University of Alabama

FI 414 (514) **Dr. Anup Agrawal**
Investments

Quiz 2 (Sample)

Name ______________________________________ SS#_________________________.
Print

Instructions: Answer all questions in both parts. All the best!

Part A (3 problems, 80 points)

Instructions: Show all work, but be precise. There is partial credit for method. If using the financial calculator, show inputs to the calculator in coming up with the answer.

1. Indigo Inc. just paid a dividend of $6 per share. Dividends are expected to grow at 9% per year over the next 5 years and at 4% per year after that. What is the stock price if investors require a 12% annual return on the stock?

(20 points)

2. Consider two 5% semiannual coupon bonds with a yield to maturity of 7.2%. Bond A matures in 5 years and bond B in 25 years.

   a. Calculate the price of each bond.

   b. Calculate the new bond prices if the market interest rate changes to 9.4%.

   c. Which bond is more sensitive to changes in the discount rate?

(25 points)

3. Your fund has an obligation to pay out $40 million in 5 years and $90 million in 7 years. You want to immunize this liability with a 2-year zero coupon bond (bond A) and a 10-year 6% annual coupon bond (bond B), both with a yield to maturity of 5%.

    a. Find the duration of your liability.

    b. What is the duration of each bond?

    c. What proportion of your investment should you put in each bond to immunize your position?

    d. What is the dollar amount you need to invest in each bond?

    e. What is the face value of your investment in each bond?

(35 points)

Part B: Multiple choice (10 problems, 2 points each)

Instructions: Encircle the *one* correct answer to each problem.

1. Which of the following beliefs would **not** preclude charting as a method of portfolio management.

A) The market is strong form efficient.
B) The market is semi-strong form efficient.
C) The market is weak form efficient.
D) Stock prices follow recurring patterns.

2. The weak form EMH states that ________ must be reflected in the stock price.

A) all market trading data
B) all publicly available information
C) all information including inside information
D) none of the above

3. When the market risk premium rises, stock prices will ________.

A) rise
B) fall
C) recover
D) have excess volatility

4. Which of the following is not a method employed by followers of technical analysis?

A) charting
B) relative strength analysis
C) earnings forecasting
D) All of the above are methods employed by technical analysts

5. Small firms have tended to earn abnormal returns primarily in _______________ .

A) the month of January
B) the month July
C) the trough of the business cycle
D) the peak of the business cycle

6. Consider two bonds, A and B. Both bonds presently are selling at their par value of $1,000. Each pay interest of $120 annually. Bond A will mature in 5 years while bond B will mature in 6 years. If the yields to maturity on the two bonds change from 12% to 14%, __________.

A) both bonds will increase in value but bond A will increase more than bond B
B) both bonds will increase in value but bond B will increase more than bond A
C) both bonds will decrease in value but bond A will decrease more than bond B
D) both bonds will decrease in value but bond B will decrease more than bond A

7. A callable bond pays annual interest of $60, has a par value of $1,000, matures in 20 years but is callable in 10 years at a price of $1,100, and has a value today of $1055.84. The yield to call on this bond is __________.

A) 6.00%
B) 6.58%
C) 7.20%
D) 8.00%

8. Interest rate risk increases as a bond's ___________.

A) coupon rate increases
B) coupon rate decreases
C) maturity decreases
D) default risk increases

9. Duration is a concept that is useful in assessing a bond's __________.

A) credit risk
B) liquidity risk
C) interest rate risk
D) None of the above

10. Stocks A and B are expected to pay a dividend per share of $3 and $2, respectively, in the upcoming year. The expected growth rate of dividends for both stocks is 4%, and investors require a return of 11% on each. Using the constant growth model, the intrinsic value of stock A __________.

A) will be higher than the intrinsic value of stock B
B) will be the same as the intrinsic value of stock B
C) will be less than the intrinsic value of stock B
D) more information is necessary to answer this question

FORMULAE

Bond Valuation:

1. PV of a bond with coupon rate i, face value F and T periods to maturity, at a discount rate k:

$$PV = \underbrace{iF\,(ADF_{k,T})}_{\text{Annuity Discount Factor}} + F\,\underbrace{(DF_{k,T})}_{\text{Discount Factor}}$$

2. Yield to maturity (ytm) of a bond is the discount rate y at which PV of bond = its price.

$$y \cong \frac{\frac{F-P_0}{T} + iF}{.6P_0 + .4F}$$

3. Duration, D of a bond

$$D = \frac{1}{P_0}\left[\left(\sum_{t=1}^{T} t \cdot \frac{iF}{(1+y)^t}\right) + T \cdot \frac{F}{(1+y)^T}\right]$$

$$= \frac{i(1+y)\,ADF_{T,y} + T(y-i)\,DF_{T,y}}{i + (y-i)\,DF_{T,y}}$$

Common Stock Valuation:

1. Constant dividend model: If a stock is expected to pay a dividend of \$d per period and investors require a rate of return of k, from it, then the intrinsic value of the stock

$$V_0 = \frac{d}{k}$$

2. Constant Dividend Growth model:

If a stock paid a dividend of \$$d_0$ at time 0, ~~and~~ dividends are expected to grow at a rate g per period and investors require a rate of return of k, the value of the stock,

$$V_0 = \frac{d_0(1+g)}{k-g}$$

3. **2-stage growth model:**

If a stock paid a dividend of \$$d_0$ at time 0, dividends are growing at g_s period for T periods and at g_n per period after that and investors require a return of k on the stock, then its value

$$V_0 = \left(\sum_{t=1}^{T} \frac{d_0(1+g_s)^t}{(1+k)^t}\right) + \frac{1}{(1+k)^T}\left[\frac{d_0(1+g_s)^T(1+g_n)}{k-g}\right]$$

