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CAPITAL BUDGETING ANALYSIS IN WHOLLY OWNED SUBSIDIARIES

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Abstract

Since the common stock of a wholly owned subsidiary contributes to the holding parent's debt capacity, the value of the parent's debt-related tax shields must be considered when evaluating new investments at the subsidiary level. If financial managers fail to consider the subsidiary's equity risk, resources will be misallocated across subsidiaries and firm value will decline. If financial managers treat the subsidiary as if it were an independent firm and fail to recognize the tax shields, new investments with positive net present value will be rejected and firm value will not be maximized. With the objective to improve capital budgeting analysis for wholly owned subsidiaries, this paper proposes an equity hurdle rate that accounts for not only the subsidiary's equity risk, but also the value of debt capacity created by the subsidiary's common stocks. This risk-adjusted cost of equity is derived in such a way that it is consistent with the goal of value maximization in financial management.

INTRODUCTION

When all the common stocks of an operating firm is owned by a holding parent, the operating firm is known as a wholly owned subsidiary. The capital structure of a wholly owned subsidiary is double levered if the parent company finances its holdings of the subsidiary's equity through a levered capital structure. Two alternative approaches are used to determine the minimum required return on equity of a wholly owned subsidiary. One of them is known as the independent firm approach, which treats the subsidiary as if it were an independent firm and requires the subsidiary to earn its stand-alone cost of equity, approximated by the return on equity in the firms of comparable risk.[1] The other is referred to as the double leverage approach, which accounts for the subsidiary's double-levered capital structure by requiring the subsidiary to earn the parent's weighted-average cost of capital on its equity investments.[2] It is demonstrated in this paper that both approaches are inconsistent with the goal of value maximization in managerial finance. As the parent holds the subsidiary's equity as an asset that provides debt capacity, it allows the parent to use debt financing. As the interest expense on debt is tax deductible, the parent captures the debt related tax benefit. Under the independent firm approach, this tax benefit is completely ignored and new investments with positive net contribution to the parent are rejected. Under the double leverage approach, the tax benefit is accounted for when the parent's weighted-average cost of capital is used as the subsidiary's cost of equity.[3] However, since all subsidiaries have the same cut-off rate on equity regardless of the subsidiary's equity risk, resources are misallocated and firm value is not maximized. To remedy this problem, various methods have been presented to adjust the cost of capital to a wholly owned subsidiary (e.g., Rozeff (1983), Beedles (1984), Sweeney (1985), and Ezzell, Hsu & Miles (1991)). Using the valuation framework of Ezzell, Hsu & Miles (1991), this paper derives a simple specification of cost of equity to a wholly owned subsidiary that is similar in spirit to that of the double leverage approach, but is consistent with the goal of shareholder wealth maximization.

ANALYSIS

A Risk-Adjusted Double Leverage Approach

The objective of this section is to derive the minimum required return on equity for a wholly owned subsidiary. It is generally accepted in financial management that firm-wide weighted-average cost of capital is not the correct hurdle rate

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to evaluate divisional projects. Divisional project risk must be considered to determine project hurdle rate so as to prevent misallocation of resources and value destruction (Brealey & Myers (1996)). Wholly owned operating subsidiaries can be viewed as divisions within the parent. A subsidiary's equity risk should be a determinant of its required return on equity. The principal merit of the approach proposed in this paper over the double leverage approach resides in its accounting for the equity risk of the subsidiary. Assume the following:

1. The common stocks of the operating subsidiary are held as assets by the parent company.
2. The parent finances its holdings of the subsidiaries' common stocks through a levered capital structure.
3. All equity-financed new investments are expected to generate level, perpetual cash flows, and support fixed permanent debt.

