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The irrelevance of capital structure decisions

Company value

- To assess the impact capital structure decisions have on company value, we can compare the value of companies with different levels of debt
- Company value here refers to the value of debt and equity combined
- This value will be based on the ability of the company to generate profits

Levered and unlevered companies

- Companies generate an identical surplus from its investment in the next time period
- If the company has no debt, this surplus is accruing to its equity holders
- $V \rightarrow \hat{E}$
- If the company has debt, this surplus is accruing to equity holders and lenders
- $V \rightarrow E + L$

Investing into the levered company

- If a company has debt, its equity holders will only obtain the surplus less the loan repayment including interest
- $E \to V - (1 + r_L) L$

Investing into the unlevered company

- Suppose an investor makes the same equity investment into the unlevered company as in the levered company
- When investing into the unlevered company he also takes out a loan such that he obtains a fraction $\frac{E+L}{\hat{E}}$ of the company
- He will receive his fraction of the surplus and repay his loan including interest
- $E \to \frac{E+L}{\hat{E}} V - (1 + r_L) L$

Indifference to the form of financing

- As both initial investments were identical, the outcome must be identical
- $V - (1 + r_L)\, L = \frac{E+L}{\hat{E}} V - (1 + r_L)\, L$

$\Rightarrow \hat{E} = E + L = V$

$\Rightarrow$ The company value is independent of the capital structure

- This is known as the Modigliani-Miller theorem or the irrelevance of the capital structure

Equity values

- The value of equity is given from the surplus accruing to the equity holders, discounted at the appropriate cost of equity
- For the unlevered company the surplus consists of the total surplus the company generates
- $\hat{E} = \sum_{\tau=1}^{+\infty} \frac{V}{(1+\hat{r}_E)^\tau} = \frac{V}{\hat{r}_E}$
- For the levered company the surplus consists of the total surplus the company generates less the interest on the loan
- $E = \sum_{\tau=1}^{+\infty} \frac{V - r_L L}{(1+r_E)^\tau} = \frac{V - r_L L}{r_E}$
- The discount rates of the two companies might be different as they are financed in a different way

Cost of equity

- The relationship between these discount rates can now be obtained from the equity value
- $E = \frac{V - r_L L}{r_E} = \frac{\hat{r}_E}{r_E}\frac{V}{\hat{r}_E} - \frac{r_L}{r_E}L$
  $= \frac{\hat{r}_E}{r_E}\hat{E} - \frac{r_L}{r_E}L = \frac{\hat{r}_E}{r_E}(E + L) - \frac{r_L}{r_E}L$

$\Rightarrow$ $r_E = \hat{r}_E + (\hat{r}_E - r_L)\frac{L}{E}$

$\Rightarrow$ The cost of equity increases with leverage

Weighted average cost of capital

- The weighted average cost of capital consist of the cost of equity and costs of debt, with their weights in the financing of the company
- $r_{\text{WACC}} = r_E \frac{E}{E+L} + r_L \frac{L}{E+L}$

$\Rightarrow$ $r_{\text{WACC}} = \hat{r}_E$

- The weighted average cost of capital is unaffected by the capital structure
- The increase in the cost of equity as leverage increases is compensated for by the use of lower-cost loans

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