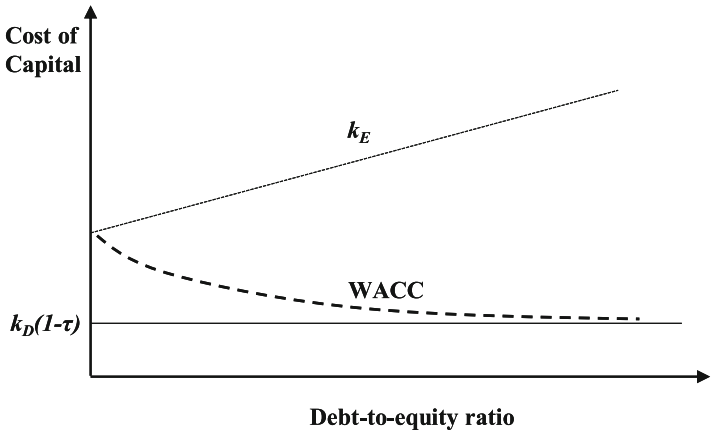

Fig. 7.1 The WACC can be represented as a weighted average of cost of equity and cost of debt

$$r_{\text{WACC}} = r_E\left(\frac{E}{V}\right) + r_D\left(\frac{D}{V}\right)$$

where:

V is the firm's total value.

$\frac{D}{V}$ is the proportion of debt (leverage ratio).

$\frac{E}{V}$ is the proportion of equity.

The WACC varies according to the variations of the debt-to-equity ratio. Given the model, both the cost of equity and cost of debt vary according to the capital mix, with the cost of debt increasing for higher levels of leverage, and the cost of equity increasing too due to the higher riskiness of capital due to high leverage.

The costs of debt and equity track each other because equity holders are always taking more risk than debt holders and therefore require a premium return above that of debt holders.

The WACC equation shows that the overall cost of capital of the firm is given by the weighted average of its debt and equity costs, as from the initial assumption. However, in its simplest form, it does not take into account the effect of tax relief of interest payments on debt.

The firm can in fact benefit from a tax shield which is given by the savings made on taxes by paying the interests on the loan to the bank or the yield on the bond. It turns out that the debt part of the cost of capital is affected by the relief (see Fig. 7.2).

It is then possible to calculate the cost of capital of the firm's assets by computing the weighted average of the firm's equity and debt cost of capital and also including the tax shield effect. The equation can be written as

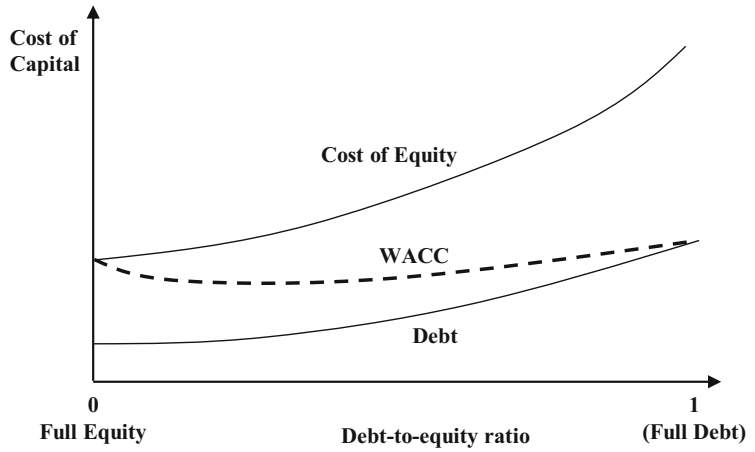

Fig. 7.2 The graph shows the WACC line as a result of combining the cost of equity and cost of debt in different proportions without tax effects

$$r_{\text{WACC}} = r_E\left(\frac{E}{V}\right) + r_D\left(\frac{D}{V}\right)(1 - \tau_C)$$

where:

τ_C is the effective marginal corporate tax rate.

Example 7.1 The equity of a company Z is valued €31,200 million, and the debt has a value of €7350 million. The total value is

$$31,200 + 7350 = €38,550$$

Given a cost of equity of 13.25%, a cost of debt of 6.5% and a tax rate of 33%, the corresponding WACC is

$$r_{\text{WACC}} = 0.1325\left(\frac{31,200}{38,550}\right) + 0.0655\left(\frac{7350}{38,550}\right)(1 - 0.33) = 11.56\%$$

When the cost of equity is not directly available, it is sometimes necessary to calculate it by using the CAPM formula.

Example 7.2 A company as a capital structure consisting of a 35% debt and 65% equity. The tax rate is 33% and the cost of debt for the company is 6%. The risk-free rate in the economy is 2%, and the beta of the company stock is 1.1. The risk premium calculated on the market is 7%. It is possible to use the parameters to calculate the WACC as

$$r_E = 0.02 + 1.1(0.07) = 9.70\%$$

The WACC is therefore

$$r_{\text{WACC}} = 0.0977 \times (0.65) + 0.06 \times (0.35)(1 - 0.33) = 7.76\%$$

Actual values of WACC for companies vary widely. It is not uncommon for WACCs to range from 3 to 4% up to 20% or more. Various websites provide WACC estimates for publicly traded companies.

One of the main controversies of WACC application is that the rate is calculated without any time dependence factor, as a static measure valid at an instant in time, but it is then used to model the time value of money.

Another problem is that while it may accurately reflect what a company believes its cost of money is at the current time, the dynamics of the broader economy and the company's capital structure change with time.

The WACC is therefore not static, but dynamic in time, for several reasons. First of all, the company debt ratio changes over time, with only few companies adopting a policy of fixed debt ratio.

Moreover, both the cost of equity and cost of debt may change over time, with a tax rate correlated to the profitability of the company, with some companies getting different breaks due to their location.

It is important to calculate the WACC for a future period of time, even if it is a very difficult task. The standard assumption of constant WACC in the future could in fact lead to severe mistakes in the calculation of the firm's value.

Several factors determine the WACC for every specific company, given the industrial sector of operations. Some industries become so mature that the investors in companies of that sector demand lower risk premiums.

Also, the situation of the global economy affects the cost of debt, through the level of interest rates in the economy. The dynamics also involves the debt ratio, which will vary according to the ability of the firm to reduce their risk, therefore taking on large shares of debt. Finally, the corporate tax rate will change because the company becomes profitable and the expiration of tax breaks granted by local and national governments.

Practical solutions to make the WACC dynamic are to look at the inputs from a dynamic point of view. For example, the trends over time in the cost of debt can be modelled with a yield curve, and the cost of equity can be modelled using a CAPM model with a beta trending over time.

The bottom line is that the WACC is basically a probability distribution given that all the parameters affecting it are probability distributions. The appropriate distribution can be estimated through numerical simulations, including Monte Carlo. In addition, the WACC is a nonstationary process.

