**Cost of Capital**

**Learning Outcomes**

After completing this module, students will be able to:

1. Calculate the weighted average cost of capital using appropriate weights, correctly incorporating issuance costs, and applying a suitable adjustment for project risk.
2. Measure the costs of debt and equity capital using the capital asset pricing model, implied cost of capital, or treasury spread methods.
3. Determine a weighted marginal cost of capital for projects in new industries or multi-divisional organizations.
4. Decide on the appropriate risk-free rate and market risk premium in the capital asset pricing model.
5. Calculate a firm’s raw beta in the capital asset pricing model.

**Introduction**

Managers must be able to accurately estimate the cost of capital to value their firm, its different business units, or any potential acquisitions and to make wise capital budgeting decisions. Another name for the cost of capital is the required rate of return, which is the return investors expect to earn to be fairly compensated for the risks they assume.

The cost of capital is difficult to measure accurately, and minor errors have a significant impact on decision-making. Reliable market data is usually available for large, publicly traded companies but not for smaller private firms. The cost of capital should reflect the risk of a new project, but this may be different from a company’s current business. Many large corporations have several business segments or reporting units that operate in very different industries that need their own cost of capital. Researchers and practitioners have developed a variety of models to estimate the cost of capital, but they are complex and unreliable, and there is considerable disagreement about which ones provide the best results.

Given this dilemma, most companies do not attempt to calculate their cost of capital alone but instead rely on outside financial information providers to supply expert advice and the needed inputs. These information providers use a variety of approaches, so companies must be able to assess the methods used critically. Firms typically estimate their cost of capital in several different ways to verify their results and gain more confidence in their findings.

Despite these problems, firms know they must devote considerable resources to accurately determining their cost of capital. Rough guesses or rules of thumb are not acceptable, given the impact this figure has on decision-making.

* 1. **| Weighted Average Cost of Capital**

The value of a business equals the present value of the future after-tax cash flows that it expects to generate for investors. Businesses are valued from two perspectives:

**Firm.** This perspective includes all debt, preferred share, and common share investors. Interest paid to debt holders or dividends paid to preferred and common shareholders are not deducted when calculating the cash flows generated by the company.

**Equity.** This perspective includes only common shareholders. Interest and preferred share dividends are deducted, but common share dividends are not deducted when calculating the cash flows generated by the company.

The weighted average cost of capital (WACC) is used to value a business from the firm’s perspective, while the cost of common equity, a component of WACC, is used to value a company from the equity holder’s perspective. For business valuation purposes, preferred equity is equivalent to debt as these investors do not vote, receive regular fixed interest and principal payments, and are usually not entitled to a portion of the firm’s residual income, just like bondholders. The discount rate used to value a firm increases with the riskiness of its future cash flows.

Valuing a firm from the equity perspective is the most common, as analysts are typically estimating the value of a company’s common shares. WACC is sometimes used in business valuation, but it is generally employed in capital budgeting, where managers try to determine if a new project’s expected after-tax cash flows exceed the cost of debt and equity financing.

The formula for WACC is:

(Wd) x (kd) + (Wp) x (kp) + (Wc) x (kc)

Wd – Weight of debt

Wp – Weight of preferred shares

Wc – Weight of common shares

kd – After-tax cost of debt

kp – Cost of preferred shares

kc – Cost of common shares

Small variations in the discount rate have a significant impact on a firm’s valuation or a capital project’s profitability, so most analysts put considerable energy into calculating WACC. Despite these efforts, there is still a significant estimation error. Several factors contribute to this problem:

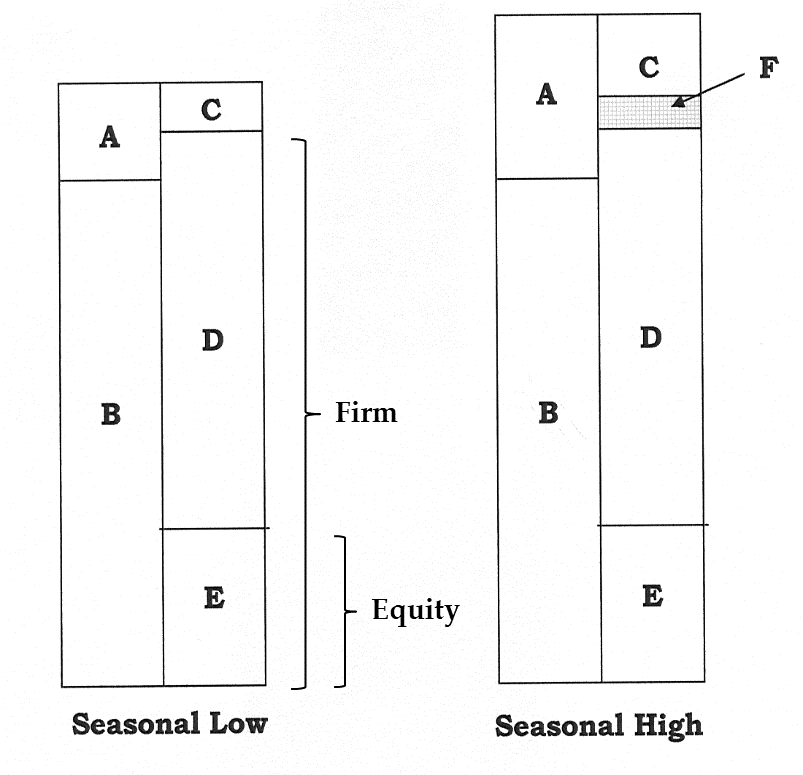
* Accurate financial information needed to calculate WACC is frequently not available, especially for small public corporations and private firms.
* Analysts may only want to value part of a business, like a subsidiary, but most of the financial data available is for the entire firm.
* Techniques for calculating WACC are numerous and complex, and there is considerable debate over which methods produce the most accurate results.
* Many models for calculating WACC are statistically unreliable.

To deal with these issues, analysts are relying more on outside financial information providers to help determine WACC.

**Weighted-Average Cost of Capital Weights**

WACC is the weighted average cost of the permanent debt and equity financing used to finance a firm’s long-term assets and long-term net working capital. Long-term net working capital is the level of working capital at the seasonal low. Since the amount of net working capital never falls below this amount, it should be financed with permanent debt and equity financing. The current portion of any long-term liabilities is also included in permanent debt. Temporary financing should not be included, as this is used to finance seasonal variations in net working capital only.

**Exhibit 1: Capital Structure Components**



**A** – Current assets

**B** – Long-term assets

**C** – Current liabilities

**D** – Permanent debt financing

**E –** Permanent equity financing

**A – C** = Net working capital

**F** – Temporary financing

The cost of debt, cost of preferred shares, and cost of common shares components of WACC are weighted based on the book value or market value of a firm’s debt and equity or its target capital structure. The book value of debt and equity is readily available in a firm’s financial statements, but the amounts vary considerably depending on the accounting policies adopted and are usually outdated. Book value weights are also not forward-looking, so they do not incorporate any planned changes in the firm’s capital structure.

Market values are up-to-date, but they fluctuate significantly in the short term due to up and down movements in the financial markets. They are also difficult to attain for private companies whose securities do not trade publicly. As more firms adopt fair value accounting under International Financial Reporting Standards (IFRS), differences between book and market value are becoming less pronounced. Stocks and bonds are also typically issued at different times depending on market conditions and in large amounts due to economies of scale for issuance costs. This causes debt and equity weights to vary considerably in the short term, thus distorting a company’s WACC.

Target capital structure is the ratio of permanent debt to permanent equity financing that maximizes a firm’s value. Most companies know their target capital structure and try to maintain it over time. It balances the benefits of financial leverage with the safety of having more equity. Target capital structure is the preferred method for weighting the different costs of capital when calculating WACC, as it is future-oriented, more stable, matches the long-term time horizon of most companies and capital projects, and can be calculated without a current share price. External analysts may have difficulty determining a firm’s target capital structure as managers are not required to disclose it publicly. Industry average debt levels, trends in actual capital structure, or statements by management may be used to approximate it.

Some companies do not know their target capital structure, so using the market value of debt and equity to calculate WACC is the next best choice. Many firms use book value when market prices are not available. Module: Target Capital Structure examines how firms determine their target capital structure.

