Cost of Capital with Flotation Costs

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A zero net present value project is one whose acceptance does not affect share price. Based upon the above invariance property and the assumption the firm maintains constant capital structure weights, this article derives a formula for the cost of capital with flotation costs. It is shown that other widely used methods do not possess the invariance property and, consequently, could lead to incorrect capital budgeting decisions.

Introduction

An important role of corporations in the economy is finding and exploiting profitable long-term investment opportunities. Capital budgeting is the decision-making process that corporations use to evaluate potential investment opportunities. A key input to the process is the opportunity cost of capital. For an investment to add value to a corporation, it must earn a return greater than the cost of capital. The weighted average cost of capital, based upon the theoretical work of Modigliani and Miller (1958, 1963), is the most common method for determining the cost of capital. Under this method the cost of capital is the weighted sum of the costs of the component sources of capital, with the weights chosen to maintain the same capital structure.

The original work by Modigliani and Miller does not consider the flotation costs associated with the sale of new debt or equity. Flotation costs can have a significant effect on the cost of capital, especially for small issues. Based upon information from Securities Data Company New Issue database, Lee et al. (1996) computed the average flotation cost as a percentage of issue size for equity and debt from 1990 to 1994. They determined the average equity flotation cost was 7.1 percent for seasoned issues and 11.0 percent for initial public offerings. For debt issues they determined the average flotation cost was 2.2 percent. The results depended upon the issue size and the credit rating of the issuer. If the issue size was between \$2 million and \$9.9 million, the flotation cost was 13.8 percent for seasoned equity and 4.5 percent for debt. For seasoned issues over \$500 million, the flotation costs declined to 3.2 percent for equity and 1.53 percent for debt.

The two standard methods of adjusting the cost of new equity and debt for flotation costs are not consistent with the Modigliani and Miller framework and active

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capital structure management. The internal rate of return (IRR) method (see Brigham, 1998; Brigham and Gapenski, 1991; Clark, Hindelang, and Pritchard, 1989; Gitman, 2000; Keown, 1998) uses the same financing weights as weighted average cost of capital. The cost of each component source of capital is the IRR of the source of financing based upon the net proceeds after flotation.

The IRR approach understates the cost of new equity. For example, suppose the constant growth model applies with a dividend growth rate of 9 percent, and a cost of existing equity of 10 percent, and a flotation cost equal to 50 percent of the proceeds of the new issue.[1] If next year's dividend is $1, then the stock price that provides a cost of equity of 10 percent equals $100. The cost of new equity k_{ns} is computed by equating the net proceeds per share, $50, to the present value of the dividend stream, $1/(k_{ns} – .09)$, and solving for the cost of new equity: $k_{ns} = 11$ percent. The cost of new equity with a flotation cost of 50 percent must be greater than 11 percent.

The investment method (Ezzel and Porter, 1976; Copeland and Weston, 1992; Ross and Westerfield, 1991; Van Horne 1992) involves adjusting the initial investment of a project for the flotation costs based upon the optimal capital structure weights and then computing the net present value using cost of capital before flotation. There are several drawbacks to this method. First, the investment method does not allow the firm to examine the cost of capital adjusted for flotation costs. Second, the method violates the separation principal of the net present value method, wherein the determination of cash flows, including initial investment, is independent of financing. Third, as shown in the next two sections, the method is not consistent with the Modigliani and Miller framework. Finally, as pointed out by Brigham and Gapenski (1991), the investment method assigns the flotation costs to a particular project rather than the firm as a whole. In other words, for a project to have a zero net present value it must recover flotation costs associated with the initial investment. They argue that because a firm is a going concern, it is more reasonable to assign the flotation cost to the firm by adjusting the cost of capital.

This paper generalizes Modigliani and Miller (1958, 1963) to include flotation costs. It develops the cost of capital with flotation costs for perpetuity cash flow streams. The paper compares the flotation-adjusted cost of capital to the investment method.