The overall corporate cost of capital is determined by each component of the firm's capital. Financial managers take into account the impact of all types of capital which represent a cost to the firm.

Investors who put money in the stock and bonds of a company are locking money that could be used elsewhere. The expected return from those alternative investments constitutes an opportunity cost to them.

The corporate cost of capital should be calculated as a mix of the cost of different sources of capital. The most common way is to calculate a Weighted Average Cost of Capital, defined as the weighted average of equity and debt cost of capital.

The weights are represented by the proportions of debt and equity in the firm's capital mix. It is then possible to calculate the weights just by looking at the right-hand side of the balance sheet.

But an important modification must be made to it, because the real proportions are not given by the book values. The calculation involves the market values of the debt and equity. Proportions are then determined by using those proportions.

Recall that the book values in fact reflect historical costs, as opposed to market values, which are forward-looking and based on the cash flows that the assets are expected to produce in the future.

The investors value a company not for its book value but for the value assigned by other investors to it, due to market conditions and available information. Of course, the market value balance sheet must still balance.

Therefore, the total market value of the firm's assets must equate the market value of the firm claims (debt and equity). This equality clearly confirms that the equity and debt issued by the firm derive their value from the underlying assets they claim.

As a consequence, the risk and required return of debt and equity are determined by the risk of the firm assets they employ. The WACC derivation is based on this important concept.

In order to derive the WACC, a good approach is to consider two different financing scenarios of a firm with debt and without debt. This allows to understand the use of market value weights.

If the firm has no debt, therefore fully financed with equity, all the free cash flows are paid to equity. The free cash flows to the equity are the same as those from the assets so that according to the valuation principle, the market value, risk, and cost of capital for the firm's equity are equal to the corresponding amounts for its assets.

In the case of full equity financing, it is then possible to calculate the cost of capital by simply applying the CAPM and estimate the cost of equity, which in turn is the cost of capital for the firm as a whole. For example, both Cisco and Apple do not issue debt, so the cost of capital for Cisco's or Apple's assets is the same as the firms' costs of equity.

In the case of a firm issuing debt, on the other hand, the issue is about how to incorporate the cost of debt in the calculation of the overall cost of capital of the firm as a whole.

In order to do so, recall the market value balance sheet, and consider the leveraged firm and a corresponding replicating portfolio of the firm's debt and equity. Holding the portfolio is the same as holding the firm's debt and equity.

Holding that portfolio yields the same cash flows as those generated by holding the firm's assets directly. Recall that the return of a portfolio is given by the weighted average of the returns of the securities in it. It follows that the relationship between the required returns (costs) of equity, debt, and assets is given by the WACC.

The WACC is driven by the risk of a company's line of business and, because of the tax effect of interest, its leverage. As a result, WACCs vary widely across industries and companies.

When estimating WACC in practice, financial managers have to face some issues. For example, in some cases, the weights are calculated by using an adjusted value for the debt part. Many practitioners now use net debt, the total debt outstanding minus any cash balances as defined by

$$D_N = D - S_{\text{RF}}$$

where:

D_{NET} is the net debt.

D is the debt.

S_{RF} is the cash and risk-free securities.

The reason to subtract cash from debt is that, assuming interest is paid and earned on both, the two cash flows will offset each other, just as if the firm held no cash and no debt. In fact, we can view cash as being equivalent to negative debt.

When the firm has a huge amount of excess cash on its balance, assessing the risk and cost of capital of the asset employed in some line of business is complicated. Separating the debt from any cash holdings therefore requires measuring the leverage of the firm in terms of its net debt and measuring the market value of a firm's business assets using its enterprise value.

The sum of the market value of the equity of a company plus its net debt is called enterprise value. It can be used to calculate the WACC through a new equation with weights given by

$\frac{E}{V_E}$ and $\frac{D_N}{V_E}$ where:

$V_E = E + D_N$ is the enterprise value of the equity.

The adjustment is very important for companies that have a large excess of cash reserves; otherwise it will not change much the WACC estimate for companies with low levels of cash.

Back to the use of CAPM for estimating the cost of equity, recall that the model involves the risk-free rate in the calculation. It is usually determined using the yields of governmental securities like US Treasury securities, which are free from default risk.

The main issue is about the time horizon to use and which maturity should be observed. Following the rules of CAPM, one should use the risk-free interest corresponding to the investment horizon of the firm's investors. This is why, when it comes to valuing companies, usually the chosen maturities are very long, ranging from 10 years to 30 years.

Another important piece of the CAPM equation is the market risk premium, which can be estimated in several ways. One way is to look at historical data, but being interested in the future market risk premium, there is an issue regarding accuracy and the amount of data we use.

In fact, even if a large amount of data ensures statistical accuracy, going backward for a too long period of time may include data that are very old and that may have little relevance for investors' expectations of the market risk premium today.

7.2 Payout Policy

Learning Outcomes

- Understand the role of dividends in the capital structure.
- Understand the role of share repurchase in the capital structure.
- Learn how to reconsider the Modigliani–Miller framework.

7.2.1 Dividends vs. Share Repurchase

Dividends are distributions of a share of the earning made by the company, to some class of shareholders. The dividend payment is decided by the board of directors and can be issued as cash payments, as shares of stock, or other property.

There are two ways to quote a dividend of a company. It can be either quoted in terms of the actual amount of money received by the shareholders (dividend per share) or can be quoted as a percentage of the current market price of the share (dividend yield).

Dividends are commonly paid out every 3 months and give stockholders a steady return, regardless of what happens to the stock price. It is a cash return of substantial importance for the investors.

Another way to employ the company's earnings is through retained earnings, so keeping them in the equity of the company. Also, it is possible for the company to use net profits to repurchase their own shares in the open markets in a share buyback.

Both dividends and share repurchases are payout policies that do not change the fundamental value of the outstanding shares. Dividend must be approved by the shareholders and may be structured as a one-time special dividend or as an ongoing cash flow to owners and investors.

The expected dividends are a variable of interest in determining the value of the corporate shares. Besides being a cash inflow for the shareholders, they provide information about the profitability of the company.

Retained earnings stay in the company in the form of equity, therefore altering the capital structure of the firm. This is why the dividend policy can impact on the external financing requirements of the firm.

So if the firm needs to raise capital, the amount to be raised from external sources will be higher, for larger cash dividend paid to the shareholders. The company will then have to borrow debt or issue new shares.

The issue and payment of dividends follow a very specific procedure that can be summarized in several steps. The decision about issuing dividends is made by the board of directors at quarterly or semiannual meetings.

The dividend decision is based on the past financial performance and on the future outlook on the profitability. Moreover, recent dividend payments are taken into account for the decision. The payment date of the cash dividend, if one is declared, must also be established.

The dividend policy of the firm sets the amount of dividend and other important decisions. The management of the company can change the policy on the basis of significant changes in earnings.

