

Weighted average cost of capital

Corporate capital consists of debt and equity. The ytm on corporate bonds as well as the interest rate on bank loans depend on the borrower's capacity to repay as well as the collateralization of the bond/loan. We can measure this by looking at recent debt issues and bank loans.

For projects that have no special collateral considerations and that do not alter the risk structure of the firm, we use the weighted average cost of capital to discount the expected future after-tax *cash flows*. The weighted average cost of capital (or wacc) is measured:

$$\text{wacc} = w_e \cdot k_e + w_d \cdot (1 - \tau) \cdot \{r_f + \text{debt risk premium}\}$$

My notation: w_e is the weight of equity in the company's capital structure. For example, 3M has 595,609,224 shares of common stock outstanding, and the market price of the stock is \$238.00. So 3M's market capitalization of equity is \$141.755 billion. 3M also has roughly \$15 billion in debt. So the total market capitalization of the company ("enterprise value") is \$156.755 billion. $w_e = \frac{141.755}{156.755} = 0.904$. w_d is the weight of debt in the capital structure. So for 3M: $w_d = \frac{15}{156.755} = 0.096$. τ is the company's marginal income tax rate. r_f is the risk-free rate, k_e is the cost of equity and k_d is the expected return on the company's debt.

According to our analysis, 3M has a beta of 0.85. The risk-free rate (30-year Treasury) is roughly 3.5%, and the market risk premium is 4%. So 3M's cost of equity (k_e) = $.035 + .85 \cdot .04 = 6.9\%$. 3M has AA rated debt, its credit spread on 30-year term is around 100 basis points. It has a marginal corporate income tax rate of 23%. Our rule of thumb is that the debt risk premium comprises one-half of the credit spread. (The other half of the credit spread is compensation for expected loss—and is not part of the cost of debt.) So its pre-tax cost of debt (k_d) is 4%, and therefore, its wacc is:

$$\text{wacc} = .904 \cdot .069 + .096 \cdot .77 \cdot .04 = .06533.$$

Now, it is not appropriate to use this wacc for projects that have a different collateral structure or risk from that of the overall corporation. A good example of this is real estate. If 3M wants to buy land and build a new office building, for example, that is collateralizable so that the company's wacc is too high to use for the discount rate in analyzing the value of this project. The reasons for this are that debt is cheaper, and generally preferred by the firm, than equity, and the firm can pledge the assets as collateral against a mortgage loan.

Debt is considered a cost of business, and so it is a tax-deductible expense. We would overstate this tax shield if we used the yield to maturity as the pre-tax cost of debt. This is because we cannot take advantage of this tax shield in the event of default. Therefore the after-tax cost of debt is: $(1 - \tau) \cdot k_d$. Here τ is the firm's statutory tax rate, and k_d is the expected return on its debt.

By contrast, the payment of dividends to owners is not recognized as a tax-deductible expense. Thus the after-tax cost of equity is the same as the pre-tax cost.

Capital budgeting entails analyzing whether a company should use some of its costly capital to acquire a capital asset—one that will produce or enhance the production of the firm's goods and services. The rule should be that a company invest if the net present value of the expected future cash flows from the project is positive.

Cash Flows

The key to proper capital budgeting is the identification of all cash flows—current and future—associated with a project. Costs of acquiring a project and getting it into operation include: the shipping costs, installation costs, training costs associated with new technology, and new maintenance costs. If the project requires and/or results in more inventory then that must be recognized as a cash flow. If a project “ties-up” an asset, such as land, that we already own then the value of that asset is a cash outflow at the beginning of the project, and if we recover it at the end, we recognize a cash inflow at that time.

Tax considerations include the following:

- Investment tax credit. Some income tax regimes provide an incentive for new investment called the ITC. An example is a 10% ITC. In this case, if we buy a \$6 million project, then we receive a credit against our income tax of \$600,000. In order to take advantage of this we have to have a tax obligation that exceeds \$600,000.
- Depreciation. Buying a capital good (such as a truck) is not considered a business expense. (It is an investment.) However, depreciation is an allowable expense. The faster the depreciation, the more advantageous for the company. The current schedule in the US is the modified accelerated cost recovery schedule (MACRS).
- Income is taxed. For tax purposes the company wants to minimize reported income. In some cases it can use different accounting treatments for reporting (GAAP) and tax (IRS) purposes. Examples include depreciation schedules and inventory costing.

You want to know: “if we put this project into effect, how will it affect my business?” And in particular, what are the implications for future cash flows.