Flotation Adjusted Cost of Capital

Consider a company that needs to finance I dollars in investments. It will do so by issuing D dollars of perpetuity debt at i percent per year and S dollars of new

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[1]Under the constant growth model, the annual cash flow stream grows g percent each year forever. If the cost of capital is $k > g$ percent and the first cash flow paid in one year is C dollars, the present value equals $C/(k – g)$.

stock. The company has flotation costs of F percent of a new stock issue and F_D percent of a new bond issue, and so

$$I = (1 - F) S + (1 - F_D)D \tag{1}$$

Because of flotation costs, I is less than S + D.

We assume that the firm maintains the same capital structure weights over time. Miles and Ezzel (1980) showed that if the capital structure weights are constant over time, then the weighted average cost of capital is consistent with the Modigliani and Miller framework. The assumption of constant capital structure requires that the firm follow an active debt and/or equity management policy. If this assumption is violated, then the weighted average cost of capital is no longer consistent with Modigliani and Miller. Lewellen and Emery (1986), however, argue for the practical relevance of active debt management. Further, Clubb and Doran (1995) compare project valuations with weighted average cost of capital to those under a more realistic partially active debt management. They find that there is little difference in project valuations under the two methods.

Suppose the firm has a capital structure consisting of θ_S percent equity and θ_D percent debt. Following Modigliani and Miller, assume that the after-tax cash flow stream from the project is perpetuity and the tax rate is a flat τ percent of income. Let k* be the cost of capital applied to the after-tax cash flows used to compute the net present value. Then the annual after-tax cash flow of a zero net present value perpetuity investment is k*I. Further, the cash flow available to shareholders is Ik* - D(1 - τ)i, where i is the interest rate. Define P as the price of the stock before the project is accepted and N as the number of shares of stock outstanding. The firm's value before the new issue is PN.

The new investment is going to be financed with a mixture of debt and equity. If P* is the price after the new stock issue, including added value from the new investment, then the number of new shares will equal

$$\frac{S}{P*} .$$

The firm value immediately after the new issue is the sum of the old value plus the value of the new investment:

$$PN + \frac{Ik* - D(1-\tau)^{i}}{k} - FS - F_D D \tag{2}$$

where k is the cost of common stock. Clearly, the number of shares after the new issue is given by

$$N + \frac{S}{P*} . \tag{3}$$

So the new price is given by the ratio of equation (2) to equation (3):

$$P^* = \left(PN + \frac{Ik^* - D(1-\tau)i}{k}\right)\Big/\left(N + \frac{S}{P^*}\right)$$

The zero net present value condition requires that if an investment earns the cost of capital, the share price before and after the investment is accepted will be the same:

$$P = \left(PN + \frac{Ik^* - D(1-\tau)i}{k}\right)\Big/\left(N + \frac{S}{P}\right)$$

Solving the above equation for cost of capital, we obtain

$$k^* = \frac{S}{I}k + \frac{D}{I}i(1-\tau) \tag{4}$$

The formula has the same form as the weighted average cost of capital except the sum of the weights in equity (S/I) and in debt (D/I) are greater than one, because of flotation costs, and so the cost of capital with flotation costs is higher.

Assume that the firm has an optimal capital structure consisting of θ_S percent stock and θ_D percent debt. Further, assume that the new project does not alter the optimal percentages, so that

$$\theta_S = \frac{S}{S+D}$$

$$\theta_D = \frac{D}{S+D} \tag{5}$$

Define the flotation cost multiplier as

$$m = \frac{1}{1-\theta_S F - \theta_D F_D} \tag{6}$$

Based upon equation (1) and equation (5),

$$I = (S + D)/m. \tag{7}$$

Substituting equation (5) and equation (7) into the cost of capital equation (4), we can write the flotation-adjusted cost of capital (FACC) as:

$$k^* = mk_0^* \tag{8}$$

where

$$k_0^* = \theta_S k + \theta_D(1-\tau)i$$

is the weighted average cost of capital.

