Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2013/2014

COURSE NAME	:	FINANCIAL STATISTICS
COURSE CODE	:	BWB20602
PROGRAMME	:	2 BWQ
EXAMINATION DATE	:	DECEMBER2013/JANUARY 2014
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) The following Table **Q1(a)** gives the weekly stock returns

Table Q1(a): Weekly Stock Return

Week	Financial Return (decimal)	Return Relative (decimal)
1	0.0084	1.0084
2	-0.0045	0.9955
3	0.0021	1.0021
4	0.0001	1.1000

Calculate the Arithmetic Mean and Geometric Mean from the weekly stock returns and explain the differences between the two means.

(6 marks)

(b) The monthly stock returns for Stocks A and B are shown in Table **Q1(b)**.

Table Q1(b): Monthly Stocks A and B

Month	Stock A (%)	Stock B (%)
1	4	2
2	-1	1
3	4	5
4	1	4

Calculate

i. The mean and variance return of stock A and stock B.

ii. The covariance and correlation for Stocks A and B.

(9marks)

Q2 Let an investment in Sime Darby Stock worth \$10,000 for one month. Assume that R is the simple monthly return on the investment and R is a random variable that is normally distributed with the mean 0.05 and the standard deviation 0.1.

(a) Determine the probability distribution of end of month wealth, namely $W_1 = \$A(1+R)$ where \$A is the investment amount.

(5 marks)

(b) Calculate the $P(W_1 < \$9{,}000)$ and the simple return on Sime Darby produces wealth $W_1 = \$9{,}000)$.

(5 marks)

(c) Calculate the VaR on the investment with 5% probability.

(5 marks)

Q3 Consider the following asset prices and the total share outstanding that are publically traded assets, as shown in Table **Q3**.

Table Q3: Asset Price and Total Share

Assets	**1**	**2**	**3**	**4**	**5**
Price of asset	120	320	23	110	127
Outstanding	23	7	1000	265	12

(a) Give 3 basic assumptions in Capital Asset Pricing Model (CAPM).

(5 marks)

(b) Calculate the market portfolio of the assets given in the Table **Q3**.

(7marks)

Q4 Consider a long forward contract on a 5 year bond which is currently traded at a price of \$900.00. The delivery price is \$910, the time to maturity of the forward contract in one year. The financial charges or coupon payment of the bond of \$60 occur after 6 and 12 months. The continuously compounded annual interest rates for 6 months and 12 months are 9% and 10%, respectively.

(a) Calculate the value of the forward contract.

(7 marks)

(b) Show that the forward price F_t of the forward contract is \$871.26.

(5 marks)

Q5 Suppose a stock with price S_0, a call option on the stock has a strike price K, where the current price is C_0 (also known as the fair price). In order to determine the fair price, consider the cash flow of the call and portfolio of stock and zero bond in **Table Q5**.

Table Q5: Cash Flow of the Call and Portfolio of Stock

Strategy	**Flow at 0**	**Flow at *T***	
		S^u	S^d
Call	$-C_0$	$S_T - K$	0
Stock + Zerobond	$-(xS^u + y)$	$(xS^u + y)$	$(xS^d + y)$

x is the number of stocks chosen and y is the amount of a zero bond that ensures the same amount of payoff as the call at time T.

(a) Determine the fair price C_0 (option price) of the call option.

(6 marks)

(b) Suppose that q is the probability of price changes from the current stock price S^u and the possible stock value S^d at time T and the payoffs of the call expiration r^u and r^d. Show that the probability of price change is

$$q = \frac{S_0 - S^d}{S^u - S^d}$$

(8 marks)

Q6 In a binary one-period model, a martingales measure is given by a probability measure q such that the expected return of the share at time T is 0. Suppose a stock with price $S_0 = 270$, an American call option on a stock with strike $K = 270$, a zero bond with price $1.(1+r)^{-1}$ with interest rate r =5% (i.e. price of zero bond corresponds to 1/1.05). The stock can either increase to 300 or decrease to 250

(a) Show that the number of stock x and the zerobond y is 0.6 and -150, respectively.

(4marks)

(b) Determine the price C_0 of the call option and the corresponding probability.

(5 marks)

(c) Using Martingale measure approach, show that the price of the call is the same as in (b).

(7 marks)

Q7 (a) Give 4 reasons why ARCH models are successful in applying to financial data.

(4 marks)

(b) Without lost of generality, the ARCH(1) process can be presented as $\mu_t = \varepsilon_t \sqrt{\alpha_0 + \alpha_1 \mu_{t-1}^2}$ where $\{\varepsilon_t\}_{t=0}^{\infty}$ is a white noise stochastic process. Shows that the mean of μ_t is 0.

(6 marks)

(c) Consider a simple GARCH (1,1) model given as follows:

$$r_t = \mu + \varepsilon_t \ ; \varepsilon_t = \sigma_t \xi_t \ and \ \xi_t \sim N(0,1)$$

$$\sigma_t^2 = \omega + \sum_{i=1}^{p} \beta_i \sigma_{t-1}^2 + \sum_{j=1}^{q} \alpha_i \varepsilon_{t-1}^2$$

$$\omega > 0, \ \beta_i \geq 0, i = 1,2,..., p, \alpha_i \geq 0, j = 1,2,..., q$$

Where σ_t^2 is a conditional variance. If $\sigma_t^2 = h_t$, the conditional variance with a linear function of its own lags. Show that the three-ahead forecast is

$$\hat{h}_{t+3} = \omega + \omega(\alpha_1 + \beta_1) + \omega(\alpha_1 + \beta_1)^2 + (\alpha_1 + \beta_1)^2 [(\alpha_1 \varepsilon_1^2 + \beta_1 h_t]$$

(6 marks)

- END OF QUESTION -