The decision of issuing a dividend is commonly followed by a statement indicating the information related to the decision and the execution of it. It therefore reports the record date and payment date. The statement is usually published on major financial magazines.

The record date is the time when existing shareholders at that time are recorded to receive the dividend. The recorded shareholders are called holders of record and are eligible to receive the dividend payment at a specified future time.

The trading of a stock on the financial market involves bookkeeping which is time consuming. It takes some time to register the purchase of a stock, and that is why the stock begins selling ex dividend in 2 days prior to the date of record.

Purchasers of a stock selling ex dividend do not receive the current dividend.

A simple way to determine the first day on which the stock sells ex dividend is to subtract 2 days from the date of record.

In case of a weekend, 4 days must be subtracted instead. In normal market conditions, the price of the stock in ex dividend days is expected to drop by the amount of the dividend, as declared.

After the record date, the management also sets a payment date, when the firm is supposed to send the dividend payments to the holders of record. It normally takes a few weeks after the record date for it.

Many companies nowadays offer to the shareholder dividend reinvestment plans, a policy that allows the shareholder to purchase additional shares using the proceedings from the dividend.

The advantage is that the purchase can even be fractional and there are no transaction costs involved (or they are very small). Some companies even allow investors to make their initial purchases of the firm's stock directly without the need of a broker.

There is usually a small discount on the market price, when buying shares through a dividend reinvestment plan. It is also a cheaper way to issue new shares, avoiding the typical issues of a public sale. Clearly, the existence of a DRIP may enhance the market appeal of a firm's shares.

The dividend policy is a plan of action, and the management follows it after the decision about issuing dividends is made. The policies developed by the companies are logically consistent with their corporate goals.

The factors affecting a dividend policy can be legal, contractual, internal, and economical (related to the firm's growth potential). There are also issues related to the market and the shareholders.

Legal constraints are those related to the current regulation in the country of the firm. For example, it is a widely developed principle that a company cannot pay out as dividends any portion of its legal capital.

Legal capital is generally defined as the par value of the common stocks, but the definition changes geographically. Some countries include in the legal capital also paid in capital beyond the par value. These capital impairment restrictions are generally established to provide a sufficient equity base to protect creditors' claims.

Sometimes there are limitations on the earnings required to issue a certain amount of dividends, which must be adequately high. The firm is not allowed to pay out dividend amounts beyond the sum of recent retained earnings.

Other regulatory systems prohibit the payment of cash dividends in case the company is not solvent, with overdue liabilities in the record. On the other hand, some authorities also punish an excessive accumulation of earnings, usually meant at reducing the shareholders' taxation.

As mentioned above, there are also contractual constraints to the dividend payment. Generally, these constraints allow the firm to pay cash dividends only when a certain level of earnings has been achieved. It could be also the case that dividends are limited to a certain dollar amount or percentage of earnings.

There are also internal constraints, mainly due to the amount of liquid assets available to the firm at the time of dividend issue. In fact, it is possible for a company to borrow funds to pay dividends, but the lenders are not keen to give this type of loan in that they are not productive, making the loan itself very risky.

The dividend policy must be designed in order to take into account two major issues. First of all, there must be sufficient funds, and secondarily the dividends must be such to give sufficient financing and maximizing the wealth of the firm's owners.

As mentioned above, several dividend policies can be applied, and in some cases, the policy is customized so as to contain one or more element from each of the following policies.

The constant-payout-ratio dividend policy implies there is a constant-payout-ratio in the dividend policy of the firm. It means that the firm pays out to the shareholders a constant percentage of each euro earned.

The ratio is calculated by dividing the cash dividend per share by earnings per share. A constant-payout-ratio dividend policy means that the firm establishes a certain percentage payment on earnings to the shareholders in each dividend period.

This policy has a downturn related to the fluctuation of earnings overtime. It could happen in fact that the dividends may become very low or null. Given the signaling effect of dividends, the firm's stock price may thus be adversely affected.

Another popular dividend policy is the so-called regular dividend policy, which is based on the payment of a fixed-dollar dividend in each period. The shareholders

usually get positive information from that policy, thereby minimizing their uncertainty.

This policy is subject to changes, and the amount of the regular dividend is usually increased when there is a stable and proven increase in earnings. The opposite in general never happens and dividends are not decreased.

The dividend following a regular payment policy is often built around a target dividend-payout ratio. The dividend is set at a target ratio and kept regular at the beginning. If any fluctuation occurs, the ratio is adjusted to the target payout.

Some companies adopt a policy on a low-regular-and-extra basis, thus paying a regular dividend, and attaching an extra dividend to it in times of increased earnings. This policy allows to always be realistic and avoid making unreliable promises to the shareholders. This policy is especially common among companies that experience cyclical shifts in earnings.

Having a regular dividend, even of a low amount, is useful for the company to gain the confidence of the shareholders. On top of that the extra dividend allows the shareholder to share the benefits of good business cycles.

The companies adopting such a policy usually are entitled to pay out the extra dividend only if and when earnings are proven to increase. The use of a target dividend-payout ratio in establishing the regular dividend level is advisable.

Finally, it is important to also analyze the stock split strategy. It is a strategy commonly used to lower the market price of some stock, by increasing the number of shares belonging to each shareholder.

The most common type of stock split is the 2-for-1 split, where two new shares are exchanged for each old share. Each new share is worth half the value of each old share. As for dividends, a stock split has no effect on the firm's capital structure.

The reason for a stock split is usually related to the perception that a stock is priced too high and that lowering the market price will enhance trading activity, making the investors more attracted to it.

The right moment for a stock split is generally right before issuing new stocks, in that the marketability is enhanced and the market gets properly stimulated. Sometimes stock splits generate a small increase in the stock price, given the information implied in it and the general increased in dividend payments after a split. Stock can be split in any way desired. Sometimes a reverse stock split is made: a certain number of outstanding shares are exchanged for one new share.

The practice of share repurchase has gained popularity and increased application in recent years. A company can in fact buy back its own shares on the market, thus reducing the number of shares outstanding.

There are several reasons behind the choice of repurchasing own shares, mostly related to having shares available for employee stock option plans and retiring shares. Stock repurchases enhance shareholder value and help to discourage an unfriendly takeover.

The value for the existing shareholder is enhanced in that the number of shares outstanding is reduced, therefore increasing the earnings per share. Moreover, the strategy sends a positive signal to investors (undervalued share). It also provides a temporary floor for the stock price, when declining for some reason.

As a tool for preventing and discouraging hostile takeovers, the share repurchase is based on the belief that a hostile investor is less likely to gain control of the firm if there are fewer publicly traded shares available.

As a signal, the decision of repurchasing shares shows the confidence of the management in the profitability of the company, therefore attracting the interest of investors on the market.

