Estimating the Cost of Capital for Operating Assets

Timothy Vines and ChengHo Hsieh

Abstract

A firm's total assets include non-operating and operating components. In the conventional value-based management and economic value-added models, the value created comes from the firm's operating assets; therefore, the weighted average cost of capital in the models should also be based on the operating assets instead of the total assets. A method to find this cost of capital is presented. This modification also has implications for other areas in the study of financial management, such as capital budgeting and capital structure.

I: INTRODUCTION

Value Based Management

The 1980's produced many headlines associated with the market for corporate control. Equally important, this decade produced a shift in majority stock ownership from individual shareholders collectively to institutional investors. Corporate managers found that societal concern over agency relationships was increasingly leading to activism by the more sophisticated institutional investors and to changes in the legal environment. The need for managers to cooperate with ownership and find better ways to communicate the relationship between decision making and firm value became increasingly important.

Prior to these changes, ratios based on accounting earnings and discounted cash flow techniques were the most frequently used measures to supplement stock price as managerial performance measures. The reasons for accounting information to deviate from economic valuations are well established.[1] Discounted cash flow techniques are hampered by the need to adjust existing accounting information. Chari (2009) finds that there may be as many as 160 possible adjustments possible in the transformation of earnings into cash flow, although only 7 are frequent and significant.

Determining the best way to measure firm performance and how it is affected by decisions has been a subject of great interest to business social scientists. Of much recent notoriety is the growing literature on value-based management (VBM). The value of the firm's operating assets, V_O, is taken to be the present value of the free cash flow from operation, FCF.

$$V_o = \sum \frac{FCF_t}{(1+WACC)^t} \qquad (1)$$

In this equation, t is the time period from 1 to infinity, and WACC is the weighted average cost of capital of the firm given capital structure. Traditionally WACC is defined as:

$$WACC = W_D R_D (1 - T) + W_S R_S \qquad (2)$$

Timothy Vines and ChengHo Hsieh, Department of Economics and Finance, Louisiana State University Shreveport.

[1] See for example, Sloan (1996), Shrieves and Wachowicz (2001), or Martin and Petty (2000).

In this equation, the W's represent the weights of debt (D) and equity (S), R's are the costs to the firm of each type of financing, and T represents the tax rate.

The total market value of the non-operating assets, V_N, is added to V_O to obtain the total value of the firm, V.

$$V = V_O + V_N \quad (3)$$

The market value of debt is then subtracted from the value of the firm to arrive at the estimated value of equity, V_S. The estimated stock price per share is V_S divided by the number of shares outstanding.

The key to VBM seems to be trying to identify how managerial decisions have affected stock value in a way that is not masked by systematic factors in the economy and financial markets or by the nuances of accepted accounting practices. Often this avenue of research is so heavily focused upon the overall measure and its important correlation with observed market value, or on accounting or cash flow data definitions and adjustments, that serious consideration of the appropriate measure of WACC in this context has been somewhat neglected. This is important because without a meaningful way to accurately measure WACC, biases can be introduced into the performance metrics which detract from the desired result of identifying the true link between decisions and performance and to the value of the firm's debt and equity.

Economic Value Added and Market Value Added

Although conceptually compatible with Equation (1) and other discounted cash flow techniques[2], the models most often associated with VBM are known as residual income models. Perhaps the most frequently discussed are Economic Value Added (EVA) and Market Value Added (MVA) by Stewart (1991). EVA is the additional firm value created in a period. MVA is the net value created since the beginning of a company and is also the sum of the present value of all the expected future EVA.

$$EVA = NOPAT - WACC(OC) \quad (4)$$

Alternatively,

$$EVA = (ROIC - WACC)(OC) \quad (5)$$

In these equations, NOPAT is net operating profit after taxes and OC is operating capital (book value of operating assets) considering adjustments for intangibles and sometimes leases. Although precise variable definitions are sometimes vague and differ in various papers discussing the usefulness of EVA, NOPAT is conceptually like FCF. ROIC is the return on invested capital, which is equal to NOPAT/OC. Equations (4) and (5) indicate that EVA is additional operating cash created over and above the operating and financial cash flows.

$$MVA = Market\ Value\ of\ Stock - Book\ Value\ of\ Equity \quad (6)$$

[2] See for example Dillon and Owers (1997), Hartman (2000), and Shrieves and Wachowitz (2001).

