Cost of Capital

Chapter 14

A) The Cost of Capital: Some Preliminaries:

The Security market line (SML) and capital asset pricing model (CAPM) describe the relationship between systematic risk and expected return in the financial markets. This relationship also allows use to identify the relevant opportunity cost for an investment in a capital budgeting project. In general, capital budgeting projects with a given level of risk (β) must provide an expected return greater than the return available in the financial markets for other projects with the same risk (measured by β). The expected return in financial markets is the investor's opportunity costs; thus, it is the relevant cost of capital for the firm. The cost of capital specifies the minimum acceptable return; therefore, it is also referred to as the required return.

The cost of capital depends primarily on the use of the funds, rather than the source of the funds. For example, if the firm raises equity capital, the cost of equity depends on the riskiness of the project in which the funds will be invested.

B) The Cost of Capital:

There are two approaches for computing the cost of equity capital: The dividend growth model approach and the security market line approach.

a) The Dividend Growth Model Approach:

Recall the constant dividend growth model for the price of a firm's stock:

$P_0 = (D_0 \times (1+g)) / (R_E - g) = D_1 / (R_E - g)$

where P_0 is the current price of the firm's stock, D_0 is the most recent dividend paid, D_1 is the next year's projected dividend, and R_E is the required return on the firm's stock. Solving this equation for R_E :

$R_E = D_1/P_0 + g$

Therefore, if D_0, P_0 and g are known, the cost of equity capital R_E can be determined. Note that if D_0 and g are known, then D_1can by computed. Of the required data, only g is not directly observable and therefore must be estimated. If historical data are representative of future growth rates, g can be estimated from historical dividend data; alternatively, an estimate of g can be based on forecasts of future dividend payments or growth rates.

Example: A firm has recently declared and paid a dividend of \$2.50 per share of common stock. The current price of the common stock is \$20 per share and it is estimated that the dividend will increase at a rate of 4% per year for the foreseeable future. Compute the cost of equity capital.

First, compute D_1 as follows:

$D_1 = D_0 \times (1 + g) = \$2.50 \times 1.04 = \$2.60$

Next, using the dividend growth model:

$R_E = D_1/P_0 + g = \$2.60/\$20 + 0.04 = .17 = 17\%$

Therefore the cost of capital is 17%

Estimating g:

There are three ways of estimating the growth g

1) Using historical growth rates.

Example: suppose you observe the following dividends:

Year	Dividend per share
1988	\$1.87
1989	2.24
1990	2.24
1991	2.48
1992	2.74
1993	3.01

What is the compound growth rate of the series.

Solution: The historical compound growth rate (five periods of growth) is approximately 10% (exactly 9.9879%). \$1.87 $\times$ (FVIF$_{g\%}$, 5) = \$3.01. Solving for g%, we get 10%. Thus if the historical pattern of growth in dividends per share (or earning per share) is expected to continue in the future, this approach can be applied.

2) Another way to estimate g is useful when the firm's reinvestment rate is less than its retention rate. To estimate g, we multiply the Retention Ratio by the Book Value Return on Equity (ROE). The retention ratio is defined as retained earnings divided by the net revenue (or 1 - payout ratio, the latter being dividends divided by net income) and the ROE is net income after interest and taxes divided by common shareholders equity.

3) Finally, g may be estimated by using analysts'forecasts of future growth rates which are available from the research departments of investment dealers.

The deficiencies of the dividend growth model approach are: (1) it is based on an assumption of constant growth in dividends , (2) the value of g must be estimated, and forecasting errors have a direct impact on the estimate of R$_E$, and (3) the dividend growth model does not explicitly consider risk.

b) The SML Approach:

The SML approach is based on the CAPM equation for the expected (required) return on an asset:

$E(R_i) = R_f + \beta_i \times [E(R_M) - R_f]$

where

$E(R_i)$ and β_i are the expected return and beta, respectively, for any asset. In using the CAPM to compute the cost of equity capital, we assume the required return R_E is the same as the expected return $E(R_i)$, so that the above equation is now written:

$R_E = R_f + \beta_E \times [(R_M) - R_f]$

Example: Suppose the market risk premium is 8.5%, the risk free rate is 5.5%, and the Pettway Company has β equal to 0.7. Use the SML to compute the firm's cost of equity capital.

Solution: Using the SML, the expected return:

$R_E = R_f + \beta_E \times [(R_M) - R_f] = 0.055 + (0.7 \times 0.085) = 0.1145 = 11.45\%$

The security market line indicates that the expected return, for an investment with β equal to 0.7 is 11.45%. Consequently, investors expect this return for an investment in Pettway common stock.

The advantages of the SML approach to computing the cost of equity capital are: (1) it explicitly adjusts for risk; and (2) it is applicable to any firm for which the value of β can be determined. However, this approach requires that both β and the market risk premium $[(R_M) - R_f]$ be determined. Since neither of these quantities can be known with certainty, the value of R_E may be inaccurate.

C) The Costs of Debt and Preferred Stock

Corporations use also debt and preferred stock financing. In this section, we discuss the cost of these forms of financing.

a) The Cost of Debt:

The cost of debt financing (R_D) is the market interest rate the firm would pay on new debt. This cost can be observed directly in the financial markets in the following ways.