If the retained earnings are constant, the share repurchase decreases the amount of outstanding shares, thus positively affecting the earnings per share and the market price per share.

The repurchase of common stock results in a type of reverse dilution, because the EPS and the market price of stock are increased by reducing the number of shares outstanding. The net effect of the repurchase is similar to the payment of a cash dividend.

There are also tax benefits for shareholders, given that if no dividend is distributed, there is no ordinary income tax to be paid on it. The repurchase instead increases the market value of the share of an amount equal to the dividend not paid, and the value increase is not taxed until the shareholder sells the stock on the market.

Also when the stock is sold, the capital gain taxation on it is usually much more favorable than the taxation on dividends. However, the monitoring authorities in some countries are supposed to issue a penalty when it is believed repurchases have been made to delay the payment of taxes by stockholders.

From an accounting point of view, the stock repurchase reduces the cash and adds up an entry on the other side of the book, commonly named treasury stock, which is shown as a deduction from stockholders' equity.

The process of repurchasing share involves informing the shareholders about the intention of the management. In particular, the purpose of the repurchase should be communicated, as well as the use to be made of the repurchased shares.

There are commonly three methods of repurchase that can be used. One method is the purchase of the stocks on the open market, which puts pressure on the price to increase, when the quantity repurchased is reasonably large in comparison with the total number outstanding.

Another method is the tender offer, which is a formal proposal of purchase at a specified price, issued to the shareholders. The price at which a tender offer is made is normally set above the current market price to attract sellers.

Sometimes, in case the tender offer does not allow to buy back the full amount of shares desired, the two methods can be complemented, and the additional shares can be bought on open market.

Tender offers are preferred when large numbers of shares are repurchased, because the company's intentions are clearly stated and each stockholder has an opportunity to sell shares at the tendered price.

A third method is through negotiation of large blocks of shares between major shareholders. The firm in this case must make sure that the purchase price is fair and equitable in view of the interests and opportunities of the remaining shareholders.

7.2.2 Modigliani–Miller Revisited

Under the assumptions of homogeneous expectations and perfect market, the Miller and Modigliani (MM) dividend irrelevancy proposition asserts.

While dividends are relevant, the dividend policy is irrelevant. The proof of just a statement relies on the cash flows analysis. Consider again two firms, A and B, both having earnings represented by a random variable I. Define:

- d_t: dividend at time t
- D_t: borrowings of the firm at time t
- L: investment at time 1
- I_1: returns at time 1
- I_2: returns at time 2

Following the logic of the above proof of the MM theorem, suppose that the total return I of a firm is unaffected by financial decisions, and buying and selling of securities happen at the same terms for all investors.

First of all, the sum of the borrowing at time 1 and the returns at time 1 must be equal to the sum of the dividends at time 1 and the investment at time 1, as from

$$I_1 + D_1 = d_1 + L$$

or

$$D_1 = d_1 + L - I_1$$

The returns at time 2 are given by the sum of the dividend at time 2, and the amount borrowed at time 1 increased of the interest at the risk-free rate r, as defined by

$$I_2 = d_2 + D_1(1 + r)$$

where the amount of dividends at time 2 is given by

$$d_2 = I_2 - (d_1 + L - I_1)(1 + r) \tag{7.1}$$

Consider an investor owning a share α of the equity. The budget constraint of the investor is given by

$$c_1 + = \frac{c_2}{(1 + r)} = e_1 + \alpha d_1 + \frac{e_2}{(1 + r)} + \alpha \frac{d_2}{(1 + r)} \tag{7.2}$$

where:

c_1 is the consumption at time 1.
c_2 is the consumption at time 2.
e_1 is other income at time 1.
e_2 is other income at time 2.

By substituting from 7.1 into 7.2, one obtains

$$c_1+ = \frac{c_2}{(1+r)} = e_1 + \alpha d_1 + \frac{e_2}{(1+r)} + \alpha \frac{I_2 - (d_1 + L - I_1)(1+r)}{(1+r)}$$

which can be rewritten as

$$c_1+ = \frac{c_2}{(1+r)} = e_1 + \alpha d_1 + \frac{e_2}{(1+r)} + \alpha \frac{I_2}{(1+r)} - \alpha \frac{(d_1 + L)(1+r)}{(1+r)} + \alpha \frac{I_1(1+r)}{(1+r)}$$

It follows that

$$c_1+ = \frac{c_2}{(1+r)} = e_1 + \frac{e_2}{(1+r)} + \alpha \frac{I_2}{(1+r)} + \alpha I_2 - \alpha L$$

The result shows that the shareholder's budget constraint is independent of the dividend, since neither d_1 or d_2 appear in the final formula. Therefore the consumption is totally independent of dividend policy.

Example 7.3 Suppose a firm has 100,000 shares of stock and cash flow of €100,000 in perpetuity. The discount rate is 10%. Three dividend policies are possible.

– The first policy is to pay €10 dividend per year. In this case the stock price should be

$$P_0 = \frac{10}{0.1} = €100$$

– Another policy is to pay a €20 dividend in the next period and the remainder afterward. To do this, the company must go on a debt of €100,000, thus paying a passive interest of

$$P_0 = \frac{20}{(1+0.10)} + \frac{10}{(1+0.10)} \times \frac{0.90}{0.10} = €100$$

– A final option is to pay each shareholder 1 share of stock today so that the firm has 20,000 shares outstanding, each giving the right for €5 dividend. It follows that

$$P_0 = \frac{5}{0.10} = €50$$

Since all existing shareholders have now double number of shares, their total wealth remains unchanged also in this last case.

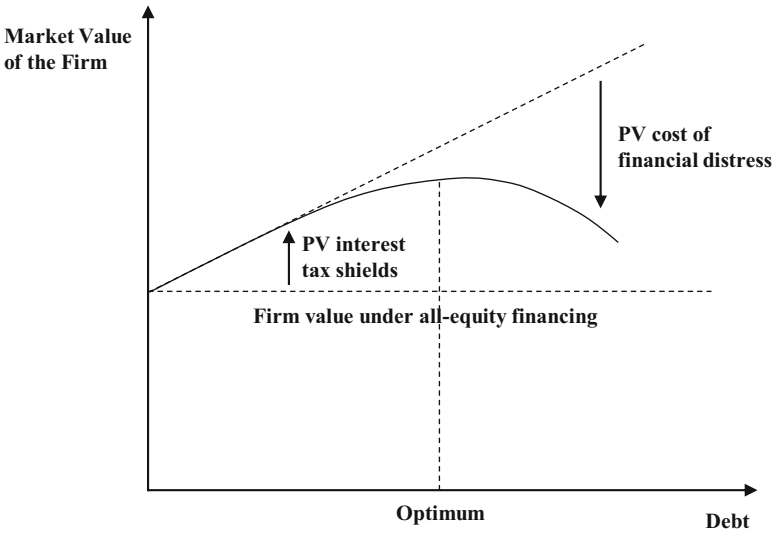

Fig. 7.3 The static trade-off theory predicts an optimal target over which the actual debt ration reverts. The optimum is derived from the interest tax shields and the costs of financial distress

7.3 Modern Theories of Capital Structure

Learning Outcomes

- Learn the static trade-off theory of capital structure and the pecking order hypothesis.
- Learn how to calculate the adjusted present value of an investment.
- Understand the role of taxes in the theory of capital structure.