Example

Suppose that the target debt ratio is 40 percent and the equity ratio is 60 percent, the flotation cost of equity is 10 percent and debt is 5 percent, and the corporate tax rate is 30 percent. Further, a par bond with maturity of 15 years can be issued with a coupon rate of 8 percent and the cost of equity equals 12 percent based upon the constant growth model with a dividend growth rate of 10 percent. The cost of capital before flotation equals 9.44 percent and the flotation costs multiplier equals 1.087. So the FACC equals 10.26 percent. In this example, flotation costs increase the cost of capital by 0.82 percent.

Let us also determine the cost of capital using the incorrect IRR method. Under this method, the cost of debt is the yield that equates the present value of the coupons and face value to the net proceeds from the issue. Given a flotation cost of 5.00 percent, the cost of debt is the yield to maturity on a $95 bond, which equals 8.61 percent. The cost of new equity equals the dividend yield divided by (1 – F) plus the growth rate in the dividend. So for the IRR method, the cost of new equity equals 12.22 percent, and the weighted average cost of capital equals 9.74 percent. The IRR method understates the true cost of capital by 0.52 percent.

The difference between FACC and IRR methods increases with the size of the flotation costs and the equity weight. To illustrate the difference between the cost of capital under two methods, Table 1 presents the cost of capital for the FACC and IRR methods, applied to the above example, for target equity weights ranging from zero to one. The bias in the IRR method is positive for equity weights less than 0.15, but negative for weights greater than 0.15. For example, at zero equity the bias is 0.14 percent, whereas at 100 percent equity the bias is -1.11 percent. The bias is more pronounced on the negative side, when the equity weight is greater than 0.15. Table 2 presents the same information with flotation costs of equity and debt increased to 15 percent and 10 percent, respectively. With larger flotation costs, the bias is negative for all equity weights and greater in magnitude, ranging from -0.19 percent to -1.77 percent.

Cost of Internal Financing

Now assume that the firm has S^i dollars of retained earnings that it can either pay out or invest in a new project. Based upon the firm's capital structure, the firm should finance I with S dollars in equity and D dollars in debt. Consequently, the firm needs to issue $S^e = S - S^i$ dollars of new stock. Clearly,

$$I = S^i + (1 - F)S^e + (1 - F_D)D \tag{9}$$

If a project earns the cost of capital, then the share price before and after the project is accepted will be the same:

Table 1—Cost of Capital for FACC and IRR Methods versus Target Weights for Equity and Debt Flotation Costs of 10 Percent and 5 Percent

Target Weights			Cost of Capital		
Equity	Debt	Multiplier	Unadjusted	FACC	IRR
0.00	1.00	1.0526	5.60	5.89	6.03
0.10	0.90	1.0582	6.24	6.60	6.65
0.20	0.80	1.0638	6.88	7.32	7.27
0.30	0.70	1.0695	7.52	8.04	7.89
0.40	0.60	1.0753	8.16	8.66	8.51
0.50	0.50	1.0811	8.80	9.51	9.12
0.60	0.40	1.0870	9.44	10.26	9.74
0.70	0.30	1.0929	10.08	11.02	10.36
0.80	0.20	1.0989	10.72	11.8	10.98
0.90	0.10	1.1050	11.36	12.55	11.60
1.00	0.00	1.1111	12.00	13.33	12.22

Table 2—Cost of Capital for FACC and IRR Methods versus Target Weights for Equity and Debt Flotation Costs of 15 Percent and 10 Percent

Target Weights			Cost of Capital		
Equity	Debt	Multiplier	Unadjusted	FACC	IRR
0.00	1.00	1.1111	5.60	6.22	6.03
0.10	0.90	1.1173	6.24	6.97	6.66
0.20	0.80	1.1236	6.88	7.73	7.29
0.30	0.70	1.1299	7.52	8.50	7.92
0.40	0.60	1.1364	8.16	9.27	8.56
0.50	0.50	1.1429	8.80	10.06	9.19
0.60	0.40	1.1494	9.44	10.85	9.82
0.70	0.30	1.1561	10.08	11.65	10.46
0.80	0.20	1.1628	10.72	12.47	11.09
0.90	0.10	1.1696	11.36	13.29	11.72
1.00	0.00	1.1765	12.00	14.12	12.35

$$P = \left(PN - S^i + \frac{Ik^* - D(1-\tau)i}{k}\right) \Big/ \left(N + \frac{S^e}{P}\right)$$

