

Chapter 14: Capital Structure in a Perfect Market

14.1 Equity vs. Debt Financing

1. Capital structure: **mix of debt and equity issued by the firm to fund its assets**
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:
 - **total value**
 - **stock price**
 - **weighted average cost of capital**
 - 2) when leverage increases:
 - a) **equity cost of capital rises**
 - b) **expected return on equity rises**
 - c) **a) and b) exactly offset**
5. Reason study a model with such unrealistic assumptions
 - => starting point that examine in FIN 4360
 - 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

=> combining 2) and 3), a change in capital structure has no impact on the combined value of the firm's stock and bonds

Note: **capital structure decisions only affect who gets the firm's cash flows**

B. Homemade Leverage

Basic idea: **investors can duplicate the impact of any capital structure on their own**

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

- => when the firm has debt and equity, it has split its cash flows into two pieces**
- => an investor can recombine the cash flows by purchasing both the firm's debt and its equity**
- => *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

- => an investor can split an unlevered firm's cash flow into two pieces through personal borrowing**
- => the investor is left with exactly the same cash flows as if the firm had done the same amount of borrowing**
- => *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

=> **buy the firm's equity**

=> amount of own money must invest: **\$2500**

=> net annual cash flow to investor: **\$100 or \$150**

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

=> **buy the firm's bonds and the firm's stock**

=> amount of own money must invest: **\$2500 = 1000 + 1500**

=> net annual cash flow to investor: **\$100 = 40 + 60 or \$150 = 40 + 110**

Note: investment and possible cash flows are the same regardless of whether or not the firm has issued debt

=> investors wanting an unlevered position in the firm will be indifferent to whether or not the firm has debt

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

=> **buy the firm's stock**

=> amount of own money must invest: **\$1500**

=> net annual cash flow to investor: **\$60 or \$110**

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

=> **borrow \$1000 at 4% and buy the firm's equity for \$2500**

=> amount of own money must invest: **\$1500 = 2500 - 1000**

=> net annual cash flow to investor: **\$60 = 100 - 40 or \$110 = 150 - 40**

Note: **investment and possible cash flows are the same regardless of whether or not the firm has issued debt**

=> **investors wanting a levered position in the firm will be indifferent to whether or not the firm has debt**

C. Overall conclusion: **investors are indifferent to capital structure**

14.3. 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

=> **the firm promises more of its first, least risky cash flows to bondholders**

=> **stockholders left with increasingly risky cash flows**

2. Leverage and expected return

=> stockholder expected returns rise with leverage

=> **the firm will be able to borrow at a rate that is less than expected return on their investments**

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

=> **the firm earns a spread on every dollar it borrows and invests**

=> *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

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

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

\Rightarrow as leverage increases, **D rises and E falls**

$\Rightarrow \frac{D}{E}$ **rises**

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

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

\Rightarrow impact on β_E and r_E as leverage increases: **both rise**

2. Leverage and expected return

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

\Rightarrow as leverage increases, $\frac{D}{E}$ rises

\Rightarrow in equilibrium, $E(R_D) < E(R_U)$

\Rightarrow impact on $E(R_E)$ as leverage increases: **rises**

3. Leverage, expected return, and cost of capital

Key: leverage impacts equity's expected return and equity's cost of capital in exactly the same way

=> leverage does not make stockholders better or worse off

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

$$\Rightarrow r_U = r_A \quad (14.6)$$

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?

$$1) r_A = .10 = .04 + 1.2(.05) = r_U$$

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

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

Note: this is the beta of levered equity

$$r_E = .1225 = .04 + 1.65(.05)$$

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

=> **use firm's weighted average cost of capital as discount rate on the project**

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

=> **use weighted average cost of capital of firms with the same risk as the project**

14.4 Capital Structure Fallacies

A. Leverage and Earnings Per Share

Incorrect thinking: leverage can increase earnings per share and thus stock price

Key error: **EPS more volatile due to leverage**

B. Equity Issuances and Dilution

Incorrect thinking: issuing equity dilutes ownership of existing shareholders

Key error: **Increase in firm's assets from cash brought in exactly offsets higher number of shares**

Notes:

1) **Shares must be issued at a fair price**

2) Any gain or loss depends on the NPV of projects undertaken with the funds raised.

14.5. Implications of Modigliani and Miller beyond Capital Structure

Key => **with perfect capital markets, financial transactions neither add nor destroy value, but simply repackage risk and return**

=> if financial transaction appears to create value:

a) **exploiting some market imperfection**

b) **too good to be true**

=> **to tell the difference, make sure understand source of market imperfection**