7.3.1 Static Trade-Off Theory and the Pecking Order Hypothesis

The static trade-off theory was developed by Myers in 1984 and 2001, and focuses on the debt ratio of the firm. In particular, it states that there is an optimal target debt-to-value ratio and the firm's capital structure is gradually moving toward the optimum.

In order to determine the optimal level of debt to include in the capital structure, one must consider the balance between the tax shield advantage and the disadvantage coming from the bankruptcy costs (see Fig. 7.3).

The equilibrium corresponds to an optimum where the marginal benefit of an additional dollar of debt balances the marginal cost for it. For levels of debt above the optimal point, the bankruptcy costs will prevail. The theory can be illustrated by using a graph.

Some authors, like van der Wijst and Thurik (1993), argue that several factors affect the tax effect on the profitability of the firm. First of all, there are other non-debt tax shields, such as depreciation deduction, tax loss carry-forward, and investment tax credits, that can substitute efficiently the tax shield from leveraging.

Moreover, there is an offset effect of personal taxes on the interest of debt, when the tax on fixed income earnings is higher than the income from equity holdings, as described by Miller in 1977.

Third, different tax regimes can generate differences in investors' preferences. In countries with lower tax rates applying to capital gains than to dividends, investors prefer capital gains to stock ownership.

Tax shield interest generally creates incentive for corporate leveraging, and in case there are no costs offsetting the benefit of the tax shield, the debt will be used at its maximum level.

The reality is of course different. Standard borrowing of funds carries bankruptcy costs that are not avoidable. Therefore, the static theory claim that there is an optimal level of debt makes sense.

It is also useful to understand what these bankruptcy costs are and how they can impact on the choice of leveraging. They are all the costs that are added when the company goes bankrupt, and the failure is being processed, with the firm not changing its operating or external financing activities (Haley and Schall 1979).

The costs of bankruptcy can be divided in direct costs and indirect costs. The former category refers to all legal and administrative costs, plus the cost of negotiation with the stakeholders.

The indirect costs can arise from the imperfection of secondary markets or opportunity loss, such as decline in market share and distress sales. Investors react negatively to the hypothesis of financial distress, and the stock price goes down. Moreover, the benefits generated from tax advantage can be cancelled out by the increasing debt levels.

The pecking order hypothesis was first introduced by Myers and Majluf in 1984. The theory states that companies choose internal funds preferentially, up to some amount of internal funds available for investment.

If the investment needs exceed the threshold, the company raises the funds as debt, to fill the remaining part. Debt finance is then prioritized to equity finance, and equity finance will be used only when the investment exceeds beyond a further threshold, equal to the sum of internal funds, and the debt issued to fill the financing deficit.

Some companies may decide to not use all internal available funds in order to maintain a reserve of equity for future opportunities. In this case external resources will be needed when the investment exceeds the internal fund net of the reserves to be kept.

Due to the information-sensitive equity issuances, debt is issued to fill the financing gap along with insufficient internal funds if there is no significant financial distress. Literally, firms will never issue equity and the second (higher) threshold is infinite.

Firms have to issue equity in case the investment exceeds the debt capacity, which is the sustainable leverage. In case of a cost of equity lower than the value generated by positive NPV investments, the firm will raise funds through equity issuance.

The same holds in case the NPV of the total corporate assets is above the capital gain that can be realized on the newly issued share. The asymmetric information between inside management and investors generates variance of percentage changes in equity value. The firm will issue new equity in case the investors overestimate the variance rate.

The asymmetry of information between managers and shareholders is the basis of the pecking order theory. Current shareholders have different expectations compared to new investors and tend to act to protect themselves.

Therefore, equity is the last option for financing externally due to the fact that current shareholders are not willing to share the benefits of investment or cause the decline of share prices.

The advantage of internal funding in terms of costs is given by the absence of the typical costs of external financing, which are generated by the asymmetric information and the agency costs. Thus the availability of internal funds can heavily influence the major investment decisions of the company (Cleary 1999).

The information possessed by managers is always superior to that possessed by the investors. An issuance of debt or equity is a signal to the investors that internal funding is not enough to cover new investments.

If a decision of issuing equity was released, investors would feel the stock price is overvalued. The reaction of the market will be to sell the shares, and the stock price will drop, damaging the value of firm.

The adverse selection problem caused by the asymmetry of information has been described by Akerlof in 1970. If there are both good and bad opportunities for investment, investors cannot distinguish which ones are good or bad.

This is because investors have less accurate information so that they are possibly prone to take the worse opportunities while giving up the good ones according to the average level of products.

It follows that the good investment opportunities will be underestimated and not implemented, and the adverse selection cost will hit severely on the investors that will then be penalized by investing in bad projects.

Solutions to the problem have been proposed by Healy and Palepu (2001) among others. The authors state that optimal contracts between investors and firm management should be provided for disclosure of private information.

Secondarily, regulators should take care of forcing managers to disclose the private information they have. The final provision proposed by the authors is the introduction of information intermediaries, analysts, or agencies, to reduce the information gap.

The message from the pecking order hypothesis is that the equity capital is very sensitive to the information hitting the investors and carries a large adverse selection, compared to other securities. This is why for external financing, debt is usually preferred given the lower amount of adverse selection cost.

Small firms have commonly more asymmetric information than big ones, therefore facing more severe adverse selection problems. As a consequence, they are supposed to perform better in pecking order hypothesis.

But one should consider the lower credit capacity and higher riskiness of small businesses compared to the big ones. This may lead the former to opt for equity financing and perform worse in pecking order.

There are also moral hazard aspects connected to information asymmetry. As underlined by Holmstrom in 1979, the quality of financial investments is not perceived by the investors due to lack of information.

Managers are prone to cheat or fail to make the necessary efforts, because they often fail to act in the best interest of the investors. For instance, managers can expropriate investors' funds through both issuance of debt and equity.

7.3.2 The Adjusted Present Value

The traditional NPV analysis does not take into account the implications of debt financing when valuing a project. In order to capture these aspects, it is possible to run an adjusted present value (NPV) analysis.

APV is defined as the present value of a project if financed solely by equity plus the present value of financing benefits. It stands as an alternative valuation method similar to the NPV approach.

