

Question Number 1, year 2014

Q. Suppose an investor purchased m shares. Let two events A and B are defined as;

A: the market price of x shares was increased during a particular period, where $0 < x < m$

B: the market price of y shares was increased during a particular period, where $y \leq 1$

Are the two events A and B dependent or independent for

- i) $m=3$ ii) $m=4$

Solution

Let "I" denotes the increase in price and "N" denotes the price was not increased or it was remain constant then

- (i) for $m=3$

$S = \{III, IIN, INI, NII, INN, NIN, NNI, NNN\}$

$A = \{IIN, INI, NII, INN, NIN, NNI\}$

$B = \{INN, NIN, NNI, NNN\}$

Now $A \cap B = \{INN, NIN, NNI\}$

$$P(B) = \frac{4}{8} = \frac{1}{2}$$

$$P(A \cap B) = \frac{3}{8}$$

$$P(A) = \frac{6}{8} = \frac{3}{4}$$

$$P(B/A) = P(A \cap B) / P(A) = \frac{3}{8} / \frac{3}{4} = \frac{1}{2}$$

Since $P(B/A) = P(B)$, therefore A and B are independent

- (ii) for $m=4$

$S = \{IIII, IIII, IINI, INII, NIII, IINN, ININ, INNI, NIIN, NINI, NNII, INNN, NINN, NNIN, NNNI, NNNN\}$

$A = \{IIII, IINI, INII, NIII, IINN, ININ, INNI, NIIN, NINI, NNII, INNN, NINN, NNIN, NNNI\}$

$B = \{INNN, NINN, NNIN, NNNI, NNNN\}$

Now $A \cap B = \{INNN, NINN, NNIN, NNNI\}$

$$P(B) = \frac{5}{16}$$

$$P(A \cap B) = \frac{4}{16} = \frac{1}{4}$$

$$P(A) = \frac{14}{16} = \frac{7}{8}$$

$$P(B/A) = P(A \cap B) / P(A) = \frac{1}{4} / \frac{7}{8} = \frac{2}{7}$$

Since $P(B/A) \neq P(B)$, therefore A and B are dependent

Sheikh Zayed Islamic Centre
University of Karachi

Business Statistics
Terminal Examination

Master in Islamic Banking and Finance

Max.Marks:100
Max.Time:3:00 hours
Instruction:

Date: June 18, 2009
Course Supervisor: Amin A.K. Vazir
Attempt any **FIVE**. All questions carry equal marks.

Q.1 Of 500 employees of a takaful company, 200 participate in a company's profit-sharing plan (P), 400 have major-medical insurance coverage (M), and 200 employees participate in both program.

What is the probability that a randomly selected employee

- (a) (i) will be a participant in at least one of the two programs ?
 - (ii) will not be a participant in either program?
 - (iii) will be a participant in the profit sharing plan given that the employee has major-medical insurance coverage ?
- (b) Determine whether the two events are dependent or independent?

Q.2 During a particular period, 80 percent of the common stock issues in an industry which includes just 10 companies have increased market value. If an investor chose two of these issues randomly, what is the probability that both issues increased in market value during this period?

If the investor chose three of these issues randomly, what is the probability that

- (a) only one of the three issues increased in market value ?
- (b) two issues increased in market value ?
- (c) at least two issues increased in market value ?

Q. 3(a) The probability that a randomly selected employee of an Islamic Bank is a participant in an optional retirement program is 0.40. If 10 employees are chosen randomly, the probability that the proportion of participants is at least 0.70 is ?

(b) During a particular year, 70 percent of the common stock listed on a Stock Exchange increased in market value, while 30 percent were unchanged or declined in market value. At the beginning of the year a stock advisory service chose 10 stock issues as being "specially recommended". If the 10 issues represent a random selection, what is the probability that (i) all 10 issues and (ii) at least eight issues increased in market value?

Q.4 The amount of time required per individual at a bank teller's window has been found to be approximately normally distributed with $\mu = 130$ sec and $\sigma = 45$ sec.

- (a) What is the probability that a randomly selected individual will
 - (i) require less than 100 sec to complete a transaction?
 - (ii) spend between 2.0 and 3.0 min at the teller's window?
 - (b) Within what length of time do the 20 percent of individual with the simplest transactions complete their business at the window?
- (c) At least what length of time is required for the individuals in the top 5 percent of required time?

Q. 5(a) An auditor wishes to test the assumption that the mean value of all accounts receivable is \$260.00 against the alternative that it is less than this amount and this test is to be carried out at the 5 percent level of significance. Suppose a sample of size 36 has the sample mean $\bar{X} = \$240.00$ and the standard

deviation $\sigma = \$43.00$. Mention all the steps of his test to reach the conclusion. Identify the probability of committing type I error. Evaluate type II error for the alternative $\mu = 240$.

(b) The returns of security A and security B for the two- assets portfolio are given below:

SECURITY a		SECURITY b	
p_A	$R_A(\%)$	p_B	$R_B(\%)$
0.1	- 10	0.1	- 30
0.2	5	0.2	0
0.4	15	0.4	20
0.2	25	0.2	40
0.1	40	0.1	70

The investment proportion of security A, i.e., $w_A=0.75$. Find the expected return R_p and the risk σ_p of the portfolio.

Q6(a) Monthly return data (in percent) are presented below for ABC stock and XYZ index for a 12 month period.

MONTH	xyz INDEX RETURN R_M	abc STOCK RETURN R_i
1	7.41	9.43
2	- 5.33	0.00
3	- 7.35	- 4.31
4	- 14.64	- 18.92
5	1.58	- 6.67
6	15.19	26.57
7	5.11	20.00
8	0.76	2.93
9	- 0.97	5.25
10	10.44	21.45
11	17.47	23.13
12	20.15	32.83

- compute and interpret the correlation coefficient for the above data
- calculate beta β_i of ABC stock using
 - regression method
 - correlation method
- find the equation of the regression line to predict the return of the ABC stock from the return of XYZ index

Suppose XYZ index is expected to move up by 10 percent next month. How much return would you expect from ABC stock ?

Sheikh Zayed Islamic Centre
University of Karachi

Business Statistics
Terminal Examination

Master in Islamic Banking and Finance

Max.Marks:100

Date: July 4, 2009

Max.Time:3:00 hours

Course Supervisor: Amin A.K. Vazir

Instruction:

Attempt any **FIVE**. All questions carry equal marks.

Q1 Rs. 15 million is invested in shares in ABC and Rs. 10 million is invested in shares in XYZ. The shares in ABC and XYZ have an expected return of zero. The shares in ABC have a standard deviation of 30 percent per annum and the shares in XYZ have a standard deviation of 20 percent per annum. The correlation coefficient between the returns on the two shares is 0.65. Suppose that returns follow a normal probability distribution.

Suppose also that abnormally bad market conditions are expected 5 percent of the time.

- (i) Find the **Value at Risk** of the investment in ABC.
- (ii) Find the **Value at Risk** of the investment in XYZ.
- (iii) Find the **Value at Risk** of the portfolio of the investments in ABC and XYZ.
- (iv) Compare the **Value at Risk** of the portfolio of the investments in ABC and XYZ with the total **Value at Risk** of the individual investments in ABC and XYZ to justify diversification.

For what value of correlation coefficient the two **Values at Risk** are same?

Q. 2(a) The probability that a randomly selected employee of an Islamic Bank is a participant in an optional retirement program is 0.40. If 10 employees are chosen randomly, the probability that the proportion of participants is at least 0.70 is?

(b) An auditor wishes to test the assumption that the mean value of all accounts receivable is \$260.00 against the alternative that it is less than this amount and this test is to be carried out at the 5 percent level of significance. Suppose a sample of size 36 has the sample mean $\bar{X} = \$240.00$ and the standard deviation $\sigma = \$43.00$. Mention all the steps of his test to reach the conclusion. Identify the probability of committing type I error. Evaluate type II error for the alternative $\mu = 240$.

Q3(a) The mean weekly wage for a sample of 30 hourly employees in a bank $\bar{X} = \$280.00$ with a sample standard deviation of $s = \$14.00$. The weekly wage amounts in the bank are assumed to be approximately normally distributed. The 95 percent confidence interval for estimating the mean of weekly wage in the population is ?

(b) During a giving week the probability that a particular common stock issue will increase (*I*) in price, remain unchanged (*U*), or decline (*D*) in price is estimated to be 0.30, 0.20, and 0.50, respectively.

- (a) What is the probability that the stock issue will increase in price or remain unchanged?
- (b) What is the probability that the price of the issue will change during the week?

Q4 Monthly return data (in percent) are presented below for ABC stock and XYZ index for a 12 month period.

MONTH	xyz INDEX RETURN R_M	abc STOCK RETURN R_i
1	7.41	9.43
2	- 5.33	0.00
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9	- 0.97	5.25
10	10.44	21.45
11	17.47	23.13
12	20.15	32.83

- (a) compute and interpret the correlation coefficient for the above data
- (b) calculate beta β_i of ABC stock using
 - a. regression method
 - b. correlation method
- (c) find the equation of the regression line to predict the return of the ABC stock from the return of XYZ index

Suppose XYZ index is expected to move up by 10 percent next month. How much return would you expect from ABC stock ?

Q.5 During a particular period, 80 percent of the common stock issues in an industry which includes just 10 companies have increased market value. If an investor chose two of these issues randomly, what is the probability that both issues increased in market value during this period?

If the investor chose three of these issues randomly, what is the probability that

- (a) only one of the three issues increased in market value ?
- (b) two issues increased in market value ?
- (c) at least two issues increased in market value ?

Q.6(a) During a particular year, 70 percent of the common stock listed on a Stock Exchange increased in market value, while 30 percent were unchanged or declined in market value. At the beginning of the year a stock advisory service chose 10 stock issues as being “specially recommended”. If the 10 issues represent a random selection, what is the probability that (i) all 10 issues and (ii) at least eight issues increased in market value?

(b) The returns of security A and security B for the two- assets portfolio are given below:

SECURITY a		SECURITY b	
p_A	$R_A(\%)$	p_B	$R_B(\%)$
0.1	- 10	0.1	- 30
0.2	5	0.2	0
0.4	15	0.4	20
0.2	25	0.2	40
0.1	40	0.1	70

The investment proportion of security A, i.e., $w_A=0.75$. Find the expected return R_p and the risk σ_p of the portfolio.

Sheikh Zayed Islamic Centre

University of Karachi

Business Statistics(NB)

Terminal Examination

Master in Islamic Banking and Finance

Max.Marks:100

Max.Time:3:00 hours

Date: May 19, 2010

Course Supervisor: Amin A.K. Vazir

Instruction: Attempt any **FIVE**. All questions carry equal marks.

Q.1 Of 500 employees of a takaful company, 200 participate in a company's profit-sharing plan (P), 400 have major-medical insurance coverage (M), and 200 employees participate in both program. What is the probability that a randomly selected employee

(a) (i) will be a participant in at least one of the two programs ?

(ii) will not be a participant in either program?

(iii) will be a participant in the profit sharing plan given that the employee has major-medical insurance coverage ?

(b) Determine whether the two events are dependent or independent?

Q.2 The amount of time required per individual at a bank teller's window has been found to be approximately normally distributed with $\mu = 130$ sec and $\sigma = 45$ sec.

(a) What is the probability that a randomly selected individual will

(i) require less than 100 sec to complete a transaction?

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(b) Within what length of time do the 20 percent of individual with the simplest transactions complete their business at the window?

(c) At least what length of time is required for the individuals in the top 5 percent of required time?

Q.3 Rs. 15 million is invested in shares in ABC and Rs. 10 million is invested in shares in XYZ. The shares in ABC and XYZ have an expected return of zero. The shares in ABC have a standard deviation of 30 percent per annum and the shares in XYZ have a standard deviation of 20 percent per annum. The correlation coefficient between the returns on the two shares is 0.65. Suppose that returns follow a normal probability distribution.

Suppose also that abnormally bad market conditions are expected 5 percent of the time.

(v) Find the **Value at Risk** of the investment in ABC.

(vi) Find the **Value at Risk** of the investment in XYZ.

(vii) Find the **Value at Risk** of the portfolio of the investments in ABC and XYZ.