In the above expression, the total value of the firm is decreased by the cash expenditure S^i, but the market value of the assets is increased by the investment of S^i in the project as represented by the present value of the cash flow stream. The number of new shares issued is smaller than before. Solving the above equation for the FACC, we obtain

$$k^* = \left(\frac{S^i}{I}\right)k + \left(\frac{S^e}{I}\right)k + \left(\frac{D}{I}\right)i(1-\tau) \ .$$

Separate the weight in equity θ_S into an internally financed component

$$\theta_I = \frac{S^i}{S^i + S^e + D}$$

and an externally financed component

$$\theta_E = \frac{S^e}{S^i + S^e + D} \ .$$

The flotation cost multiplier is defined as

$$m = \frac{1}{1 - \theta_E F - \theta_D F_D} \ .$$

Then the FACC is

$$k^* = mk_o^* \ .$$

If flotation costs equals zero, then the above equation reduces to the standard formula for weighted average cost of capital.

Investment Method

The investment method involves adjusting the initial investment of a project for the flotation costs based upon optimal capital structure weights and then computing the net present value using cost of capital before flotation. This section shows that the investment method is not consistent with the FACC method.

Consider a project that requires an investment of I dollars and generates a cash flow stream $C_1, \ldots, C_T$. Under the investment method, the first step is the allocation of the flotation cost to the initial investment. An initial investment of I dollars is financed with S^e dollars of new stock, D dollars of debt, and S^i dollars of retained earnings. Consequently, the adjusted initial investment equals $S^e + S^i + D$, which of course is greater than I. The adjusted initial investment can be obtained by rearranging equation (7) as follows:

$$S^e + S^i + D = mI.$$

The net present value under the investment method equals

$$V_i = \sum_{j=1}^{T} \frac{C_j}{\left(1 + k_0^*\right)^j} - mI \qquad (11)$$

and under FACC method equals

$$V_C = \sum_{j=1}^{T} \frac{C_j}{\left(1 + mk_0^*\right)^j} - I \qquad (12)$$

Comparison of equation (11) to equation (12) shows that the two methods assign a different net present value to the same cash flow stream.

For example, for a perpetuity cash flow stream the net present value is determined by

$$V_I = \frac{C}{k_0^*} - mI$$

under the investment method, and by

$$V_C = \frac{C}{mk_0^*} - I$$

under the FACC method. From the above two equations, it is easy to see that the percentage difference is given by

$$\frac{V_i - V_C}{V_C} = m - 1\ . \tag{13}$$

Clearly, for positive flotation costs ($m > 1$), the bias in the investment method is positive. As in the last example, suppose the target debt ratio is 40 percent, the equity ratio is 60 percent, the flotation cost of equity is 10 percent, flotation cost of debt is 5 percent, and the corporate tax rate is 30 percent. Again, the flotation costs multiplier equals 1.087. So the investment method overstates the net present value by 8.7 percent of FACC net present value.

