

Finance 340 – Financial Management
Fall 2011

Midterm Exam #2 – Version A – Suggested Solutions

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TTh 9:30-10:45

- 1) (15 points) The real risk-free rate of interest, r^* , is 3% and it is expected to remain constant over time. Inflation is expected to be 2% per year for the next 3 years and 4% in the 4th year. The maturity risk premium is equal to $0.1(t - 1)\%$, where t = the bond's maturity. The default risk premium for a BBB-rated bond is 1.3%.

- a) What is the average expected inflation rate over the next 4 years?

$$IP_{1-4} = \sqrt[4]{(1 + 0.02)^3 \times (1 + 0.04)} - 1 = 2.50\%$$

- b) What is the yield on a 4-year Treasury bond?

$$r_{T4} = r^* + IP_{1-4} + MRP_4 = 3\% + 2.5\% + 0.1(4 - 1)\% = 5.8\%$$

- c) What is the yield on a 4-year BBB-rated corporate bond with a liquidity premium of 0.5%?

$$\begin{aligned} r_{BBB4} &= r^* + IP_{1-4} + MRP_4 + DRP_{BBB} + LP_{BBB} \\ &= 3\% + 2.5\% + 0.1(4 - 1)\% + 1.3\% + 0.5\% \\ &= 7.6\% \end{aligned}$$

- 2) (10 points) The yield on 1-year Treasury securities is 6%, 2-year securities yield 6.2%, and 3-year securities yield 6.3%. There is no maturity risk premium. Using the pure expectations theory, forecast the yields on the following securities:

- a) A 1-year Treasury security, 1 year from now.

$$\begin{aligned} (1 + r_2)^2 &= (1 + r_{1,1}) \times (1 + r_{1,2}) \\ 1.062^2 &= 1.06 \times (1 + r_{1,2}) \\ 1 + r_{1,2} &= 1.064 \\ r_{1,2} &= 6.4\% \end{aligned}$$

- b) A 2-year Treasury security, 1 year from now.

$$\begin{aligned} (1 + r_3)^3 &= (1 + r_{1,1}) \times (1 + r_{2,2})^2 \\ 1.063^3 &= 1.06 \times (1 + r_{2,2})^2 \\ (1 + r_{2,2})^2 &= 1.1332 \\ 1 + r_{2,2} &= 1.0645 \\ r_{2,2} &= 6.45\% \end{aligned}$$

- 3) (5 points) Last year John purchased a \$1,000 face value corporate bond with an 11% annual coupon and 10 years remaining until maturity. At the time of the purchase, it had an expected yield to maturity of 9.79%. If John sold the bond today for \$1,060.49, what rate of return would he have earned for the past year?

$P/Y = 1, N = 10, I = 9.79, PMT = 110, FV = 1,000 \Rightarrow PV = -1,075.02 =$ price last year.

Change $N = 1$ and $FV = 1,060.49$ and solve for $I = 8.88\%$.

- 4) (15 points) IFI Associates issue a new series of bonds on January 1, 2001. The bonds were sold at par (\$1,000), had a 7% coupon, and mature in 20 years. Coupon payments are made semi-annually.

- a) What was the yield to maturity on January 1, 2001?

Since the bonds were issued at par, the YTM = coupon rate = 7%.

You can also solve this as $N = 20 \times 2 = 40, P/Y = 2, PMT = 70 / 2 = 35, FV = 1,000, PV = -1,000 \Rightarrow I/Y = YTM = 7.0\%$.

- b) Suppose that the market's required yield for this bond had fallen to 5% on January 1, 2006, five years after the bond was issued. What was the price of the bond at that time? Was this a discount or premium bond?

$N = 15 \times 2 = 30, I/Y = 5 \Rightarrow PV = -1,209.30$

This is a premium bond.

- c) What were the current yield and capital gains yield on this bond on January 1, 2006?

Current yield = $70 \div 1,209.30 = 5.79\%$

Capital gains yield = $YTM - CY = 5.00 - 5.79 = -0.79\%$.

- 5) (5 points) Consider a bond with a par value of \$25,000, an annual coupon, and 15 years remaining until maturity. If the bond's yield to maturity is 5.75% and its current price is \$26,234, what is the bond's coupon rate?

$P/Y = 1, N = 15, I = 5.75, PV = -26,234, FV = 25,000 \Rightarrow PMT = 1,562.49$

\Rightarrow Coupon rate = $PMT / FV = 1,562.49 / 25,000 = 6.25\%$.

- 6) (15 points) Stock X has a 10% expected return, a beta coefficient of 0.9 and a 35% standard deviation of expected returns. Stock Y has a 12.5% expected return, a beta coefficient of 1.2 and a 25% standard deviation. The risk-free rate is 6% and the return on the market portfolio is 11%.

- a) Calculate each stock's coefficient of variation.

$$CV_X = \sigma_X / \hat{r}_X = 35\% / 10\% = 3.5$$

$$CV_Y = \sigma_Y / \hat{r}_Y = 25\% / 12.5\% = 2.0.$$

- b) Which stock is riskier for a diversified investor? Explain.

Stock Y is riskier for a diversified investor because its beta is larger.