The difference is that it uses the cost of equity as the discount rate rather than WACC. And APV includes tax shields such as those provided by deductible interests. APV analysis is effective for highly leveraged transactions.

Recall the basic NPV capital budgeting equation defined as

$$\mathrm{NPV} = \sum_{t=1}^{N} \frac{C_t}{(1 + r_{\mathrm{WACC}})^t} + \frac{\mathrm{TV}_N}{(1 + r_{\mathrm{WACC}})^N} - C_0 \tag{7.3}$$

where:

C_t is the expected after-tax cash flow for year t.
TV_T is the expected after-tax terminal value.
C_0 is the initial investment.

The NPV is the difference between the present value of all cash flows, and recall that the related rule states that a project should be accepted when its NPV is positive, and rejected otherwise. The NPV decision rule is considered the superior framework for analyzing a capital budgeting expenditure.

First of all, the NPV equation must be expanded in order to innovate the analysis. Capital budgeting is concerned with the change in the firm's total cash flows assigned to the capital expenditure.

The incremental change in the total cash flows to the firm for a period t which results from the capital project is given by

$$C_t = NI_t + D_t + I_t(1 - \tau_C) \tag{7.4}$$

where:

NI is the net income at time t.
D_t is the depreciation at time t.
I_t is the interest expense at time t.
τ_C is the corporate tax rate.

Eq. (7.4) shows that the incremental cash flow is given by the sum of three main cash flows.

Recall that depreciation is not a cash flow, and the second term of the equation adds it back to the calculation, after it was subtracted from the Nit just for tax purposes in the previous mathematical passage.

Through simple math, it is possible to rework Eq. (7.4) to obtain

$$C_t = C_t^{\text{OP}}(1 - \tau_C) + \tau_C D_t$$

where:

C_t^{OP} is the amount of operating cash flows.

It is now possible to expand the NPV model, by substituting Eq. (7.4) into (7.3), so that the NPV equation becomes

$$\text{NPV} = \sum_{t=1}^{N} \frac{C_t^{\text{OP}}(1 - \tau_C)}{(1 + r_{\text{WACC}})^t} + \sum_{t=1}^{N} \frac{(1 - \tau_C D_t)}{(1 + r_{\text{WACC}})^t} + \frac{\text{TV}_N}{(1 + r_{\text{WACC}})^N} - C_0$$

Recall that Modigliani and Miller derived a statement about the relationship between the value of a levered firm and the corresponding equivalent unlevered firm, as described by

$$V_L = V_U + \tau_C \text{DBT}_t$$

where:

DBT_t is the debt at time t.

By separating the equity part and the debt part, the final version of the APV is given by

$$\text{APV} = \sum_{t=1}^{N} \frac{C_t^{\text{OP}}(1 - \tau_C)}{(1 + r_E)^t} + \sum_{t=1}^{N} \frac{\tau_C D_t}{(1 + r_D)^t} + \sum_{t=1}^{N} \frac{\tau_C I_t}{(1 + r_D)^t} + \frac{\text{TV}_N}{(1 + r_E)^N} - C_0$$

where:

r_E is the cost of equity.
r_E is the cost of debt.

Capital budgeting through APV is a value-additivity approach that considers every source of value singularly. Cash flows are discounted at a relevant rate that is consistent with the risk inherent in that cash flow.

In particular note that the OCF_t and TV_T are discounted at the rate Ku. These cash flows in fact would reach the company from a capital project regardless of whether the firm was levered or unlevered.

The discount rate for the amount of tax shield savings, It, is the before-tax borrowing rate, *i*. There are also tax savings due to depreciation, τD_t, that should be discounted at the rate i as well, due to the relative low risk compared to operating cash flows.

The decision rule for APV is the same as for the NPV. The project should be accepted if APV ≥ 0 and rejected otherwise. A multinational company can use it to analyze one of its domestic capital expenditures.

The comparison of APV and cost of capital analysis shows that there are several important differences. In an APV valuation, the value of a levered firm is obtained by adding the net effect of debt to the unlevered firm value.

The effect of leverage is instead directly embedded in the cost of capital. The tax shield is in fact incorporated in the cost of debt, while the levered beta and pre-tax cost of debt incorporate the distress costs.

In theory the results from the two models should be equivalent, but there are differences. For example, the APV approach handles bankruptcy costs with more flexibility regarding treatment of the indirect costs.

The result from APV approach will therefore be more conservative in value estimation. Moreover, APV approach considers the tax benefit from a dollar debt value, while the cost of capital approach estimates the tax benefit from a debt ratio that may require the firm to borrow increasing amounts in the future.

7.3.3 Tax-Based Theories of Capital Structure

In order to introduce taxation in the theories of capital structure, it is necessary to make some assumptions to define the environment of a firm's operations and the ideal market for business.

The first assumption is the absence of transaction costs to buy and sell securities on the market. Moreover, there is no bid-ask spread, so the buying price is the same as the selling price.

Another assumption is perfect competition on the capital market, with firms and investors being price takers. Bankruptcy costs are absent. Also recall that in the original MM framework, there are no corporate or personal taxes. Information is homogeneous on the market.

Consider two firms, which are identical in the distribution of cash flows but have different capital structure. It is possible to examine the implications of corporate and personal taxation for optimal capital structure.

The two firms are such that U is an all-equity firm, while firm L is leveraged, and they both generate a random cash flow, X˜, whose expectation is Xˆ in each period of operations.

Compared to the abovementioned original MM work, the assumption of absence of taxation is modified, and a unique corporate tax rate for all firms, τ_C, is introduced. Moreover, personal taxes on interest income, τ_D, and on equity (dividend and capital gains), τ_E, are also included in the model.

In order to complete the set of assumptions, there is an interest rate r_0 on tax-exempt bonds and a before-tax yield r on risk-free corporate bonds. By maintaining the assumptions of the original MM model and modifying the absence of corporate taxation with the introduction of the abovementioned taxation, the new model can be defined as

$$V_L = V_U + \left[1 - \frac{(1-\tau_C)(1-\tau_E)}{1-\tau_D}\right] D$$

In order to give a proof to the above equation, consider an investor holding a fraction α of the unlevered firm U. His per-period net future cash flow is

$$\alpha I(1-\tau_C)(1-\tau_E)$$

and the value of his portfolio is αV_U.

Consider an investment strategy consisting in selling the shares in firm U and using the proceedings to buy

- A fraction α of the equity of levered firm L
- A fraction $\beta = \alpha I(1-\tau_D D)(1-\tau_C)(1-\tau_E)$ of the debt of firm L

In this way the investor uses his wealth to generate a leveraged position, which simulates the capital structure of the levered firm.

