Chapter 14: Capital Structure in a Perfect Market

I. Overview

1. Capital structure:

   Note: usually use leverage ratios like debt/assets to measure the mix of debt and equity in a firm's capital structure

2. Basic question: Can a firm make stockholders better (or worse) off by changing its capital structure?

3. Perfect capital markets

   1) all securities are fairly priced
   2) there are no taxes or transaction costs
   3) the total cash flows generated by the firm's project is unaffected by how the firm raises the money to invest in the projects

4. Basic ideas: In perfect capital markets:

   1) capital structure has no impact on the firm's:

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      -

   2) when leverage increases:

      a)

      b)

      c)

5. Reason study a model with such unrealistic assumptions

   => starting point

   Ch 15: how do taxes change our conclusions?
   Ch 16: how do bankruptcy, conflicts of interest, and access to information change our conclusions?

II. Modigliani–Miller I: Leverage and Firm Value

A. Law of One Price

1) the total cash paid to a firm's investors (debt and equity) equals the total cash generated by the firm's assets
2) by the Law of One Price, the firm's debt and equity must have same value as the firm's assets
3) by assumption, capital structure has no impact on the total cash flow generated by firm's assets

=>

Note:

B. Homemade Leverage

Basic idea:

1. Creating an unlevered position in a firm with debt:

=>

=>

=> *just as if the firm never split them up*

2. Creating a levered position in a firm with no debt

Note: in a perfect market, investors can borrow at the same rate as firms

=>

=>

=> *it doesn't matter if the firm or the investor does the borrowing*

Ex. Assume a firm has assets with a market value of $2500 will generate a cash flow of either $100 or $150 per year.

1. Creating an unlevered position in the firm

   a. Assume the firm is 100% equity financed

      => firm's stock is worth $2500
      => cash flow paid out to stockholders = $100 or $150 per year
      Q: How create an unlevered investment in the firm's assets?

      =>

      => amount of own money must invest:

      => net annual cash flow to investor:

   b. Assume the firm has issued bonds worth $1000 at a 4% interest rate

      => firm's stock is worth $1500 = 2500 – 1000
      => annual interest paid by the firm = $40
      => cash flow paid out to stockholders = $60 = 100 – 40 or $110 = 150 – 40
      Q: How create an unlevered investment in the firm's assets?

      =>

      => amount of own money must invest:

      => net annual cash flow to investor:

   Note:

      =>

2. Creating a levered position in the firm

   a. Assume the firm has issued bonds worth $1000 at a 4% interest rate

      => firm's stock is worth $1500 = 2500 – 1000
      => annual interest paid by the firm = $40
      => cash flow paid out to stockholders = $60 = 100 – 40 or $110 = 150 – 40

Q: How create a levered investment in the firm's assets?

=>

=> amount of own money must invest:

=> net annual cash flow to investor:

b. Assume the firm is 100% equity financed

=> firm's stock is worth $2500
=> cash flow paid out to stockholders = $100 or $150 per year
Q: How create a levered investment in the firm's assets?

=>

=> amount of own money must invest:

=> net annual cash flow to investor:

Note:

=>

C. Overall conclusion:

II. Modigliani-Miller II: Leverage and Risk

A. Intuition

1. Leverage, risk, and the cost of equity capital

When a firm has more leverage in its capital structure:

=> cost of capital for equity rises

=>

=>

2. Leverage and expected return

=> stockholder expected returns rise with leverage

=>

=> *reason: bondholders promised the first, safest cash that the firm earns*

=>

=> *reason: firm will be able to borrow at a lower rate than it will expect to earn*

B. Math

Note: to prove the increase in E(R) and r offset, must use math

Note: See Chapter 14 supplement for development of the math

Let:

E = market value of the firm's outstanding equity
D = market value of the firm's outstanding debt
β_E = beta of firm's levered equity
β_D = beta of firm's debt
β_U = beta of firm's unlevered equity (if it has no debt) = beta of firm's assets = β_A
r_E = cost of capital for firm's levered equity
r_D = cost of capital for firm's debt
r_U = cost of capital for firm's unlevered equity = cost of capital for firm's assets = r_A

1. Leverage, risk, and the cost of equity capital

$$\beta_E = \beta_U + \frac{D}{E}(\beta_U - \beta_D) \quad (14.10)$$

$$r_E = r_U + \frac{D}{E}(r_U - r_D) \quad (14.5)$$

=>

=>

Note: $\beta_D < \beta_U$ and $r_d < r_U$

Reason: debt holders get the assets' first, least risky cash flows

=> impact on β_E and r_E as leverage increases:

2. Leverage and expected return

$$E(R_E) = E(R_U) + \left(\frac{D}{E}\right)\left(E(R_U) - E(R_D)\right) \quad (14.A)$$

=> as leverage increases, $\frac{D}{E}$ rises
=> in equilibrium, $E(R_D) < E(R_U)$

=> impact on $E(R_E)$ as leverage increases:

3. Leverage, expected return, and cost of capital

Key:

=>

C. Weighted Average Cost of Capital

1. All equity firms

=> all free cash flows are paid to the firm's stockholders
=> the risk of a firm's equity equals the risk of the firm's assets

=> $r_U = r_A$ (14.6)

2. Firms with debt and equity in their capital structure

Let: r_{WACC} = firm's weighted average cost of capital

$$r_{WACC} = \left(\frac{E}{D+E}\right) r_E + \left(\frac{D}{D+E}\right) r_D = r_U = r_A \quad (14.7) \text{ and } (14.8)$$

Key: In perfect markets, the firm's weighted average cost of capital does not change as the firm changes its capital structure

Example: Assume a firm's assets have a beta of 1.2, that the risk-free rate is 4% and that the market risk premium is 5%. 1) What is the firm's cost of capital if it is funded with $1100 of equity? 2) What is the firm's weighted average cost of capital if it is funded with $300 of risk-free debt and $800 of equity?

1) $\boldsymbol{r_A}$ = .10 =

Note: this is the cost of capital for the firm's assets and unlevered equity

2) $\beta_E = 1.2 + \left(\frac{300}{800}\right)(1.2 - 0) = 1.65$: *Equation 14.10 (p. 5)*

Note: this is the beta of levered equity

r_E = .1225= .

Note: this is the cost of capital for levered equity in Eq. 12.4

$$r_{WACC} = \left(\frac{800}{1100}\right).1225 + \left(\frac{300}{1100}\right).04 = (.73).1225 + (.27).04 = .1 = r_U = r_A$$

Note: if firm holds cash and risk-free securities, use firm's net debt for "D"
Net debt = debt - cash and risk-free securities held by the firm

3. Using the weighted average cost of capital

Main use => estimating the cost of capital for a project

1) project has the same risk as the firm's existing assets

=>

2) project's risk differs from the firm's existing assets

=>

III. Implications of Modigliani and Miller beyond Capital Structure

Key =>

=> if financial transaction appears to create value:

a)

b)

=>