

Gearing and the Cost of Capital

First, some theory:

The tax advantage of debt follows from the income tax deductibility of interest expenses. Name the effective interest rate r % per year, the amount of debt D and the marginal income tax rate t , then:

annual interest expenses are $r * D$.
annual tax savings on interest expenses $t * r * D$.

If debt is assumed perpetual, the PV of interest tax savings is $t * r * D / r = t * D$ and the value of a levered firm $V_l =$ value of unlevered firm V_u plus the interest tax shield giving:

$$\boxed{V_l = V_u + t * D}$$

The cost of debt can be annotated as $k_d = r * (1 - t)$ when interest costs are tax deductible. In words: if a company maintains a levered capital structure, its total value is higher than that of an equivalent unlevered firm. The equity of the levered firm benefits from that tax shield.

Basic exercise (1):

1. Complete following table: assume identical companies, except for their leverage.

Company	<u>UNLEVERED</u>	<u>LEVERED</u>
Operating earnings *)	€100	€100
Total market value	€1,000	€.....
Value of equity	€.....	€.....
Value of debt	€0	€400
Cost of debt as a %	8%	8%
Interest expenses	€0	€.....
Cost of equity as a %
Cost of capital as a %

- *) All depreciation is reinvested; no growth is expected, planning horizon is undetermined.

Advanced exercises (2-3):

2. The value of an unlevered company UNLEVER is €900 million. Its marginal tax rate is 40%.

Compute the value of equity, of debt and of the whole company if UNLEVER borrows €25 million at 8% annually as a perpetual debt, using this amount to repurchase equity.

3. Apply the Modigliani-Miller theorem to the following data:

Consider two companies (1) Apple and (2) Bees. The two companies only differ in respect to their leverage. Apple is an all-equity financed company, and Bees has financed its activities with equity as well as debt, with debt financing amounting to €40 million. Both companies realise an EBIT of €20 million per year forever (or in perpetuity). The cost of capital of Apple is 10% annually, the tax rate is 40%, and cost of debt financing is 6%.

- a) Compute the total market value of company Apple.
1) in a world *without* taxes.
2) in a world *with* taxes.
- b) Compute the total market value of company Bees.
1) in a world *without* taxes.
2) in a world *with* taxes.

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