ECON 133 – Securities Markets – FALL 2010, UCSC

MIDTERM EXAM 2 (16 Questions, 100 Points)

Name:_____

Student Number:_____

Instructions: You have 70 minutes to complete this test. This is a closed book, closed notes test. You may use a calculator. For multiple choice questions, circle the choice that best answers the question. For problem solving questions, show your work (for partial credit) and box your final answers. ANSWERS NOT BOXED WILL NOT BE CONSIDERED. This testing procedure will be covered by the University of California Academic Integrity Protocol.

Equations:

Equity Valuation

$$E(r_i) = r_f + \beta\left[E(r_m) - r_f\right]$$

$$g = ROE(1 - dpr)$$

$$D_0 = EPS \times drp$$

$$V_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+k)^t} = \frac{D_0(1+g)}{(k-g)}$$

Econometrics

$$y = \alpha + \beta x + \epsilon$$

$$\beta = \frac{Cov(x,y)}{Var(x)} = \frac{\rho\sigma_x\sigma_y}{\sigma_x^2}$$

$$\sigma_y^2 = \beta^2\sigma_x^2 + \sigma_\epsilon^2$$

Fixed Income Valuation

$$PV = \sum_{t=1}^{T} \frac{CF_t}{(1+r)^t} + \frac{\$1,000}{(1+r)^T}, \text{ where } \sum_{t=1}^{T} \frac{1}{(1+r)^t} = \frac{1}{r}\left[1 - \frac{1}{(1+r)^T}\right]$$

$$D = \sum_{t-1}^{T} t \times w_t, \text{ where } w_t = \left[CF_t/(1+y)^t\right]/PV$$

$$D^* = \frac{D}{(1+y)} = -\frac{\Delta P}{\Delta y}\frac{1}{P}$$

The Yield Curve

$$(1+y_n)^n = (1+y_{n-1})^{n-1} \times (1+f_n)$$

Multiple Choice (3 Questions, 9 Points):

1. The semi-strong form of the EMH states that _____ must be reflected in the current stock price.
   A. all security price and volume data
   B. all publicly available information
   C. all information including inside information
   D. all costless information

2. When discussing bonds, convexity relates to the _____.
   A. shape of the bond price curve with respect to interest rates
   B. shape of the yield curve with respect to maturity
   C. slope of the yield curve with respect to liquidity premiums
   D. size of the bid-ask spread

3. All other things equal, a bond's duration is _____.
   A. higher when the coupon rate is higher
   B. lower when the coupon rate is higher
   C. the same when the coupon rate is higher
   D. indeterminate when the coupon rate is high

Fixed Income Analysis (7 Questions, 55 Points)

You are analyzing the following bond: $1000 par value, 3 year, 7% semi-annual coupon, with an 8% yield to maturity.

4. Using the bond pricing formula, calculate the exact price of this bond. (10 Pts.)

$$PV = 35\left[\frac{1-\frac{1}{(1.04)^6}}{.04}\right] + 1{,}000\left(\frac{1}{1.04}\right)^6$$

$PV = \$973.7893157$

5. Is this a premium or discount bond? Why? (5 Pts.)

Discount bond, because coupon rate is less than YTM.

6. Using the duration table, compute this bond's duration. Please remember that duration is reported in 'years'. (10 Pts.)

t	CF_t	$PV(CF_t)$	w_t	$t(w_t)$
1	35	33.65338465	.034383136	.034383136
2	35	32.35946746	.0324369207	.0648738414
3	35	31.11487255	.0306008686	.0918026058
4	35	29.91814669	.028868744	.1154749976
5	35	28.76744894	.027234664	.1361733205
6	1035	817.9755341	.8357048023	5.014228814
Total:		978.7893157	1.00	5.456936694

$$\text{Annual Duration} = \frac{5.456936694}{2}$$

$$D = 2.728468347 \text{ years}$$

7. Using the bond pricing formula, calculate the exact price change of a 1% decrease in the yield to maturity (i.e., yields move to 7%). (10 Pts.)

$$PV' = 35\left[\frac{1-\left(\frac{1}{1.035}\right)^6}{.035}\right] + 1000\left(\frac{1}{1.035}\right)^6$$

$$= 1000$$

$$\Delta P = 26.2106843$$

8. Using the modified duration approach, calculate the approximate price change of a 1% decrease in the yield to maturity (i.e., yields move to 7%). (5 Pts.)

$$D^* = \frac{D}{1+Y} = \frac{2.728468347}{1.04} =$$

$$\Delta P = -D^*(\Delta Y)(P)$$

$$= (-2.623527256)(-.01)(973.7893157)$$

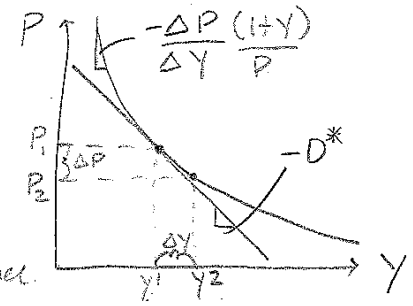
$$\Delta P = 25.54762811$$

9. What accounts for the difference, if any, between your answers to Q7 and Q8? (5 Pts.)

ΔP in Q15 was more accurate. The answer to Q16 was derived using modified duration, hence it is only an approximation to the actual yield sensitivity of the price of this bond.

