Chapter 16: The structure of capital

Some abbreviations:

D = market value of debt

E = market value of levered equity

U = market value of unlevered equity

VL = value of the firm with leverage

VU = value of the firm without leverage

NPV = net present value

EPS = earnings per share

Tc = marginal corporate tax rate

rD = expected return (cost of capital) of debt

rE = expected return (cost of capital) of levered equity

rU = expected return (cost of capital) of unlevered equity

rf = risk-free interest rate

rWACC = weighted average cost of capital

Capital structure choices

The *capital structur*e of a firm is determined by the relative proportions of debt, equity and other securities that a firm has outstanding. Most firms choose to finance with equity alone or a combination of debt and equity. Various financing choices will promise different future amounts to each security holder in exchange for the cash that is raised today.

A firm must also take into account whether the securities it issues will receive a fair price in the market, have tax consequence, entail transactions costs or change its future investment opportunities. Decisions on whether to accumulate cash, pay off debt or pay dividend, or conduct share repurchases also affect the capital structure.

The *debt-to-value ratio* is the fraction of a firm's total value that corresponds to debt.

Debt to value ratio = D/ (E+D)

The debt-to-value ratios differ across industries (see figure 16.1, page 511). But the debt-to-value ratio may also differ within industries.

Perfect capital markets

The decision of a financial manager to issue debt, equity or other securities to fund a new investment has got many potential consequences. It is very important whether different choices will affect the value of the firm and thus the amount of capital it can raise.

First step is to consider this in a simple environment: a perfect capital market. A perfect capital market is a market in which the following conditions hold:

- Securities are fairly priced. Investors and firms can trade the same set of securities at competitive market prices equal to the present value of their future cash flows.
- There are no tax consequences or transaction costs, there are no frictions.
- Investment cash flows are independent of financing choices.

A perfect capital market seems unrealistic in practice but it provides great insight into the benefits and costs of leverage.

A tool to measure a possible financing decision in a perfect capital market is the Net present value(NPV). If the NPV is positive, you need to raise the money for the upfront investment. But how?

The value of a security equals the present value of its future cash flows.

PV (equity cash flows) = (future) cash flow / firm's equity cost of capital.

The firm's equity cost of capital is the same as the discount rate for the NPV, because the risk is the same.

Unlevered equity is equity in a firm with no debt. Imagine the present value of the equity cash flows is $50.000 then you can raise $50.000 by selling all the unlevered equity in your firm. The project's NPV represents the value to the initial owner of the firm created by the project.

Another possibility is levered financing; borrowing some of the money you will need to invest. If a part of the cash flow is certain, you can borrow that amount at the current risk-free interest rate, because you will be able to pay the debt at the end of the year without any risk of defaulting. Levered equity is equity in a firm with outstanding debt.

The amount equity holders can expect to receive is the total (future) cash flow minus the repayment of the debt. Although financing with debt seems very promising, there is a downside: leverage will increase the risk of the firm's equity and raise its equity cost of capital.

The researchers Modigliani and Miller considered whether leverage would increase the total value of the firm. They come up with what we called the 'first Modigliani and Miller proposition';

MM proposition I: in a perfect capital market, the total value of a firm is equal to the market value of the free cash flows generated by its assets and is not affected by its choice of capital structure.

$VL = E + D = VU$

An overview of unlevered versus levered cash flows in perfect capital markets can be found in the book on page 514, figure 16.3.

Because leverage increases the risk of the equity of a firm, it is inappropriate to discount the cash flows of levered equity at the same discount rate that we used for unlevered equity. The expected return of levered equity is the expected payoff divided by the amount equity holders are willing to pay for the levered equity, minus 1.

Leverage increases the risk of equity even when there is no risk that the firm will default. Leverage splits the firm's return between low-risk debt and high-risk levered equity compared to the equity of an unlevered firm.

Homemade leverage is when investors use leverage in their own portfolios to adjust the leverage choice made by a firm. Homemade leverage is a perfect substitute for the use of leverage by the firm, as longs as investors can borrow or lend at the same interest rate as the firm (this is the case of a perfect capital market).

Because the portfolio of equity and debt of a levered firm together have the same value and cash flows as the unlevered firm, the expected return of the portfolio should equal the expected return of the unlevered firm. This can be reflected in the *weighted average cost of capital* (pretax).

$$WACC = r_E (E/(E+D) + r_D (D/(E+D) = r_U$$

The pretax WACC: the weighted average cost of capital computed using the pretax cost of debt. The right-hand side represents the fraction of the firm's value financed by equity and the fraction financed by debt. According to the equation, the pretax WACC is unchanged for any choice of capital structure and remains equal to the firm's unlevered cost of capital.

