



Corporate Investment Appraisal

Masters in Finance

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Fall Semester

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**Problem Set 6: Cost of Capital & Capital Structure I
To check at home**

1. Estimate the Equity Cost of Capital (r_E)

Suppose that MCDONALD'S stock has a beta of 0.35. If the riskless interest rate is 4% and the expected return of the market portfolio is 9%, what is MCDONALD'S's cost of equity?

According to the CAPM:

$$4\% + 0.35 \times (9\% - 4\%) = 5.75\%$$

2. Estimate the Cost of Debt (r_D)

In mid-2009, Company XYZ had 5-year bonds outstanding in the market, with BBB rating and yield to maturity of 4.25%. If the annual probability of these bonds defaulting is 1.5%, and the expected loss in case of default is 40%, what is your estimate of the expected return for these bondholders?

Considering ytm $y=4.25\%$, probability of default $p=0.015$ and expected loss $L=40\%$:

$$y - p \times L = 4.25\% - 1.5\%(.40) = 3.65\%$$

3. Estimate the Cost of Debt (r_D)

In mid-2009, Company ZZZ had issued 5-year bonds, with rating CCC and yield to maturity of 17.5%. In the same period, US Treasury bonds with the same maturity had a yield of 3%. Suppose that the risk premium of the market portfolio is 5%, and that you are convinced that ZZZ's bonds have a beta of 0.3.

If the expected loss in these bonds in case of default is 60%, what is the annual default probability consistent with the presented yield to maturity?

According to the CAPM:

$$R_d = 3\% + .3(5\%) = 4.5\%$$

According to the adjusted yield, we would reach an implied probability of default:

$$4.5\% = y - pL = 17.5\% - p(.60)$$

$$p = (17.5\% - 4.5\%) / .60 = 21.666\%$$

4. Modigliani-Miller Proposition I and Homemade Leverage

Suppose MM's scenario of the 1958 article. Company ABC has no debt, and company XYZ has debt of 4000, for which it pays interest of 10% per year. Both companies have identical projects that generate annual free cash flows (FCFF) of 600 or of 1000. Both companies pay out all their net income as dividends.

- a) Fill the table showing how much shareholders and bondholders would receive in each scenario.

FCF	ABC		XYZ	
	Debt Payments	Equity Dividends	Debt Payments	Equity Dividends
\$600	0	600	400	200
\$1,000	0	1000	400	600

- b) Suppose you hold 10% of ABC's shares. What alternative portfolio could you hold in order to obtain the exact same cash flows?

Unlevered Equity = Debt + Levered Equity.

Buy 10% of XYZ's debt and 10% of XYZ's equity. Receive cash flows from each item:
 $(40,40) + (20,60) = (60,100)$.

- c) Suppose now that you hold 10% of XYZ's shares. If you could get a loan at an annual rate of 10%, what alternative investment would deliver the same cash flows?

Levered Equity = Unlevered Equity + Borrowing.

Borrow \$400, buy 10% of ABC's shares, receiving $(60,100) - (40, 40) = (20, 60)$

5. Modigliani-Miller Proposition II

HHH Enterprises is currently an unlevered firm, with an expected return of 10%. It considers a recapitalization through which the firm would get a loan to repurchase its own stock.

- a) Suppose HHH borrows so that its debt-equity ratio is 0.75. With this level of debt, the cost of debt would be 7%. What is the expected return for shareholders after this transaction?

$$r_e = r_u + d/e(r_u - r_d) = 10\% + 0.75(10\% - 7\%) = 12.25\%$$

- b) If however the debt-equity ratio reaches 1.50, debt will involve more risk and creditors will demand an annual return of 8%. What is the expected return to shareholders, in this case?

$$r_e = 10\% + 1.50(10\% - 8\%) = 13\%$$

6. Modigliani-Miller Proposition II

Suppose that Microsoft has no debt and that its equity cost of capital is 9.5%. The average debt-to-value ratio in the software industry is 14%. What would Microsoft's equity cost of capital be if it chose a level of debt similar to the industry average, with a cost of debt of 6%?

$$\begin{aligned} r_E &= r_U + \frac{D}{E}(r_U - r_D) \\ r_E &= 0.095 + \frac{0.14}{0.86}(0.095 - 0.06) \\ &= 0.1007 \\ &= 10.07\% \end{aligned}$$

7. Modigliani-Miller Propositions I and II

MMM Corp. is a company with 10 million shares outstanding and debt with a market value of \$100 million. The current stock price is \$70. MMM's equity cost of capital is 8%. The company has just announced that it will issue \$300 million new debt. This amount will be used to retire current debt, and the remaining \$200 million will be spent in an immediate dividend. Assume perfect capital markets.

- a) Estimate the price of a share immediately after the announcement, but before the transaction is completed.

MM => no change, \$70

- b) What share price do you expect at the end of the transaction?

Initial Enterprise Value = $70 \times 10 + 100 = 800$ million

New Debt = 300 million

$E = 800 - 300 = 500$

Share Price = $500/10 = \$50$

- c) Suppose that the current debt is risky, with an expected return of 4.5%, but that the new debt is riskier and involves an expected return of 5.25%. Estimate the equity cost of capital of MMM after the transaction.

$$R_u = (700/800) \times 8\% + (100/800) \times 4.5\% = 7.5625\%$$

$$R_e = 7.5625\% + 300/500(7.5625\% - 5.25\%) = 8.95\%$$