(viii) Compare the **Value at Risk** of the portfolio of the investments in ABC and XYZ with the total **Value at Risk** of the individual investments in ABC and XYZ to justify diversification.

For what value of correlation coefficient the two **Values at Risk** are same?

Q.4 Monthly return data (in percent) are presented below for ABC stock and XYZ index for a 12 month period.

MONTH	xyz INDEX RETURN R_M	abc STOCK RETURN R_i
1	7.41	9.43
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- (d) compute and interpret the correlation coefficient for the above data
- (e) calculate beta β_i of ABC stock using
- regression method
 - correlation method
- (f) find the equation of the regression line to predict the return of the ABC stock from the return of XYZ index

Suppose XYZ index is expected to move up by 10 percent next month. How much return would you expect from ABC stock ?

Q.5 (a) During a particular year, 70 percent of the common stock listed on a Stock Exchange increased in market value, while 30 percent were unchanged or declined in market value. At the beginning of the year a stock advisory service chose 10 stock issues as being “specially recommended”. If the 10 issues represent a random selection, what is the probability that (i) all 10 issues and (ii) at least eight issues increased in market value?

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0.4	15	0.4	20
0.2	25	0.2	40
0.1	40	0.1	70

The investment proportion of security A, i.e., $w_A=0.75$. Find the expected return R_p and the risk σ_p of the portfolio.

Q.6 (a) From a box containing 4 dimes and 2 nickels,3 coins are selected at random without replacement. Find the probability distribution for the total T of the 3 coins. Express the probability distribution graphically as a probability histogram.

(b) A probability distribution is given by

$$f(x) = \frac{10 - |11 - x|}{100}, \quad x=2,3,4,\dots, 20$$

form a table and then

- show that $f(x)$ is a probability distribution
- find $P(X \leq 20)$
- find $P(X \geq 20)$
- find $\text{Var}(x)$

Sheikh Zayed Islamic Centre
University of Karachi

Business Statistics(B)
Terminal Examination

Master in Islamic Banking and Finance

Max.Marks:100

Date: June 6, 2010

Max.Time:3:00 hours

Course Supervisor: Amin A.K. Vazir

Instruction:

Attempt any **FIVE**. All questions carry equal marks.

Q1(a) The mean weekly wage for a sample of 30 hourly employees in a bank $\bar{X} = \$280.00$ with a sample standard deviation of $s = \$14.00$. The weekly wage amounts in the bank are assumed to be approximately normally distributed. The 95 percent confidence interval for estimating the mean of weekly wage in the population is ?

(b) During a giving week the probability that a particular common stock issue will increase (*I*) in price, remain unchanged (*U*), or decline (*D*) in price is estimated to be 0.30, 0.20, and 0.50, respectively.

(c) What is the probability that the stock issue will increase in price or remain unchanged?

(d) What is the probability that the price of the issue will change during the week?

Q.2 Of 500 employees of a takaful company, 200 participate in a company's profit-sharing plan (*P*), 400 have major-medical insurance coverage (*M*), and 200 employees participate in both program.

What is the probability that a randomly selected employee

(a) (i) will be a participant in at least one of the two programs ?

(ii) will not be a participant in either program?

(iii) will be a participant in the profit sharing plan given that the employee has major-medical insurance coverage ?

(b) Determine whether the two events are dependent or independent?

Q.3 During a particular period, 80 percent of the common stock issues in an industry which includes just 10 companies have increased market value. If an investor chose two of these issues randomly, what is the probability that both issues increased in market value during this period?

If the investor chose three of these issues randomly, what is the probability that

(a) only one of the three issues increased in market value ?

(b) two issues increased in market value ?

(c) at least two issues increased in market value ?

Q. 4(a) The probability that a randomly selected employee of an Islamic Bank is a participant in an optional retirement program is 0.40. If 10 employees are chosen randomly, the probability that the proportion of participants is at least 0.70 is ?

(b) During a particular year, 70 percent of the common stock listed on a Stock Exchange increased in market value, while 30 percent were unchanged or declined in market value. At the beginning of the year a stock advisory service chose 10 stock issues as being "specially recommended". If the 10 issues represent a random selection, what is the probability that (i) all 10 issues and (ii) at least eight issues increased in market value?

Q.5 (a) From a box containing 4 dimes and 2 nickels, 3 coins are selected at random without replacement. Find the probability distribution for the total T of the 3 coins. Express the probability distribution graphically as a probability histogram.

(b) A probability distribution is given by

$$f(x) = \frac{10 - |11 - x|}{100}, \quad x=2,3,4,\dots, 20$$

form a table and then

- iv) show that $f(x)$ is a probability distribution
- v) find $P(X \leq 20)$
- vi) find $P(X \geq 20)$
- iv) find $\text{Var}(x)$

Q6(a) Monthly return data (in percent) are presented below for ABC stock and XYZ index for a 12 month period.

MONTH	xyz INDEX RETURN R_M	abc STOCK RETURN R_i
1	7.41	9.43
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- (d) compute and interpret the correlation coefficient for the above data
- (e) calculate beta β_i of ABC stock using
 - (i) regression method
 - (ii) correlation method
- (f) find the equation of the regression line to predict the return of the ABC stock from the return of XYZ index

Suppose XYZ index is expected to move up by 10 percent next month. How much return would you expect from ABC stock ?

Sheikh Zayed Islamic Centre

University of Karachi

Business Statistics

Terminal Examination

Master in Islamic Banking and Finance

Max.Marks:100

Max.Time:3:00 hours

Date: May 23, 2011

Course Supervisor: Amin A.K. Vazir

Instruction: Attempt any **FIVE**. All questions carry equal marks.

- Q. 1(a) An auditor wishes to test the assumption that the mean value of all accounts receivable is \$260.00 against the alternative that it is less than this amount and this test is to be carried out at the 5 percent level of significance. Suppose a sample of size 36 has the sample mean $\bar{X} = \$240.00$ and the standard deviation $\sigma = \$43.00$. Mention all the steps of his test to reach the conclusion. Identify the probability of committing type I error. Evaluate type II error for the alternative $\mu = 240$.
- (b) The returns of security A and security B for the two- assets portfolio are given below:

SECURITY a		SECURITY b	
p_A	$R_A(\%)$	p_B	$R_B(\%)$
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The investment proportion of security A, i.e., $w_A=0.75$. Find the expected return R_p and the risk σ_p of the portfolio.

Q.2 Rs. 15 million is invested in shares in ABC and Rs. 10 million is invested in shares in XYZ. The shares in ABC and XYZ have an expected return of zero. The shares in ABC have a standard deviation of 30 percent per annum and the shares in XYZ have a standard deviation of 20 percent per annum. The correlation coefficient between the returns on the two shares is 0.65. Suppose that returns follow a normal probability distribution.

Suppose also that abnormally bad market conditions are expected 5 percent of the time.

- (ix) Find the **Value at Risk** of the investment in ABC.
- (x) Find the **Value at Risk** of the investment in XYZ.
- (xi) Find the **Value at Risk** of the portfolio of the investments in ABC and XYZ.
- (xii) Compare the **Value at Risk** of the portfolio of the investments in ABC and XYZ with the total **Value at Risk** of the individual investments in ABC and XYZ to justify diversification.

For what value of correlation coefficient the two **Values at Risk** are same?

Q.3 Monthly return data (in percent) are presented below for ABC stock and XYZ index for a 12 month period.

MONTH	xyz INDEX RETURN R_M	abc STOCK RETURN R_i
1	7.41	9.43
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10	10.44	21.45
11	17.47	23.13
12	20.15	32.83

- (g) compute and interpret the correlation coefficient for the above data
- (h) calculate beta β_i of ABC stock using
- regression method
 - correlation method
- (i) find the equation of the regression line to predict the return of the ABC stock from the return of XYZ index
- Suppose XYZ index is expected to move up by 10 percent next month. How much return would you expect from ABC stock ?

- Q4(a)** The mean weekly wage for a sample of 30 hourly employees in a bank $\bar{X} = \$280.00$ with a sample standard deviation of $s = \$14.00$. The weekly wage amounts in the bank are assumed to be approximately normally distributed. The 95 percent confidence interval for estimating the mean of weekly wage in the population is ?
- (b)** An insurance company has written 100 policies of Rs. 100000, 500 of Rs.50000 and 1000 of Rs. 10000 for people of age 20. If experience shows that the probability that a person will die at age 20 is 0.001, how much can the company expect to pay out during the year the policies were written?

Q5(a) A bank has found that most customers at the tellers' windows either cash a check or make a deposit. The below indicates the transactions for one teller for one day.

	CASH CHECK	NO CHECK	TOTALS
Make Deposit	50	20	70
No Deposit	30	10	40
Totals	80	30	110

Letting C represent "cashing a check" and D represent "making a deposit," express each of the following probabilities in words and find its value.

- (i) $P(D'/C)$ (ii) $P(C'/D)$

Are C and D dependent? Why or why not?

(b) Among users of automated teller machines, 92% use ATMs to withdraw cash, and 32% use them to check their account balance. Suppose that 96% use ATMs to either withdraw cash or check their account balance (or both). Given a man who uses an ATM to check his account balance, what is the probability that he also uses an ATM to get cash?

Are "withdrawing cash" and "checking account balance" dependent? Why or why not?

Q6(a) The insurance industry has found that the probability is 0.1 that a life insurance applicant will disqualify at the regular rates. Find the probabilities that of the next 10 applicants for life insurance the following numbers will qualify at the regular rates.

- (i) Exactly 10 (ii) At least 9

(b) The probability that a small business will be safe and will not go bankrupt in its first year is 0.79. For 50 such small businesses, find the following probabilities.

- (i) Exactly 8 go bankrupt (ii) No more than 2 go bankrupt

Sheikh Zayed Islamic Centre

University of Karachi

Business Statistics

Terminal Examination

Master in Islamic Banking and Finance

Max.Marks:100

Max.Time:3:00 hours

Date: May 22, 2012

Course Supervisor: Amin A.K. Vazir

Instruction: Attempt any **FOUR**. All questions carry equal marks.

Q.1 Rs. 15 million is invested in shares in ABC and Rs. 10 million is invested in shares in XYZ. The shares in ABC and XYZ have an expected return of zero. The shares in ABC have a standard deviation of 30 percent per annum and the shares in XYZ have a standard deviation of 20 percent per annum. The correlation coefficient between the returns on the two shares is 0.65. Suppose that returns follow a normal probability distribution.

Suppose also that abnormally bad market conditions are expected 5 percent of the time.

- (xiii) Find the **Value at Risk** of the investment in ABC.
- (xiv) Find the **Value at Risk** of the investment in XYZ.
- (xv) Find the **Value at Risk** of the portfolio of the investments in ABC and XYZ.
- (xvi) Compare the **Value at Risk** of the portfolio of the investments in ABC and XYZ with the total **Value at Risk** of the individual investments in ABC and XYZ to justify diversification.

For what value of correlation coefficient the two **Values at Risk** are same?

Q.2(a) Of 500 employees of a takaful company, 200 participate in a company's profit-sharing plan (*P*), 400 have major-medical insurance coverage (*M*), and 200 employees participate in both program.

What is the probability that a randomly selected employee

- (i) will be a participant in at least one of the two programs ?
- (ii) will not be a participant in either program?
- (iii) will be a participant in the profit sharing plan given that the employee has major- medical insurance coverage ?
- (iv) Determine whether the two events are dependent or independent?

Q.3(a) An investment analyst collects data on stocks and notes whether or not dividends were paid and whether or not the stocks increased in price over a given period. Data are presented in the following table.

Price increase	No Price increase	Total	
Dividends paid	34	78	112
No dividends paid	85	49	134
Total	119	127	246

- (i) What is the probability that randomly selected stock neither paid dividends nor increased in price?
- (ii) Given that a stock increased in price, what is the probability that it also paid dividends?

(b) A bank loan officer knows that 12% of the banks mortgage holders lose their jobs and default on the loan in the course of 5years.She also knows that 20% of the bank's mortgage holders also lose their jobs during this period. Given that one of her mortgage holders just lost his job, what is the probability that he will now default on the loan?