MVA is interpreted as the market's perception of the current value of the expected future EVA. It is the additional market value created by managerial decisions. These measures are complimentary and interdependent. Both rely upon publicly available information that allows users to verify statements about performance issued by the managers of adopting firms. Adjustments to this public information made by the users and by academics studying the phenomenon have been debated by many, but the preponderance of the evidence suggests that EVA and MVA outperform the use of accounting information alone as a determinant of market value.

Alternate versions of EVA have been presented. The predominant motivation for the restatements seems to be variable redefinitions that the corresponding authors feel make significant improvement. Surveys and the literature indicate VBM and EVA are widely adopted by firms world-wide. After the initial wave of publicity and academic interest in the U.S., value-based management techniques spread globally. Ryan and Trahan (1999) and Dodd and Johns (1999) survey usage and attitudes among U.S. firms. Feltham, et.al. (2004) study Canadian firms. Fernandez (2002) investigates the use by Spanish firms. Sandoval (2001) uses data from firms in Chile, while West and Worthington (2004) base their conclusions on Australian firms. Yet, in the thousands of words subsequently written about EVA, very little has been related to the use of WACC. This is again problematic due to the essential role the cost of capital plays in the technique. Using a false measure of capital cost results in inaccurate measures of value, making it much more difficult to establish the important links between decisions and value that is the cornerstone of the study of financial management.

In the following section we explain why the WACC currently used for VBM and EVA is not correct and result in over- or under-valuation. In Section III, we present the correct WACC, the WACC for operating assets, and use a numerical example to show how it is estimated. We also briefly explain how the correct WACC improves capital budgeting process and the determination of optimal capital structure. In Section IV, we apply the findings to clarify and improve the MVA. Section V concludes this paper.

II: THE WACC IN VBM AND EVA

Stewart (1994) makes several clarifying comments about EVA and MVA and how to use them. He has pointed out that there are as many as 164 accounting-based performance measurement issues that could be adjusted for, but an individual firm typically would only need 5 to 10 that have material effect. The only adjustment to WACC specifically mentioned is the inclusion of capitalized operating leases in the weight of debt. Stewart also compares MVA to NPV in use and interpretation. The value created by managers at the firm level is analogous to the value created by a positive NPV project when the expected future project cash flows are discounted with WACC. Herein lies the problem with a mis-specified WACC measure. The market value of the weights of financing in the WACC calculation will add to 100% and by necessity will equal the market value of all the firm's assets. This would include non-operating assets that are held for a variety of beneficial reasons not related directly to operations. Such assets may be held to manipulate the perception of overall firm risk, to satisfy bond or loan covenants, or as financial slack. In other words, although these non-operating assets have liquidation value and market value, they do not directly contribute to the NOPAT or FCF that is capitalized in Equation (1), or to EVA

and MVA. Prior to discounting the firm's expected cash flow stream, WACC should be adjusted for the presence of non-operating assets. This would enable analysts and researchers to, in effect, measure the performance of the assets that generate cash flows and other assets separately and more accurately.

Consider the formulation of WACC in Equation (2) as the comprehensive firm WACC, $WACC_{COMP}$. In essence, $WACC_{COMP}$ should be thought of as the combined financial cost of the operating assets, $WACC_O$, and the cost of the non-operating assets, $WACC_N$.

$$WACC_{COMP} = \frac{O}{A}(WACC_O) + \frac{N}{A}(WACC_N) \qquad (7)$$

In this equation, O is the size of the operating assets, A of the total assets, and N of the non-operating assets.