**Cost of Common Equity**

The cost of common equity is calculated using the capital asset pricing model (CAPM), implied cost of common equity, or treasury spread approach.

**CAPM.** This model states that:

kc = kf + Bc (km – kf)

kc – Cost of common equity

kf – Risk-free rate

Bc – Beta of the firm

km – Market rate

(km – kf) – Market risk premium

All investors expect to earn the risk-free rate plus the market risk premium (MRP) adjusted for the riskiness of the company as measured by its beta. The risk-free rate is the return investors expect to earn on riskless government bonds with a maturity that matches the time horizon of the company or the project being evaluated. Given the long life of most companies and projects, this is typically the 20-year or 30-year government bond rate.

The market rate is the return on a market portfolio of risky stocks that are only exposed to market risk. Market risk is the non-diversifiable risk due to inflation, interest movements, or the business cycle that affects all companies simultaneously and cannot be diversified away. The MRP is the extra return that investors expect to earn if they go from an investment in riskless government bonds to the market portfolio of risky stocks. The return on the market portfolio is determined using a broad-based, market value-weighted index that represents a large proportion of all stocks traded, like the S&P 500 or the Russell 3000. Specialized or smaller indexes like the Dow 30, which is the 30 largest companies in the U.S., should not be used.

Beta measures the riskiness of a company’s stock relative to the market portfolio and is used to adjust the MRP to determine the appropriate return for an investment. B > 1.0 means the company moves together with the market portfolio but fluctuates more, B < 1.0 means the company moves together with the market portfolio but fluctuates less, and B = 1.0 means the company moves together with the market portfolio and fluctuates the same. B < 0.0 means the company and the market portfolio move in opposite directions.

Correctly determining the risk-free rate and MRP is also critical when estimating a firm’s cost of common equity. The risk-free rateshould be based on government debt securities with a maturity that matches the life of the capital project being analyzed. Even though government bonds are free of default risk, they are exposed to interest rate risk and reinvestment risk, so rates rise as maturities increase. Rates on short-term instruments such as the 90-day treasury bill should not be used unless the project has a very short life, which is unlikely. The 20-year or 30-year government bond rate is typically used as the proxy for the risk-free rate, as this timeframe reflects the infinite lives of most capital projects. These long-term rates are also more stable than short-term rates, and there is little difference between the 20-year and 30-year rates due to the flatter shape of the yield curve at higher maturities. The 20-year rate is preferred as many financial information providers use it. Whatever term is chosen, companies should ensure that the term of the risk-free rate is the same as the risk-free rate used in calculating the MRP.

MRP, also called the equity risk premium (ERP), is the extra return investors require to move from a risk-free investment in government bonds to an investment consisting of the market portfolio of risky stocks. Miscalculating the MRP is the most significant source of error when determining the cost of capital. Firms must take great care to estimate it correctly themselves or to find a financial information provider who can supply a reliable estimate. This isn't easy given the variety of methods used by researchers and practitioners. Some analysts believe that the MRP’s past performance is the best predictor of its future performance, so they use historical market data. Other analysts think the MRP should be calculated using forward-looking information.

**Implied cost of common equity.**  This model estimates the cost of common equity using the one-stage dividend discount model (DDM). The DDM formula is rearranged to isolate the cost of common equity.

kc = (D1 / P0) + gd

kc – Cost of common equity

D1 – Next year’s dividend

P0 – Current share price

gd – Growth rate of dividends

The cost of common equity is equal to the company’s dividends next year divided by its current share price, which is called the expected dividend yield, plus the growth rate of dividends. The growth rate of dividends can be estimated using the average historical dividend growth rate, analyst estimates of future earnings growth, or the sustainable growth rate. Estimated earnings growth rates are a proxy for dividend growth and are available from financial information providers for the next three to five years.

**Treasury spread.** The difference between a firm’s cost of common equity and the return on government bonds of the same maturity should be stable, assuming there are no major changes in the company’s operations.

kc = kf + SpreadT

kc – Cost of common equity

kf – Risk-free rate

SpreadT – Treasury spread

The treasury spread will vary somewhat over the business cycle, but these changes will average out over the long-term time horizon of most companies or capital projects. The spread typically falls in good economic times and rises during recessions as investors favour safer government securities as part of a “flight to quality” strategy. The spread is calculated using comparable companies with the same credit rating. For example, if a company has a B credit rating, other companies with a B rating trade at a 6.5% spread over the treasury rate, and the current long-term treasury rate is 5.0%, its cost of common equity is approximately 11.5%.