CAPM: $E_i = r_f + \beta_i (E_m - r_f)$,

where E_i & E_m are the expected return on stock i & market portfolio

r_f = risk free rate

$\beta_i = \frac{\sigma_{im}}{\sigma_m^2}$ = systematic risk of stock i

Duration of a bond portfolio:

Portfolio p has n bonds. The weight of bond i is x_i and its duration is D_i years. Then the duration of portfolio p is:

$$D_p = \sum_{i=1}^{n} x_i D_i = x_1 D_1 + x_2 D_2 + \cdots + x_n D_n$$

Portfolio performance evaluation: For portfolio i:

Sharpe index, $S_i = \frac{\bar{r}_i - r_f}{\sigma_i}$

Treynor index, $T_i = \frac{\bar{r}_i - r_f}{\beta_i}$

Jensen index, $\alpha_i = \bar{r}_i - r_f - \beta_i(\bar{r}_m - r_f)$,

where $\bar{r}_i$ = Average return on portfolio i

$\bar{r}_m$ = " " " market index m

r_f = riskfree rate

σ_i = standard deviation of portfolio i

Duration of a bond,

$$D = \frac{1+y}{y} - \frac{(1+y) + T(i-y)}{i\left[(1+y)^T - 1\right] + y},$$

where y = yield to maturity

i = coupon rate

T = No. of periods to maturity

Duration of bond portfolio p invested in n bonds with weights $x_1, x_2, \cdots x_n$,

$$D_p = x_1 D_1 + x_2 D_2 + \cdots + x_n D_n,$$

where D_i = duration of bond i

Portfolio performance evaluation (cont.):

M^2 measure for portfolio i:

$$M_i^2 = \bar{r}_{i*} - \bar{r}_m,$$

where $\bar{r}_{i*} = x_i \bar{r}_i + (1-x_i) r_f$

and $x_i = \frac{\sigma_m}{\sigma_i}$

Spot and forward interest rates:

$$(1+S_n)^n = (1+S_{n-1})^{n-1}(1+F_n),$$

where S_n = n-year spot rate

F_n = n-year forward rate

Solutions to Quiz 2

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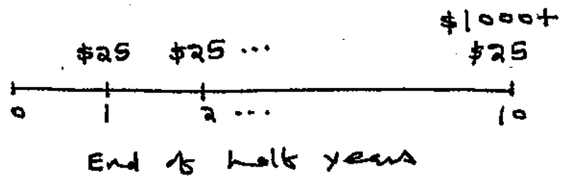
Part A

1. $$P_0 = \sum_{t=1}^{5} \frac{6(1.09)^t}{1.12^t} + \frac{6(1.09)^5(1.04)}{1.12^5\,(.12-.04)}$$

$$= \$27.67 + 68.10$$

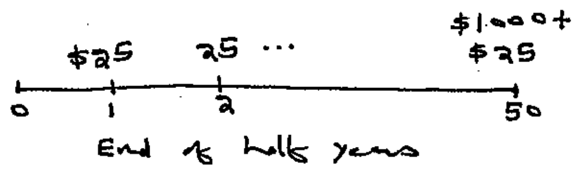
$$= \$95.77$$

2. A:



$FV = \$1000$
$PMT = \$25$
$N = 10$ half years
$y = 3.6\%$

B:



$FV = \$1000$
$PMT = \$25$
$N = 50$ half years
$y = 3.6\%$

(10) a. $P_0^A = \$908.98$

$P_0^B = \$746.58$

(10) b. $P_0^A = \$827.62$

$P_0^B = \$579.01$

(5) c. Bond B, ∵ it has the higher duration.

3. (7) a.

t (years)	C_t (\$m.)	$PV_{5\%}(C_t)$	$\frac{PV(C_t)}{P_0}$	$\frac{PV(C_t)}{P_0} \cdot t$
5	40	31.34	.329	1.645
7	90	63.96	.671	4.697
		$P_0 = \$95.3$m.	1	$D_L = 6.342$ years

(7) b. Let Z = Zero coupon bond

C = Coupon bond

Then $D_Z = 2$ years

Bond C: $T = 10$ years, $i = .06$, $y = .05$

Then $D_C = \dfrac{1+y}{y} - \dfrac{(1+y) + T(i-y)}{i[(1+y)^T - 1] + y}$

$= \dfrac{1.05}{.05} - \dfrac{(1.05) + 10(.06 - .05)}{.06[1.05^{10} - 1] + .05}$

$= 21 - \dfrac{1.15}{.0877}$

$= 7.887$ years

(7) c. Let x_Z be the proportion invested in bond Z.

Then the duration of the bond portfolio p:

$D_p = x_Z D_Z + x_C D_C = 6.342$

$\therefore$ $x_Z(2) + (1 - x_Z)\,7.887 = 6.342$

$\therefore$ $x_Z = \dfrac{1.545}{5.887} = .26244$

so invest .26244 in Z and the remaining in C.

(7) d. Investment in $Z = .26244(95.3) = \$25.01$ million

" $C = 95.3 - 25.01 = \$70.29$ million

(7) e. Face value of investment in $Z = 25.01(1.05)^2 = \$27.57$ million

Price of bond C:

$\left.\begin{array}{l} N = 10 \\ PMT = \$60 \\ FV = \$1000 \\ y = 5\% \end{array}\right\} \Rightarrow P_0 = \$1077.22$

$\therefore$ Face value of investment in $C = \dfrac{1000}{1077.22}(70.29) = \$65.25$ million

Part B

1. D	2. A	3. B	4. C	5. A
6. D	7. A	8. B	9. C	10. A