Q.4(a) An insurance company offers an Rs. 80,000 catastrophic fire insurance policy to homeowners of a certain type of house. The policy provides protection in the event that such a house is totally destroyed by fire in a 1-year period. The company has determined that the probability of such an event is 0.0002.

- (i) if the annual policy premium is Rs. 52, find the expected gain per policy for the company.
- (ii) if the company wants an expected gain of Rs. 50 per policy, determine the annual premium.

(b) The financial analyst of XYZ Securities believes there is no difference in the annual average returns for steel industry stocks and mineral industry stocks. Using the following information, test the hypothesis that there is no significant difference in the average returns for these two types of stocks.

Steel industry stocks : mean=9%, n=33 $\sigma=2.4\%$.

Mineral industry stocks: mean =11%, n=41, $\sigma=4\%$. Use a 10% significance level.

Q.5(a) The mean weekly wage for a sample of 30 hourly employees in a bank $\bar{X} = \$280.00$ with a sample standard deviation of $s = \$14.00$. The weekly wage amounts in the bank are assumed to be approximately normally distributed. The 95 percent confidence interval for estimating the mean of weekly wage in the population is ?

(b) Most investment firms provide estimates, called betas, of systematic risks of securities. A stock's beta measures the

relationship between its rate of return and the average rate of return for the market as a whole. The term derives its name

beta-coefficient for the slope is simple linear regression, where the dependent variable is the stock's rate of return (y) and the independent variable is the market rate of return (x). Stocks with beta values (i.e., slopes) greater than 1 are considered "aggressive" securities since their rates of return are expected to move (upward or downward) faster than the market as a whole. In contrast, stocks with beta values less than 1 are called "defensive" securities since their rates of return move slower than the market. A stock with a beta value near 1 is called a "neutral" security because its rate of return mirrors the market. The data in the accompanying table are monthly rates of return (in percent) for a particular stock and the market as a whole for seven randomly selected months. Conduct a complete simple linear regression analysis of the data. Based on your analysis, how would you classify this stock-aggressive, defensive, or neutral?

Month	Stock Rate of Return y	Market Rate of Return x
1	12.0	7.2
2	-1.3	0.0
3	2.5	2.1
4	18.6	11.9
5	9.0	5.3
6	-3.8	-1.2
7	-10.0	-4.7

Sheikh Zayed Islamic Centre

University of Karachi

Business Statistics

Terminal Examination

Master in Islamic Banking and Finance

Max.Marks:100

Max.Time:2:30 hours

Date: May 27, 2013

Course Supervisor: Amin A.K. Vazir

Instruction: Attempt any **THREE**. Question #1 is compulsory.

Q.1(a) In a city, savings banks are permitted to sell a form of life insurance called Savings Bank Life Insurance (SBLI). The approval process consists of underwriting, which includes a review of the application, a medical information bureau check, possible requests for additional medical information and medical exams, and a policy compilation stage where the policy pages are generated and sent to the bank for delivery. The ability to deliver approved policies to customers in a timely manner is critical to the profitability of this service to the bank. During a period of 1 month, a random sample of 27 approved policies was selected INSURANCE and the total processing time in days recorded with mean= 43.89 and standard deviation=25.28

(i). Construct a 95% confidence interval estimate of the mean processing time.

(ii).What assumption must you make about the population distribution in (i)?

(b) State the theorem related to the sample size for estimating mean. Find the minimum required sample size for estimating the average number of designer shirts sold per day with 90% confidence that the maximum error will be of 5 units if the standard deviation of the number of shirts sold per day is about 50.

Q.2(a) The probability that an employee of a bank is a religious tax(zakat) payer is 0.67. If 200 employees of the bank are randomly selected, what is the probability that at least 150 of them are religious tax payers?

(b)The following table lists the number of haji employees and non-haji employees of an Islamic bank and a conventional bank:

	Employees of the Islamic bank	Employees of the Conventional bank
Haji employees	100	400
Non-haji employees	40	60

(i) Find the probability that a haji employee is chosen given the chosen one belongs to the Islamic bank, first using

reduced sample space and then original sample space.

(b)Are the two events i.e., “an employee is chosen” and “the chosen one belongs to the Islamic bank” dependent ? explain why or why not ?

Q.3(a) An investment analyst collects data on stocks and notes whether or not dividends were paid and whether or not the stocks increased in price over a given period. Data are presented in the following table.

Price increase	No Price increase	Total	
Dividends paid	34	78	112
No dividends paid	85	49	134
Total	119	127	246

(iii) What is the probability that randomly selected stock neither paid dividends nor increased in price?

(iv) Given that a stock increased in price, what is the probability that it also paid dividends?

(b) A bank loan officer knows that 12% of the bank's mortgage holders lose their jobs and default on the loan in the course of 5 years. She also knows that 20% of the bank's mortgage holders also lose their jobs during this period. Given that one of her mortgage holders just lost his job, what is the probability that he will now default on the loan?

Q.4(a) An insurance company offers an Rs. 80,000 catastrophic fire insurance policy to homeowners of a certain type of house. The policy provides protection in the event that such a house is totally destroyed by fire in a 1-year period. The company has determined that the probability of such an event is 0.0002.

(i) if the annual policy premium is Rs. 52, find the expected gain per policy for the company.

(ii) if the company wants an expected gain of Rs. 50 per policy, determine the annual premium.

(b) The financial analyst of XYZ Securities believes there is no difference in the annual average returns for steel industry stocks and mineral industry stocks. Using the following information, test the hypothesis that there is no significant difference in the average returns for these two types of stocks.

Steel industry stocks : mean=9%, n=33 $\sigma=2.4\%$.

Mineral industry stocks: mean =11%, n=41, $\sigma=4\%$. Use a 10% significance level.

Sheikh Zayed Islamic Centre

University of Karachi

Business Statistics

Terminal Examination

Master in Islamic Banking and Finance

Max.Marks:100

Date: June 14, 2014

Max.Time:3:00 hours

Course Supervisor: Amin A.K. Vazir

Instruction: Attempt **THREE** questions. Question #1 is compulsory.

Q1 Suppose an investor purchased m shares. Let two events A and B are defined as;

A: the market price of x shares was increased during a particular period, where $0 < x < m$

B: the market price of y shares was increased during a particular period, where $y \leq 1$

Are the two events A and B dependent or independent for

- i) $m=3$ ii) $m=4$

Q2 Rs. 15 million is invested in shares in ABC and Rs. 10 million is invested in shares in XYZ. The shares in ABC and XYZ have an expected return of zero. The shares in ABC have a standard deviation of 30 percent per annum and the shares in XYZ have a standard deviation of 20 percent per annum. The correlation coefficient between the returns on the two shares is 0.65. Suppose that returns follow a normal probability distribution.

Suppose also that abnormally bad market conditions are expected 5 percent of the time.

(xvii) Find the **Value at Risk** of the investment in ABC.

(xviii) Find the **Value at Risk** of the investment in XYZ.

(xix) Find the **Value at Risk** of the portfolio of the investments in ABC and XYZ.

(xx) Compare the **Value at Risk** of the portfolio of the investments in ABC and XYZ with the total **Value at Risk** of the individual investments in ABC and XYZ to justify diversification.

For what value of correlation coefficient the sum of **Values at Risk** of the two investments and the **Value at Risk** of the portfolio are same? For what values of the two proportions and correlation coefficient, the **Value at Risk** of the portfolio is zero?

Q3(a) The probability that a randomly selected employee of an Islamic Bank is a participant in an optional retirement program is 0.40. If 10 employees are chosen randomly, the probability that the proportion of participants is at least 0.70 is?

(b) An auditor wishes to test the assumption that the mean value of all accounts receivable is \$260.00 against the alternative that it is less than this amount and this test is to be carried out at the 5 percent level of significance. Suppose a sample of size 36 has the sample mean $\bar{X} = \$240.00$ and the standard deviation $\sigma = \$43.00$. Mention all the steps of his test to reach the conclusion. Identify the probability of committing type I error. Evaluate type II error for the alternative $\mu = 240$.

Q4(a) The mean weekly wage for a sample of 30 hourly employees in a bank $\bar{X} = \$280.00$ with a sample standard deviation of $s = \$14.00$. The weekly wage amounts in the bank are assumed to be approximately normally distributed. The 95 percent confidence interval for estimating the mean of weekly wage in the population is ?

(b) During a giving week the probability that a particular common stock issue will increase (I) in price, remain unchanged (U), or decline (D) in price is estimated to be 0.30, 0.20, and 0.50, respectively.

(e) What is the probability that the stock issue will increase in price or remain unchanged?

(f) What is the probability that the price of the issue will change during the week?

PAST PAPERS OF Business Statistics MIBF 1
 Sheikh Zayed Islamic Centre
University of Karachi
Business Statistics

Master in Islamic Banking and Finance

Max.Marks:100
 Max.Time:3:00 hours
 Instruction:

Date: June 18, 2009
 Course Supervisor: Amin A.K. Vazir

Attempt any **FIVE**. All questions carry equal marks.

Q.1 500 employees of a takaful company, 200 participate in a company's profit-sharing plan (P), 400 have major-medical insurance coverage (M), and 200 employees participate in both program. What is the probability that a randomly selected employee.

- (a) (i) will be a participant in at least one of the two programs ?
 (ii) will not be a participant in either program?
 (iii) will be a participant in the profit sharing plan given that the employee has major-medical insurance coverage ?

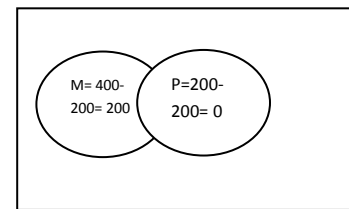
Solution:- i)

$P(\text{participate in at least one program}) = 400/500 = 0.80$

i) $P(\text{NOT BE A PARTICIPATE}) = 100/500 = 0.20$

ii) $P(P/M) = 200/500 = 0.40$

Determine whether the two events are dependent or independent?



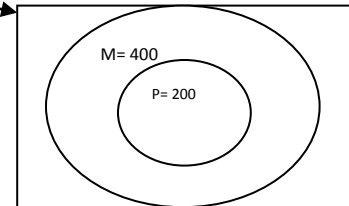
Q.1 (b) Determine whether the two events are dependent or independent?

Note: Same question in 19/5/2010 and, 2b) 6/6/10

Solution:-

$p(p) = 200/500 = 0.40$

Since $p(p/m) \neq p(p)$ therefore p and m are dependent.



Q.2 During a particular period, 80 percent of the common stock issues in an industry which includes just 10 companies have increased market value. If an investor chose two of these issues randomly, what is the probability that both issues increased in market value during this period?

If the investor chose three of these issues randomly, what is the probability that

- (a) only one of the three issues increased in market value ?
 (b) two issues increased in market value ?
 (c) at least two issues increased in market value ?

Note: Same question # 5 in 4/7/09, and Q # 3 in 6/1/10

Solution:-

A) 80% of 10=8, $p(\text{issue 1}), p(\text{issue 2/issue 1}) = 8/10 \times 7/9 = 56/90 = 0.62$

B) (not for part b,c and d these issues are chosen

$P(\text{INN}) + P(\text{NIN}) + P(\text{NNI}) = 8/10 \times 2/9 \times 1/8 + 2/10 \times 8/9 \times 1/8 + 2/10 \times 1/9 \times 8/8 = 48/720 = 0.07$

C) $p(\text{INN}) + P(\text{NIN}) + P(\text{NII}) = 0.47$

D) $p(\text{INN}) + P(\text{NIN}) + P(\text{NII}) + p(\text{III}) = 0.93$

Q. 3(a) The probability that a randomly selected employee of an Islamic Bank is a participant in an optional retirement program is 0.40. If 10 employees are chosen randomly, the probability that the proportion of participants is at least 0.70 is ?

Note: Same question # 2a in 4/7/09, and Q # 4a in 6/6/10

Solution:-

$$\sum_{x=7}^{10} p(x; 10, 0.4) = 1 - 0.9542 = 0.0548$$

Q. 3b) During a particular year, 70 percent of the common stock listed on a Stock Exchange increased in market value, while 30 percent were unchanged or declined in market value. At the beginning of the year a stock advisory service chose 10 stock issues as being “specially recommended”. If the 10 issues represent a random selection, what is the probability that (i) all 10 issues and (ii) at least eight issues increased in market value?