CAPM is the most commonly used method for determining the cost of common equity in practice. It is a theoretically sound model that, unlike the implied cost of common equity, adjusts for risk directly using beta and does not require that a company pay dividends or be able to calculate its dividend growth rate. The risk-free rate, market risk premium, and beta are challenging to estimate accurately, though, and small errors in these inputs dramatically affect the results. Using the implied cost of common equity is in decline, but it is still employed to verify CAPM results or if a firm’s beta cannot be measured accurately.

Besides common shares, some firms have complex capital structures that include other types of equity such as stock options, rights, warrants, and conversion features on debt and preferred share issues. The costs of these securities are included in WACC, but they usually represent a small portion of a firm’s total equity.

**Cost of Debt**

The cost of debt is calculated using either the implied cost of debt or the treasury spread.

**Implied cost of debt.** Using the yield-to-maturity formula, a firm inputs a bond’s current price, semi-annual interest coupon, the return of principal at maturity, and the number of interest payments and then solves for the implied cost of debt.

P0 = (I) (1 – (1 + kd)-n) / kd) + Principal / (1 + kd)n

kd after-tax = (kd) (1 – t)

P0 – Current bond price

I – Interest coupon

kd – Cost of debt

n – Number of payments

t – Marginal tax rate

Interest, unlike dividends, is tax-deductible, which reduces the after-tax cost of borrowing. A firm’s marginal tax is used to calculate the after-tax cost of debt. This is the tax rate on the firm’s last dollar of taxable income, but it may be different if rates are expected to change over the life of the company or project. Some provinces collect their corporate income taxes, so always include both the federal and provincial tax rates. Expected future business losses or unused income tax loss carrybacks or carryforwards will reduce the marginal tax rate and raise the cost of borrowing.

**Treasury spread.** The treasury spread approach can be applied to bonds as it was applied to common equity.

kd = kf + SpreadT

kd after-tax = (kd) (1-t)

kd – Cost of debt

kf – Risk-free rate

SpreadT – Treasury spread

If a bond price is not available, a firm’s cost of debt can be estimated using bonds of other companies with similar credit ratings, terms to maturity, collateral, subordination, and guarantees. These features should be similar as they affect the bond’s risk level and yield-to-maturity. If a firm does not have a formal credit rating, a synthetic credit rating can be estimated.

Instead of bonds, many companies use commercial loans and leases to finance their operations. Interest rates on recently negotiated lending agreements with the same maturity and similar features can be used to approximate the cost of debt. A firm will likely have more than one source of debt financing, so it should determine a weighted average cost of debt using the market value of each issue.

The cost of debt is more difficult to determine when bonds have floating interest rates, are convertible into common shares or redeemable at the discretion of the investor, are callable by the issuer, or have purchase fund requirements.

**Cost of Preferred Shares**

The cost of preferred shares is calculated using the implied cost of preferred shares. The formula is the same as the implied cost of common equity, except the dividend growth rate is zero, as preferred share dividends are fixed.

kp = D1 / P0

kp – Cost of preferred equity

D1 – Next year’s dividend

P0 – Current share price

CAPM is not used to calculate the cost of preferred shares, as these shares have fixed payments like debt that are uncorrelated with the market portfolio, so their betas are typically very close to zero. Like bonds, if the price of the firm’s shares cannot be accurately determined, the cost of preferred shares can be estimated using firms with the same credit rating. If a firm does not have a formal credit rating, a synthetic preferred share credit rating can be estimated. Credit rating agencies have separate rating scales for long-term bonds, short-term debt securities, and preferred shares.

Most preferred shares have fixed dividends and unlimited lives, but these features do vary. Some preferred shares have cumulative, adjustable, or participating dividends, are convertible into common shares or redeemable at the discretion of the investor, callable by the issuer, or have limited terms that force the company to re-purchase the shares at set time intervals over their lives. These features make it more challenging to estimate the cost of the preferred shares.

