Valuing Investment Decisions: Flotation Costs and Capital Budgeting

Neeraj J. Gupta, Elon University
Wonhi Synn, Elon University

ABSTRACT

The contemporary corporate finance education literature extensively discusses how to evaluate capital budgeting decisions. 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 the literature has been to adjust the discount rate to include flotation costs. 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. We describe 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.

INTRODUCTION

The contemporary corporate finance education literature extensively discusses how to evaluate capital budgeting decisions. Net Present Value (NPV), a measure used widely[1] by managers as investment criterion, is calculated as:

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

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

Weighted average cost of capital (WACC) is obtained as:

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

[1] Graham and Harvey (2001) find that 75 percent of firms surveyed always or almost always use NPV as their investment criterion; the proportion of large firms using NPV was even higher.

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

where,

w_d, w_{ps}, w_{cs} = proportion of firm capital invested in debt, preferred stock, and common stock, respectively,

r_d, r_{ps}, r_{cs} = rate of return on firm's debt (after-tax), preferred stock, and common stock, respectively,

T = 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 the literature (Brealey, Myers and Marcus (2007), Brigham and Ehrhardt (2005), Ross, Westerfield, and Jaffe (2002)) has been to adjust the discount rate to include flotation costs.

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:

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

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

$$\mathbf{r_{cs}^f} = \frac{\mathbf{r_{cs}} - \mathbf{g_c F_{cs}}}{1 - \mathbf{F_{cs}}}$$ [2]

where,

$\mathbf{r_d^f}$, $\mathbf{r_{ps}^f}$, $\mathbf{r_{cs}^f}$ = rate of return on new debt (pre-tax), preferred stock, and common stock, respectively,

F_d, F_{ps}, F_{cs} = flotation cost of debt (after-tax), preferred stock, and common stock, respectively,

PV_d, PMT_d, FV_d, = present value, coupon payments, and face value of debt maturing at time *t*,

g_c = 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.

[2] 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. Conseq

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 (‘000 $) – First Project	$NPV = -10000 + \sum_{i=1}^{25} \frac{1260}{(1.1084)^i}$	+$737
NPV (‘000 $) – Second Project	$NPV = -10000 + \sum_{i=1}^{10} \frac{1800}{(1.1084)^i}$	+$672

Table 1: NPV Calculations without Flotation Costs

Without flotation costs, the manager would choose to invest in both projects.

Project Analysis: Using the Prevalent Approach

In Table 2, we rework the NPV valuation using the traditional approach in most textbooks for factoring 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 (‘000 $) – First Project	$NPV = -10000 + \sum_{i=1}^{25} \frac{1260}{(1.1186)^i}$	-$18
NPV (‘000 $) – Second Project	$NPV = -10000 + \sum_{i=1}^{10} \frac{1800}{(1.1186)^i}$	+$231

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

Project Analysis: Using the Alternate Approach

Table 3 provides a detailed working of NPV valuations using the alternate approach of considering 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	$\mathbf{C_0^f = \left[\frac{-10000}{1-10.1\%}\right](1-10.1\% * 40\%)}$	-$10674
NPV ('000 $) – First Project	$\mathbf{NPV = -10674 + \sum_{i=1}^{25} \frac{1260}{(1.1084)^i}}$	+$63
NPV ('000 $) – Second Project	$\mathbf{NPV = -10674 + \sum_{i=1}^{10} \frac{1800}{(1.1084)^i}}$	-$2

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

CONCLUSION

Through the detailed calculations above, we illustrate that a project analysis based on the current method 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 describe 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.

REFERENCES

Graham, J. R., and C. R. Harvey (2001), "The Theory and Practice of Corporate Finance: Evidence from the Field", *Journal of Financial Economics*, 187-243.

Brealey, Richard A., and Stewart C. Myers (2000), *Principles of Corporate Finance*, New York, New York: Irwin/McGraw-Hill.

Brealey, Richard A., Stewart C. Myers, and Alan J. Marcus (2007), *Fundamentals of Corporate Finance*, New York, New York: Irwin/McGraw-Hill.

Brigham, Eugene F. and Joel F. Houston (2004), *Fundamentals of Financial Management*, Mason, Ohio: South-Western.

Brigham, Eugene F. and Michael C. Ehrhardt (2005), *Financial Management: Theory and Practice*, Mason, Ohio: South-Western.

Ross, Stephen A., Randolph W. Westerfield, and Jeffrey F. Jaffe (2002), *Corporate Finance*, New York, New York: Irwin/McGraw-Hill.

Ross, Stephen A., Randolph W. Westerfield, and Bradford D. Jordan (2002), *Fundamentals of Corporate Finance*, New York, New York: Irwin/McGraw-Hill.