UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, NOV-DEC 2013

COURSE NO : **MA 477**
COURSE NAME : **TIME SERIES AND FORECASTING 1**
CLASS : MA IV TIME: **3 HRS**

Name: Emmanuel Azane Quaysie Index Number: 4230 8710

Answer ALL Questions. All Questions Carry Equal Marks

Q1. a. Forecasting methods such as moving averages and exponential smoothing are not well suited for data series that have trends. Explain why this is so.

b. The yearly income (in millions of cedis) of Gold Company recorded over a period of ten years is given below

Years	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Income	90	76	80	98	60	79	85	70	92	50

i. Prepare a three-period moving average forecast for the year 2010. What is the error on each year?

ii. Use exponential smoothing with smoothing constant of 0.2 to forecast for the year 2010.

iii. Which of these two forecasts is the best?

Q2. a. With which characteristic movement of a time series would you mainly associate each of the following?

i. Political election disputes delaying production for some months random

ii. An increase in umbrella cards during rainy season Seasonal

iii. Prosperity of a business which was immediately followed by recession. cyclical

iv. Fire outbreak destructing the operations of an organization random

b. The manager of HGY department at a high street has asked you to perform time series analysis on the quarterly sales figures of the numbers of fridges sold over the past three years. The figures are given in the table below.

Df	0.100	0.050	0.025	0.010
1	3.078	6.314	12.706	31.821
2	1.886	2.920	4.303	6.965
3	1.638	2.353	3.182	4.541
4	1.533	2.132	2.776	3.747
5	1.476	2.015	2.571	3.365
6	1.440	1.943	2.447	3.143
7	1.415	1.895	2.365	2.998
8	1.397	1.860	2.305	2.896

Q2. (a). State and explain all the components of time series.

(b). You have just completed an analysis into the sales of book over the past nine years and the results is shown in the table below;

Year	2	3	4	5	6	7	8	9	10
Sales	65	11	50	75	80	16	35	88	90

Test the significance of the regression coefficient at 5% level. What do the results tell you?

Least square regression

Q3. A Paper box company makes carryout beef boxes. The operations planning department knows that the beef sales of a major client depends on advertisement. Operation planning is interested in determine in advance the sales. The amount of beef boxes the client will order in cedi volume is known to be a fixed parent of sales. The director of operations and planning predicted thirteen years ago that sales in year 1 would be 42 cedis. The table below shows the sales obtained from various advertisement.

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Sales	15	20	18	19	23	41	32	28	12	23	15	19	20

(a) .Using exponential smoothing with the following weights;

(i) $\alpha = 0.4$

$$F_t = F_{t-1} + \alpha(Y_{t-1} - F_{t-1})$$

(ii) $\alpha = 0.2$

develop forecasts for the year 1993 .

(b). Using Mean Absolute Deviation ,which of the following weights provide the best forecast and why?

$$MAD = \frac{\Sigma |Error|}{n}$$

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FIRST SEMESTER EXAMINATIONS, NOV-DEC 2013

COURSE NO : MA 477
COURSE NAME : TIME SERIES AND FORECASTING 1
CLASS : MA IV TIME: 3 HRS

Name: _____ Index Number: _____

Answer ALL Questions. All Questions Carry Equal Marks

$f_1 = 90$
$f_3 = f_1 + \alpha(Y_1 - f_1)$
$f_2 = 90 + 0.2($

1a. Forecasting methods such as moving averages and exponential smoothing are not well suited for data series that have trends. Explain why this is so.

b. The yearly income (in millions of cedis) of Gold Company recorded over a period of ten years is given below

Years	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Income	90	76	80	98	60	79	85	70	92	50

i. Prepare a three-period moving average forecast for the year 2010. What is the error on each year?

ii. Use exponential smoothing with smoothing constant of 0.2 to forecast for the year 2010.

iii. Which of these two forecasts is the best?

2a. With which characteristic movement of a time series would you mainly associate each of the following?

i. Political election disputes delaying production for some months- ~~trend~~ Random

ii. An increase in umbrella cards during rainy season – Seasonal Variations

iii. Prosperity of a business which was immediately followed by recession. – Cyclic variation

iv. Fire outbreak destructing the operations of an organization – Random Variations

b. The manager of HGY department at a high street has asked you to perform time series analysis on the quarterly sales figures of the numbers of fridges sold over the past three years. The figures are given in the table below.

profit could also be large. There is less risk with selling to the retailers but the potential profit would also be less. The safe option is to sell to everybody, but in this case the chance of making large profits would be lost. The estimated profits for each decision depend on the state of the market, which has been defined as high, medium and low. The probability that the state of the market will be high, medium or low has been estimated as 0.1, 0.4 and 0.5 respectively. The expected profits in (GHC 1000) are shown in the table below:

	State of Market		
Decision	High (P = 0.1)	Medium (P = 0.4)	Low (P = 0.5)
Nationwide	120	76	51
Retailers	87	54	-33
Everybody	80	43	50

i. Using a decision tree, how does the Marketing firm make its decision given that it has limited knowledge of the likely demand for the product? 8 Marks

Q3. a. How does qualitative forecasting differ from quantitative forecasting? 2 Marks

b. Briefly distinguish between forecasting and prediction. 2 Marks

c. A Paper box company makes carryout beef boxes. The operations planning department knows that the beef sales of a major client depends on advertisement. Operation planning is interested in determine in advance the sales. The amount of beef boxes the client will order in cedi volume is known to be a fixed parent of sales. The director of operations and planning predicted thirteen years ago that sales in year 1 would be 42 cedis. The table below shows the sales obtained from various advertisements.

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Sales	15	20	18	19	23	41	32	28	12	23	15	19	20

i. Using exponential smoothing with $\alpha = 0.4$ develop forecast for the year 1993 6 Marks

ii. Construct a three-year moving average table and forecast for the year 1993. 5 Marks

iii. Using Mean Absolute Deviation, which of the following above weights provide the best forecast and why? 5 Marks

MAD = $\frac{\Sigma|Error|}{n}$

Actual −

Error = A − F

A = E + F

E = S + T − F

=

S + T = A

S = A − T

A = S + R + C + T

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TIME SERIES AND FORECASTING 1 MA 477

QUIZ 2 (20 Marks)

TIME: 60 MINUTES (Read the questions carefully)

1. Define the following terms

a. Test statistic b. Null hypothesis c. Alternate hypothesis **6 Marks**

2. In a symbolic form using H_0 and H_1, write the null and alternate hypothesis of the following statements

   a. It is published that the mean length of obtaining University degree is four years and you think that the true mean length of obtaining university degree is different from four years.

H_0: $\mu = 4$ yrs

H_1: $\mu \neq 4$ yrs **2 Marks**

   b. Cocoa processing factory produces chocolate in Ghana. Assume that the monthly production of chocolate by Cocoa processing factory in Ghana is normally distributed with a mean of 80tonnes. The manager wanted to investigate whether there has been change in the monthly production of chocolate from the factory.

H_0: $\mu = 80$ tonnes

H_1: $\mu > 80$ tonnes **2 Marks**

3. Demand for storage shed sales at Tarkwa General PBC increased steadily in 2003 as seen in the following table.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Shed Sales	10	12	13	16	19	23	26	30	28	18	16	14

Prepare a three–period weighted moving average forecast for January 2004 using the weights $W_1 = 3$ (last month), $W_2 = 2$ (last 2 months) and $W_3 = 1$ (last 3 months). **10 Marks**

Lewis Brew – Course Lecturer

Year	QUARTER		
	1	2	3
1999	100	125	127
2000	102	104	128
2001	130	107	110
2002	131	133	107

By means of moving averages method and using both additive and multiplicative models, determine the errors for each model.

Q3. a. Determine the dependent and independent variable in each of the following cases.

i. Demand for a product and the number of consumer

ii. A man's age and the cost of his life insurance

iii. Height of the son and height of the father

iv. Time spent working on a term paper and the grade received

b. Briefly identify and discuss the FOUR basic components of a time series.

c. The quarterly sales (in thousands of cedis) of HGM Company in recent years have been given as follows:

Year	QUARTER			
	1	2	3	4
2004	100	125	127	150
2005	102	104	128	160
2006	130	107	110	120

By means of moving averages method and using the multiplicative model:

i. Obtain the trend

ii. Determine the seasonal index of the sales

Examiner: ***L. Brew***

UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, DEC., 2011

COURSE NO: MA 477
COURSE NAME: Time Series and Forecasting I
CLASS: MA IV
TIME: 3 HOURS

Name: _____ Index Number: _____

ANSWER THREE QUESTIONS IN ALL. QUESTION ONE AND ANY OTHER TWO QUESTIONS.

Q1. (a). How does a qualitative forecasting differ from a quantitative forecasting?

(b). Briefly distinguish between forecasting and prediction .

(c). University of Mines and Technology organizes an orientation course for freshers every year. Each year is divided into four quarters. The enrolment by quarter from 1980 to 1991 is shown in the table below.

