

Cost of Capital and Optimal Capital Structure

**Agribusiness Finance
LESE 306 Fall 2010**

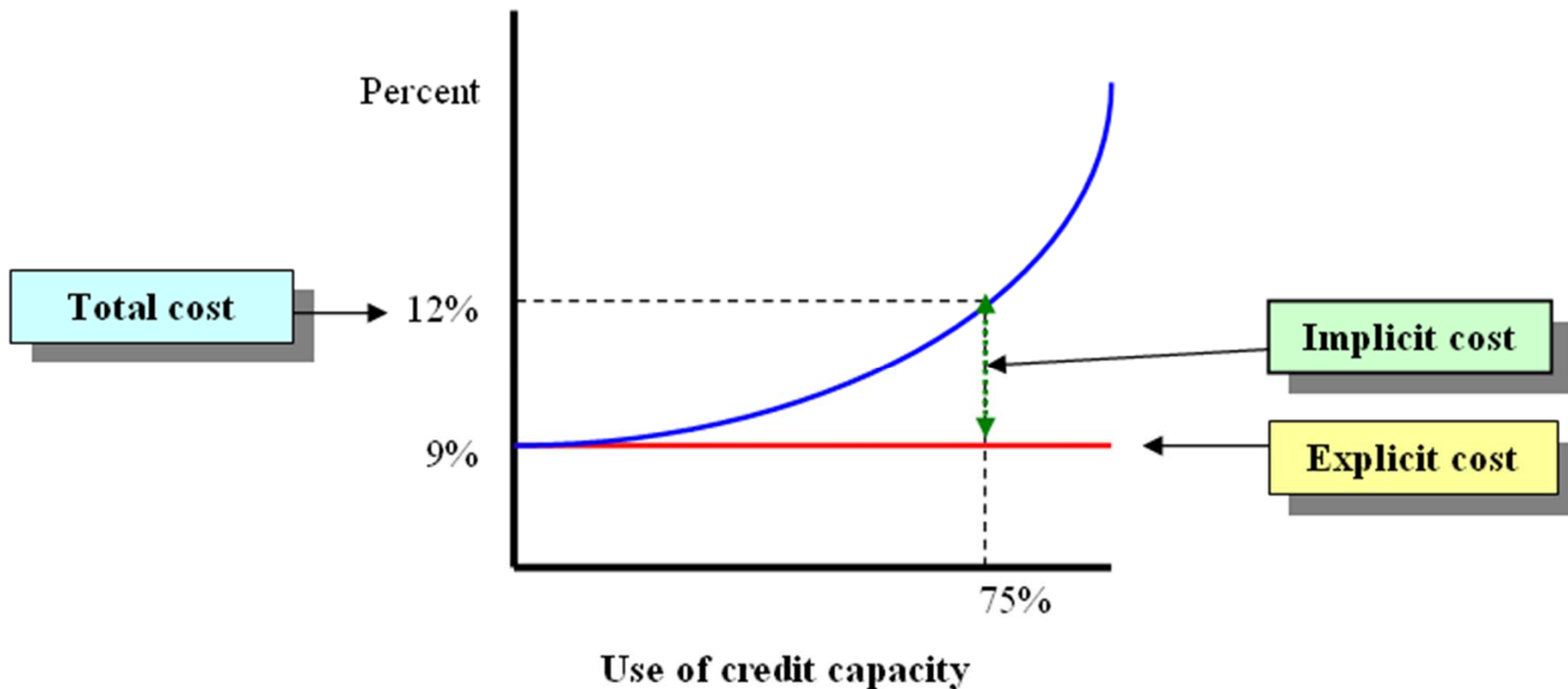
Part VI: The Capital Budget

A. Optimal Capital Structure

Explicit and implicit costs of capital

Thus far we have focused on the required rate of return, mentioning the cost of debt capital only in comparison to the rate of return on assets (ROA) when discussing the rate of growth in equity capital and when discussing a project's internal rate of return, or IRR. Even then we only addressed the explicit cost of debt capital, or the externally determined rate specified on the mortgage or note.

There are implicit costs of debt capital that cause firms to internally ration their use of debt capital that were more or less implied when we discussed the concept of financial risk and the financial risk premium. As the firm reduces its credit liquidity as it uses up its credit reserves, its implicit cost of debt capital rises, causing the total cost of debt capital to rise as shown below.



