Capital Structure in a Perfect Market

1. **(Alternative Example of 1)**
   Suppose the entrepreneur borrows $700 when financing the project. According to Modigliani and Miller, what should the value of the equity be? What is the expected return?

   Solution)
   Because the value of the firm's total cash flows is still $\$1{,}000$, if the firm borrows $700, its equity will be worth $300. The firm will owe $\$700 \times 1.05 = \$735$ in one year. Thus, if the economy is strong, equity holders will receive $\$1400 - 735 = \$665$, for a return of $\frac{\$665}{\$300} - 1 = 121.67\%$. If the economy is weak, equity holders will receive $\$900 - 735 = \$165$, for a return of $\frac{\$165}{\$300} - 1 = -45.0\%$. The equity has an expected return of

$$\frac{1}{2}(121.67\%) + \frac{1}{2}(-45.0\%) = 38.33\%$$

2. (Alterative Example 2)

Suppose there are two firms, each with date 1 cash flows of $1,400 or $900 (as shown in Table 1). The firms are identical except for their capital structure. One firm is unlevered, and its equity has a market value of $1,010. The other firm has borrowed $500, and its equity has a market value of $500. Does MM Proposition I hold? What arbitrage opportunity is available using homemade leverage?

Solution)

MM Proposition I states that the total value of each firm should equal the value of its assets. Because these firms hold identical assets, their total values should be the same. However, the problem assumes the unlevered firm has a total market value of $1,010, whereas the levered firm has a total market value of

$$\$500\ (equity) + \$500\ (debt) = \$1{,}000$$

Therefore, these prices violate MM Proposition I.

	Date 0	Date 1: Cash Flows	
	Cash Flow	Strong Economy	Weak Economy
Buy levered equity	$500	$875	$375
Buy levered debt	-$500	$525	$525
Sell unlevered equity	$1,010	$1,400	$-900
Total cash flow	$10	$0	$0

Note that the actions of arbitrageurs buying the levered firm's equity and debt and selling the unlevered firm's equity will cause the price of the levered firm's equity to rise and the price of the unlevered firm's equity to fall until the firms' values are equal.

3. **(Alternative Example 3)**
   Assume that the social media app you developed has gone viral and you decided to sell the company, which has $60 million in assets. You plan on splitting the firm into equity, debt, and warrants, and you expect to sell $10 million in debt and $15 million in warrants. What will the value of the equity be in a perfect capital market?

   Solution)
   According to MM Proposition I, the total value of all securities issued should equal the value of the assets, or $60 million. Given that the debt is worth $10 million and the warrants are worth $15 million, the value of the equity must be $35 million.

4. **(Alternative Example 4)**

Suppose the entrepreneur in Alternative Question 1 borrows only $700 when financing the project. Recall that the expected return on unlevered equity is 15% and the risk−free rate is 5%. According to MM Proposition II, what will be the firm's equity cost of capital?

Solution)

Because the firm's assets have a market value of $1,000, by MM Proposition I the equity will have a market value of $300. Then, using Equation (5) in the Lecture note for Week 11,

$$r_E = 15\% + \frac{\$700}{\$300}(15\% - 5\%) = 38.33\%$$

This result matches the expected return calculated in Example 1 in the Lecture Note.

5. (Alternative Example 5)

Honeywell International Inc. (HON) has a market debt−equity ratio of 0.5. Assume its current debt cost of capital is 6.5%, and its equity cost of capital is 14%. If H O N issues equity and uses the proceeds to repay its debt and reduce its debt−equity ratio to 0.4, it will lower its debt cost of capital to 5.75%. With perfect capital markets, what effect will this transaction have on H O N's equity cost of capital and WACC?

Solution)

Current WACC

$$r_{WACC} = \frac{E}{E+D} r_E + \frac{D}{E+D} r_D = \frac{2}{2+1} 14\% + \frac{1}{2+1} 6.5\% = 11.5\%$$

New cost of equity:

$$r_E = r_U + \frac{D}{E}(r_U - r_D) = 11.5\% + 0.4(11.5\% - 5.75\%) = 13.8\%$$

New WACC

$$r_{New\ WACC} = \frac{1}{1+0.4} 13.8\% + \frac{0.4}{1+0.4} 5.75\% = 11.5\%$$

The cost of equity capital falls from 14% to 13.8%, while the WACC is unchanged.