Year	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1980	120	800	900	110
1981	340	543	145	700
1982	245	102	321	420
1983	122	300	111	900
1984	108	600	401	300
1985	345	512	300	214
1986	221	390	120	453
1987	100	500	134	904
1988	200	101	301	691
1989	345	243	671	233
1990	112	612	300	465
1991	45	78	50	120

(i). Find the 4-quarter moving averages and the corresponding seasonal indices

(ii). Determine deseasonalized values

(iii). Identify the trend in the deseasonalized series and forecast for the period 49th of the first quarter.

You may consult the Student's t – Distribution table below for further assistance.

UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, DEC 2014

COURSE NO : MA 477
COURSE NAME: TIME SERIES AND FORECASTING I
CLASS : MA IV TIME: 3 HOURS

Name: AMPONSAH BOATENG ELVIS Index Number: 4230141111

ANSWER ALL QUESTIONS. ALL QUESTIONS CARRY EQUAL MARKS

Q1. a. State **four** applications of time series analysis 2 Marks

b. State and explain any two components of time series analysis. 2 Marks

c. You have just completed an analysis into the sales of fuel at Shell filling station over the past 4 years and the result is shown in the table below

Year	Quarter 1	Quarter 2	Quarter 3	Quarter 4
2000	6	9	12	8
2001	8	13.50	17	13
2002	12	20.25	30	19
2003	18	-	-	-

14.38

i. Using both the additive and multiplicative models determine the average seasonal differences and average seasonal factors for the sales of the fuel. 10 Marks

ii. Using the additive model, determine the remaining errors 6 Marks

Q2. a. You have a piece of good farmland where you think there may be diamonds. You have to decide whether to farm there or start mining. If you decide to farm you can either plant cocoa for export, or you can grow various produce for own use and sell locally. If you want to dig for diamonds you can either get a geologist in to test for diamonds, or just start digging. The probability of a good outcome with deciding on diamonds and getting a geologist, is 0.25. The value of this outcome is GHC1,000,000 and the value of a poor outcome is GHC40,000. The cost involved with a geologist is GHC200,000. The value of a positive outcome without a geologist is also GHC1,000,000 and the probability of a good outcome is 0.05. The value of a poor outcome is GHC20,000. With cocoa the cost is GHC300,000 and the probability of success is estimated at 0.6. The value of success here is GHC600,000. The value of no success here is GHC20,000. With various produce the cost is GHC40,000 and the probability of success is 0.9 with a final value of GHC600,000. The value of an unsuccessful outcome is GHC30,000. Use a decision tree to analyse the situation. Write up your final decision and justify the course of action you will take. 12 Marks

42.75

b. A Marketing firm has developed a new product and has to decide whether to market the product nationwide, to sell to retailers or to sell to everybody. The cost of distributing nationwide is very high but the

Year	QUARTER		
	1	2	3
1999	100	125	127
2000	102	104	128
2001	130	107	110
2002	131	133	107

By means of moving averages method and using both additive and multiplicative models, determine the errors for each model.

3. a. Determine the dependent and independent variable in each of the following cases.

i. Demand for a product and the number of consumer

ii. A man's age and the cost of his life insurance

iii. Height of the son and height of the father

iv. Time spent working on a term paper and the grade received

b. Briefly identify and discuss the FOUR basic components of a time series.

c. The quarterly sales (in thousands of cedis) of HGM Company in recent years have been given as follows:

Year	QUARTER			
	1	2	3	4
2004	100	125	127	150
2005	102	104	128	160
2006	130	107	110	120

By means of moving averages method and using the multiplicative model:

i. Obtain the trend

ii. Determine the seasonal index of the sales

Examiner: ***L. Brew***

Q4. (a). State the two models associated with time series and explain why one is preferred to the other?

(b). What would be the steps in the choice of a forecasting method?

(c). The Head of Department of Mathematics at the University of Mines and Technology has asked you to perform a time series analysis on the quarterly semester results of the students over the past three years. The table below displays the past three years results.

Year	Quarter	Results
2008	1	78
	2	56
	3	80
	4	90
2009	1	73
	2	65
	3	54
	4	57
2010	1	80
	2	81
	3	80
	4	60

(a). Considering three-period moving average, use the additive model to obtain the average seasonal difference for each period.

(c). Determine the Mean Square Error.

L. Brew /Prof. I. A. Adetunde

QUIZ (MA IV) 20-3-2023

MA 477 (40 Marks)

You have just completed an analysis into the sales (GHc 1000) of drinks over 3 the past years and the result is shown in the table below.

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
2020	10	14	15	16
2021	12	10	13	11
2022	8	14	16	10

Determine the average seasonal factors of the sales of the drinks (All values in 2 decimal places)

Year 1 2 3 4 Factors Average