Normally, non-operating assets, held for financial flexibility or liquidity, tend to offer lower rates of return than operating assets. Thus, one would expect that $WACC_N$ is lower than $WACC_O$, although this does not have to be the case. If this is the case, using $WACC_{COMP}$ would result in overvaluation in both EVA and VBM. Similar arguments can be made when $WACC_{COMP}$ is used in capital budgeting as the discount rate for NPV or the hurdle rate for IRR. The literature posits that if the risk level of a project under consideration is close to the average of the firm's existing assets, $WACC_{COMP}$ can be used as the discount rate to calculate the project's NPV or as the hurdle rate for the project's IRR. However, this is correct only if the "existing assets" include all assets. In the case that "existing assets" include only operating assets, one should use $WACC_O$, instead of $WACC_{COMP}$ for both NPV and IRR.

In the rare case that the non-operating assets are riskier than the operating ones, like minority interest investments in firms with greater risk, the opposite effect would occur. Using $WACC_{COMP}$ rather than $WACC_O$ would result in undervaluation.

III: ESTIMATING THE WACC FOR OPERATING ASSETS

To illustrate the benefit of this new way to think about the cost of capital, consider a firm that has debt, D, with a market value of $300 (6% required return, R_D) and equity, S, with a market value of $500 (15% required return, R_S). Thus, the weight for the debt, W_D (= D/(D+S)), is 0.375 and that for the equity, W_S (=S/(D+S)), 0.625. This makes the market value of the firm assets, A, equal to $800 with a combined required return, R_{COMP}, of 11.625%.

$$R_{COMP} = W_D R_D + W_S R_S = 0.375(.06) + 0.625(.15) = 11.625\%$$

R_{COMP} is also equal to the weighted average of the required returns of the non-operating assets and the operating assets as shown below.

$$R_{COMP} = \frac{N}{A}R_N + \frac{O}{A}R_O \qquad (8)$$

In this equation, R_N is the required return of the non-operating assets and R_O of the operating assets. Assume the firm has \$50 in non-operating assets, N, with a required return of 3.6%.[3] Since the total assets for the firm is \$800, the value of the operating assets, O, is \$750. Therefore, N/A=50/800=0.0625 and O/A=750/800=0.9375.

Let R_{ND} and R_{NS} be the required return of debt and equity respectively for the non-operating assets. Given R_N (=3.6%), W_D (=0.375), W_S (=0.625), and based on the ratio of R_D and R_S, 6%/15% (=0.4), R_{ND} and R_{NS} can be found as 1.858% and 4.645% respectively. We assume that $R_{ND}/R_{NS}= R_D/R_S=0.4$.

Based on Equation (8) and given R_{COMP} (=11.625%), R_N (=3.6%), N/A (=0.0625), and O/A (=0.9375), the required return to the operating assets, R_O, is found as 12.16%. Then based on R_O (=12.16%), W_D (=0.375), W_S (=0.625), and assuming $R_{OD}/R_{OS}= R_D/R_S=0.4$, R_{OD} and R_{OS} can be found as 6.276% and 15.69% respectively.

With an effective tax rate, T, of 40%, using Equation (2) results in a $WACC_{COMP}$ equal to 10.725%. Using Equation (2) but based on R_{OD} and R_{OS}, $WACC_O$ is found as 11.219%. This is the appropriate discount rate to find the present value of expected future FCFs, the WACC to calculate EVA, and the discount rate to estimate the NPV of a new project with similar risk of current firm operations.

Currently, the theory of determining a firm's optimal capital structure is based on the market values of the firm's debt and equity. But if the management believes that the market value of the equity does not reflect its true value, in practice, it can use the VBM to determine the value of the equity, then combined with the market value of the debt, to better assess what the optimal debt ratio is. In order to correctly use the VBM, $WACC_O$, instead of $WACC_{COMP}$, should be applied.