Note: Same question # 2a in 4/7/09, and Q # 4a in 6/6/10

Solution:-

- i) $\sum_{x=7}^{10} p(x; 10, 0.7) = 1 - 0.9718 = 0.0282$
 ii) $\sum_{x=7}^{10} p(x; 10, 0.7) = 1 - 0.6172 = 0.3828$

Q.4(a) The amount of time required per individual at a bank teller’s window has been found to be approximately normally distributed with $\mu = 130$ sec and $\sigma = 45$ sec. What is the probability that a randomly selected individual will

- (i) require less than 100 sec to complete a transaction?
 (ii) spend between 2.0 and 3.0 min at the teller’s window?

Note: Same question # 2a in 19/05/2010

Solution:-

- i) $\mu = 130 \text{ sec}, \sigma = 45, p(x < 100) = p(z < -0.67) = 0.2514$
 ii) $p(120 < x < 180) = p(-0.22 < z < -1.11) = 0.4536$

Q4(b) Within what length of time do the 20 percent of individual with the simplest transactions complete their business at the window?

Q4(c) At least what length of time is required for the individuals in the top 5 percent of required time?

Solution:-

B) $p(z < z_1) = 0.2, Z_1 = -0.842, x_1 = \sigma z_1 + \mu = 45(0.842) + 130 = 92$ seconds

C) $p(z < z_1) = 0.95, Z_1 = -1.645, x_1 = \sigma z_1 + \mu = 204$ seconds

Q. 5(a) An auditor wishes to test the assumption that the mean value of all accounts receivable is \$260.00 against the alternative that it is less than this amount and this test is to be carried out at the 5 percent level of significance. Suppose a sample of size 36 has the sample mean $\bar{X} = \$240.00$ and the standard deviation $\sigma = \$43.00$. Mention all the steps of his test to reach the conclusion. Identify the probability of committing type I error. Evaluate type II error for the alternative $\mu = 240$.

Note: Same question # 2b in 4/7/09

Solution:-

$H_0: \mu = 260, H_1: \mu < 260, \alpha = 0.05, z = -1.645$

$\bar{x} = 240 \quad (\bar{x} - 4) / 15 / \sqrt{4} = -2.79$. reject H_0 (i.e. $\mu = 260$)

P (type 1 error), $\alpha = 0.05$ or 5%

$$260 + (-1.645)(15/\sqrt{4}) = 260 + (-1.645) \times (7.17) = 248.21$$

B = P(Type 2 error) = $p(\bar{x} > 248.1, \mu = 240) = 1 - P(\bar{x} < 248.21, \mu = 240)$

$= 1 - P(z < 1.15) = 1 - 0.8749 = 0.1251 \approx 0.13$ or 13%

Q5 (b) The returns of security A and security B for the two- assets portfolio are given below:

SECURITY a		SECURITY b	
p_A	$R_A(\%)$	p_B	$R_B(\%)$
0.1	- 10	0.1	- 30
0.2	5	0.2	0
0.4	15	0.4	20
0.2	25	0.2	40
0.1	40	0.1	70

The investment proportion of security A, i.e., $w_A=0.75$. Find the expected return R_p and the risk σ_p of portfolio.

Note: Same question # 2b in 4/7/09

Solution:-

$R_A\%$	$R_B\%$	$R_A - R_B=P$	PR_A	PR_B	$P(R_A - R_B)^2$	$P(R_B - R_B)$	$P(R_A - R_A)(R_B - R_B)$
-10	-30	0.1	-1	-3	62.5	250	125
5	0	0.2	1	0	20	80	40
15	20	0.4	6	8	0	0	0
25	40	0.2	5	8	20	80	40
40	70	0.1	7	7	62.5	25	125

$$\sum P_1 R_A = R_A = 15 \sum P.R_B = 20 \quad S^2 a = 165 \quad S^2 b = 660 \quad \text{Covab} = 330$$

$$\sigma_a = \sqrt{165}, \sigma_b = \sqrt{660}, \text{Covab} = 330$$

$$P_{AB} = \text{Cov}_{AB} / \sigma_A \sigma_B = 330 / (\sqrt{165} \sqrt{660}) = 330 / 330 = 1$$

$$R_p = W_A R_S + W_B R_B = 3/4 \times 15 + 1/4 \times 20 = 45/4 + 20/4 = 65/4 = 16.25$$

$$\sigma_p = \sqrt{(0.75)^2(165) + (0.25)^2(660) + 2(0.75)(0.25)330} = \sqrt{257.8125} = 16.0565407$$

Q6(a) Monthly return data (in percent) are presented below for ABC stock and XYZ index for a 12 month period.

MONTH	xyz INDEX RETURN R_M	abc STOCK RETURN R_i
1	7.41	9.43
2	- 5.33	0.00
3	- 7.35	- 4.31
4	- 14.64	- 18.92
5	1.58	- 6.67
6	15.19	26.57
7	5.11	20.00
8	0.76	2.93
9	- 0.97	5.25
10	10.44	21.45
11	17.47	23.13
12	20.15	32.83

- (g) compute and interpret the correlation coefficient for the above data
- (h) calculate beta β_i of ABC stock using
 - (i) regression method
 - (ii) correlation method
- (i) find the equation of the regression line to predict the return of the ABC stock from the return of XYZ index. Suppose XYZ index is expected to move up by 10 percent next month. How much return would you expect from ABC stock ?

Solution:- 6 (a)

Note: Same question # 4 in 19/05/2010, Q # 6/6/10.

$$n=12, \sum R_m = 49.82, \sum R_i = 111.69, \sum R_m R_i = 2160.4812, \sum R_m^2 = 1432.7492$$

$$\sum R_i^2 = 3724.9769$$

$$P_{m,i} = n \sum R_m R_i - (\sum R_m) (\sum R_i) / \sqrt{n \sum R_m^2 - (\sum R_m)^2} \sqrt{n \sum R_i^2 - (\sum R_i)^2} = 0.9351$$

$$P^2_{m,i} = 0.8745 \text{ or } 87.450\%$$

Interpretation 87.45% of the variation in the value of R_i is accounted for by a linear relationship with R_m

Solution:- 6 (b)

β_i of ABC stock

(i) Regression Method:

$$B_i = n \sum R_m R_i - \sum R_m \sum R_i / n \sum R_m^2 - (\sum R_m)^2 = 1.384$$

ii) Correlation Method:

$$B_i = \frac{\sqrt{n \sum R_m^2 - (\sum R_m)^2}}{n \sum R_m^2 - (\sum R_m)^2}$$

$$P_{n=P_{m,i}} \sigma_i / \sigma_m = 0.935 \times 14.96 / 10.11 = 1.384$$

Solution:- 6 (c)

$$\bar{\alpha} = R_i - B_i R_m = 3.5614$$

Therefore the equation is $R_i = 1.384 R_m + 3.5614$

For $R_m = 10\%$

$$R_i = 1.384 \times 10\% + 3.5614 = 17.40$$

Sheikh Zayed Islamic Centre
University of Karachi
Business Statistics
 Master in Islamic Banking and Finance

Max.Marks:100
 Max.Time:3:00 hours
 Instruction:

Date: July 4, 2009
 Course Supervisor: Amin A.K. Vazir
 Attempt any **FIVE**. All questions carry equal marks.

Q1 Rs. 15 million is invested in shares in ABC and Rs. 10 million is invested in shares in XYZ. The shares in ABC and XYZ have an expected return of zero. The shares in ABC have a standard deviation of 30 percent per annum and the shares in XYZ have a standard deviation of 20 percent per annum. The correlation coefficient between the returns on the two shares is 0.65. Suppose that returns follow a normal probability distribution.

Suppose also that abnormally bad market conditions are expected 5 percent of the time.

- (xxi) Find the **Value at Risk** of the investment in ABC.
- (xxii) Find the **Value at Risk** of the investment in XYZ.
- (xxiii) Find the **Value at Risk** of the portfolio of the investments in ABC and XYZ.
- (xxiv) Compare the **Value at Risk** of the portfolio of the investments in ABC and XYZ with the total **Value at Risk** of the individual investments in ABC and XYZ to justify diversification.

For what value of correlation coefficient the two **Values at Risk** are same?

(Note: - Same question in 19/5/10) + Q11 [assignment #3]

Solution:-

Investment in the share ABC=Rs15million(given)

Investment in the share XYZ=Rs10million(given)

In $w_1 = \frac{15}{15+10} = \frac{15}{25} = 0.6$ and $w_2 = 0.4$

Expected return $= \bar{R} = \mu = 0$ (given)

Standard deviation in the investment of Share ABC $= \frac{30}{100} * 15 = 4.5$ million σ_1 (by value)

Standard deviation in the investment of Share XYZ $= \frac{20}{100} * 10 = 2$ million σ_2 (by value)

$\rho = 0.65$ (given)

Expected by market condition $= \alpha = 5\%$ of the timing $= 0.05$

- (i) The value at right of the investment in ABC
5%

$P(Z < Z_1) = 0.05 \therefore$ from table $Z_1 = -1.645$

$X_1 = \mu + \sigma_1 Z_1 = 0 + 4.5(-1.645)$ or $X_1 = -7.4025$ million

$X = -7.4025$ million

- (ii) The value at right of the investment in XYZ

$P(Z_1 < Z_2) = 0.05 \therefore Z_2 = -1.645$

$X_2 = \mu + \sigma_2 Z_2 = 0 + 2(-1.645)$ or $X_2 = -3.29$ million

$X = -3.29$ million

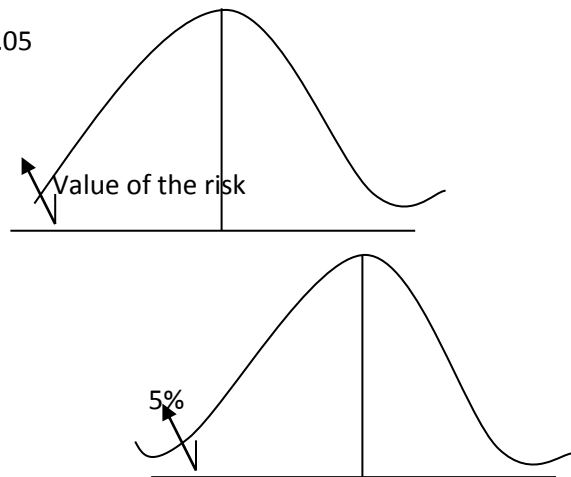
- (iii) The value at right of the portfolio of the investment in ABC and XYZ

$W_1 = 0.6, W_2 = 0.4, \sigma_1 = 30(\text{by } \%) = 0.3, \sigma_2 = 20(\text{BY } \%) = 0.2, \rho = 0.65$

$\sigma_p = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \rho \sigma_1 \sigma_2} = \sqrt{0.05752} = 0.239833$

The S.D part foki will be $0.239833 * 25 = 5.9958$

\therefore The value of rise of the part foci $= 5.9958 * (-1.645) = -9.8631$ million $\rightarrow -9.8631 = 9.8631$ million



(iv) Comparison:

Total value at risk of the dimensional measurement is A B C and X Y Z was $(-7.4025)+(-3.29)=-10.6925$, $[-10.6925]=10.6925$ million which is greater than 9.8631 million, which justify the portfolio.

If the return on the share of the ten companies who perfectly correlated (i.e. $P=1$) then the two values at risk will be same.

Q. 2(a) The probability that a randomly selected employee of an Islamic Bank is a participant in an optional retirement program is 0.40. If 10 employees are chosen randomly, the probability that the proportion of participants is at least 0.70 is?

Solution:-

$$\sum_{x=7}^{10} p(x; 10, 0.4) = 1 - 0.9542 = 0.0548$$

Q.2 (b) An auditor wishes to test the assumption that the mean value of all accounts receivable is \$260.00 against the alternative that it is less than this amount and this test is to be carried out at the 5 percent level of significance. Suppose a sample of size 36 has the sample mean $\bar{X} = \$240.00$ and the standard deviation $\sigma = \$43.00$. Mention all the steps of his test to reach the conclusion. Identify the probability of committing type I error. Evaluate type II error for the alternative $\mu = 240$.

