

Corporate Finance, Final Exam, Practice Problems, Perfect Capital Markets

(The attached PDF file has better formatting.)

*Question 1.1: Perfect Capital Markets

Suppose the corporate tax rate is zero, the costs of bankruptcy are zero, and there are no other capital market imperfections, so the Modigliani and Miller proposition 1 holds. The opportunity cost of capital for an all-equity financed firm is 12% per annum. If the firm issues debt at 8% per annum and repurchases some shares, which of the following is true?

- A. The return on assets increases above 12%; the return on equity decreases below 12%.
- B. The return on assets stays the same; the return on equity decreases below 12%.
- C. The return on assets increases above 12; the return on equity increases above 12%.
- D. The return on assets stays the same; the return on equity increases above 12%.
- E. The return on assets decreases below 12%; the return on equity increases above 12%.

Answer 1.1: D

The Modigliani and Miller arbitrage argument shows that

the value of the firm in perfect capital markets does not depend on the capital structure.

- The dollar return on assets is the return before payments to capital providers and does not depend on the capital structure.
- The percentage return is the dollar return divided by assets, so its also doesn't change.

The risk of the equity depends on the systematic risk of the firm. Debt payments are fixed; they do not depend on the income of the firm. We assume the firm has

- high income when markets do well in prosperous years and
- low income when markets do poorly in recession years.

Suppose the firm has assets of \$20 million and earns \$1 million in bad years and \$3 million in good years. If bad and good years are equally probable, the firm makes an average 10% return on assets. The return is 5% in bad years and 15% in good years.

- If the firm is all equity financed, the return on equity capital is 10% on average: 5% in bad years and 15% in good years.
- If the firm is 50% financed with 8% debt, it pays \$800,000 each year to creditors on \$10 million of debt. The shareholders receive the remaining income:
 - \$200,000, or 2%, in bad years.
 - \$2,200,000, or 22%, in good years.

The variability in shareholder returns with a 50%-50% capital structure is

- 3 to 1 in the all equity financed firm and
- 11 to 1 in the 50% debt financed firm.

The required return to creditors also increases as the percentage of debt increases. Suppose the firm is a high-tech start-up or a pharmaceutical firm, whose assets have no value in bankruptcy. The firm has a high cost of bankruptcy, and its cost of debt capital increases as the percentage of debt increases.

Suppose the firm has \$20 million of assets, which are used to fund research that pays for new products. The assets are funded by a combination of equity and debt. The risk-free interest rate is 10% per annum. The firm's income is uniformly distributed over (\$0.1 million, \$5.1 million).

The firm's expected income is \$2.6 million, and its return on assets is 13%.

- If the firm borrows \$1 million, it can surely repay the interest at year end. Creditors require 10% on their capital.
- If the firm borrows \$5 million at a 10% coupon rate, it must earn at least \$0.5 million for the interest payment. The probability that it earns less than \$0.5 million is

$$(\$0.5 \text{ million} - \$0.1 \text{ million}) / (\$5.1 \text{ million} - \$0.1 \text{ million}) = 8.00\%.$$

Creditors demand a return greater than 10% to offset the chance of not receiving their money.

*Question 1.2: Perfect Capital Markets

Suppose the corporate tax rate is zero and there are no capital market imperfections, so the Modigliani and Miller proposition 1 holds: the value of the firm does not depend on the capital structure (the relative amounts of debt and equity). The costs of bankruptcy are zero, and principal agent problems are nil. The debt-to-equity ratio is 25%: it has \$20 million of long-term debt and \$80 million of equity.

The firm's yield to maturity on its debt is 7% the return on equity capital demanded by its shareholders is 15%.

The firm issues \$20 million of additional debt to repurchase \$20 million of shares, thereby increasing the debt-to-equity ratio to 66.7% (\$40 million of debt and \$60 million of equity). The yield to maturity on the debt does not change. What is the new return on equity?

- A. The return on assets increases and the return on equity decreases.
- B. The return on assets stays the same and the return on equity decreases.
- C. The return on assets increases and the return on equity increases.
- D. The return on assets stays the same and the return on equity increases.
- E. The return on assets decreases and the return on equity increases.

Answer 1.2: D

With the old capital structure, the return on assets is $20\% \times 7\% + 80\% \times 15\% = 13.40\%$.

With the new capital structure, we have

$$13.4\% = 40\% \times 7\% + 60\% \times R \Rightarrow R = (13.4\% - 40\% \times 7\%) / 60\% = 17.67\%.$$