To maximize firm value, financial managers undertake the investment with positive net present value (NPV). The NPV of subsidiary j's investment is the market value of its equity cash flows net of its initial equity investment outlay (E_j),

$$NPV_j = r_{sj}E_j / k_{sj} - E_j$$

where r_{sj} is subsidiary j's expected internal rate of return on investment j and k_{sj} is subsidiary j's stand-alone cost of equity. To capture the market value of the cash flows associated with investment j ($r_{sj}E_j$), the subsidiary's stand-alone cost of equity (k_{sj}) is used as the capitalization rate. Let $PVTS_p$ denote the present value of the parent debt-related tax shields created by the new common stocks of the subsidiaries and α_j denote subsidiary j's contribution to the parent's debt capacity. Applying Myers (1974) adjusted present value (APV) concept, investment j's net contribution to the value of the parent is:

Equation 1

$$APV_j = r_{sj}E_j/k_{sj} - E_j + \alpha_j PVTS_p$$

Note that, in equation (1), APV_j is subsidiary j's stand-alone NPV adjusted for subsidiary j's contribution to $PVTS_p$. The correct valuation of the parent's interest tax shields depends upon specific assumptions regarding its debt transaction plan. Assuming that the parent is to maintain a fixed permanent debt policy, $PVTS_p$ equals:

Equation 2

$$PVTS_p = \tau \; L_p \; \Sigma_i E_i$$

where τ is the corporate tax rate and L_p is the parent's debt to total assets ratio. A primary objective of capital budgeting is to identify investments with positive net contributions to firm value. The hurdle rate used by financial managers making capital budgeting decisions should be the minimum rate of return required to maintain firm value. To maintain the value of the parent (or the wealth of subsidiary j's shareholder), APV_j must equal zero. Incorporating the value maintenance condition, $APV_j = 0$, substituting (2) into (1), and solving for r_{sj} yields the risk adjusted equity hurdle rate:

Equation 3

$$r(RA)_{sj} = k_{sj} [1 - (\alpha_j \tau \; L_p \; \Sigma_i E_i/E_j)]$$

The decision variable in (3) is α_j, the proportion of the parent's interest tax shields allocated to subsidiary j. The task of financial managers is to derive a proper tax shield allocation scheme.[4] The objective here is to explicitly recognize the value of the parent's borrowing capacity created by each subsidiary. Since the subsidiaries' common stocks contribute to the debt capacity of the parent, an intuitive solution is to allocate the parent debt-related tax shields based upon each subsidiary's relative contribution to the parent's total holdings of the subsidiaries' common stocks. That is:

$$\alpha_j = E_j / \Sigma_i E_i$$

Thus, (3) reduces to:

Equation 4

$$r(RA)_{sj} = k_{sj} (1 - \tau L_p)$$

Note that this equity hurdle rate reflects the subsidiary's equity risk and that it increases with the subsidiary's stand-alone cost of equity, k_{sj}. Under the risk-adjusted approach, a high equity hurdle rate is employed by a subsidiary of high equity risk and vice versa. Note also that this equity hurdle rate is lower than k_{sj} since it is adjusted to account for the value of the parent's debt related tax shields created by the subsidiary.

The Double Leverage Approach

To account for the double levered capital structure of a wholly owned subsidiary j, the double leverage approach sets its required return on equity, $r(DL)_{sj}$, equal to the parent's weighted average cost of capital, k_{op}. That is:

Equation 5

$$\begin{aligned} r(DL)_{sj} &= k_{op} \\ &= k_{up} (1 - \tau L_p) \end{aligned}$$

where k_{up} is the parent un-levered cost of capital.[5] A comparison of (4) and (5) reveals the following:

1. The double leverage approach under-allocates resources to subsidiary j if $k_{sj} < k_{up}$,
2. The double leverage approach over-allocates resources to subsidiary j if $k_{sj} > k_{up}$, and
3. The double leverage approach allocates resources properly only if $k_{sj} = k_{up}$.