Solution:-

$H_0: \mu=260, H_1: \mu<260, \alpha=0.05, z=-1.645$

$\bar{x}=240$ (" $\bar{x} - 4$) / $15/\sqrt{4}=-2.79$. reject H_0 (i.e. $\mu=260$)

P (type 1 error) , $\alpha=0.05$ or 5%

$$260+(-1.645)(15/\sqrt{4})=260+(-1.645) \times (7.17)=248.21$$

$B = P(\text{Type 2 error}) = p(\bar{x} > 248.1, \mu=240) = 1 - P(\bar{x} < 248.21, \mu=240)$

$= 1 - P(z < 1.15) = 1 - 0.8749 = 0.1251 \approx 0.13$ or 13%

Q3(a) The mean weekly wage for a sample of 30 hourly employees in a bank $\bar{X} = \$280.00$ with a sample standard deviation of $s = \$14.00$. The weekly wage amounts in the bank are assumed to be approximately normally distributed. The 95 percent confidence interval for estimating the mean of weekly wage in the population is ?

Note: Same question in 1(a) [6 | 6 | 10]

Solution:-

$$\bar{x} - Z \lambda \sqrt{2 S} \sqrt{n} < \mu < \bar{x} + Z \lambda \sqrt{2 S} \sqrt{n}$$

$$275 < \mu < 285$$

Q.3 (b) During a giving week the probability that a particular common stock issue will increase (I) in price, remain unchanged (U), or decline (D) in price is estimated to be 0.30, 0.20, and 0.50, respectively.

(g) What is the probability that the stock issue will increase in price or remain unchanged?

(h) What is the probability that the price of the issue will change during the week?

Note: Same question in 1(b) [6 | 6 | 10]

Solution:-

(i) $P(I \text{ or } U) = 0.3 + 0.2 = 0.5$

(ii) $P(I \text{ or } D) = 0.3 + 0.5 = 0.8$

Q4 Monthly return data (in percent) are presented below for ABC stock and XYZ index for a 12 month period.

MONTH	xyz INDEX RETURN R_M	abc STOCK RETURN R_i
1	7.41	9.43
2	- 5.33	0.00
3	- 7.35	- 4.31
4	- 14.64	- 18.92
5	1.58	- 6.67
6	15.19	26.57
7	5.11	20.00
8	0.76	2.93
9	- 0.97	5.25
10	10.44	21.45
11	17.47	23.13
12	20.15	32.83

- (a) compute and interpret the correlation coefficient for the above data
 (b) calculate beta β_i of ABC stock using
 (i) regression method
 (ii) correlation method
 (c) find the equation of the regression line to predict the return of the ABC stock from the return of XYZ index Suppose XYZ index is expected to move up by 10 percent next month. How much return would you expect from ABC stock ?

Solution:- 4 (a)

$$n=12 \sum R_m = 49.82, \sum R_i = 111.69, \sum R_m R_i = 2160.4812, \sum R_m^2 = 1432.7492$$

$$\sum R_i^2 = 3724.9769$$

$$P_{m,i} = n \sum R_m R_i - (\sum R_m) (\sum R_i) / \sqrt{n \sum R_m^2 - (\sum R_m)^2} \sqrt{n \sum R_i^2 - (\sum R_i)^2} = 0.9351$$

$$P^2_{m,i} = 0.8745 \text{ or } 87.450\%$$

Interpretation 87.45% of the variation in the value of R_i is accounted for by a linear relationship with R_m

Solution:- 4 (b)

β_i of ABC stock

(i) Regression Method:

$$B_i = n \sum R_m R_i - \sum R_m \sum R_i / n \sum R_m^2 - (\sum R_m)^2 = 1.384$$

ii) Correlation Method:

$$B_i = \frac{\sqrt{n \sum R_m^2 - (\sum R_m)^2}}{\sum R_m} P_{m,i}$$

$$P_{m,i} = 0.9351 \times 14.96 / 10.11 = 1.384$$

Solution:- 4 (c)

$$\bar{\alpha} = R_i - B_i R_m = 3.5614$$

Therefore the equation is $R_i = 1.384 R_m + 3.5614$

For $R_m = 10\%$

$$R_i = 1.384 \times 10\% + 3.5614 = 17.40$$

Q.5 During a particular period, 80 percent of the common stock issues in an industry which includes just 10 companies have increased market value. If an investor chose two of these issues randomly, what is the probability that both issues increased in market value during this period?

If the investor chose three of these issues randomly, what is the probability that

- (a) only one of the three issues increased in market value ?
 (b) two issues increased in market value ?
 (c) at least two issues increased in market value ?

Solution:-

- A) 80% of 10=8, p(issue 1), p(issue 2/issue 1)=8/10x7/9=56/90≈0.62
- B) (not for part b,c and d these issues are chosen
 $P(\text{INN})+P(\text{NIN})+P(\text{NNI})=8/10 \times 2/9 \times 1/8 + 2/10 \times 8/9 \times 1/8 + 2/10 \times 1/9 \times 8/8 = 48/720 = 0.07$)
- C) $p(\text{INN})+P(\text{NIN})+P(\text{NII})= 0.47$
- D) $p(\text{INN})+P(\text{NIN})+P(\text{NII})+p(\text{III})= 0.93$

Q. 6(a) During a particular year, 70 percent of the common stock listed on a Stock Exchange increased in market value, while 30 percent were unchanged or declined in market value. At the beginning of the year a stock advisory service chose 10 stock issues as being “specially recommended”. If the 10 issues represent a random selection, what is the probability that (i) all 10 issues and (ii) at least eight issues increased in market value?

Solution:-

- i) $\sum_{x=7}^{10} b(x; 10, 0.7) = 1 - 0.9718 = 0.0282$
- ii) $\sum_{x=7}^{10} p(x; 10, 0.7) = 1 - 0.6172 = 0.3828$

Q6 (b) The returns of security A and security B for the two- assets portfolio are given below:

SECURITY a		SECURITY b	
p_A	$R_A(\%)$	p_B	$R_B(\%)$
0.1	- 10	0.1	- 30
0.2	5	0.2	0
0.4	15	0.4	20
0.2	25	0.2	40
0.1	40	0.1	70

The investment proportion of security A, i.e., $w_A=0.75$. Find the expected return R_p and the risk σ_p of portfolio.

Solution:-

$R_A\%$	$R_B\%$	$R_A - R_B=P$	PR_A	PR_B	$P(R_A - R_B)^2$	$P(R_B - R_B)$	$P(R_A - R_A)(R_B - R_B)$
-10	-30	0.1	-1	-3	62.5	250	125
5	0	0.2	1	0	20	80	40
15	20	0.4	6	8	0	0	0
25	40	0.2	5	8	20	80	40
40	70	0.1	7	7	62.5	25	125

$\sum P_i R_A = R_A = 15 \sum P . R_B = 20 \quad S^2 a = 165 \quad S^2 b = 660 \quad \text{Covab} = 330$

$\sigma_a = \sqrt{165}, \sigma_b = \sqrt{660}, \text{Covab} = 330$

$P_{AB} = \text{Cov}_{AB} / \sigma_A \sigma_B = 330 / \sqrt{165} \sqrt{660} = 330 / 330 = 1$

$R_p = W_A R_s + W_B R_B = 3/4 \times 15 + 1/4 \times 20 = 45/4 + 20/4 = 65/4 = 16.25$

$\sigma_p = \sqrt{(0.75)^2(165) + (0.25)^2(660) + 2(0.75)(0.25)330} = \sqrt{257.8125} = 16.0565407$

Sheikh Zayed Islamic Centre
University of Karachi
Business Statistics(NB)
 Master in Islamic Banking and Finance

Max.Marks:100
 Max.Time:3:00 hours

Date: May 19, 2010
 Course Supervisor: Amin A.K. Vazir

Instruction: Attempt any **FIVE**. All questions carry equal marks.

Q.1 Of 500 employees of a takaful company, 200 participate in a company's profit-sharing plan (P), 400 have major-medical insurance coverage (M), and 200 employees participate in both program. What is the probability that a randomly selected employee.

- (a) (i) will be a participant in at least one of the two programs ?
 (ii) will not be a participant in either program?
 (iii) will be a participant in the profit sharing plan given that the employee has major-medical insurance coverage ?

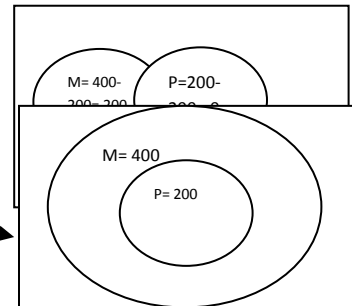
Solution:- i)

$P(\text{participate in at least one program}) = 400/500 = 0.80$

i) $P(\text{NOT BE A PARTICIPATE}) = 100/500 = 0.20$

ii) $P(P/M) = 200/500 = 0.50$

etermine whether the two events are dependent or independent?



Q.1 (b) Determine whether the two events are dependent or independent?

Solution:-

$p(p) = 200/500 = 0.40$

Since $p(p/m) \neq p(p)$ therefore p and m are dependent.

Q.2 The amount of time required per individual at a bank teller's window has been found to be approximately normally distributed with $\mu = 130$ sec and $\sigma = 45$ sec.

- (a) What is the probability that a randomly selected individual will
 (i) require less than 100 sec to complete a transaction?
 (ii) spend between 2.0 and 3.0 min at the teller's window?

Solution:-

i) $\mu = 130 \text{ sec}, \sigma = 45, p(x < 100) = p(z < -0.67) = 0.2514$

ii) $p(120 < x < 180) = p(-0.22 < z < -1.11) = 0.4536$

Q2(b) Within what length of time do the 20 percent of individual with the simplest transactions complete their business at the window?

Q2(c) At least what length of time is required for the individuals in the top 5 percent of required time?

Solution:-

B) $p(z < z_1) = 0.2, Z_1 = -0.842, x_1 = \sigma z_1 + \mu = 45(0.842) + 130 = 92$ seconds

C) $p(z < z_1) = 0.95, Z_1 = -1.645, x_1 = \sigma z_1 + \mu = 204$ seconds

Q3 Rs. 15 million is invested in shares in ABC and Rs. 10 million is invested in shares in XYZ. The shares in ABC and XYZ have an expected return of zero. The shares in ABC have a standard deviation of 30 percent per annum and the shares in XYZ have a standard deviation of 20 percent per annum. The correlation coefficient between the returns on the two shares is 0.65. Suppose that returns follow a normal probability distribution.

Suppose also that abnormally bad market conditions are expected 5 percent of the time.

- (i) Find the **Value at Risk** of the investment in ABC.
- (ii) Find the **Value at Risk** of the investment in XYZ.
- (iii) Find the **Value at Risk** of the portfolio of the investments in ABC and XYZ.
- (iv) Compare the **Value at Risk** of the portfolio of the investments in ABC and XYZ with the total **Value at Risk** of the individual investments in ABC and XYZ to justify diversification.

For what value of correlation coefficient the two **Values at Risk** are same?

