

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICAL SCIENCES
DHAHRAN, SAUDI ARABIA

STAT 212: BUSINESS STATISTICS II

Semester 051

Final Exam

Sunday 29 January, 2006

7:30am – 10:30am

Please **circle** your instructor ' s name:

1. Prof. Hassen A .Muttlak

2. Dr. Walid al- Sabah

3. Mr. Marwan Al-Momani

Name:

ID#:

Section:

Question No	Full Marks	Marks Obtained
1	10	
2	10	
3	12	
4	13	
5	15	
6	25	
7	20	
8	15	
Total	120	

1. (6 + 4 = 10 Marks) A trucking firm suspects the claim that the average lifetime of certain tires is at least 29000 miles. To check this claim, the firm puts 31 of these tires on its trucks and gets a mean lifetime of 28463 miles with a standard deviation of 1600 miles. What can it conclude if level of significance is 0.01?

a. **Fill** in the blanks and **tick** the **right choice**:

The null hypothesis H_0 : _____ vs. the alternative hypothesis H_a : _____ we must reject / accept the null hypothesis since the observed z/t is given by _____ and at 1% level of significance, the rejection region is _____.

b. The firm suspected that the standard deviation is less than 1700 miles; test this hypothesis using 5% level of significance.

2. (5 + 5 = 10 Marks) A random sample of 400 students owning cars at KFUPM, it is found that 300 have automatic transmission.

a) The transport department claims that over 60% of car owners at KFUPM have automatic transmission. Does given data support the claim, if we allow only 1% chance of making a wrong decision? Use the p-value to test the hypothesis.

b) What are the assumptions needed to perform the test in par (a)

3. (9 +3 =12 Marks) To test the claim that the average sale can be increase by more than SR5000 weekly if the company flow the advise of the consultant firm, 56 weeks of sales obtained before applying the consultant firm advise yielded mean and standard deviation SR20500 and SR2400 respectively, and 59 weeks of sales obtained after applying the consultant firm advise yielded mean and standard deviation SR26300 and SR 3600 respectively.

a. Fill in the blanks to answer the question:

To test the null hypothesis H_0 : _____ against the alternative hypothesis

H_a : _____, too _____ values of the difference of sample means will give

evidence in favor of the _____ hypothesis. The value of the test statistic _____ is given

by _____ with *p-value* _____. This means that one must _____ the null

hypothesis at any significance level (α) not exceeding _____.

b. What are the assumptions that you need to answer part a.

4. (5 + 5 + 3 = 13 Marks) The following data set gives relationship between the square footage (in thousands of feet) of heated floor space and the sales price (in thousands of Riyals) of six houses randomly selected from those sold during a given week:

Footage (x)	1.5	2.1	1.7	1.5	1.9	2.4
Price (y)	89	109	101	91	102	113

Given that: the regression equation is $\hat{y} = 53.1995 + 25.748 x$. With $\sum(x_i - \bar{x})^2 = 0.635$, $\sum x_i y_i - \sum x_i \sum y_i / n = 16.35$ and $MSE = 7.963$.

- a) Does a linear relationship exist between the selling price and square feet of heated floor? Use 5% level of significance.
- b) Find 95% confidence interval for the expected price of a house with 2000 square feet of the heated floor space.
- c) What is the coefficient of determination if the correlation coefficient is 93%. Interpret both of them.

5. (15 Marks) The following table classifies an individual in 2 ways: gender and education.

Gender	no college	2-year college	4-year college	total
Male	7	13	30	50
Female	13	17	20	50
Total	20	30	50	100

Do you think that there is a relationship between gender and education? Explain, using 1% level of significance.

6. (4 + 4 + 5 + 3 + 3 + 6 = 25 Marks) The objective set forth in a recent staff meeting at D. L. Green & Associates is to develop a regression model for predicting company stock price (Y) using several potential independent variables: X1: Annual 3-S-year growth rate in sales as a percentage; X2: Total sales in millions of dollars for last four quarters; X3: Profits for last four quarters; X4: Stock price 1 year earlier; X5: Price earnings (P/E) ratio over last four quarters.

The Stock Market for which the company is traded are Over the Counter (OTC), New York Stock Exchange (NYSE) or NASDAQ.

X6 = 1 if the company stock is traded in NYSE

= 0 otherwise

X7 = 1 if the company stock is traded in NASDAQ

= 0 otherwise

Use the MINITAB output given below to answer the following questions:

- a. Predict the stock price if, X1= 260, X2=5000, X3=200, X4=30, X5=100 and the company stock is traded in the NYSE.
- b. How much of the total variation in the stock price can be explained by these independent variables? Would you conclude that the model is significant at the 5% level? Explain.
- c. Develop a 95% confidence interval for the regression coefficient of the variable X2 and interpret this confidence interval. Based on your finding can conclude that the (X2) total sales in millions of dollars for last four quarters playing a significant role? Explain.

