AFM 372 Formulas for Exams Spring 2020

Capital Budgeting

- Capital cost of allowance

Fundamentals of Capital Budgeting

- UCC and CAA for year t, and $\text{CCA}_t = \text{UCC}_t \times d$

$$\text{UCC}_t = \begin{cases} \text{CapEx}/2 & \text{for } t = 1 \\ \text{CapEx} \times (1 - d/2) \times (1 - d)^{t-2} & \text{for } t \geq 1 \end{cases}$$

- Free Cash Flow

$$\begin{aligned} \text{FCF}_t =& (\text{Revenues}_t - \text{Costs}_t) \times (1 - \tau_t) - \text{CapEx}_t - \Delta\text{NWC}_t \\ &+ \tau_c \times \text{CCA}_t \end{aligned}$$

- PV of CCA tax shields

$$\text{PV}_{\text{CCA tax shields}} = \frac{\text{CapEx} \times d \times \tau_c}{r + d} \times \left[\frac{1 + r/2}{1 + r}\right]$$

- PV of lost CCA tax shields

$$\text{PV}_{\text{lost CCA tax shield}} = \frac{\min(\text{Sale Price}, \text{CapEx}) \times d \times \tau_c}{r + d} \times \frac{1}{(1 + r)^t}$$

Estimating the Cost of Capital

- CAPM

$$r_i = r_f + \beta_i \times \underbrace{(E[R_{Mkt}] - r_f)}_{\text{market risk premium}}$$

- expected return of the bond is

$$\begin{aligned} r_D = (1 - p)y + p(y - L) &= y - pL \\ &= \text{Yield to Maturity} - \text{Prob(default)} \times \text{Expected Loss Rate} \end{aligned}$$

- the relationship between different ratios

$$\frac{D}{E} = x \implies \frac{E}{V} = \frac{1}{x + 1} \implies \frac{D}{V} = 1 - \frac{E}{V}$$

- asset or unlevered cost of capital, where D is the net debt (also known as pretax WACC)

$$r_U = \frac{E}{E + D} r_E + \frac{D}{E + D} r_D$$

- asset or unlevered beta

$$\beta_U = \frac{E}{E + D} \beta_E + \frac{D}{E + D} \beta_E$$

- weighted average cost of capital with firm's corporate tax rate τ_C

$$r_{wacc} = \frac{E}{E + D} r_E + \frac{D}{E + D} r_D (1 - \tau_C)$$

Capital Structure of a Perfect Market

- cost of capital of levered equity
$$r_E = r_U + \frac{D}{E}(r_U - r_D)$$
- In a setting of perfect capital markets, there are no taxes, so the firm's WACC and unlevered cost of capital conincide
$$r_{wacc} = r_U = r_A$$
- a firm's unlevered or asset beta is the weighed average of its equity and debt beta
$$\beta_U = \frac{E}{E+D}\beta_E + \frac{D}{E+D}\beta_D$$
- a firm's equity beta
$$\beta_E = \beta_U + \frac{D}{E}(\beta_U - \beta_E)$$

Debt and Taxes

- Interest Tax Shield in the all-equity case the total amount available for all investors is (EBIT − Interest)$(1-\tau_c)$, but in the levered case it is

$$\begin{aligned} &\underbrace{(\text{EBIT} - \text{Interest})(1-\tau_c)}_{\text{Available to shareholders}} + \underbrace{\text{Interest}}_{\text{Paid to debtholders}} \\ = \quad &\underbrace{\text{EBIT}(1-\tau_c)}_{\substack{\text{Cash flows to investors} \\ \text{without leverage}}} + \underbrace{\text{Interest} \times \tau_c}_{\text{Interest tax shield}} \end{aligned}$$

- the total value of the levered firm exceeds the value of the firm without leverage due to the PV of the tax savings from debt with corporate taxes

$$V^L = V^U + \text{PV(Interest tax shield)}$$

- PV of the Interest tax shield given permanent debt

$$\begin{aligned} \text{PV(Interst tax shield)} &= \text{PV}(\tau_c \times \text{Future interest payments}) \\ &= \tau_c \times \text{PV(Future interest payments)} \\ &= \tau_c \times D \end{aligned}$$

- the weighted average cost of capital given after-tax interest rate

$$\begin{aligned} r_{wacc} &= \frac{E}{E+D} r_E + \frac{D}{E+D} r_D (1-\tau_c) \\ &= \underbrace{\frac{E}{E+D} r_E + \frac{D}{E+D} r_D}_{\text{Pretax WACC}} - \underbrace{\frac{D}{E+D} r_D \tau_c}_{\substack{\text{Decrease from} \\ \text{interest tax shield}}} \end{aligned}$$

- the effective tax advantage of debt is

$$\tau^* = 1 - \frac{(1-\tau_c)(1-\tau_e)}{(1-\tau_i)}$$

Financial Distress, Managerial Incentives, and Information

- the total value of a levered firm equals the value of the firm without leverage plus the PV of the tax savings from debt, less the PV of financial distress costs

$$V^L = V^U + \text{PV(Interest tax shield)} - \text{PV(Financial distress costs)}$$