In the case where the non-operating assets have more risk than the operating assets, the procedure would be the same. However, unlike the above example, the resulting $WACC_O$ would be lower than $WACC_{COMP}$.

IV: EFFECT OF WACC MISCALCULATION

In order to show the potential effect of the misestimation of WACC, we return to the sample firm in Section III. Assume that, although the market value of the operating assets is \$750, the book value is only \$725. If market and book values are the same for the non-operating assets and the debt, the book value of the equity must be \$475. The MVA calculation would thus yield the correct value of \$25. An efficient market would recognize that $WACC_O$ (11.219%) is the appropriate discount rate. Assuming that EVA is expected to continue from current levels as a perpetuity, EVA is \$2.80475. This is consistent with a NOPAT of \$84.1425. Following the existing literature, management would use $WACC_{COMP}$ and incorrectly estimate EVA as \$6.38625 and

[3] The market value and required return of the non-operating assets (for example, cash and marketable securities) is normally easier to estimate than that of the operating assets.

MVA as $59.5455. Using the wrong capital cost gives managers the impression that they are creating a lot more value (238% for MVA and 228% for EVA) than the market valuation indicates.

In the case where the firm has non-operating assets with higher risk than the operating assets the opposite effect would occur. The incorrectly calculated EVA and MVA would be lower than the correctly determined values. Since MVA depends, in effect, on projections based upon the current level of value creation, misestimation of EVA is magnified when considering the MVA. The degree of error in each case is a function of the difference between the risk, required returns, and sizes of the operating and non-operating assets.

V: REVISITING MVA

Finding firm value with $WACC_O$ rather than $WACC_{COMP}$ also has implications for the interpretation of MVA in equation (6). Given the more appropriate focus on the assets that generate the FCF that determine value creation, an improved reformulation of MVA could be

$$MVA = Vo - Book\ Value\ of\ O \qquad (9)$$

where O still refers to the operating assets. To the extent that this additional value from managerial operating decisions increases the market value of the firm's equity, it should be consistent with the original specification of MVA in (6). However, as operating value increases, it is possible that the value of all the firm's market-traded financial claims benefit, and vice versa. This provides an additional useful interpretation of MVA as

$$MVA = Market\ Value\ of\ D\ and\ S - Book\ Value\ of\ Assets \qquad (10)$$

where D and S refer to debt and equity as in Section III. This might depend on the nature of the firm's non-operating assets. In the typical case where they are low risk assets such as cash and marketable securities, equation (10) should suffice. Risky non-operating assets, such as minority interest are more susceptible to fluctuations of market value from book value due to the way minority interest is accounted for by the investing firm. As market value of the minority assets fluctuates, it may take longer for the book value to adjust. This potential problem could be minimized by interpreting MVA as

$$MVA = Market\ Value\ of\ D\ and\ S - N - Book\ Value\ of\ O \qquad (11)$$

Here, N is the estimated market value of the non-operating assets. Each of these new MVA formulations allow for a more precise discussion of the linkage between decision-making and operating value that is the focus of VBM.

V. CONCLUSION

The purpose of the study of Financial Management is to provide linkages between the choices of the decision makers and the value of the firm. The increased sophistication of firm owners, or the financial institutions that serve as the ultimate owner's agents, and of those that study managerial performance calls for more precise estimates of value. Given the importance of

the cost of capital, the current real-world treatment of the WACC has been somewhat neglected, both in concept and procedure. The ability to identify the appropriate measure for valuing the operating assets is vital to advances in our understanding. This paper addresses these shortcomings by proposing an appropriate distinction between the treatment of operating and non-operating assets as well as a clear, easily usable procedure for estimating the correct WACC. Although this paper is couched in terms of the most popular Value Based Management tools, the proposed approach to finding WACC has important implications for capital budgeting and the study of capital structure. Advances in these areas are all dependent on accurately measuring and utilizing the firm's cost of capital.

VI: REFERENCES

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