1) The rate on new debt will equal the current yield on the firm's existing debt

2) The rate on new debt will equal the current yield on debt securities issued by other firms of similar risk.

In each case, the yield to maturity can be determined using the trial-and-error approach described in Chapter 6.

Example: Suppose BC LTD, will issue bonds with 15 year maturity, a coupon rate of 9.75 percent at $950.50 each. What is BC's cost of debt

Solution: using the approximation formula from Chapter 6, we need to calculate the yield to maturity on this bond:

YTM $=[Coupon + (FaceValue - Price)/Maturity] / (\mathrm{Pr}ice + FaceValue)/2$

YTM $= [\$97.50 + (\$1000 - \$950.50)/15] / (\$950.50 + \$1000)/2 = \$100.8/\$975.25$

$= 10.34\%$

The approximate yield is 10.34%.

b) The Cost of Preferred Stock

The cost of preferred stock financing (R_p) can also be observed in the financial markets. A firm which expects to issued preferred stock would compute the yield for either its own currently outstanding preferred issue or for preferred stock issued by other firms with ratings similar to that which the firm expects to issue. Since the dividend paid on preferred stock is in the form of a perpetuity, the dividend yield can be computed directly using the procedures described in Chapters 5 and 6. The yield or return for a perpetuity is given by the following formula:

R = C/PV

where C is the size of the constant payment. For preferred stock, this can be:

$\mathrm{R}_p = D/P_0$

where D is the constant annual dividend payment and P_0 is the current price per share of the preferred stock.

Example: As of September, 1995, the Island Company (ILCO, a gas and electric utility) has several issues of preferred stock outstanding. On September 21, 1995 one of these issues paid an annual dividend of \$4.35 per share and was trading at a price of \$42 per share; two other issues paid dividends of \$8.12 and \$8.30 respectively, and market prices of \$78.50 and \$80.50 respectively. What is ILCo's cost of preferred stock financing on September 21.

Solution: The return for the first issue is computed as:

$\mathrm{R}_p = D/P_0 = \$4.35/\$42 = 0.10357 = 10.35\%$

The dividend yields for the other preferred stock issues are 10.344% and 10.311% respectively. Clearly the cost of preferred stock financing for ILCo's is between 10.3% and 10.4%.

D) The Weighted Average Cost of Capital

The firm's overall cost of capital is its weighted average cost of capital (WACC). It concentrates on long-term debt and equity as the major components, and assumes that the firm's optimal mix of debt and equity has been already been established.

a) The unadjusted weighted average cost of capital:

For a firm that uses both debt and equity, the average cost of capital is the total amount the firm expects to pay, to both stockholders and bondholders, per dollar of financing obtained. The total cost of debt measured in dollars is $(D \times R_D)$, where D is the market value of debt. The total cost of equity is $(E \times R_E)$, where E is the market value of the firm's equity.

The average cost of capital is the summation of both, or: $(D \times R_D) + (E \times R_E)$ divided by V, the total value of the firm's capital, where V = D + E.

Thus the average cost of capital for the firm is:

Average cost of capital = Total expected cost of capital/Total value of capital

$= [(D \times R_D) + (E \times R_E)]/V = (D \times R_D)/V + (E \times R_E)/V = (D/V) \times R_D + (E/V) \times R_E$

That expression indicates that the average cost of capital is a weighted average of the firm's cost of equity (R_E) and the firm's cost of debt (R_D) ; the weights are the proportion of the total firm value represented by equity (E/V) and the proportion represented by debt (D/V). This weighted average is the **unadjusted weighted average cost of capital (WACC)**, because it ignores taxes.

b) Taxes and the WACC

Interest is a tax-deductible expense, while dividends paid to stockholders are not tax-deductible. Consequently, the equation for the WACC must be adjusted to reflect this difference in tax treatment.

Consider a firm with $R_D = 10\%$ and corporate tax rate $T_c = 34\%$. If the firm pays 10% interest on \$1000 of debt, the before-tax cost of the debt is:

$D \times R_D = \$1000 \times 10\% = \$100$

Since the \$100 interest expense is tax-deductible, it reduces the firm's taxable income by \$100 and consequently reduces the firm's taxes by:

$D \times R_D \times T_c = \$1000 \times 10\% \times 0.34 = \$34$

The after-tax cost of debt, measured in dollars, is therefore equal to:

$D \times R_D \times (1 - T_c) = \$1000 \times 10\% \times (1 - 0.34) = \$66$

The after-tax cost of debt, as an interest rate, is $R_D \times (1 - T_c)$ and the unadjusted WACC must be adjusted as follows:

Weighted Average cost of capital $= (D/V) \times R_D \times (1 - T_c) + (E/V) \times R_E$

The WACC is the rate of return which the firm must earn on its investment in order to be able to exactly compensate the debt-holders and equity-holders who provide the financing to the firm. The WACC is thus the required return for the firm's investments, and it is the appropriate discount rate to use in analysis of capital budgeting projects.

