Valuing Investment Decisions: Flotation Costs And Capital Budgeting

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ABSTRACT

We highlight a measurement problem inherent in the prevalent approach to factoring flotation costs in capital budgeting decision-making. This arises because the traditional method calculates a higher cost of capital, while keeping the initial cash-flow unchanged. We demonstrate an alternate approach that corrects for this problem by assigning a higher initial investment due to flotation costs, while keeping the cost of capital unchanged.

Keywords: Flotation costs, capital budgeting, investment decisions, valuing, project analysis

INTRODUCTION

Shareholder wealth maximization is the primary goal of a corporation, and the foremost mandate of its financial managers. Capital allocation and budgeting decisions play a significant role in this value creation. The contemporary corporate finance education literature extensively discusses various criteria to evaluate capital budgeting decisions. Graham and Harvey (2001) find that most firms use Net Present Value (NPV), Internal Rate of Return (IRR), Payback, or the Profitability Index.

Academics argue that NPV is the most theoretically rigorous, a view supported by most financial managers - 75 percent of firms surveyed by Graham and Harvey (2001) always or almost always use NPV as their investment criterion; the proportion of large firms using NPV is even higher.

For a project under consideration, NPV is calculated as the present value of expected cash-flows discounted at the firm's weighted average cost of capital:

$$\mathbf{NPV_0} = -\mathbf{C_0} + \sum_{i=1}^{n} \frac{\mathbf{C_i}}{(1+\mathbf{WACC})^{i}} \quad (1)$$

where,

NPV_0 is the net present value of the project today (time *0*),
C_0 is the cash-flow in project today (the project investment),
C_i is the cash-flow from project at future time *i*, and
n is the period in which last cash-flow occurs.

The firm's weighted average cost of capital (WACC) is the market-value weighted average of the various components of the firm's capital:

$$\mathbf{WACC} = \mathbf{w_d r_d} + \mathbf{w_{ps} r_{ps}} + \mathbf{w_{cs} r_{cs}} \quad (2)$$

$$\mathbf{r_d} = \mathbf{r_{d,pretax}}(1-\mathbf{T}) \quad (3)$$

where,

w_d, w_{ps}, w_{cs} are the proportion of firm's capital invested in debt, preferred stock, and common stock, respectively,
r_d, r_{ps}, r_{cs} are the rates of return on firm's debt (after-tax), preferred stock, and common stock, respectively, and
T is the marginal federal-plus-state tax rate for the firm.

The literature, however, inadequately addresses how to handle flotation costs in the context of a firm using new capital to finance projects. The traditional treatment in textbooks has been to adjust the discount rate to include flotation costs. This approach is advocated by popular finance textbooks used for undergraduate and graduate courses in colleges and universities globally. Slightly different variations of the traditional approach can be found in textbooks such as Brigham and Houston (2007), Brealey, Myers and Marcus (2007), Brigham and Ehrhardt (2005), Ross, Westerfield, and Jaffe (2002), Ross, Westerfield, and Jordan (2002), Brealey and Myers (2000).

In the following section, we discuss the prevalent approach in depth, and demonstrate that it incorrectly assigns a higher cost of capital and lower initial investment, thus biasing the measurement of NPV. This implies that managers evaluating whether to invest in projects may be incorrectly undervaluing (overvaluing) NPV, and rejecting (accepting) projects that is, in fact, viable (unviable). We also detail an approach, used in only one textbook, which overcomes these measurement errors, and provides managers more accurate and rigorous decision-making criteria.

INCORPORATING FLOTATION COSTS USING THE TRADITIONAL APPROACH

The traditional literature estimates the costs of the new capital components in many different ways. For example, Brigham and Houston (2007) solve for them as:

$$PV_d(1-F_d) = \sum_{j=1}^{t} \frac{PMT_d(1-T)}{(1+r_d^f)^j} + \frac{FV_d}{(1+r_d^f)^t}$$

$$r_{ps}^f = \frac{r_{ps}}{1-F_{ps}}$$

$$r_{cs}^f = \frac{r_{cs} - g_c F_{cs}}{1 - F_{cs}}$$

where,

$r_d^f, r_{ps}^f, r_{cs}^f$ are the rates of return on new debt (pre-tax), preferred stock, and common stock, respectively,

F_d, F_{ps}, F_{cs} are the flotation costs of debt (after-tax), preferred stock, and common stock, respectively,
PV_d, PMT_d, FV_d are the present value, coupon payments, and face value of debt maturing at time *t*, and
g_c is the constant rate at which firm's dividends (and profits) can grow perpetually.