Specifically, the equity hurdle rate under the double leverage approach is too high for lower risk subsidiaries and too low for higher risk subsidiaries. Thus, low risk subsidiaries will reject new investments that more than compensate for the equity risk of the subsidiaries, and high risk subsidiaries will undertake new investments with returns not high enough to compensate for the risk level of the subsidiaries. The approach results in misallocation of resources and destruction of shareholders' wealth.

The Independent Firm Approach

As the independent firm approach treats the subsidiary as if it were an independent firm, subsidiary j's required rate on equity, $r(IF)_{sj}$, equals its stand-alone cost of equity, k_{sj}. That is:

Equation 6

$$r(IF)_{sj} = k_{sj}$$

Note that this equity hurdle rate is higher than the risk adjusted cost of equity as specified in (4). Because the parent's interest tax shields created by the subsidiary is not recognized, projects with positive incremental net value to the parent are rejected when this hurdle rate is used in capital budgeting analysis.

A Numerical Example

In this section, a numerical example is presented to show the effects of alternative approaches upon shareholders' wealth. Assume that two wholly owned subsidiaries of an integrated parent company, subsidiary 1 and subsidiary 2, are evaluating two all equity-financed projects, project 1 and project 2, respectively. Also assume the following:

Subsidiary 1's stand-alone cost of equity = k_{s1} = 25%
Subsidiary 2's stand-alone cost of equity = k_{s2} = 16%
Parent's weighted average cost of capital = k_{op} = 15%
Parent's debt to assets ratio = L_p = 60%
Corporate income tax rate = τ = 35%

Project 1's investment outlay = $300 million

Project 2's investment outlay = $200 million

Project 1's expected internal rate of return = 17%

Project 2's expected internal rate of return = 14%

By (4), the risk-adjusted costs of equity are

$r(RA)_{s1} = k_{s1}(1-\tau L_p) = .25[1-.35(.6)] = 20\%$

$r(RA)_{s2} = k_{s2}(1-\tau L_p) = .16[1-.35(.6)] = 13\%$

Notice that project 1's expected internal rate of return (17%) is below the required rate of 20% and project 2's internal rate of return (14%) is above the required rate of 13%. Applying the internal rate of return decision rule, project 1 should be rejected and project 2 should be accepted. The capital budgeting decisions made under the risk adjusted double leverage approach are justified in Table 1 where each project's net contribution to the shareholders' wealth is examined. Note from Table 1 that, after allocating the parent's interest tax shields created by each new investment, project 1 is rejected as the returns are not high enough to preserve the value of the parent, while project 2 is accepted as it enhances the value of the parent.

TABLE 1
Projects' Net Contribution To Shareholders' Wealth

	Subsidiary 1	**Subsidiary 2**
Expected return on equity to subsidiary j: r_{sj}	17%	14%
Subsidiary j's investment outlay: E_j	$300 million	$200 million
Expected cash flows to subsidiary j: $r_{sj}E_j$	$51 million	$28 million
Subsidiary j's stand-alone cost of equity: k_{sj}	25%	16%
Market value of j's equity cash flows: $S_j = r_{sj}E_j/k_{sj}$	$204 million	$175 million
$PVTS_p$ created by new equity: $PVTS_p = \tau L_p \Sigma E_i$	$105 million	
Subsidiary j's contribution to $PVTS_p$: $\alpha_j = E_j/\Sigma E_i$	.6	.4
$PVTS_p$ created by j's equity: $\alpha_j PVTS_p$	$63 million	$42 million
APV of subsidiary j's investment: $APV_j = S_j+\alpha_j PVTS_p-E_j$	-$33 million	$17 million
Correct decision:	reject	accept

Table 2 shows different accept/reject decisions derived from the three alternative approaches. The double leverage approach uses the parent's weighted average cost of capital (15%) as the hurdle rate for both projects, thus project 1 is accepted and project 2 is rejected. The approach results in misallocation of resources; it accepts a negative APV project (project 1) and rejects a positive APV project (project 2). At the parent's consolidated level, such capital budgeting decisions lead to value destruction. On the other hand, the independent firm approach uses each subsidiary's stand-alone

cost of equity as the hurdle rate, i.e., 25% for project 1 and 16% for project 2, and both projects are rejected. As the approach fails to account for the value of the parent's interest tax shields created by the subsidiary's new equity, it rejects a project with net incremental value to the parent (project 2).