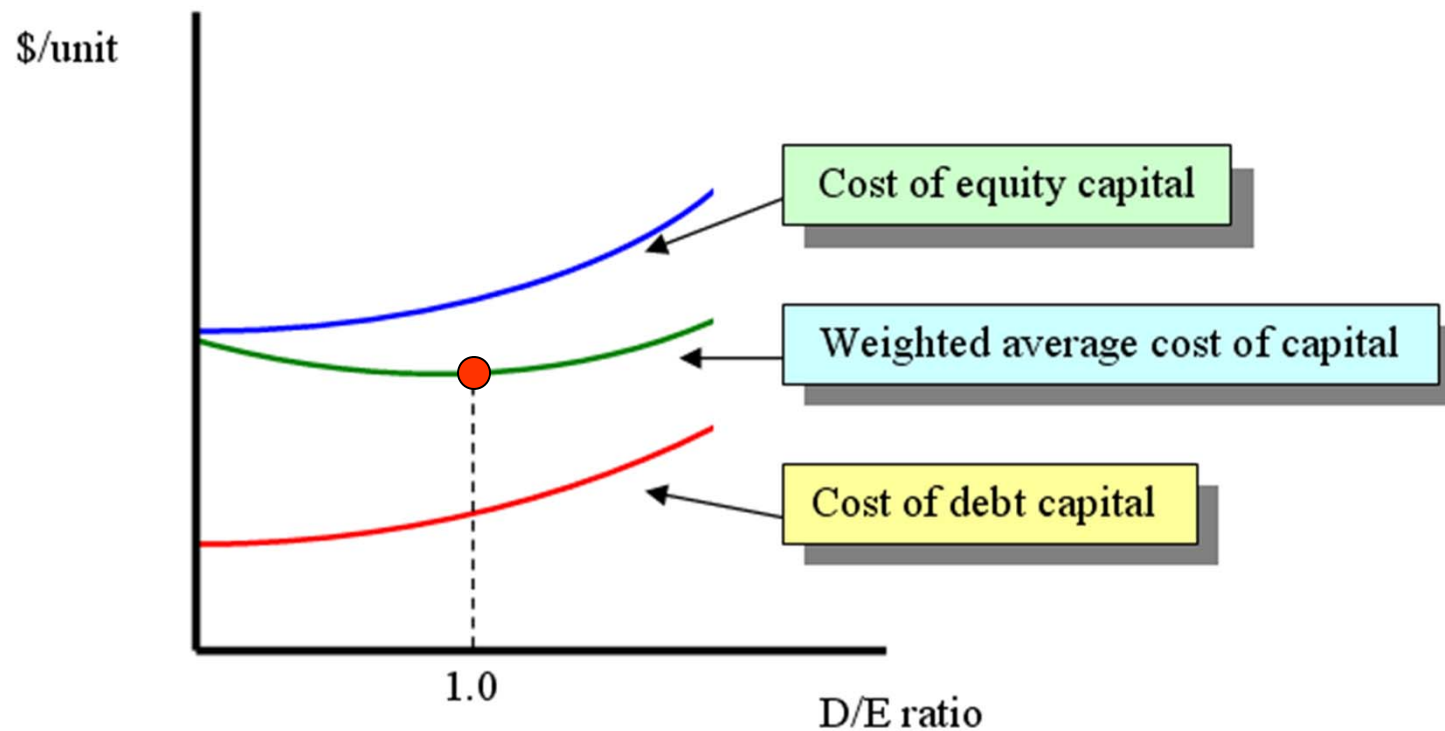
Weighted average cost of capital

The weighted average cost of capital (WACC) employed by the firm is given by the following equation:

$$WACC = W_{EQ}(r_E) + W_{DT}(r_D)$$

where W_{EQ} is the relative importance of equity in the firm's balance sheet, r_E is the cost of equity capital, W_{DT} is the relative importance of debt in the firm's balance sheet, and r_D is the total cost of debt capital. The optimal capital structure of the firm's balance sheet is given by the least cost combination of debt and equity capital.

We can illustrate the point where this occurs in the graph below:



Two features are worth noting in the graph above. The first is the fact that the cost of debt capital is *less than* the cost of equity capital. How can this be? Think of the cost of debt capital as the minimum opportunity rate of return available to the firm. After all, one of the opportunities available to using the firm's equity capital is to make loans to others at the going cost of debt capital!

The other feature has to do with the shape of the weighted cost of capital curve and the optimal location on that curve. This curve falls sharply at low debt/equity ratios since the cost of equity capital is higher and carries a higher weight. The optimal location on the weighted average cost of capital curve is at *its lowest point*. At this point, the firm is *minimizing* its cost of capital. Any other combination of debt and equity capital would reduce the returns from the firm's portfolio.

A numerical example corresponding to the graph depicted above is presented below:

Table 7 – Calculation of the Weighted Cost of Capital.

Leverage ratio	Source of capital	Unit cost	WACC
0.0	Debt	0.04	0.060
	Equity	0.06	
0.5	Debt	0.04	0.053
	Equity	0.06	
1.0	Debt	0.04	0.050
	Equity	0.06	
1.5	Debt	0.05	0.062
	Equity	0.08	
2.0	Debt	0.06	0.074
	Equity	0.10	



We see above that the least cost combination of debt and equity capital occurs where the firm achieves a 50-50 balance of debt and equity capital on its balance sheet. At this point we see that the weighted average cost of capital is 5 percent.