Solution:-

Investment in the share ABC=Rs15million(given)

Investment in the share XYZ=Rs10million(given)

In $w_1 = \frac{15}{15+10} = \frac{15}{25} = 0.6$ and $w_2 = 0.4$

Expected return $= \bar{R} = \mu = 0$ (given)

Standard deviation in the investment of Share ABC $= \frac{30}{a} * 15 = 4.5$ million σ_1 (by value)

Standard deviation in the investment of Share XYZ $= \frac{20}{100} * 10 = 2$ million σ_2 (by value)

$\rho = 0.65$ (given)

Expected by market condition $= \alpha = 5\%$ of the timing $= 0.05$

- (i) The value at right of the investment in ABC
5%

$P(Z < Z_1) = 0.05 \therefore$ from table $Z_1 = -1.645$

$X_1 = \mu + \sigma_1 Z_1 = 0 + 4.5(-1.645)$ or $X_1 = -7.4025$ million

$X = -7.4025$ 0

- (ii) The value at right of the investment in XYZ

$P(Z_1 < Z_2) = 0.05 \therefore Z_2 = -1.645$

$X_2 = \mu + \sigma_2 Z_0 + (-1.645)$ or $x_2 = -3.29$ million

$X = -3.29$ 0

- (iii) The value at right of the port foki of the investment in ABC and XYZ

$W_1 = 0.6, W_2 = 0.24, \sigma_1 = 30$ (by %) $= 0.3, \sigma_2 = 20$ (BY%) $= 0.2, \rho = 0.65$

$\sigma_p = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \rho \sigma_1 \sigma_2} = \sqrt{0.05752} = 0.239833$

The S.D part foki will be $0.239833 * 25 = 5.9958$

\therefore The value of rise of the part foci $= 5.9958 * (-1.645) = -9.8631$ million $\rightarrow -9.8631 = 9.8631$ million

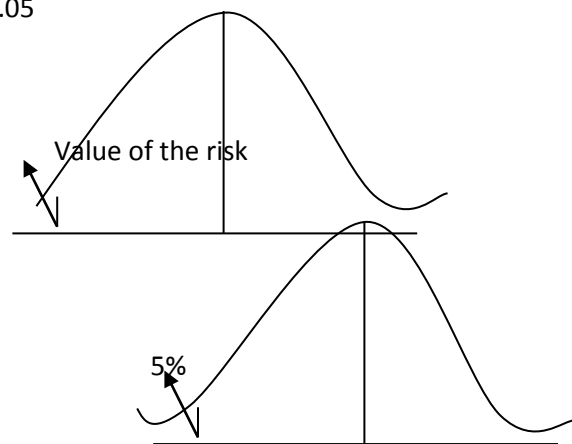
- (iv) Comparison:

Total value at risk of the dimensional measurement is A B C and X Y Z was $(-7.4025) + (-3.29) = -10.6925$, $[-10.6925] = 10.6925$ million which is greater than 9.8631 million, which justify the portfolio.

If the return on the share of the ten companies who perfectly correlated (i.e. $P=1$) then the two values at risk will be same.

Q4 Monthly return data (in percent) are presented below for ABC stock and XYZ index for a 12 month period.

MONTH	xyz INDEX RETURN R_M	abc STOCK RETURN R_i
1	7.41	9.43
2	- 5.33	0.00
3	- 7.35	- 4.31
4	- 14.64	- 18.92
5	1.58	- 6.67
6	15.19	26.57



7	5.11	20.00
8	0.76	2.93
9	-0.97	5.25
10	10.44	21.45
11	17.47	23.13
12	20.15	32.83

- (a) compute and interpret the correlation coefficient for the above data
 (b) calculate beta β_i of ABC stock using
 (i) regression method
 (ii) correlation method
 (c) find the equation of the regression line to predict the return of the ABC stock from the return of XYZ index Suppose XYZ index is expected to move up by 10 percent next month. How much return would you expect from ABC stock ?

Solution:- 4 (a)

$$n=12 \quad \sum R_m = 49.82, \quad \sum R_i = 111.69, \quad \sum R_m R_i = 2160.4812, \quad \sum R_m^2 = 1432.7492$$

$$\sum R_i^2 = 3724.9769$$

$$r_{m,i} = \frac{n \sum R_m R_i - (\sum R_m)(\sum R_i)}{\sqrt{n \sum R_m^2 - (\sum R_m)^2} \sqrt{n \sum R_i^2 - (\sum R_i)^2}} = 0.9351$$

$$r_{m,i}^2 = 0.8745 \text{ or } 87.450\%$$

Interpretation 87.45% of the variation in the value of R_i is accounted for by a linear relationship with R_m

Solution:- 4 (b)

β_i of ABC stock

(i) Regression Method:

$$B_i = \frac{n \sum R_m R_i - \sum R_m \sum R_i}{n \sum R_m^2 - (\sum R_m)^2} = 1.384$$

(ii) Correlation Method:

$$B_i = \frac{\sum R_m R_i - \frac{\sum R_m \sum R_i}{n}}{\sum R_m^2 - \frac{(\sum R_m)^2}{n}}$$

$$r_{m,i} = \frac{\sum R_m R_i - \frac{\sum R_m \sum R_i}{n}}{\sqrt{\sum R_m^2 - \frac{(\sum R_m)^2}{n}} \sqrt{\sum R_i^2 - \frac{(\sum R_i)^2}{n}}} = 0.9351$$

Solution:- 4 (c)

$$\bar{a} = R_i - B_i R_m = 3.5614$$

Therefore the equation is $R_i = 1.384 R_m + 3.5614$

For $R_m = 10\%$

$$R_i = 1.384 \times 10\% + 3.5614 = 17.40$$

Q. 5(a) During a particular year, 70 percent of the common stock listed on a Stock Exchange increased in market value, while 30 percent were unchanged or declined in market value. At the beginning of the year a stock advisory service chose 10 stock issues as being "specially recommended". If the 10 issues represent a random selection, what is the probability that (i) all 10 issues and (ii) at least eight issues increased in market value?

Solution:-

$$i) \quad \sum_{x=7}^{10} b(x; 10, 0.7) = 1 - 0.9718 = 0.0282$$

$$ii) \quad \sum_{x=7}^{10} p(x; 10, 0.7) = 1 - 0.6172 = 0.3828$$

Q.5 (b) The returns of security A and security B for the two- assets portfolio are given below:

SECURITY a		SECURITY b	
p_A	$R_A(\%)$	p_B	$R_B(\%)$
0.1	-10	0.1	-30
0.2	5	0.2	0
0.4	15	0.4	20
0.2	25	0.2	40
0.1	40	0.1	70

The investment proportion of security A, i.e., $w_A = 0.75$. Find the expected return R_p and the risk σ_p of portfolio.

Solution:-

$R_A\%$	$R_B\%$	$R_A - R_B = P$	PR_A	PR_B	$P(R_A - R_B)^2$	$P(R_B - R_B)$	$P(R_A - R_A)(R_B - R_B)$
-10	-30	0.1	-1	-3	62.5	250	125
5	0	0.2	1	0	20	80	40
15	20	0.4	6	8	0	0	0
25	40	0.2	5	8	20	80	40
40	70	0.1	7	7	62.5	25	125

$$\sum P_i R_A = R_A = 15 \quad \sum P_i R_B = 20 \quad S^2 a = 165 \quad S^2 b = 660 \quad \text{Covab} = 330$$

$$\sigma_a = \sqrt{165}, \quad \sigma_b = \sqrt{660}, \quad \text{Covab} = 330$$

$$P_{AB} = \text{Cov}_{AB} / \sigma_A \sigma_B = 330 / (\sqrt{165} \sqrt{660}) = 330 / 330 = 1$$

$$R_P = W_A R_S + W_B R_B = 3/4 \times 15 + 1/4 \times 20 = 45/4 + 20/4 = 65/4 = 16.25$$

$$\sigma_P = \sqrt{(0.75)^2(165) + (0.25)^2(660) + 2(0.75)(0.25)330} = \sqrt{257.8125} = 16.0565407$$

Q.6 (a) From a box containing 4 dimes and 2 nickels, 3 coins are selected at random without replacement. Find the probability distribution for the total T of the 3 coins. Express the probability distribution graphically as a probability histogram.

Solution:-

$$1) 10 + 2(10) = 20$$

$$1(5) = 25$$

$$2) 20 +$$

$$3) 30 + 0(0) = 30$$

X	1(20)	2(25)	3(30)
F(x)	4/20	12/20	4/20

$$F(x) = \frac{{}^4C_x {}^2C_{3-x}}{6}, \quad X=1,2,3$$

Q.6(b) A probability distribution is given by

$$f(x) = \frac{10 - |11 - x|}{100}, \quad x=2,3,4,\dots, 20$$

form a table and then

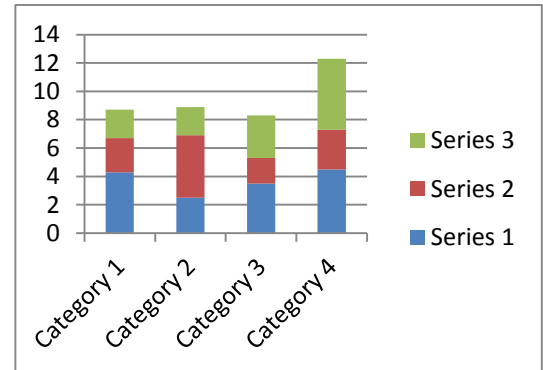
- vii) show that $f(x)$ is a probability distribution
- viii) find $P(X \leq 20)$
- ix) find $P(X \geq 20)$
- iv) find $\text{Var}(x)$

Solution:-

x	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
F(x)	1/100	2/100	3/100	4/100	5/100	6/100	7/100	8/100	9/100	10/100	9/100	8/100	7/100	6/100	5/100	4/100	3/100	2/100	1/100

1. $\sum_{x=2}^{20} f(x) = 1.1$ $f(x)$ is a probability distribute.
2. $p(x \leq 20) = 1$
3. $p(x \geq 20) = 1/100$
4. $\text{var}(x) = ?$

$$\begin{aligned} \sum(x) &= \frac{2+6+12+20+30+42+56+72+90+110+138+168+198+228+258+288+318+348+378+408}{100} \\ &= \frac{1100}{100} = 11 \\ \text{Var}(x) &= \frac{81+128+147+144+125+96+63+32+9+0+9+\dots+81}{100} \\ &= \frac{1650}{100} = 16.5 \end{aligned}$$



Sheikh Zayed Islamic Centre
University of Karachi
Business Statistics
 Master in Islamic Banking and Finance

Max.Marks:100
 Max.Time:3:00 hours

Date: May 23, 2011
 Course Supervisor: Amin A.K. Vazir

Instruction: Attempt any **FIVE**. All questions carry equal marks.

Q. 1(a) An auditor wishes to test the assumption that the mean value of all accounts receivable is \$260.00 against the alternative that it is less than this amount and this test is to be carried out at the 5 percent level of significance. Suppose a sample of size 36 has the sample mean $\bar{X} = \$240.00$ and the standard deviation $\sigma = \$43.00$. Mention all the steps of his test to reach the conclusion. Identify the probability of committing type I error. Evaluate type II error for the alternative $\mu = 240$.

Solution:-

$H_0: \mu=260, H_1: \mu<260, \alpha=0.05, z=-1.645$

" $\bar{x}=240$ (" $\bar{x} - 4$)/ $15/\sqrt{4}=-2.79$. reject H_0 (i.e. $\mu=260$)

P (type 1 error) , $\alpha=0.05$ or 5%

" $260+(-1.645)(15/\sqrt{4})=260+(-1.645) \times (7.17)=248.21$

$B = P(\text{Type 2 error}) = p(\bar{x} > 248.1, \mu = 240) = 1 - P(\bar{x} < 248.21, \mu = 240)$

$= 1 - P(z < 1.15) = 1 - 0.8749 = 0.1251 \approx 0.13$ or 13%

Q.1 (b) The returns of security A and security B for the two- assets portfolio are given below:

SECURITY a		SECURITY b	
p_A	$R_A(\%)$	p_B	$R_B(\%)$
0.1	- 10	0.1	- 30
0.2	5	0.2	0
0.4	15	0.4	20
0.2	25	0.2	40
0.1	40	0.1	70

The investment proportion of security A, i.e., $w_A=0.75$. Find the expected return R_p and the risk σ_p of portfolio.

Solution:-

$R_A\%$	$R_B\%$	$R_A - R_B = P$	PR_A	PR_B	$P(R_A - R_B)^2$	$P(R_B - R_B)$	$P(R_A - R_A)(R_B - R_B)$
-10	-30	0.1	-1	-3	62.5	250	125
5	0	0.2	1	0	20	80	40
15	20	0.4	6	8	0	0	0
25	40	0.2	5	8	20	80	40
40	70	0.1	7	7	62.5	25	125

$\sum P_i R_A = R_A = 15 \sum P. R_B = 20 \quad S^2 a = 165 \quad S^2 b = 660 \quad Cov_{ab} = 330$

$\sigma_a = \sqrt{165}, \sigma_b = \sqrt{660}, Cov_{ab} = 330$

$P_{AB} = Cov_{AB} / \sigma_A \sigma_B = 330 / \sqrt{165} \sqrt{660} = 330 / 330 = 1$

$R_p = W_A R_s + W_B R_B = 3/4 \times 15 + 1/4 \times 20 = 45/4 + 20/4 = 65/4 = 16.25$

$$\sigma_p = \sqrt{(0.75)^2(165) + (0.25)^2(660) + 2(0.75)(0.25)330} = \sqrt{257.8125} = 16.0565407$$

Q.2 Rs. 15 million is invested in shares in ABC and Rs. 10 million is invested in shares in XYZ. The shares in ABC and XYZ have an expected return of zero. The shares in ABC have a standard deviation of 30 percent per annum and the shares in XYZ have a standard deviation of 20 percent per annum. The correlation coefficient between the returns on the two shares is 0.65. Suppose that returns follow a normal probability distribution.