The strategy yields peculiar per-period payoffs. In particular, the payoff from equity is given by

$$\alpha I(1-\tau_D D)(1-\tau_C)(1-\tau_E)$$

and the net payoff from debt is

$$\beta r_D D(1-\tau_D)$$

Hence the total per-period net payoff of the investor is

$$\begin{aligned}
&\alpha I(1-\tau_D D)(1-\tau_C)(1-\tau_E)+\beta r_D D(1-\tau_D)\\
&=\alpha I(1-\tau_D D)(1-\tau_C)(1-\tau_E)+\frac{\alpha(1-\tau_C)(1-\tau_E)}{(1-\tau_D)} r_D D(1-\tau_D)\\
&=\alpha I(1-\tau_C)(1-\tau_E)
\end{aligned}$$

This result is equal to the payoff given by holding the fraction α of U's equity. It follows that the two investment strategies have the same payoff, and for no-arbitrage condition to hold, they should cost the same. Therefore

$$\begin{aligned}
\alpha V_U &= \alpha(V_U - D) + \beta D\\
&= \alpha(V_U - D) + \left[1 - \frac{(1-\tau_C)(1-\tau_E)}{(1-\tau_D)}\right] D
\end{aligned}$$

which corresponds to the MM third proposition, revisited for the introduction of taxation in the model. It is now possible to make several remarks on the proposition. First of all, if there are no taxes at all so that

$$\tau_C = \tau_E = \tau_D = 0$$

then

$$V_L = V_U$$

which is exactly the result of the MM proposition one.

If there are no personal taxes in the economy, then

$$\tau_E = \tau_D = 0$$

It follows that the value of the leveraged firm is given by

$$V_L = V_U + \tau_C D$$

which is exactly the result of M&M1 with corporate taxation. Therefore, the Miller's proposition can be viewed as a generalization of M&M to a world with personal taxes.

Moreover, it holds that

$$(1-\tau_C)(1-\tau_E) = (1-\tau_D) \quad \rightarrow \quad V_L = V_U$$

Recall that $(1-\tau_D)$ is the after-tax interest income on every dollar of debt, while

$$(1-\tau_C)(1-\tau_E)$$

is the after-tax income from dividends or and capital gains. When the after-tax income from debt and equity is equal to the one from debt, the condition

$(1-\tau_C)(1-\tau_E) = (1-\tau_D)$ holds. Therefore, the investors should be indifferent to the firm's capital structure meaning that the firm will have nothing to gain by using one type of securities rather than another.

A final consideration is that the Miller's proposition indirectly implies that the debt is preferred to equity if

$$(1 - \tau_D) > (1 - \tau_C)(1 - \tau_E)$$

This is a very strict relationship, which itself implies that, in case $\tau_D = \tau_E = \tau_C$ all firms would be

- All-debt if $V_L > V_U$
- All-equity financed if $V_L < V_U$

No company would therefore use a mix of equity and debt in the capital structure. In case of an all-debt firm, all the income goes to debtholders in the form of interest. Given exemption on taxability, the taxable corporate income would result to be zero. At a personal level, however, investors would have to pay a tax of τ_D per each dollar they receive, so their net payoff in this case would be $\tilde{X}(1-\tau_D)$.

In case a firm was all-equity financed, the payoff of shareholders would consist in full dividends, if all income is distributed to them, or capital gains, if the income is retained as retained earnings.

Since there are no interest payments to deduct, the taxable income of the firm would be I, and the net income to distribute to the shareholders would be

$$I(1 - \tau_C)$$

The personal tax on that income would result in a payment of

$$I(1 - \tau_C)\tau_E$$

and the net payoff would be

$$I(1 - \tau_C)(1 - \tau_E)$$

Comparing this payoff with the payoff when the firm is all-debt, $I(1 - \tau_D)$, leads to the conclusion about the capital structure of the firm.

7.4 Summary

The capital structure of the company can get complex when different types of assets belong to it. For many years, scientists and practitioners have been interrogating themselves about the rationale behind choosing some particular structure.

From the classical theory, stating that debt would decrease the capital cost, being cheaper itself, the field of valuation moved to the Modigliani–Miller theorem, asserting that capital structure is meaningless to the value of the firm.

The irrelevance of capital structure is in fact at the center of the MM work, and it carries a lot of information about the riskiness of equity and debt and the interactions among the two.

One of the inspirations of the MM work is the Weighted Average Cost of Capital, as a measure of the cost of capital that takes care of the leverage of the firm. The authors take it as an inspiration for their arguments.

The WACC calculates the cost of capital as an average of cost of equity and cost of debt, weighted by the respective proportions of the two. When taxation is taken into consideration, the shield offered by debt lowers down the cost of capital of the levered firm, which become lower than if taxes were not there.

The payout policy of the firm has a central role, and the decision of the management regarding whether to pay out dividends or not impacts on the value of the firm. Also share repurchases have an effect on it.

Modigliani and Miller revisited their theorem based on the existence of the dividends updating their conclusions, in response to the criticisms received by the other scientists about such a limitation of their model.

Other theories of capital structure are based on information and take into account the asymmetry of information on the market to justify different choices of the management for the capital structure.

Theories like the trade-off theory, the pecking order hypothesis, the adjusted present value, and the theories based on the presence of taxes are all meant to relax the assumptions of the standard MM theorem, so as to make the model structure fit the reality.

Problems

1. Tecom LTD is an all equity firm with a current market value of €750,000,000 and will be worth €600,000,000 or €900,000,000 in 1 year. The risk-free interest rate is 3%. Suppose Tecom LTD issues zero-coupon, 1-year debt with a face value of €850,000 and uses the proceeds to pay a special dividend to shareholders. Assuming perfect capital markets, use the binomial model to answer the following:
   (a) What are the payoffs of the firm's debt in 1 year?
   (b) What is the value today of the debt today?
   (c) What is the yield on the debt?
2. Given the company and the number in Exercise 1:
   (a) According to the Modigliani–Miller theory, what is the value of the equity before the dividend is paid?
   (b) What is the value of equity just after the dividend is paid?
3. Media Corp. has planned free cash flow in the coming year of €18,000,000, expected to grow at a rate of 2% per year perpetually, afterward. Media Corp. has a cost of equity of 16%, a cost of debt of 7%, and corporate tax rate of 38%. The debt to equity ratio is 0.65. What is the value of Flagstaff as an all equity firm?
4. Rina Industries is an all-equity firm with 65,000,000 shares outstanding and €180,000,000 in cash. The firm expects future free cash flows of €68,000,000 per year. Money can be used to expand the business and increase the expected

future free cash flows by 12%. The cost of capital is 10%, and capital markets are perfect. An alternative strategy is to use the €200,000,000 to repurchase shares instead of funding the expansion. If you were advising the board:
   (a) What course of action would you recommend, expansion or repurchase?
   (b) Which provides the higher stock price?
5. According to Modigliani and Miller, what is the significance of a company's capital structure? How did they come to this conclusion?
6. According to the trade-off theory:
   (a) What is traded off against what in the trade-off theory?
   (b) When is optimal capital structure reached? Be precise in your answer.
7. For each of the four characteristics below, does the trade-off theory predict that it will lead to more or less debt in optimal capital structure, other things equal?
   (a) Selling durables that need future maintenance and repair
   (b) Having very volatile earnings
8. Firms can change their capital structures with stock repurchases and with equity offerings.
   (a) What does the trade-off theory of optimal capital structure predict about the effect on the value of the firm of stock repurchases, will the value go up or down?
   (b) What does the trade-off theory of optimal capital structure predict about the effect on the value of the firm of equity offerings, will the value go up or down?
9. The trade-off theory and the pecking order theory both explain firms' capital structures as a function of firms' characteristics. The table below lists a number of empirical proxy variables that are often used to test these theories. Complete the table below by writing "+," "–," or "0" in the columns behind each variable, depending on whether the theory predicts it is associated with more (+) or less (−) debt in capital structure or 0 if the theory does not predict anything regarding this variable.