TABLE 2
Capital Budgeting Decisions Under Alternative Approaches

Approach	Subsidiary	Expected Rate	Required Rate	Decision
Double leverage	1	17%	15%	accept
Independent firm	1	17%	25%	reject
Risk adjusted	1	17%	20%	reject
Double leverage	2	14%	15%	reject
Independent firm	2	14%	16%	reject
Risk adjusted	2	14%	13%	accept

CONCLUSION

With the objective to improve capital budgeting analysis for wholly owned subsidiaries, this paper proposes a simple cost of equity formula based upon a generally accepted financial valuation theory. To estimate the required rate of return on equity for a wholly owned subsidiary, the subsidiary's stand-alone cost of equity must first be approximated and then adjusted downward to account for the interest tax shields created by the subsidiary's equity. It is important that financial managers adopt such a risk-adjusted cost of equity as the equity hurdle rate when evaluating new investments in wholly owned subsidiaries. If managers fail to consider the subsidiary's equity risk, resources will be misallocated across subsidiaries and firm value will decline. If managers fail to account for the value of the parent's debt related tax shields provided by the subsidiary's new equity, investments with positive incremental value will be rejected and firm value will not be maximized. It is demonstrated in this paper that the risk-adjusted double leverage approach has advantages over the current methods; it not only incorporates the subsidiary's equity risk but also accounts for subsidiary's double-levered capital structure. This risk-adjusted cost of equity is derived in such a way that it is consistent with the goal of value maximization in capital budgeting.

ENDNOTES

1. Pettway and Jordan (1983), and Beranek and Miles (1988) are in favor of the independent firm approach.

2. The double leverage approach is discussed, among others, in O'Donnell & Walker (1989).

3. Under the double leverage approach, the weighted-average cost of capital of a wholly owned subsidiary j (k_{oj}) equals:

$$k_{oj} = (1-L_j)k_{op} + L_j(1-\tau)\, k_d \qquad \text{(i)}$$

where L is the firm's debt to total assets ratio, τ is the corporate income tax rate, k_d is the market cost of debt, k_{op} is the parent's weighted-average cost of capital,

$$k_{op} = (1-L_p)k_{sp} + L_p(1-\tau)\, k_d \qquad \text{(ii)}$$

and k_{sp} is the parent's market cost of equity. Substituting (ii) into (i) for k_{op} and rearranging,

$$k_{oj} = (1-L_j)(1-L_p)k_{sp} + [(1-L_j)L_p)+L_j](1-\tau)\, k_d \qquad \text{(iii)}$$

Notice from (iii) that the capital structure of subsidiary j is double levered, the debt ratio of subsidiary j has increased from L_j to $[(1-L_j)L_p)+L_j]$ which is equivalent to:

$$(E_j/A_j)(D_p/\Sigma_i E_i) + E_j/A_j = [(E_j/\Sigma_i E_i)D_p + D_j]/A_j$$

where E is the firm's equity value, D is the firm's debt value and A is the firm's total asset. In fact, the parent's debt D_p is allocated to subsidiary j on the basis of the subsidiary's relative contribution to the parent's total holdings of the subsidiary equity ($\Sigma_i E_i$).

4. It is clear that there is no one correct answer to this tax shield allocation problem without an equilibrium theory of debt capacity. Financial managers have some leeway in developing an allocation scheme deemed fair and reasonable for the subsidiary. For illustration purposes, the specific allocation scheme implied in the double leverage approach is employed in this paper.

5. Miller & Modigliani (1966) derive this cost of capital equation under the assumption of a permanent debt policy.

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