Suppose also that abnormally bad market conditions are expected 5 percent of the time.

- (i) Find the **Value at Risk** of the investment in ABC.
- (ii) Find the **Value at Risk** of the investment in XYZ.
- (iii) Find the **Value at Risk** of the portfolio of the investments in ABC and XYZ.
- (iv) Compare the **Value at Risk** of the portfolio of the investments in ABC and XYZ with the total **Value at Risk** of the individual investments in ABC and XYZ to justify diversification.

For what value of correlation coefficient the two **Values at Risk** are same?

Solution:-

Investment in the share ABC=Rs15million(given)

Investment in the share XYZ=Rs10million(given)

In $w_1 = \frac{15}{15+10} = \frac{15}{25} = 0.6$ and $w_2 = 0.4$

Expected return $= \bar{R} = \mu = 0$ (given)

Standard deviation in the investment of Share ABC $= \frac{30}{100} * 15 = 4.5$ million σ_1 (by value)

Standard deviation in the investment of Share XYZ $= \frac{20}{100} * 10 = 2$ million σ_2 (by value)

$\rho = 0.65$ (given)

Expected by market condition $= \alpha = 5\%$ of the time $= 0.05$

- (i) The value at right of the investment in ABC
5%

$P(Z < Z_1) = 0.05 \therefore$ from table $Z_1 = -1.645$

$X_1 = \mu + \sigma_1 Z_1 = 0 + 4.5(-1.645)$ or $X_1 = -7.4025$ million

$X = -7.4025 \quad 0$

- (ii) The value at right of the investment in XYZ

$P(Z_1 < Z_2) = 0.05 \therefore Z_2 = -1.645$

$X_2 = \mu + \sigma_2 Z_0 + (-1.645)$ or $x_2 = -3.29$ million

$X = -3.29 \quad 0$

- (iii) The value at right of the port foki of the investment in ABC and XYZ

$W_1 = 0.6, W_2 = 0.4, \sigma_1 = 30$ (by %) $= 0.3, \sigma_2 = 20$ (BY%) $= 0.2, \rho = 0.65$

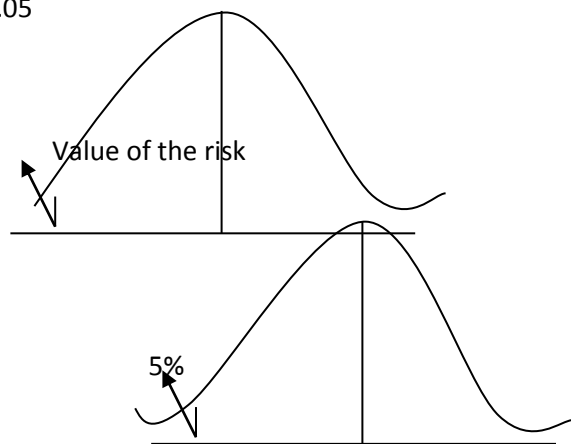
$\sigma_p = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \rho \sigma_1 \sigma_2} = \sqrt{0.05752} = 0.239833$

The S.D part foki will be $0.239833 * 25 = 5.9958$

\therefore The value of rise of the part foci $= 5.9958 * (-1.645) = -9.8631$ million $\rightarrow -9.8631 = 9.8631$ million

- (iv) Comparison:

Total value at risk of the dimensional measurement is A B C and X Y Z was $(-7.4025) + (-3.29) = -10.6925$, $[-10.6925] = 10.6925$ million which is greater than 9.8631 million, which justify the portfolio.



If the return on the share of the ten companies who perfectly correlated (i.e. P=1) then the two values at risk will be same.

Q.3 Monthly return data (in percent) are presented below for ABC stock and XYZ index for a 12 month period.

MONTH	xyz INDEX RETURN R_M	abc STOCK RETURN R_i
1	7.41	9.43
2	- 5.33	0.00
3	- 7.35	- 4.31
4	- 14.64	- 18.92
5	1.58	- 6.67
6	15.19	26.57
7	5.11	20.00
8	0.76	2.93
9	- 0.97	5.25
10	10.44	21.45
11	17.47	23.13
12	20.15	32.83

- compute and interpret the correlation coefficient for the above data
- calculate beta β_i of ABC stock using
 - regression method
 - correlation method
- find the equation of the regression line to predict the return of the ABC stock from the return of XYZ index Suppose XYZ index is expected to move up by 10 percent next month. How much return would you expect from ABC stock ?

Solution:- 3 (a)

$$n=12, \sum R_m = 40.82, \sum R_i = 111.69, \sum R_m R_i = 2160.4812, \sum R_m^2 = 1432.7492$$

$$\sum R_i^2 = 3724.9769$$

$$P_{m,i} = \frac{n \sum R_m R_i - (\sum R_m)(\sum R_i)}{\sqrt{n \sum R_m^2 - (\sum R_m)^2} \sqrt{n \sum R_i^2 - (\sum R_i)^2}} = 0.9351$$

$$P^2_{m,i} = 0.8745 \text{ or } 87.450\%$$

Interpretation 87.45% of the variation in the value of R_i is accounted for by a linear relationship with R_m

Solution:- 3 (b)

β_i of ABC stock

(i) Regression Method:

$$B_i = \frac{n \sum R_m R_i - \sum R_m \sum R_i}{n \sum R_m^2 - (\sum R_m)^2} = 1.384$$

ii) Correlation Method:

$$B_i = \frac{\sum R_m R_i - \frac{(\sum R_m)(\sum R_i)}{n}}{\sum R_m^2 - \frac{(\sum R_m)^2}{n}}$$

$$P_{m,i} = \beta_i \sigma_i / \sigma_m = 0.935 \times 14.96 / 10.11 = 1.384$$

Solution:- 3 (c)

$$\bar{\alpha} = R_i - B_i R_m = 3.5614$$

Therefore the equation is $R_i = 1.384 R_m + 3.5614$

For $R_m = 10\%$

$$R_i = 1.384 \times 10\% + 3.5614 = 17.40$$

Q4(a) The mean weekly wage for a sample of 30 hourly employees in a bank $\bar{X} = \$280.00$ with a sample standard deviation of $s = \$14.00$. The weekly wage amounts in the bank are assumed to be approximately

normally distributed. The 95 percent confidence interval for estimating the mean of weekly wage in the population is ?

Solution:-

$$\bar{x} - Z\lambda \sqrt{2 S \setminus Jn} < \mu < \bar{x} + Z\lambda \sqrt{2 S \setminus Jn}$$

$$275 < \mu < 285$$

Q.4(b) An insurance company has written 100 policies of Rs. 100000, 500 of Rs.50000 and 1000 of Rs. 10000 for people of age 20. If experience shows that the probability that a person will die at age 20 is 0.001, how much can the company expect to pay out during the year the policies were written?

Solution:-

Total amount invested for the three policies (at age 20) = $100 \times 100000 + 500 \times 50000 + 1000 \times 10000 = \text{Rs } 45,000,000$

Problem (company expect to pay) = $45,000,000 \times 0.001 = \text{Rs } 45,000$

Q5(a) A bank has found that most customers at the tellers' windows either cash a check or make a deposit. The below indicates the transactions for one teller for one day.

	CASH CHECK	NO CHECK	TOTALS
Make Deposit	50	20	70
No Deposit	30	10	40
Totals	80	30	110

Letting C represent "cashing a check" and D represent "making a deposit," express each of the following probabilities in words and find its value. (i) $P(D'/C)$ (ii) $P(C'/D)$

Are C and D dependent? Why or why not?

Solution:-

From the given table

$$a) P(D'/C) = P(D' \cap C) / P(C) = 30 / 80 = 3/8 = 0.375$$

$$b) P(C'/D) = 20 / 70 = 2/7 = 0.2857$$

$P(C) = 3/8$ and $P(C/D) = 5/7$. $P(C/D) \neq P(C)$ (\therefore C and D are dependent)

Q.5 (b) Among users of automated teller machines, 92% use ATMs to withdraw cash, and 32% use them to check their account balance. Suppose that 96% use ATMs to either withdraw cash or check their account balance (or both). Given a man who uses an ATM to check his account balance, what is the probability that he also uses an ATM to get cash?

Are "withdrawing cash" and "checking account balance" dependent? Why or why not?

Solution:-

$$P(W) = 0.92, P(B) = 0.32, P(W \cup B) = 0.96$$

$$\therefore P(W \cap B) = 0.92 + 0.32 - 0.96 = 0.28$$

$$P(W/B) = P(W \cap B) / P(B) = 0.28 / 0.32 = 0.875 \therefore P(W/B) \neq P(W) = 0.92$$

Q6(a) The insurance industry has found that the probability is 0.1 that a life insurance applicant will disqualify at the regular rates. Find the probabilities that of the next 10 applicants for life insurance the following numbers will qualify at the regular rates.

(i) Exactly 10 (ii) At least 9

Solution:-

$$P(\text{problem of qualifying}) = 1 - p' = 1 - 0.1 = 0.9, P(X=10) = \sum b(10; 10, 0.9) - \sum b(9; 10, 0.9) = 1 - 0.6513 = 0.3487$$

$$P(X \geq 9) = 1 - \sum b(x; 10, 0.9) = 1 - 0.2639 = 0.7361$$

Q.6 (b) The probability that a small business will be safe and will not go bankrupt in its first year is 0.79. For 50 such small businesses, find the following probabilities.

(i) Exactly 8 go bankrupt (ii) No more than 2 go bankrupt

Solution:-

$$p = 1 - p' = 1 - 0.79 = 0.21, m = 50 (\therefore \mu = np = 50 \times 0.21 = 10.5) s = 2.88$$

$$Z = (x - \mu) / s = (8 - 10.5) / 2.88 = -0.868$$

$$P(X=8) = P(Z < -0.868) - P(Z < -1.0417) = 0.1938 - 0.1492 = 0.0446$$

Sheikh Zayed Islamic Centre
University of Karachi
Business Statistics
 Master in Islamic Banking and Finance

Max.Marks:100
 Max.Time:3:00 hours

Date: May 22, 2012
 Course Supervisor: Amin A.K. Vazir

Instruction: Attempt any **FOUR**. All questions carry equal marks.

Q.1 Rs. 15 million is invested in shares in ABC and Rs. 10 million is invested in shares in XYZ. The shares in ABC and XYZ have an expected return of zero. The shares in ABC have a standard deviation of 30 percent per annum and the shares in XYZ have a standard deviation of 20 percent per annum. The correlation coefficient between the returns on the two shares is 0.65. Suppose that returns follow a normal probability distribution.

Suppose also that abnormally bad market conditions are expected 5 percent of the time.

- (i) Find the **Value at Risk** of the investment in ABC.
- (ii) Find the **Value at Risk** of the investment in XYZ.
- (iii) Find the **Value at Risk** of the portfolio of the investments in ABC and XYZ.
- (iv) Compare the **Value at Risk** of the portfolio of the investments in ABC and XYZ with the total **Value at Risk** of the individual investments in ABC and XYZ to justify diversification.

For what value of correlation coefficient the two **Values at Risk** are same?