This can be explained because the two effects of leverage (we finance a larger fraction of the firm with debt, which has lower cost of capital, but simultaneously we add leverage, which raises the firm's equity cost of capital) should exactly cancel out because the firm's total risk has not changed.

The WACC equation can be rearranged to an equation that gives the cost of capital of levered equity. This is the Modigliani and Miller proposition II.

MM proposition II: the cost of capital of levered equity is equal to the cost of capital of unlevered equity plus a premium that is proportional to the debt-equity ratio (measured using market values).

$$r_E = r_U + D/E (r_U - r_D)$$

The MM propositions we made were based on the assumption of perfect capital markets. However, in practice capital markets are not perfect. In the real world, we will find that the capital structure can have an effect on a firm's value. MM's propositions reveal that any effect of capital structure must similarly be due to frictions that exist in capital markets. Possible sources of these frictions are: debt and taxes, bankruptcy costs, agency costs and (asymmetric) information.

Debt and taxes

One important market friction is corporate taxes. How can the firm's choice of capital structure affect the taxes it must pay and therefore its value to investors?

Corporations have got the possibility to deduct interest expenses from their taxable income. Because the deduction reduces the taxes and increases the amount available to pay to investors, the value of the corporation will increase.

It seems that net income of a firm is lower with leverage than without leverage. But, a firm can be better off with leverage even though its earnings are lower. The total amount available to all investors can be higher with leverage. The difference can be explained by the interest tax shield.

The *interest tax shield* is the reduction in taxes paid due to the tax deductibility of interest payments. It is the additional amount a firm can pay to investors by saving the taxes it would have paid if it did not have leverage.

Interest tax shield = Corporate tax rate *x* Interest payments.

This interest tax shield is a tax benefit, when the firm uses debt. We can determine the benefit of leverage for the value of the firm, by computing the present value of the stream of future interest tax shield a firm will receive.

Each year a firm makes interest payments, the cash flows it pays to investors will be higher than they would be without leverage by the amount of the interest tax shield.

Cash flows to investors with leverage = cash flows to investors without leverage + interest tax shield.

Some fraction of the pretax cash flow is used to pay taxes, the rest is paid to investors. If the amount paid to debt holders increases through interest payments, the fraction of the pretax cash slows that must be paid as taxes will decrease. This gain is the interest tax shield.

The total value of the levered firm exceeds the value of the firm without leverage due to the present value of the tax savings from debt. *VL* = VU + PV (interest tax shield)

The level of future interest payments varies due to:

1. Changes of debt outstanding in the firm
2. Changes in the interest rate on the debt
3. Changes in the firm's marginal tax rate
4. The risk of default.

Imagine the case a firm has got permanent debt, as old bonds/loans mature, the firm starts new loans and issues new bonds. In this case its market value of debt can be calculated:

Market value of debt = D = PV (future interest payments).

Value of the interest tax shield of permanent debt can be calculated as following:

PV (interest tax shield) = PV (Tc *x* future interest payments)

= Tc *x* PV (future interest payments)

= Tc *x* D

The formula shows the magnitude of the interest tax shield.

This approach is simplest to apply when the amount of debt is fixed permanently. Another way to calculate the benefit of the interest tax shield is to incorporate it in the cost of capital of the firm by using the WACC. *WACC with taxes:* $rWACC = r_E (E/(E+D) + r_D (1-T_C) (D/(E+D)$

The WACC with taxes is equal to the pretax WACC minus a reduction due to interest tax shield. The reduction in the WACC increases with the amount of debt financing. The WACC declines with leverage; the higher the leverage, the more the firm exploits the tax advantage of debt and the lower the WACC.

This second approach is simplest to apply when the debt-to-value ratio of a firm is constant over time. This section presents an interesting question: given the tax benefit, why don't firms shift to nearly 100% debt?

Bankruptcy and financial distress

One part of the answer to the question mentioned above is: because of the existence of bankruptcy costs. If a firm has more debt, the chance that the firm will be unable to make its required interest payments and will default on its debt obligations is greater.

A firm is in financial distress when it had difficulty meeting its obligations. Bankruptcy costs can be either direct or indirect:

- Direct costs can be fees paid to lawyers and bankruptcy experts. Every country has a bankruptcy code that descrives what process must be followed dealing with a firm in default of its debt obligations. These costs are higher for firms with more complicate business operations or with more creditors.
- Indirect costs can be a loss of customers, a loss of suppliers, a cost to employees or the fact that the firm is being forced to sell assets at a deep discount to raise money. These indirect bankruptcy costs often occur because when the firm is in financial distress, it may renege on commitments and contracts. A firm may also have to pay these indirect costs if it faces a significant possibility that financial distress may occur in the future.