The new costs of capital obtained above are used in equations (2) and (1) to estimate the *project's* weighted average cost of capital, and consequently the net present value.

We note that Brigham and Houston (2007) use a modified version of the Gordon's dividend discount model to estimate rate of return on new common stock as $r_{cs}^f = \frac{D_1}{P_0(1-F_{cs})} + g$ for a firm whose common stock trades at a price P_0, is expected to pay a dividend D_1, and is expected to grow at a constant rate g_c. We rewrite in this form for easier exposition.

INCORPORATING FLOTATION COSTS USING AN ALTERNATE APPROACH

The traditional approach is biased towards assigning a higher value to the weighted average cost of capital, and a lower value to the initial investment. This leads to significant errors in measuring net present value. The measurement errors arise primarily since flotation costs are a one-time cash-flow event, incurred only when firms raise capital. Consequently, they should not materially impact the cost of capital of the firm or of the project. We describe here an alternate approach that mitigates these shortcomings, and which can be generalized to any capital budgeting process. This method is more precise, and can be easily applied to any general capital budgeting decision.

Assuming, the firm retains its current capital structure for the project, we estimate a weighted average flotation cost (F_{WAFC}) for the project as:

$$\mathbf{F_{WAFC} = w_d F_d + w_{ps} F_{ps} + w_{cs} F_{cs}} \tag{4}$$

We then calculate a new initial investment that reflects the weighted average flotation costs of all capital components as:

$$\mathbf{C_0^f = \left[\frac{C_0}{1 - F_{WAFC}}\right](1 - F_{WAFC} T)} \tag{5}$$

Net present value of the project can then be more precisely calculated using the *firm's* weighted average cost of capital, with this new initial investment.

We note that we assumed the company retains its current capital structure for the project only for ease of exposition. Deviation in target project capital structure from that of the firm's, could be accommodated by modifying the capital weights in equations (2) and (4).

CAPITAL BUDGETING IMPLICATIONS: COMPREHENSIVE EXAMPLE

Consider a firm that has a capital structure comprised of 30 percent debt, 10 percent preferred stock, and 60 percent common stock. Management uses the yield-to-maturity on the company's 30-year bonds to estimate its cost of debt: the coupon rate on these bonds is 10 percent, and they currently trade at par. The company's preferred stock has a dividend yield of 7.6 percent and trades at a par value of $50. The firm uses the Gordon's dividend discount model to estimate its cost of common equity: the common stock trades at $50, the previous year's annual dividend was $4.19, and earnings and dividends are estimated to grow at a constant rate of 5 percent. The marginal federal-plus-state tax bracket of the firm is 40 percent. The firm estimates its cost of raising debt, preferred stock, and common stock as 2 percent, 5 percent, and 15 percent, respectively.

Management is evaluating two independent projects for investment. Though, the project funding retains the same relative capital components as the firm, it is financed entirely with new (external) investment capital. The first project requires an investment today of $10 million, and is expected to generate future year-end cash-flows of $1.26 million in each of the following 25 years. The second project entails a similar initial investment, but generates an annual cash-flow $1.8 million for 10 years.

Project Analysis: Ignoring Flotation Costs

In Table 1, we present the NPV valuation of these capital budgeting decisions, without considering flotation costs:

Table 1: NPV Calculation without Flotation Costs

Capital Component	Calculation	Result
Cost of Debt	$1000 = \sum_{j=1}^{30} \frac{100 * (1 - 40\%)}{(1 + r_d)^j} + \frac{1000}{(1 + r_d)^{30}}$	6.0%
Cost of Preferred Stock	$r_{ps} = \frac{\$3.8}{\$50}$	7.6%
Cost of Common Stock	$r_{cs} = \frac{\$4.19 * 1.05}{\$50} + 5\%$	13.8%
WACC	$WACC = 0.3 * 6\% + 0.1 * 7.6\% + 0.6 * 13.8\%$	10.84%
NPV of First Project	$NPV = -10000 + \sum_{i=1}^{25} \frac{1260}{(1.1084)^i}$	+$736,607
NPV of Second Project	$NPV = -10000 + \sum_{i=1}^{10} \frac{1800}{(1.1084)^i}$	+$672,115

Without flotation costs, the manager would clearly choose to invest in both projects since project NPVs are greater than zero.