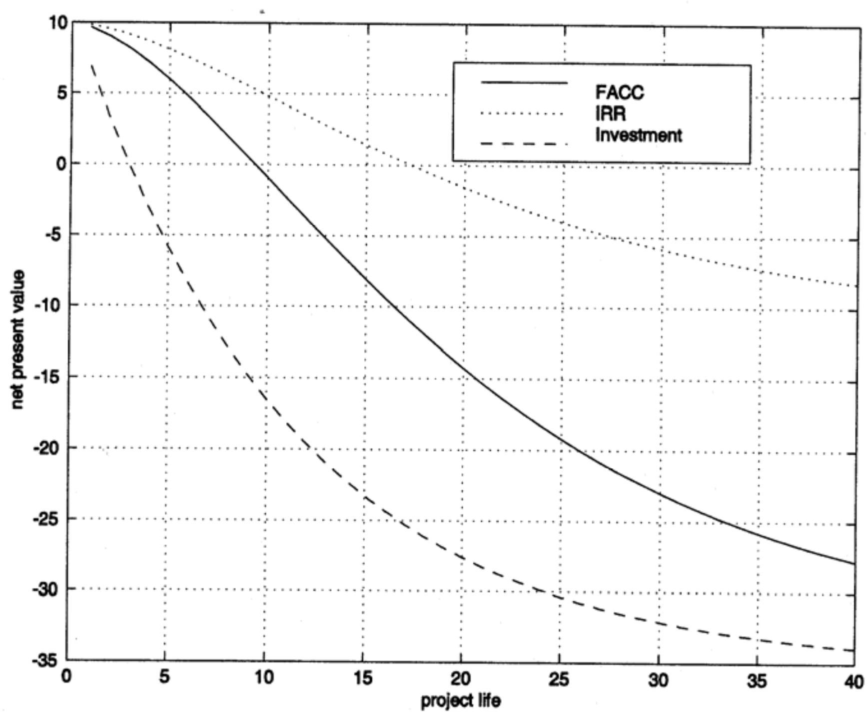
In order to examine the practical impact of the method, the net present value (NPV) is evaluated under the unadjusted (no flotation costs), FACC, IRR, and investment methods for an annuity cash flow stream with a range of project lives. Again, we assume the target debt ratio is 40 percent, the equity ratio is 60 percent, the flotation cost of equity is 10 percent, flotation cost of debt is 5 percent, and the corporate tax rate is 30 percent. The cash flow stream is $50 annuity with a range of project lives. The initial investment is chosen such that the unadjusted NPV equals $10 at each project life, so the initial investment equals the present value of a $50 annuity at the unadjusted cost of capital plus $10. In order for the unadjusted NPV to equal $10 for all project lives, the initial investment must increase with project life. As a consequence, a long-term project has greater total flotation costs than a short-term project, but the same unadjusted NPV. Therefore, in this example the NPV adjusted for flotation costs should be a declining function of project life.

Figure 1 shows the NPV under the three adjusted methods versus project lives ranging from one to 40 years. As expected, all three NPV curves are decreasing. The FACC curve falls between the IRR and investment NPV curve. For projects with lives less than the 22 years, the bias is greater under the investment method. The extent of the bias initially increases with project life and then declines. For projects with lives greater than or equal to 22 years, the bias is greater under the IRR method.

Inspection of Figure 1 reveals that the three methods result in conflicting investment decisions. Based upon the NPV rule, one-year and two-year projects are accepted under investment method, one through nine-year projects are accepted under the FACC method, and one through 17-year projects are accepted under the

IRR method. Obviously, all projects are accepted when the NPV is determined using unadjusted cost of capital. Clearly, the method used to adjust for flotation costs can affect the investment decision.

Figure 1—Net Present Value for FACC, IRR, and Investment Methods versus Project Life



Conclusion

A project has zero net present value if its acceptance does not alter share price. Based upon this invariance property and the assumption of a constant capital structure, a formula is obtained for the flotation-adjusted cost of capital. The formula expresses the cost of capital as a scalar multiple of the unadjusted cost of capital. This approach is less cumbersome than the IRR method. In contrast to the investment method, this approach separates the investment and financing decision and allows a firm to examine the cost of capital with flotation costs. The latter property could be useful in economic value added analysis or residual income valuation.[2]

[2]The two methods are essentially the same. Both require knowledge of the cost of capital. See Stowe, Robinson, Pinto, and McLeavey (2002) Chapter 5.

Finally, because the method assigns a positive net present value only to projects that increase share price, it should lead to better capital budgeting decisions.

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