- c) Calculate each stock's required return. On the basis of the two stock's expected and required returns, which stock would be more attractive to a diversified investor?

$$r_X = 6\% + (11\% - 6\%) \times 0.9 = 10.5\% > \hat{r}_X = 10\%$$

$$r_Y = 6\% + (11\% - 6\%) \times 1.2 = 12\% < \hat{r}_Y = 12.5\%$$

Stock X's required return is greater than its expected return, meaning it is overvalued. In contrast, stock Y's required return is less than its expected return, meaning it is undervalued. Stock Y would be more attractive to a diversified investor.

- 7) (15 points) CREI Corporation is a holding company with four main subsidiaries. The percentage of its capital invested in each of the subsidiaries (and their respective betas) are as follows:

<u>Subsidiary</u>	<u>Percentage of Capita</u>	<u>Beta</u>
Electric utility	60%	0.70
Cable company	25%	0.90
Real estate development	10%	1.30
International	5%	1.50

- a) What is the holding company's beta?

$$\begin{aligned}\beta_{CREI} &= 0.6 \times \beta_E + 0.25 \times \beta_C + 0.10 \times \beta_{RE} + 0.05 \times \beta_I \\ &= 0.60 \times 0.70 + 0.25 \times 0.90 + 0.10 \times 1.30 + 0.05 \times 1.50 \\ &= 0.85\end{aligned}$$

- b) If the risk-free rate is 6% and the market risk premium is 5%, what is the holding company's required rate of return?

$$\begin{aligned}r_{CREI} &= r_{rf} + (r_m - r_{rf}) \times \beta_{CREI} \\ &= 6\% + 5\% \times 0.85 \\ &= 10.25\%\end{aligned}$$

- c) CREI is considering a change in strategic focus; it will reduce its reliance on the electric utility subsidiary, so the percentage of its capital in this subsidiary will be reduced to 50%. At the same time, it will increase its reliance on the international/special projects division, so the percentage of capital in that subsidiary will rise to 15%. What will the company's required rate of return be after those changes?

After the change, the CREI's new beta will be:

$$\begin{aligned}\beta_{CREI} &= 0.5 \times \beta_E + 0.25 \times \beta_C + 0.10 \times \beta_{RE} + 0.15 \times \beta_I \\ &= 0.50 \times 0.70 + 0.25 \times 0.90 + 0.10 \times 1.30 + 0.15 \times 1.50 \\ &= 0.93\end{aligned}$$

As a result, the new required return on the holding company will be:

$$\begin{aligned}r_{CREI} &= r_{rf} + (r_m - r_{rf}) \times \beta_{CREI} \\ &= 6\% + 5\% \times 0.93\end{aligned}$$

$$= 10.65\%$$

Multiple Choice Questions (2 points each)

- _____ 1. Which of the following factors would be most likely to lead to an increase in nominal interest rates?
- A. Households reduce their consumption and increase their savings.
 - B. A NEW TECHNOLOGY LIKE THE INTERNET HAS JUST BEEN INTRODUCED, AND IT INCREASES INVESTMENT OPPORTUNITIES.**
 - C. There is a decrease in expected inflation.
 - D. The economy falls into a recession.
 - E. The Federal Reserve decides to try to stimulate the economy.
- _____ 2. Assume that interest rates on 20-year Treasury and corporate bonds are as follows:
- T-bond = 7.72% AAA = 8.72% A = 9.64% BBB = 10.18%
- The differences in these rates were probably caused primarily by:
- A. Tax effects.
 - B. Maturity risk differences.
 - C. DEFAULT RISK DIFFERENCES.**
 - D. Inflation differences.
 - E. Real risk-free rate differences.
- _____ 3. If the Treasury yield curve is upward sloping, how would the yield to maturity on a 10-year Treasury coupon bond compare to that on a 1-year T-bill?
- A. It is impossible to tell without knowing the relative risks of the two securities.
 - B. The yield on a 10-year bond would be less than that on a 1-year bill.
 - C. THE YIELD ON A 10-YEAR BOND WOULD TO BE HIGHER THAN THAT ON A 1-YEAR BILL.**
 - D. It is impossible to tell without knowing the coupon rates of the bonds.
 - E. The yields on the two securities would be equal.
- _____ 4. True or **FALSE**: A call provision gives bondholders the right to demand, or “call for,” repayment of a bond.
- _____ 5. **TRUE** or False: Sinking funds are provisions included in bond indentures that require companies to retire bonds on a scheduled basis prior to their final maturity.

- _____ 6. True or **FALSE**: The price of a premium bond will rise over time if market required returns remain constant.
- _____ 7. True or **FALSE**: Because short-term interest rates are much more volatile than long-term rates, you would generally be subject to much more interest rate price risk if you purchased a 30-day bond than if you bought a 30-year bond.
- _____ 8. **TRUE** or False: There is an inverse relationship between bonds' quality ratings and their required rates of return. Thus, the required return is lowest for AAA-rated bonds, and required returns increase as the ratings get lower.
- _____ 9. **TRUE** or False: When adding a randomly chosen new stock to an existing portfolio, the higher (or more positive) the degree of correlation between the new stock and stocks already in the portfolio, the less the additional stock will reduce the portfolio's risk.
- _____ 10. (Bonus) **TRUE** or False: I hate true-false questions.