Project Analysis: Using the Traditional Approach

In Table 2, we rework the NPV valuation using the prevalent approach in most textbooks for factoring flotation costs:

Table 2: NPV Calculation using the Traditional Consideration of Flotation Costs

Capital Component	Calculation	Result
Cost of Debt	$1000 * (1 - 2\%) = \sum_{j=1}^{30} \frac{100 * (1 - 40\%)}{(1 + r_d^f)^j} + \frac{1000}{(1 + r_d^f)^{30}}$	6.15%
Cost of Preferred Stock	$r_{ps}^f = \frac{7.6\%}{1 - 5\%}$	8.0%
Cost of Common Stock	$r_{cs}^f = \frac{13.8\% - 5\% * 15\%}{1 - 15\%}$	15.35%
WACC	$WACC = 0.3 * 6.15\% + 0.1 * 8.0\% + 0.6 * 15.35\%$	11.86%
NPV of First Project	$NPV = -10000 + \sum_{i=1}^{25} \frac{1260}{(1.1186)^i}$	-$20,840
NPV of Second Project	$NPV = -10000 + \sum_{i=1}^{10} \frac{1800}{(1.1186)^i}$	+$228,952

Using the traditional approach to factor in flotation costs, the manager's decision would be to reject the first project (negative NPV), and accept the second project (positive NPV).

Project Analysis: Using the Alternate Approach

Table 3 provides a detailed working of NPV valuations using the alternate approach of considering flotation costs:

Table 3: NPV Calculation using the Alternate Approach for Consideration of Flotation Costs

Capital Component	Calculation	Result
Cost of Debt	$1000 = \sum_{j=1}^{30} \frac{100 * (1 - 40\%)}{(1 + r_d)^j} + \frac{1000}{(1 + r_d)^{30}}$	6.0%
Cost of Preferred Stock	$r_{ps} = \frac{\$3.8}{\$50}$	7.6%
Cost of Common Stock	$r_{cs} = \frac{\$4.19 * 1.05}{\$50} + 5\%$	13.8%
WACC	$WACC = 0.3 * 6\% + 0.1 * 7.6\% + 0.6 * 13.8\%$	10.84%
Weighted Average Flotation Cost	$F_{WAFC} = 0.3 * 2\% + 0.1 * 5\% + 0.6 * 15\%$	10.1%
Adjusted Initial Investment	$C_0^f = \left[\frac{-10000}{1 - 10.1\%}\right](1 - 10.1\% * 40\%)$	-$10,674,000
NPV of First Project	$NPV = -10674 + \sum_{i=1}^{25} \frac{1260}{(1.1084)^i}$	+$62,607
NPV of Second Project	$NPV = -10674 + \sum_{i=1}^{10} \frac{1800}{(1.1084)^i}$	-$1,885

The alternate approach to factoring in project costs reverses the manager's decision. He would now accept only the first project since it has a positive NPV; the second project now has negative NPV. Clearly, under some circumstances, the two approaches may provide contradictory results.

CONCLUSION

Through the detailed calculations above, we illustrate that a project analysis based on the approach popular in most textbooks would force the manager to reject the viable first project, while accepting the unprofitable second project. This is a measurement problem inherent in the prevalent approach, and arises because the traditional method calculates a higher cost of capital, while keeping the initial cash-flow unchanged. As demonstrated above, the bias is magnified for projects with longer paybacks, and large long-run cash-flows.

We demonstrate an alternate approach that corrects for this problem by assigning a higher initial investment due to flotation costs, while keeping the cost of capital unchanged. Though we demonstrate the appropriateness of the alternate method using NPV as the decision criteria, the issue highlighted would apply to other capital budgeting decision criteria. Surprisingly, this approach is not found in the commonly-used textbooks for finance courses.

AUTHOR INFORMATION

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