The tradeoff theory

Combining our knowledge of the benefits of leverage from the interest tax shield and the information about the costs of financial distress associated with leverage gives information about the amount of debt a firm should issue to maximize its value. This is called the tradeoff theory: the total value of a levered firm equals the value of the firm without leverage plus the present value of the tax savings from debt, less the present value of financial distress costs.

VL = VU + PV (interest tax shield) – PV (financial distress costs)

The present value of financial distress costs is almost impossible to calculate. There are two qualitative factors that determine the present value of financial distress costs:

1. The probability of financial distress depending on the likelihood that a firm will be unable to meet its debt commitments and therefore default.
2. The magnitude of the direct and indirect costs related to financial distress that the firm will incur.

The tax benefits of debt will increase as the level of debt increases. As the level of debt increases, the probability of default will also increase and therefore, the present value of financial distress costs will also increase. When these effects balance out the optimal level of debt (D*) will occur, and the value of the levered firm is maximized. When a firm has got higher costs of financial distress, the optimal level of debt will be lower. The tradeoff theory helps to resolve to important facts about leverage:

- The presence of financial distress costs can explain why firms choose debt levels that are too low to fully exploit the interest tax shield.

- Differences in the use of leverage across industries can be explained by differences in the magnitude of financial distress costs and the volatility of cash flows.

Agency costs and information

Two other market imperfections are agency costs and asymmetric information:

1. Agency costs are the costs that arise when there are conflicts of interest between stakeholders. This is the consequence of the separation of ownership and control in corporations. This separation creates the possibility of management entrenchment: a situation arising as a result of the separation of ownership and control, in which managers may make decisions that benefit themselves at the investors' expense. When equity ownership is highly diluted, so that no individual shareholder has an incentive to monitor management closely, and when a great deal of cash is available for managers to spend on wasteful projects, agency costs will increase.

   In this case, debt can help: 1. Ownership of the firm may remains more concentrated when a firm decides to borrowing instead of raising funds by issuing shares. This concentration of ownership will improve the monitoring of management. 2. Debt reduces the funds available at management discretion, when a firm is forced to pay out cash to meet interest and principal payments. Conflicts of interest between equity holders and debt holders will occur if investment decisions have different consequences for the value of equity and the value of debt. This conflict is likely to occur when the financial distress costs of a firm are high. Excessive risk-taking is a situation that occurs when a company is near distress and shareholders' have an incentive to invest in risky negative-NPV projects that will destroy value for debt holders and the firm overall. An under-investment problem is a situation in which shareholders choose not to invest in a positive NPV project because the firm is in financial distress and the value of undertaking the investment opportunity will accrue to bondholders rather than to shareholders. The value of a firm increases as the level of debt increases (from the interest tax shield and improvements in managerial incentives). However, the present value of financial distress costs and agency costs from debt holder-equity holder conflicts dominated, if leverage is too high. This will reduces the value of the firm. The optimal level of debt (D*) balances these benefits and costs of leverage.

2. Another market imperfection is asymmetric information: a situation in which parties have different information. It can arise when, for example, managers have superior information to that of outside investors regarding the firm's future cash flows. Managers of a firm can use leverage as a way to convince investors that they do have information that the firm will grow. This is called the signaling theory of debt: the use of leverage as a way to signal good information to investors. Managers may attempt to engage in market timing when they have better information than outside investors. Market timing: when managers sell new shares because they believe the stock is overvalued, and rely on debt and retained earnings (and possibly repurchasing shares) if they believe the stock is undervalued. The pecking order hypothesis: the idea that managers will have a preference to fund investment using retained earnings, followed by debt, and will only choose to issue equity as a last resort. When firms are profitable and generate sufficient cash to fund their investments, they will not issue debt or equity, but just rely on retained earnings. So, highly profitable firms will have little debt in their capital structure.

Putting it all together

The optimal capital structure depends on market imperfections (taxes, financial distress costs, agency costs and asymmetric information) as follows:

1. If your firm has consistent taxable income, make use of the interest tax shield.
2. Search for a balance in the tax benefits of debt and the costs of financial distress.
3. Consider short-term debt for external financing when agency costs are significant.
4. Increase leverage to signal managers' confidence in the firm's ability to meet its debt obligations.
5. Keep in mind that investors are aware that you have an incentive to issue securities that you know are overpriced.
6. Rely first on retained earnings, then debt and finally equity.
7. Do not change the firm's capital structure unless it departs significantly from the optimal level.