**Incorporating Issuance Costs**

Issuance or flotation costs include the accounting, legal, and investment banking costs incurred by companies when raising new debt and equity capital. Debt issuance costs are the lowest as these securities are the easiest to sell due to their lower risk. Common shares are riskier, so their issuance costs are much higher, especially for initial public offerings, growth firms, or companies experiencing financial distress. Issuance costs for preferred shares fall between those of debt and common shares, but they are closer to debt because of their similar features and risk levels.

Issuance costs are included in the capital budgeting process using one of two methods:

**Increase the cost of capital**. From the company’s perspective, issuance costs reduce the proceeds received when they sell new debt or equity securities, as their investment banker takes a portion of what is raised before remitting the remainder to the issuer. This is reflected in the cost of capital by deducting after-tax issuance costs per share (f) from the share or bond price.

Retained earnings kc = (D1 / P0) + gd

New common shares kc = D1 / (P0 – f) + gd

New preferred shares kp = D1 / (P0 – f)

New debt: kd after tax (kd) (1 – t) / (1 – f)

Issuance costs are approximately 7% for seasoned common equity issues, but this rises to well above 10% for initial public offerings. Most companies use retained earnings and do not issue new common equity because of the high issuance costs and potential control issues that may arise from selling new shares. Debt issuance costs average 2%, but there is considerable variation in this rate depending on the size of the issue and the firm’s credit rating.

**Include as a negative initial cash flow.** After-tax issuance costs are included as a negative initial cash flow in the capital budgeting analysis, just like the cost of the asset and related expenses such as transportation, installation, and taxes.

The first method is the least preferred mathematically, as it spreads the issuance costs out over the life of the project by adjusting the cost of capital upward instead of recognizing all the fees at the beginning when they are incurred. The decrease in the project’s net present value due to the increase in the cost of capital under the first method does not equal the reduction in net present value when issuance costs are deducted initially under the second method.

Some still prefer adjusting the cost of capital upwards because it emphasizes the importance of issuance costs, which can be high, especially for common equity. Others feel the cost of capital should only reflect the risk of the project, so issuance costs should not be included. Academics recommend the second method, and it is more commonly used in practice. However, the choice of methods does not usually have a material effect on a project’s net present value.

**Weighted Marginal Cost of Capital**

A firm’s WACC reflects the risk level of its existing business. If a company ventures into a new industry with a different risk level, a new weighted marginal cost of capital (WMCC) needs to be calculated. WACC is a company-wide measure, so diversified companies also need to compute separate divisional costs of capital that correctly measure the risk level of each business unit. If this is not done, riskier divisions will select projects they should not because they use a lower average corporate WACC. Safer divisions will refuse projects they should not because they use a higher average corporate WACC.

Divisional costs of capital are difficult to determine as the financial data needed to calculate the cost of debt and equity is usually only available for the company as a whole. An appropriate cost of common equity can be estimated for a project in a new industry or a division by using the average or median equity beta of a group of guideline or comparable companies that operate in that industry only. These companies have similar risk levels and are frequently referred to as pure plays. Pure plays are difficult to find in practice because most businesses, especially larger ones, are diversified. Their capital structures may not be the same either, which affects their risk level, but a firm’s equity beta can be adjusted for varying borrowing levels using the formula:

BL = BU (1 + (1 – t) (D/E))

BL – Levered equity beta

BU – Unlevered equity beta

t – Marginal tax rate

D/E – Debt-to-equity ratio

WACC also needs to be adjusted for varying project risks. Some projects are routine, so they warrant a lower cost of capital than the average, while others are riskier and should have a higher-than-average rate. For example, a company whose WACC is 8% could make the following adjustments:

**Exhibit 2: Project Risk Adjustments**

|  |  |  |  |
| --- | --- | --- | --- |
| **Project Risk Category** | **Project Types** | **Adjustment** | **WACC** |
| High | New product expansions | +2% | 10% |
| Moderate | Cost savings projects  Existing product expansions | -0% | 8% |
| Low | Equipment replacement | -2% | 6% |
| Mandatory | Environmental or safety equipment | Not applicable | Not applicable |

The adjustments used to incorporate project risk are subjectively determined based on the company’s experience. Mandatory projects must be completed due to a government or legal order, so the cost of capital is not relevant.