

Short Essay Questions

1.

TM.com is undertaking a new project. If the project is successful, the value of the firm in a year will be \$650 million, but if it turns out to be a failure, the firm will be worth only \$250 million. The current value of the firm is \$400 million. The firm has outstanding bonds due in a year with a face value of \$300 million. The T-bill rate is 5 percent.

- (1) Determine the risk-neutral probability. (5%)
- (2) What is the value of the equity? (5%)
- (3) What is the value of the debt? (5%)
- (4) Write down put-call parity. Use no-arbitrage principle to verify put-call parity. (5%)
- (5) Use put-call parity to explain why the value of the debt is equal to that of the portfolio containing a long position in a default-free bond and a short position in a put option on firm's value. (5%)
- (6) If the debt beta can be neglected in practice and the asset beta is 0.8, what is the equity beta? (5%)

2.

The balance sheet of a levered firm	
V_u = Value of unlevered firm	B = Debt
$T_c B$ = Tax shield	S = Equity

The QF Company has perpetual EBIT of \$5 million per year. The after-tax, all-equity discount rate r_0 is 15%. The company's tax rate is 30%. The cost of debt capital r_B is 10%, and QF has \$10 million of debt in its capital structure.

- (1) What is QF's value (V_L)? (5%)
- (2) What is QF's cost of equity (r_S)? (5%)
- (3) What is QF's r_{WACC} ? (5%)

3. What's your opinion on the following statement?

Changing a firm's capital structure will definitely change its firm value? (5%)

4. In fundamental finance course, professors introduce the basic concepts of time value of money that can be employed to convert cash flows received or paid over an investment horizon into either a present value or future value. Of particular importance was the fact that interest rate levels, and changes in interest rate levels affect security valuation. Actually, there are many interest rate measures that can be utilized in the valuation of financial instruments by market participants. Please define these measures listed below:

- a. Required rate of return (3%)
- b. Expected rate of return (4%)
- c. Realized rate of return (3%)

5. Is it in generally in the best interests of stockholders for a Corporation to diversify? Why or why not? (10%)

6. The Markowitz Model. George W. Bush has the task of determining the weights of three securities which yield a minimum-variance portfolio having a specific expected return. He is employing the Markowitz model which represents return on security i as $\tilde{r}_{i,t} = \bar{r}_i + \tilde{\varepsilon}_{i,t}$. The model requires as inputs to the analysis the following estimates:

n estimates of expected return $\tilde{r}_{i,t}$ where $i=1,2,3,\dots,n$. In this case $n=3$.

n estimates of variance σ_i^2 , where $i=1,2,3,\dots,n$.

$n(n-1)/2$ estimates of covariance $\sigma_{i,j}$, where $i=1,2,3,\dots,n$; and $j=1,2,\dots,n$.

Having been provided with all of the above estimates, George constructed the following Lagrangian expression:

$$L = \sum_{i=1}^3 \sum_{j=1}^3 W_i W_j \sigma_{i,j} + \lambda_1 \left(\sum_{i=1}^3 W_i \bar{r}_i - E^* \right) + \lambda_2 \left(\sum_{i=1}^3 W_i - 1 \right)$$

He then took partial derivatives (with respect to $W_1, W_2, W_3, \lambda_1, \lambda_2$) of the Lagrangian expression, and set the derivatives equal to zero. The resulting five questions were restates in matrix form as $CW=B$, where

C=	0.0640	0.0200	0.0600	0.1200	1.0000
	0.0200	0.0440	0.0160	0.1100	1.0000
	0.0600	0.0160	0.1840	0.1300	1.0000
	0.1200	0.1100	0.1300	0.0000	0.0000
	1.0000	1.0000	1.0000	0.0000	0.0000

W ₁
W ₂
W ₃
λ_1
λ_2

B=	0.000
	0.000
	0.000
	E*
	1.000

$$C^{-1} = \begin{bmatrix} 20.4082 & -10.2041 & -10.2041 & 30.6122 & -3.1633 \\ -10.2041 & 5.1020 & 5.1020 & -65.3061 & 8.0816 \\ -10.2041 & 5.1020 & 5.1020 & 34.6939 & -3.9184 \\ 30.6122 & -65.3061 & 34.6939 & -444.0816 & 50.5551 \\ -3.1633 & 8.0816 & -3.9184 & 50.5551 & -5.7907 \end{bmatrix}$$

Please answer the following questions:

- What are the expected returns on securities 1, 2, and 3? (3%)
- What are the variances of return for securities 1, 2, and 3? (3%)
- What are the covariances of return for security pairs (1,2), (1,3), and (2,3)? (3%)
- What are the security weights (W_1, W_2, W_3) yielding the minimum-variance portfolio having an expected return of 12%? (5%)

7. Matching. Please place letter from right-hand column in correct blank on left side. Note: Each entry has a "best" match. Right-hand-side answers should not be used more than once. (8%)

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|-----------------------------------|--|
| _____ 1. β_i | a. $E(R_p) = R_f + [E(R_m) - R_f] [\sigma_p / \sigma_m]$ |
| _____ 2. Systematic risk | b. Diversifiable risk |
| _____ 3. Unsystematic risk | c. Nondiversifiable risk |
| _____ 4. Variance _i | d. $\rho_{ij} \sigma_i \sigma_j$ |
| _____ 5. Covariance _{ij} | e. $E(R_i) = R_f + \beta_i [E(R_m) - R_f]$ |
| _____ 6. Capital market line | f. $\sum_{i=1}^n w_i E(R_i)$ |
| _____ 7. $E(R_p)$ | g. $\sum_{i=1}^n [R_i - E(R_i)]^2 / [N - 1]$ |
| _____ 8. Security market line | h. $\sigma_{i,m} / \sigma_m^2$ |

8. Fill in the Blanks. (8%)

- a. The horizontal axis of the diagram showing the Capital Market Line is _____.
- b. The vertical axis of a diagram showing a characteristic line is _____.
- c. The slope of the CML is _____.
- d. The slope of the SML is _____.
- e. The horizontal axis of a diagram showing the Security Market Line is _____.
- f. The vertical axis of a diagram showing the SML is _____.
- g. The vertical axis of a diagram showing the CML is _____.
- h. The slope of the characteristic line is _____.