10. Sketch the relationship between bond prices and yields, illustrating how using the modified duration approach can approximate the price change due to changing yields. (10 Pts.)

modified duration is a linear approximation to the slope of a bond's Price-yield curve at any point. The larger the change in yields the less precise the Approx. becomes.



$$D = \frac{-\Delta P}{P}\frac{(1+Y)}{\Delta Y}$$

$$D^* = \frac{D}{1+Y} = \frac{-\Delta P}{\Delta Y}\frac{1}{(P)}$$

Equity Analysis (6 Questions, 36 Points)

You are an investment analyst that is analyzing the stock of ABC. In your examination of the company, you have also learned that the stock has a current EPS of $5.00 and that the Board of Directors has authorized a dividend payout ratio of 30%. In reviewing the company's financial statements, you estimate the company's return-on-equity at 10%.

You also conduct a regression analysis over the period 1997 to 2007 to obtain a better understanding of the stock's risk and performance vis-à-vis the general market (as represented by the S&P 500). In conducting your regression analysis in Excel, you note the following spreadsheet output:

SUMMARY OUPUT

Regression Statistics	
Multiple R	0.655540692
R Square	0.429733598
Adjusted R Square	0.424900832
Standard Error	0.098774962
Observations	120

ANOVA

	df	*SS*	*MS*	*F*	*Sifnificance F*
Regression	1	0.867555512	0.8675555	88.920835	4.49148E-16
Residual	118	1.151266185	0.0097565		
Total	119	2.018821697			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0.007256663	0.009101636	0.797292200	0.4268828	-0.010767053	0.025280380
X Variable 1	1.942406695	0.20598633	9.429784500	4.491E-16	1.534497687	2.350315704

Moreover, you've checked in with your firm's economists and they are forecasting an expected market return of 15%. The current risk free rate is 5%.

11. What is the company's beta? Do you have any reason to believe that the beta is significantly different from the market's beta? (6 Pts.)

market beta is $\boxed{\beta_{i,m} = 1.942406695}$. Since 1 is not in the 95% Confidence Interval of $\beta_{i,m}$, we have a good reason to believe that $\beta_i \neq \beta_m$

12. What percentage of the total variance in ABC is explainable by market (or systematic) risk? (6 Pts.)

$R^2 = 0.429733598$

Thus, $\boxed{42.97\%}$

13. Using CAPM assumptions, what is this stock's required rate of return? (6 Pts.)

$K = r_f + \beta[E(r_m) - r_f]$

$= .05 + 1.924\,06695(.15 - .05)$

$= .244\,06695$

$K \approx 24.42\%$

14. What is this stock's anticipated growth rate? (6 Pts.)

$g = ROE(1 - dpr)$

$= .1(1 - .3)$

$= .07$

$g = 7.0\%$

15. Calculate the intrinsic value of this stock, using the assumptions above. (6 Pts.)

$V_0 = \frac{D_1}{K-g} = \frac{D_0(1+g)}{K-g}$; where $D_0 = EPS(dpr) = \$5.00(.3) = \$1.50$

$V_0 = \frac{\$1.5(1.07)}{(.244\,06695 - .07)}$

$V_0 = \$9.211\,397\,113$

16. If management improves operations and the firm's ROE increases to 15% after year 2, what is the new intrinsic value of this stock? (6 Pts.)

$g_2 = ROE_2(1 - dpr) = .15(1 - .3) = .105$

$V_0 = \frac{D_0(1+g_1)}{1+K} + \frac{D_0(1+g_1)^2}{(1+K)^2} + \left(\frac{1}{(1+K)^2}\right)\frac{D_0(1+g_1)^2(1+g_2)}{(K-g_2)}$

$= \frac{1.5(1.07)}{(1.244\,06695)} + \frac{1.5(1.07)^2}{(1.244\,06695)^2} + \frac{1}{(1.244\,06695)^2}\frac{(1.5)(1.07)^2(1.105)}{(.139\,406\,695)}$

$V_0 = 1.289\,943\,368 + 1.109\,302\,595 + 8.803\,314\,235 = \$11.202\,560\,2$