Answer Key

ECO 4388
Fall 2014
Midterm 3
There are 8 questions
TOTAL POINTS: 100

Question 1 (6 points) Consider the following statement, state whether it is true or not, and explain why it is true or not. For full marks, be precise and concise and use a graph.

Statement: You are evaluating two projects A and B. You can only choose one of the two projects, but not both. You have the following information on net present values of the two projects.

\[ NPV_A > NPV_B \] for all \( k \).

You also know that \( IRR_A = 8\% \). Then, both IRR and NPV methods will always yield the same decision.

STATEMENT IS CORRECT, both methods always yield the same decision.
Question 2 (6 points) Consider the following statement, state whether it is true or not, and explain why it is true or not. For full marks, be precise and concise and use a graph.

Statement: You are evaluating two projects A and B. You can only choose one of the two projects, but not both. You have the following information on the IRRs of the two projects

\[ \text{IRR}_A = 8\% \text{ and } \text{IRR}_B = 10\% \]

If your cost of capital is LESS THAN 8\%, then in this situation NPV criteria will always pick project B.

\[ \text{NPV}_A > \text{NPV}_B \]

For \( k < 8\% \), we might have

\[ \text{NPV}_A > \text{NPV}_B \]
Question 3 (6 points) Consider the following statement, state whether it is true or not, and explain why it is true or not. For full marks, show your calculation, be precise and concise.

Statement: You are evaluating a single project A. You have

\[ NPV_A = -\$1,245 \]

Your firm is 100% internal equity financed and you use CAPM to calculate your cost of internal equity. Suppose your \( \beta_s = 2 \), the risk free rate of return is 1\% and \( r_M = 6\% \). Then this project’s IRR must be less than 11\%.

\[ NPV_A = -1,245 < 0 \text{ means } \]

\[ \text{IRR} < \text{cost of capital}. \]

\[ \text{Cost of capital} = 1\% + 2 (6\% - 1\%) \]

\[ \text{Cost of capital} = 11\% \]

\[ \text{IRR} < 11\% \]

\[ \text{Statement IS TRUE} \]
Question 4 (6 points) Consider the following statement, state whether it is true or not, and explain why it is true or not. For full marks, show your calculation, be precise and use a graph.

Statement: You are evaluating two projects A and B. You can only choose one of the two projects, but not both. Let $k$ denote your cost of capital. You have the following information on the NPVs of the two projects:

$$NPV_A > NPV_B \text{ for all } k < 8\%$$
$$NPV_A < NPV_B \text{ for all } k > 8\%$$

You also know that $IRR_A = 10\%$. Then in this situation IRR and NPV criteria will NOT always yield the same decision.

The statement is **true** because:

For $k < 8\%$, NPV picks A.
IRR picks B.
Question 5 (6 points) Consider the following statement, state whether it is true or not, and explain why it is true or not. For full marks, be precise.

Statement: Suppose you are evaluating a two year project using the IRR criteria. Suppose your cost of capital increases. Then IRR of this project will increase.

False, IRR is independent of cost of capital.
Question 6 (25 points): A company finances its operations with 40 percent debt and 60 percent equity. Its net income is \( I = \$20 \) million and it has a dividend payout ratio of \( x = 25\% \). Its capital budget is \( B = \$30 \) million this year. The interest rate on company’s debt is \( r_d = 10\% \) and the company’s tax rate is \( T = 40\% \). The company’s common stock trades at \( P_0 = \$66 \) per share, and its current dividend of \( D_0 = \$4 \) per share is expected to grow at a constant rate of \( g = 10\% \) a year. The flotation cost of external equity is \( F = 5\% \) of the dollar amount issued.

a) (15 points) What is the company’s WACC?

\[
I(1-x) = 20M(1-0.25) = 15M
\]

\[
w_d B = 0.60(30) = 18M
\]

\[
\Rightarrow \text{External Equity}
\]

Cost of external equity \( = \frac{D_0 (1+g)}{P_0 (1-F)} + g \)

\[
= \frac{4 (1+0.10)}{66 (1-0.05)} + 0.10 = 17\%
\]

\[
\text{WACC} = \ w_d r_d (1-T) + w_e \text{REC}_{\text{external}}
\]

\[
\text{WACC} = 0.40 (0.10)(1 - 0.40) + 0.6 (0.07)
\]

\[
\text{WACC} = 6.6\% \quad \text{or} \quad 12.6\% \quad \text{(rounded)}
\]
b) (10 points) What is the highest dividend payout ratio $x$ that the company can implement if they are to insist financing a capital budget of $B = 830$ million without issuing new stock?