(That was based on the assumption that the proposed capital budgeting project has the same risk that the existing risk level of the firm. If the proposed project has a different risk level, adjustments in the discount rate must be made).

Example: Assume that Pettway's cost of equity is 11.45%. The yield to maturity on Pettway's debt is 8%. The total market value of Pettway's equity is $240 million, and the value of the debt is $160 million. Pettway's corporate tax rate is 34%. Compute the WACC for Pettway.

Solution:

WACC = $(D/V) \times R_D \times (1 - T_c) + (E/V) \times R_E = [0.40 \times 0.08 \times (1 - 0.34)] + 0.60 \times 0.1145$

= 0.08982 =8.982%

Thus Pettway's weighted average cost of capital is 8.982%.

The WACC can be used as the discount rate for determining the NPV of a proposed capital budgeting project. Consider the following example:

Example: Pettway is considering moving its operations from Quebec to Ontario to obtain a more geographically central station. The cash flows derived from this investment are expected to be $25000 per year for the next 25 years. The cost of the move is estimated at $175000. Should Pettway move its operations.

Solution:

Use the NPV criteria. NPV = PV of cash flows - Cost of the project

Use the WACC as the discount rate.

NPV = C$\times PVIFA(r,t) - Cost = C \times PVIFA(WACC,t) - Cost$

WACC = 8.982%. We could find that NPV = $245923.05 - $175000 = $70923.05

Since NPV is positive, so Pettway should relocate.

Flotation Costs and The Weighted Average Cost of Capital

If the firm must issue new securities to obtain the required financing for a new project, then any flotation costs associated with the new issue are incremental costs. They must be incorporated into the NPV analysis. The **flotation costs** of issuing new debt or equity include cash expenses such as legal, accounting, engineering, trustee and listing fees, printing and engraving expenses, Securities and Exchange Commission registration fees, federal revenue stamps, and state taxes. Also an important par to many new issues is the compensation paid to investment bankers for underwriting services.

To explain the effects of flotations costs on the cost of capital, we consider the **following example:**

The ABC production company, an all-equity firm, is evaluating an investment in a new production studio with a 10 year useful life. The cost of the studio is \$460,000, which would be financed by an issue of new common stock.

Flotation costs are 8% of the amount of stock issued. The incremental after-tax cash inflow is expected to be \$95,000 per year throughout the life of the studio. The corporate tax rate is 34%, and the firm's cost of equity is 15%.

Solution:

Since the firm is all equity, the cost of capital is equal to the cost of equity (15%). The present value of the cash flows is:

PV = C $\times PVIFA(r,t) = C \times PVIFA(WACC,t)$.

At 15%, we find that $PVIFA(WACC,t) = 5.018769$

Given C = \$95,000 then PV is = 5.018769×\$95,000=

If we ignore flotation costs, then NPV =- \$460,000+\$476,783.05=+16,783.05.

However, flotation costs represents additional expense associated with the capital budgeting project. First we compute the flotation costs for the new stock equity.

Since the company requires \$460,000 of financing, the firm will have to issue more than \$460,000 of equity in order to net from the issue the required amount of financing. The dollar value of the stock issue is the value of X in the following equation:

$$\$460,000 = (1 - 0.8) \times X$$

That is, in order to obtain \$460,000 in financing after paying the 8% flotation costs, the firm must issue an amount of stock such that (1-0.08)=0.92=92% of the amount issued leaves the firm with \$460,000. Solving for X, we get:

X=$\$460,000/0.92 = \$500,000$ of common stock. So the flotation costs are $\$500,000 - \$460,000 =$

$\$40,000$ and the true cost of the studio is \$500,000.

Then the actual NPV would be:

NPV =- $\$500,000$+\$476,783.05=-\$23,216.95 So the project will not be accepted in this case.

Flotation cost of equity and debt firm

For a firm which uses both debt and equity financing, it is necessary to compute a weighted average flotation costs.

Example:

Suppose we have the same company as before, but with a capital structure which is 75% equity and 25% debt. Assume all the relevant information is exactly like before, and the cost of debt capital is 9%, with flotation costs equal to 4% of the amount of debt issued. What is the NPV of the project.

First compute WACC, we get: WACC = (E/V)R$_E$ $+ (D/V)$R$_D(1 - T_c) = 12.90\%$

The PV of C at 12.90 %, is = C$\times PVIFA(WACC, t) = \$517, 560, 00$

So the project would be accepted if flotation costs are ignored.

In order to incorporate flotation costs into the analysis, we now compute the **weighted average flotation cost** (f$_A$) :

$$f_A = (E/V) \times f_E + (E/V) \times f_D$$

then :

$$f_A = (E/V) \times f_E + (E/V) \times f_D = (0.75 \times 0.08) + (0.25 \times 0.04) = 7\%$$

where f_E and f_D are the flotation costs for equity and debt, respectively. Given the 7% weighted average flotation costs, the total financing required is the value of X in the following equation, that is:

$\$460,000 = (1 - 0.07) \times X$

X =$\$460,000/(1 - 0.07) = \$494,623.66$.

NPV would be =-$\$494,623.66 + \$517,560,00$, still positive.