Proxy variable	Trade-off theory	Pecking order theory
Depreciation/total costs		
Return on equity		
Standard deviation of stock returns		
Fixed-to-total assets		
Market-to-book value		
R&D expenses-to-total costs		
Size (total assets)		

10. Two companies A and B have the same assets that produce the same perpetual cash flow of €10 million. Both companies have 16,000,000 shares outstanding. Company A has outstanding debt with a value of €18,000,000 and current price of shares €8, for an annual return of 11.5%. Company B has outstanding debt

with a value of €80,000,000. All debt is risk-free and the risk-free interest rate is 5%. Assume a Modigliani–Miller world without taxes.

(a) Calculate the value of the assets of company A. Use an alternative calculation to check your results.
(b) Calculate the price and return of the shares of company B. Check your results.

11. Arko LTD has generated a considerable amount of cash and it now wants to pay out €15 million of it to its shareholders. Its balance sheet is depicted below. Arko LTD has 15,000,000 shares outstanding. Assume no taxes and transaction costs.

Balance sheet of Arko LTD (€M)			
Cash	20	Debt	25
Other assets	80	Equity	75
Total	100	Total	100

(a) Calculate the value per share after Arko LTD has paid out €7,000,000 dividends to its shareholders and demonstrate that this does not affect the wealth of the shareholders.
(b) Calculate the value per share after Arko LTD has used €7,000,000 to buy back its shares and demonstrate that this does not affect the wealth of the shareholders.
(c) Describe under which circumstances the management of Arko LTD would prefer buying back shares instead of paying cash dividends.

Appendix: Risk-Adjusted Return on Capital

The risk-adjusted return on capital (RAROC) is a risk-adjusted performance measurement tool, which has become important in assessing the profitability of business units.

Generally, risk adjustments compare return with capital employed in a way to incorporate an adjustment for the risk involved in the business, therefore taking in account the fact that the metrics is affected by uncertainty. RAROC is the ratio of adjusted income over economic capital:

$$\text{RAROC} = \frac{R - C - E_L}{E_C} = \frac{A_{\text{NI}}}{E_C}$$

where:
R is the amount of revenues.
C is the amount of costs.
E_L is the expected loss.

E_C is the economic capital.

A_{NI} is the adjusted net income.

For a bank issuing a loan, the numerator of RAROC measure for that loan will look like

$A_{\text{NI}} = I - E_L - C_O$

where:

I is the financial income.

C_O is the amount of operating costs.

Assuming τ is the corporate tax rate, a step further consists in multiplying the amount obtained by $(1 - \tau)$, in order to get the post-tax RAROC measure.

A further degree of complication can be added by multiplying the economic capital by a compounding factor obtained from the risk-free rate. The amount obtained is added to the numerator of RAROC equation.

RAROC can be related to CAPM analysis in order to capture the relationship with the hurdle rate. Recall CAPM equation to be

$R_i = R_f + \beta_i(R_m - R_f)$and

$$\beta_i = \frac{\sigma_{im}}{\sigma_m^2} = \frac{\rho_{im}\sigma_i\sigma_m}{\sigma_m^2} = \frac{\rho_{im}\sigma_i}{\sigma_m}$$

The CAPM equation becomes

$R_i = R_f + \frac{\rho_{im}\sigma_i}{\sigma_m}\left(R_m - R_f\right)$ from which

$R_i - R_f = \frac{\rho_{im}\sigma_i}{\sigma_m}\left(R_m - R_f\right)$ and

$\frac{R_i - R_f}{\rho_{im}\sigma_i} = \frac{R_m - R_f}{\sigma_m}$

The equation sets an important equivalence for the asset i in the portfolio. The left-hand side is the RAROC of the asset, while the right-hand side is the hurdle rate on the asset. The two are equal.

Case Study: Capital Structure

Payoux Ltd

The Case

A company shows the following financial information:

- FCFF for next year = 25,000,000
- Tax rate = 30%
- Debt = 100,000,000
- Cost of debt = 5%
- Unlevered cost of capital = 10%

Payoux is a company active in the industry of recycling. Established in 1992, it is still one of the oldest and biggest companies in the field, and employees have a good share of the people living in the nearby village.

Management has always been concerned about managing the company properly, due to the heavy social impact that distress may have on the local population, as well as for the contagion to the partner companies.

The company is quoted on the regulated exchange, and the share price has been stable to the current price of $50 in the last months. Expectations are bullish on the stock due to recent expansion and increase in the amount invested in modern recycling methods.

One of the main concerns of the managers is the riskiness of the capital of the company and how this can impact on the perception of the investors. It is therefore important in their opinion to run an analysis of the capital structure and current cost of capital.

On top of that, the company has current extra cash of $2,000,000 to be fully distributed to the shareholders. The management has to decide which payout policy to apply in the current year, dividends, or share repurchases.

The company is planned to generate, starting from the following year, an average stable amount of extra cash to be distributed to shareholders, in the order of $3,000,000 per year. The outstanding shares are 1,000,000.

The price of a stock is currently $50 and supposed to reach a price of $55 1 year from now. There is another stock on the market that currently costs $100 and supposed to reach a price of $108 1 year from now, after paying a dividend of $2 right before the end of the 1-year period. Taxes on dividends are 25%, and taxes on capital gains are 12%. Assume you want to invest in (buy) one of the two stocks and sell it back after the 1-year period.

Questions

1. What is the debt-to-equity ratio of the firm?
2. What is the WACC (MM second case) of the firm?
3. How should the capital structure change to support that increase?
4. Show that according to the MM theory of dividends (irrelevance), the choice between dividends and shares repurchase is irrelevant, at the current cost of capital.
5. Which stock would you invest in, if you believe in the irrelevance theory of dividends? Show calculations.
6. Which stock would you invest in, if you believe in the tax-preference theory of dividends? Show calculations.

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