Internal equity requires

\[ We \quad B \quad \leq \quad I \quad (1 - x) \]

\[ (0.60)(30 M) \quad \leq \quad 20 M \cdot (1 - x). \]

\[ \Rightarrow \quad 1 - x \quad > \quad \frac{(0.60)(30 M)}{20 M} \]

\[ 1 - x \quad > \quad 0.90 \]

\[ x \quad \leq \quad 10 \% \]
Question 7 (20 points): (Modified IRR)

A company is considering to undertake a project which requires an initial investment of $100,000. The project is expected to provide annual cash flows of $80,000 in each of the next 2 years. The company is using the MIRR method to evaluate this investment. The company’s capital structure is 50% internal equity and 50% debt. The cost of internal equity is \( r_e = 10\% \) and the cost of debt is also \( r_d = 10\% \). The company has a tax rate of 20%. What is the MIRR for this project and should the company go for it?

First find \( WACC \)

\[
WACC = w_d \cdot r_d (1-T) + w_e \cdot r_e
\]

\[
WACC = 0.50 \cdot (0.10) (1-0.20) + 0.50 \cdot (10\%)
\]

\[
WACC = 0.5 \cdot (0.10) (0.80) + 0.5 \cdot (0.10)
\]

\[
WACC = 9\%
\]

Future Value = \( (80,000) \) (FVIFA) \( 2,9\% \)

\[
= 167,200
\]

\[
(1+\text{MIRR})^2 = \frac{\text{Future Value}}{\text{Initial Cost}} = \frac{167,200}{100,000}
\]

\[
(1+\text{MIRR})^2 = 1.67
\]

\[
\sqrt{\text{1+MIRR}} = 1.29
\]

\[
\text{MIRR} = 29\% > 9\%
\]

Yes, company should go for it.
Question 8 (25 points) (Modified IRR): Suppose you are evaluating a two year project using the MIRR criteria. Your firm is 100% internal equity financed and you use CAPM to calculate your cost of internal equity. Suppose your \( \beta_s = 1.5 \), the risk free rate of return is 2% and \( r_M = 6\% \). The project will generate a fixed positive cash flow \$60,000\) for both the next two years. The initial cost of the project is \$x\). What is the maximum initial cost \( x \) such that the MIRR criteria recommends accepting the project?

\[
\text{cost of capital} = 2\% + 1.5(6\% - 2\%) = 8\% \\
\text{Future Value} = 60,000 \left( FVIFA_{2\%, 2} \right) \\
\text{Future Value} = 60,000 \left( 2.08 \right) = 124,800 \\
\left(1 + \text{MIRR}\right)^2 = \frac{FV}{\text{Initial Cost}} \\
\Rightarrow \text{MIRR} = \sqrt[2]{\frac{124,800}{x}} - 1. \\
\text{We need} \quad \sqrt[2]{\frac{124,800}{x}} - 1 > 0.08 \\
\frac{124,800}{x} > (1.08)^2 \\
\Rightarrow \quad x < \frac{124,800}{(1.08)^2} \\
\Rightarrow \quad x < \$106,995.9
SOME FORMULAS:

- CAPM Equation:
  \[ r_s = r_{RF} + \beta_s(r_M - r_{RF}) \]

- Constant Dividend Growth Stock Valuation
  \[ P_0 = \frac{D_0(1 + g)}{r_s - g} \] or \[ P_0 = \frac{D_1}{r_s - g} \] \( \Rightarrow r_s = \frac{D_1}{P_0} + g \)

- Note that the required return on equity (stock) can be computed in two ways.
  \[ r_s = \frac{D_1}{P_0} + g \] or \[ r_s = r_{RF} + \beta_s(r_M - r_{RF}) \]

- Choice between internal and external equity
  - If \( w_eB > I(1-x) \) external equity.
  - If \( w_eB < I(1-x) \) internal equity

- Cost of Internal equity
  \[ r^\text{internal}_e = \frac{D_1}{P_0} + g \]

- Cost of External equity
  \[ r^\text{external}_e = \frac{D_1}{P_0(1-F)} + g \]
  where \( F \) is the flotation cost.

- Weighted Average Cost of Capital
  \[ WACC = w_d r_d(1-T) + w_e r_e \]
  where cost of equity \( r_e \) depends on whether equity is internal or external.

- Modified IRR in a two year project is defined as
  \[ (1 + MIRR)^2 = \frac{\text{Future Value of Positive Cash Flows}}{\text{Initial Cost}} \]