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A COMPARISON OF THE WEIGHTED-AVERAGE COST OF CAPITAL AND EQUITY-RESIDUAL APPROACHES TO VALUATION

Methods for valuing capital-investment decisions or firms include two alternative approaches for examining streams of cash flow and their related discount rates. The first and most widely used for project-oriented capital investments discounts the after-tax *free* cash flows by the weighted-average cost of debt and equity (capital) to determine if the result will yield a positive net present value. The main alternative technique, often used in real estate or other instances where financing is easily or directly related to the investment decision, is known as the equity residual (ER) value approach. The method gets its name because the cash flows discounted in this procedure are the after-tax free cash flows *minus* debt-service flows; thus, the method values the remaining cash flows to equity, discounted by the cost of equity. The key differences in the two methods are the treatment of financial leverage and the effects of such debt use on value.

The first approach, referred to as the WACC method, results in the valuation of the entire asset base inherent in the project the "enterprise" value. From this asset value, one must subtract the value of debt to get an estimate of the remaining value to equity. In essence, the WACC approach focuses on operating considerations. Financing concerns are handled via the discount rate.

The ER approach, on the other hand, provides a direct valuation of the residual equity flows resulting from the project. **Table 1** illustrates the link between cash flows, values (of assets, debt, and equity), and discount rates.

This case was prepared by Robert S. Harris, Professor of Business Administration. It was written as a basis for class discussion rather than to illustrate effective or ineffective handling of an administrative situation.

Table 1. Comparison of WACC and ER methods of valuation.

Method	Cash Flow	Discount Rate	Result	Equity Value
WACC	Free cash flow	WACC	$V_{Enterprise}$	$V_{Equity}=V_{Enterprise}-V_{Debt}$ (indirect estimate)
ER	Equity cash flow	Cost of equity	V_{Equity}	Direct estimate

WACC is the most widely accepted method of valuing projects because of the general practice of separating the financing and investment decisions within an organization. Such separation is often desirable in a decentralized decision-making environment in which project appraisal is done by operating managers who do not participate in financing decisions. Use of WACC methodology focuses on investment decisions through which a firm can have a competitive advantage to create value. The ER approach is well suited to situations in which the specific financing of an investment is an important element of the decision. As will be demonstrated, the two methods will yield the same results if all the basic assumptions used in their application are equivalent.

Comparing Basic Methodology

To illustrate the two approaches, we use a perpetuity project. Consider the following valuation using the two methods:

- The project requires an outlay of $5,000 and generates EBIT of $1,667 a year in perpetuity.
- Assume that depreciation charges are just offset by annual capital expenditures and working capital requirements.
- Assume a tax rate of 40%, an interest rate on debt of 10%, and a required rate of return on equity of 20%.
- The firm's policy is to finance with 20% debt and 80% equity, based on market values.

WACC method

Free Cash Flow (FCF) = EBIT(1 - T) + Dep - Inc Net Work Cap. - Cap. Ex.
= $1,667 (1-.4) + 0 - 0
=1,000 per year in perpetuity

Total outlay	$5,000
Interest rate on debt	10%
Required return on equity	20%
Marginal tax rate	40%

*Note: Depreciation, changes in net working capital and capital expenditures net to zero.

The WACC approach discounts the after-tax free cash flows at a rate that incorporates operating risk, capital structure, and tax effects of interest to produce a total value for operating flows. Subtracting the value of debt yields the value of equity. The WACC is estimated using the following equation:

$$WACC = K_W = W_d K_d (1 - T) + W_e K_e$$

where K_W is the weighted-average cost of capital, W_d is the ratio of debt to total financing, K_d is the required rate of return on debt (current *market* rate of interest), T is the corporate tax rate, W_e is the ratio of equity to total financing, and K_e is the required return on equity.

$$K_W = (.200)(10\%)(1-.40) + (.800)(20\%)$$

Valuing the free cash flow using the WACC as a discount rate gives:

V(FCF) = $1,000/0.1720	=	$5,814 $V_{Enterprise}$
Less debt = .20 ($5,814)	=	-1,163 $-V_{Debt}$
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= Value of equity		$4,651 V_{Equity}.

Note that if debt is 20% of the market value of assets, the firm can issue .20($5,814) = $1,163 of debt to help finance the project. The remainder of the $5,000 outlay needed for the project must come from equity owners ($5,000 - $1,163 = $3,837).

These calculations show a clear value added from the investment. This value increase can be seen in two ways. First, consider the equity owners' perspective. Equity is valued at $4,651, and only $3,837 cash is required from shareholders to get this value. There is a gain (net present value or NPV) of $4,651 - $3,837 = $814 for shareholders as a result of this investment. Second, view the entire asset value of the project. The $814 NPV is just the value of the operating cash flow ($5,814) less the total outlay from all suppliers of capital ($5,000).

ER method

To simplify our application of the ER method, assume that the debt level is constant, so there are constant interest payments and no principal flows. If there were net debt payments, we would have to subtract them from FCF. If there was a net debt issue, we would add this to FCF. Note that interest payments provide a tax shield to the corporation:

FCF after tax	$1,000.00	
Less interest	- 116.30	(10% x $1,163)
Add interest tax effect	+ 46.52	($116.30 x 40% tax rate)
- Debt repayment	- 0	
+ Debt issue	+ 0	
Total cash flow after tax to equity	$ 930.22	

Valuing the cash flow to equity using the cost of equity as a discount rate gives:

Value of equity = V(Cash flows to equity) = $930.22/.20 = $4,651.

The ER calculations show that the equity cash flow is worth $4,651. Given the required equity outlay of $3,837, there is a gain (NPV) of $4,651 - $3,837 = $814 to shareholders as a result of the investment. Thus, we obtained exactly the same valuation of equity using either the ER or WACC method.

Reconciling the Value Estimates

Both methods signaled that this investment proposal is value creating. Why did the methods yield exactly the same values? The answer is a subtle one and has to do with the assumptions made about the mix of debt and equity financing. In our application of WACC, we assumed the project was 20% debt financed based on market values. As a result, we used debt equal to 20% of the *value* of the asset (.20 x $5,814 = $1,163) to finance the project. In essence, the project can support $1,163 of debt for the corporation. When we used this $1,163 debt figure in the ER method, we obtained exactly the same value for equity as in the WACC analysis.

Use of this $1,163 debt figure means we implicitly financed more than 20% of the $5,000 outlay for the project with debt. This is because the project's value is larger than $5,000 (i.e., the project has a positive NPV). If, in applying the ER method, we had used debt of only $1,000 (20% of the $5,000 outlay), we would not have obtained the same numerical value of equity as in the WACC approach, because this $1,000 debt level would not be consistent with our assumption of debt equal to 20% of market value used with the WACC approach. To get exactly the same numerical answers, our assumptions about debt use when we apply the two methods must be consistent.

Applying ER and WACC in Practice

Because ER and WACC are both basic discounted cash flow (DCF) approaches to valuing equity, they should theoretically give the same result as in the example. The assumptions on which the example rests are difficult, however, to emulate in practice. In WACC calculations, a constant debt weight is generally assumed. While analysts can finesse the problem of debt repayments in WACC methodology, amortization schedules are necessary in ER methodology to subtract interest and principal outflows from free cash flows, and these amortization schedules seldom maintain debt as a constant proportion of value. We should, however, obtain reasonably consistent values from the two approaches as long as we apply sound judgment in their application. Remember that the key to value estimation typically is proper estimation of underlying operating flows (sales and costs) which swamp minor deviations in assumptions about financing.