Solution:-

Investment in the share ABC=Rs15million(given)

Investment in the share XYZ=Rs10million(given)

In $w_1 = \frac{15}{15+10} = \frac{15}{25} = 0.6$ and $w_2 = 0.4$

Expected return $= \bar{R} = \mu = 0$ (given)

Standard deviation in the investment of Share ABC $= \frac{30}{100} * 15 = 4.5$ million σ_1 (by value)

Standard deviation in the investment of Share XYZ $= \frac{20}{100} * 10 = 2$ million σ_2 (by value)

$\rho = 0.65$ (given)

Expected by market condition $= \alpha = 5\%$ of the time $= 0.05$

- (i) The value at right of the investment in ABC
5%

$P(Z < Z_1) = 0.05 \therefore$ from table $Z_1 = -1.645$

$X_1 = \mu + \sigma_1 Z_1 = 0 + 4.5(-1.645)$ or $X_1 = -7.4025$ million

$X = -7.4025$ million

- (ii) The value at right of the investment in XYZ

$P(Z_1 < Z_2) = 0.05 \therefore Z_2 = -1.645$

$X_2 = \mu + \sigma_2 Z_0 + (-1.645)$ or $x_2 = -3.29$ million

$X = -3.29$ million

- (iii) The value at right of the portfolio of the investment in ABC and XYZ

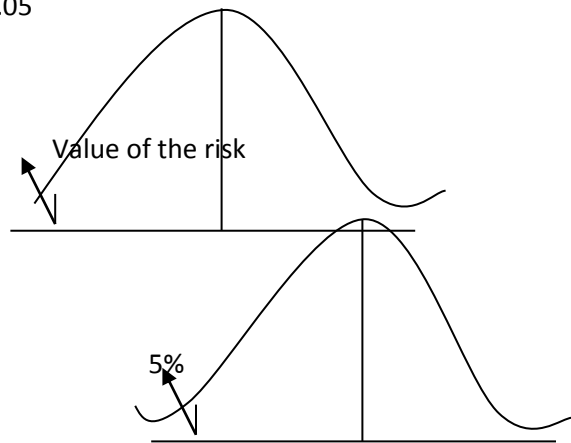
$W_1 = 0.6, W_2 = 0.4, \sigma_1 = 30(\text{by } \%) = 0.3, \sigma_2 = 20(\text{BY } \%) = 0.2, \rho = 0.65$

$\sigma_p = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \rho \sigma_1 \sigma_2} = \sqrt{0.05752} = 0.239833$

The S.D part foki will be $0.239833 * 25 = 5.9958$

\therefore The value of rise of the part foci $= 5.9958 * (-1.645) = -9.8631$ million $\rightarrow -9.8631 = 9.8631$ million

- (iv) Comparison:



Total value at risk of the dimensional measurement is A B C and X Y Z was $(-7.4025)+(-3.29)=-10.6925$, $[-10.6925]=10.6925$ million which is greater than 9.8631 million, which justify the portfolio.

If the return on the share of the ten companies who perfectly correlated (i.e. $P=1$) then the two values at risk will be same.

Q.2 Of 500 employees of a takaful company, 200 participate in a company's profit-sharing plan (P), 400 have major-medical insurance coverage (M), and 200 employees participate in both program. What is the probability that a randomly selected employee.

(a) (i) will be a participant in at least one of the two programs ?

(ii) will not be a participant in either program?

(iii) will be a participant in the profit sharing plan given that the employee has major-medical insurance coverage ?

Solution:- i)

$P(\text{participate in at least one program})=400/500=0.80$

i) $P(\text{NOT BE A PARTICIPATE})=100/500=0.20$

ii) $P(P/M)=200/500=0.50$

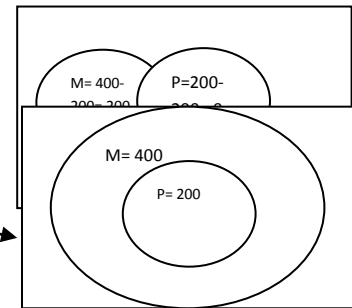
determine whether the two events are dependent or independent?

Q.2 (b) Determine whether the two events are dependent or independent?

Solution:-

$(p(p)=200/500=0.40$

Since $p(p/m) \neq p(p)$ therefore p and m are dependent



Q.3(a) An investment analyst collects data on stocks and notes whether or not dividends were paid and whether or not the stocks increased in price over a given period. Data are presented in the following table.

Price increase	No Price increase	Total	
Dividends paid	34	78	112
No dividends paid	85	49	134
Total	119	127	246

(v) What is the probability that randomly selected stock neither paid dividends nor increased in price?

(vi) Given that a stock increased in price, what is the probability that it also paid dividends?

Solution:-

i, $P(\text{No div paid} \cap \text{Price not increased})=49/246=0.199$

ii, $P(\text{Paid dividends}/\text{priced increased})=34/119=0.286$

Q.3 (b) A bank loan officer knows that 12% of the banks mortgage holders lose their jobs and default on the loan in the course of 5years. She also knows that 20% of the bank's mortgage holders also lose their jobs during this period. Given that one of her mortgage holders just lost his job, what is the probability that he will now default on the loan?

Solution:-

$P(L \cap D)=0.12$, $P(L)=0.2$, $P(D/L)=P(L \cap D)/P(L)=0.12/0.2=0.6$

Gram Loss of $(80000 - 52)=79948$ which is a gain of -79948

X	52	-79948
F(x)	0.9998	0.0002

Q.4(a) An insurance company offers an Rs. 80,000 catastrophic fire insurance policy to homeowners of a certain type of house. The policy provides protection in the event that such a house is totally destroyed by fire in a 1-year period. The company has determined that the probability of such an event is 0.0002.

(i) if the annual policy premium is Rs. 52, find the expected gain per policy for the company.

(ii) if the company wants an expected gain of Rs. 50 per policy, determine the annual premium.

Solution:-

i, $B(x)=52*0.9998+(-79948)*0.0002=36$

X	P	p-8000
F(x)	0.9998	0.0002

ii ;0.9998 P=0.0002(P – 80000)=50 P=66ū

Q.4(b) The financial analyst of XYZ Securities believes there is no difference in the annual average returns for steel industry stocks and mineral industry stocks. Using the following information, test the hypothesis that there is no significant difference in the average returns for these two types of stocks.
 Steel industry stocks : mean=9%, n=33 σ=2.4%.
 Mineral industry stocks: mean =11%, n=41, σ=4%. Use a 10% significance level.

Solution:-???

Q5 (a) The mean weekly wage for a sample of 30 hourly employees in a bank $\bar{X} = \$280.00$ with a sample standard deviation of $s = \$14.00$. The weekly wage amounts in the bank are assumed to be approximately normally distributed. The 95 percent confidence interval for estimating the mean of weekly wage in the population is ?

Solution:-

$$\bar{x} - Z_{\lambda} \frac{s}{\sqrt{n}} < \mu < \bar{x} + Z_{\lambda} \frac{s}{\sqrt{n}}$$

$$275 < \mu < 285$$

Q.5 (b) Most investment firms provide estimates, called betas, of systematic risks of securities. A stock's beta measures the relationship between its rate of return and the average rate of return for the market as a whole. The term derives its name beta-coefficient for the slope is simple linear regression, where the dependent variable is the stock's rate of return (y) and the independent variable is the market rate of return (x). Stocks with beta values (i.e., slopes) greater than 1 are considered "aggressive" securities since their rates of return are expected to move (upward or downward) faster than the market as a whole. In contrast, stocks with beta values less than 1 are called "defensive" securities since their rates of return move slower than the market. A stock with a beta value near 1 is called a "neutral" security because its rate of mirrors the markets. The data in the accompanying table are monthly rates of return (in percent) for a particular stock and the market as a whole for seven randomly selected months. Conduct a complete simple linear regression analysis of the data. Based on your analysis, how would you classify this stock-aggressive, defensive, or neutral?

Month	Stock Rate of Return y	Market Rate of Return x
1	12.0	7.2
2	-1.3	0.0
3	2.5	2.1
4	18.6	11.9
5	9.0	5.3
6	-3.8	-1.2
7	-10.0	-4.7

Sheikh Zayed Islamic Centre
University of Karachi
Business Statistics
 Master in Islamic Banking and Finance

Max.Marks:100
 Max.Time:2:30 hours

Date: May 27, 2013
 Course Supervisor: Amin A.K. Vazir

Instruction: Attempt any **THREE**. Question #1 is compulsory.

- Q.1(a)** In a city, savings banks are permitted to sell a form of life insurance called Savings Bank Life Insurance (SBLI). The approval process consists of underwriting, which includes a review of the application, a medical information bureau check, possible requests for additional medical information and medical exams, and a policy compilation stage where the policy pages are generated and sent to the bank for delivery. The ability to deliver approved policies to customers in a timely manner is critical to the profitability of this service to the bank. During a period of 1 month, a random sample of 27 approved policies was selected INSURANCE and the total processing time in days recorded with mean= 43.89 and standard deviation=25.28
- i) Construct a 95% confidence interval estimate of the mean processing time.
 (ii).What assumption must you make about the population distribution in (i)?

Solution:-

- i) $n=27, X = 43.89, S=25.28, \alpha=0.05 \dots t_{\alpha/2} = 2.056$ (Task)
 $[X-s/\sqrt{n} \ t_{\alpha/2}, \ X+s/\sqrt{n} \ t_{\alpha/2},$
 ii) It is normally distributed

Q.1(b) State the theorem related to the sample size for estimating mean. Find the minimum required sample size for estimating the average number of designer shirts sold per day with 90% confidence that the maximum error will be of 5 units if the standard deviation of the number of shirts sold per day is about 50.

Solution:-

If $Z \ t_{\alpha/2} = 1.645, \sigma = 50, e=5, n= (Z \ t/e \ X \ \sigma)^2 = (16.45)^2 = \underline{270.61}$

Q.2(a) The probability that an employee of a bank is a religious tax(zakat) payer is 0.67. If 200 employees of the bank are randomly selected, what is the probability that at least 150 of them are religious tax payers?

Solution:-

$P = 0.67, n = 200, U = 134, \sigma = 6.65, X = 149.5$

$Z = 149.5 - 134 / 6.65 = \underline{2.33}$

$P(x > 50) = p(z > 2.333) = 1 - p(z < 2.33)$

$= 1 - 0.9901 = \underline{0.0099}$

Q.2 (b) The following table lists the number of haji employees and non-haji employees of an Islamic bank and a conventional bank:

	Employees of the Islamic bank	Employees of the Conventional bank
Haji employees	100	400
Non-haji employees	40	60

(i) Find the probability that a haji employee is chosen given the chosen one belongs to the Islamic bank, first using reduced sample space and then original sample space.

(b) Are the two events i.e., "an employee is chosen" and "the chosen one belongs to the Islamic bank" dependent? Explain why or why not?

A's Haji should close.

B's Close and rely to the Islamic Bank

$P(A) = 500/600 = \underline{5/6}$ $P(B) = 140/600 = \underline{7/36}$

$$P(A \cap B) = 100/600 = \underline{1/6} \quad P(B/A) = 100/500 = \underline{1/5} \quad P(B/A') = 40/100 = \underline{2/5}$$

$$P(A/B) = 100/140 = \underline{5/7}$$

$$P(A/B) = P(A \cap B)/P(B) = \underline{1/6} = \underline{5/7}$$

Since, $P(A/B) = 5/7 \neq P(A)$

And Dependent

Q.3(a) An investment analyst collects data on stocks and notes whether or not dividends were paid and whether or not the stocks increased in price over a given period. Data are presented in the following table.

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- (i) if the annual policy premium is Rs. 52, find the expected gain per policy for the company.
- (ii) if the company wants an expected gain of Rs. 50 per policy, determine the annual premium.

Solution:-

i, $B(x) = 52 * 0.9998 + (-79948) * 0.0002 = 36$

X	P	$x - 80000$
F(x)	0.9998	0.0002

ii $0.9998 P - 0.0002(P - 80000) = 50$; $P = 66000$

Q.4(b) The financial analyst of XYZ Securities believes there is no difference in the annual average returns for steel industry stocks and mineral industry stocks. Using the following information, test the hypothesis that there is no significant difference in the average returns for these two types of stocks.

Steel industry stocks : mean = 9%, n = 33, $\sigma = 2.4\%$
 Mineral industry stocks: mean = 11%, n = 41, $\sigma = 4\%$. Use a 10% significance level.

Solution:-????

- Solution of Q # 4 (b) in 2012 and Q # 4 (b) in 2013
- Solution of Q # 5 (b) in 2012