- d. What can you say about the multicollinearity between the independent variables? Explain.
- e. What can you say about the assumptions of regression model, using the MINITAB graph for the residuals?
- f. Select the best model using the MINITAB output. Clearly justify your selection and report the values of adj-R^2 and S_E

The regression equation is

$$Y = 5.99 + 0.0032 X1 - 0.00243 X2 + 0.0498 X3 + 0.949 X4 + 0.0989 X5 - 1.85 X6 - 7.60 X7$$

Predictor	Coef	SE Coef	T	P	VIF
Constant	5.992	3.020	1.98	0.051	
X1	0.00315	0.02199	0.14	0.886	1.0
X2	-0.002433	0.001567	-1.55	0.124	1.7
X3	0.04977	0.02075	2.40	0.019	1.9
X4	0.9485	0.1346	7.04	0.000	1.6
X5	0.09889	0.02651	3.73	0.000	1.1
X6	-1.848	2.445	-0.76	0.452	1.1
X7	-7.603	3.619	-2.10	0.039	1.2

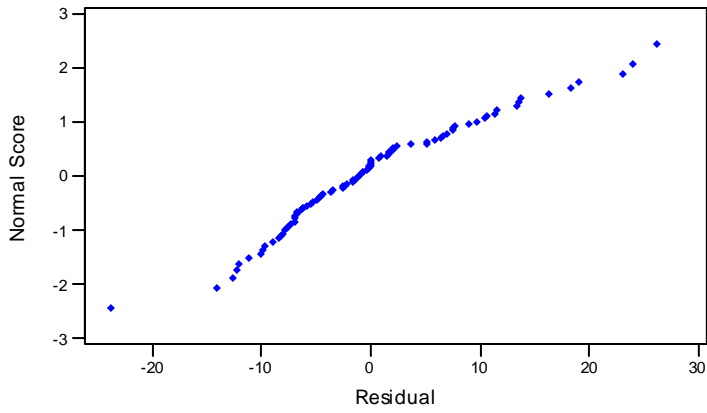
S = 9.532 R-Sq = 57.5% R-Sq(adj) = 53.7%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	7	9710.4	1387.2	15.27	0.000
Residual Error	79	7177.4	90.9		
Total	86	16887.8			

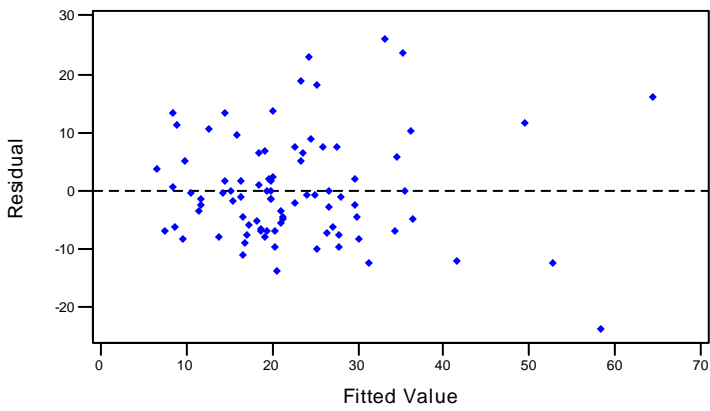
Normal Probability Plot of the Residuals

(response is Y)



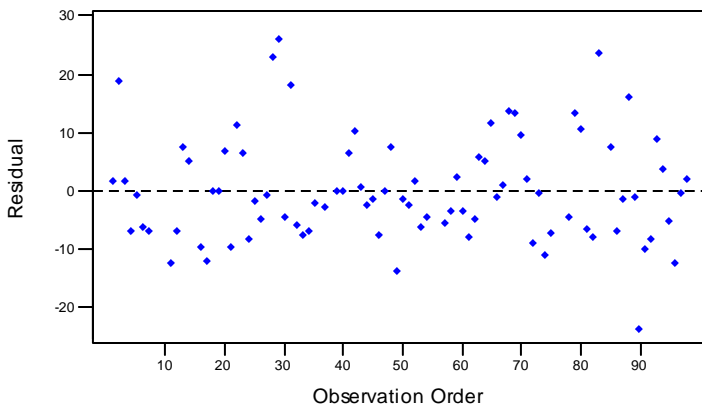
Residuals Versus the Fitted Values

(response is Y)



Residuals Versus the Order of the Data

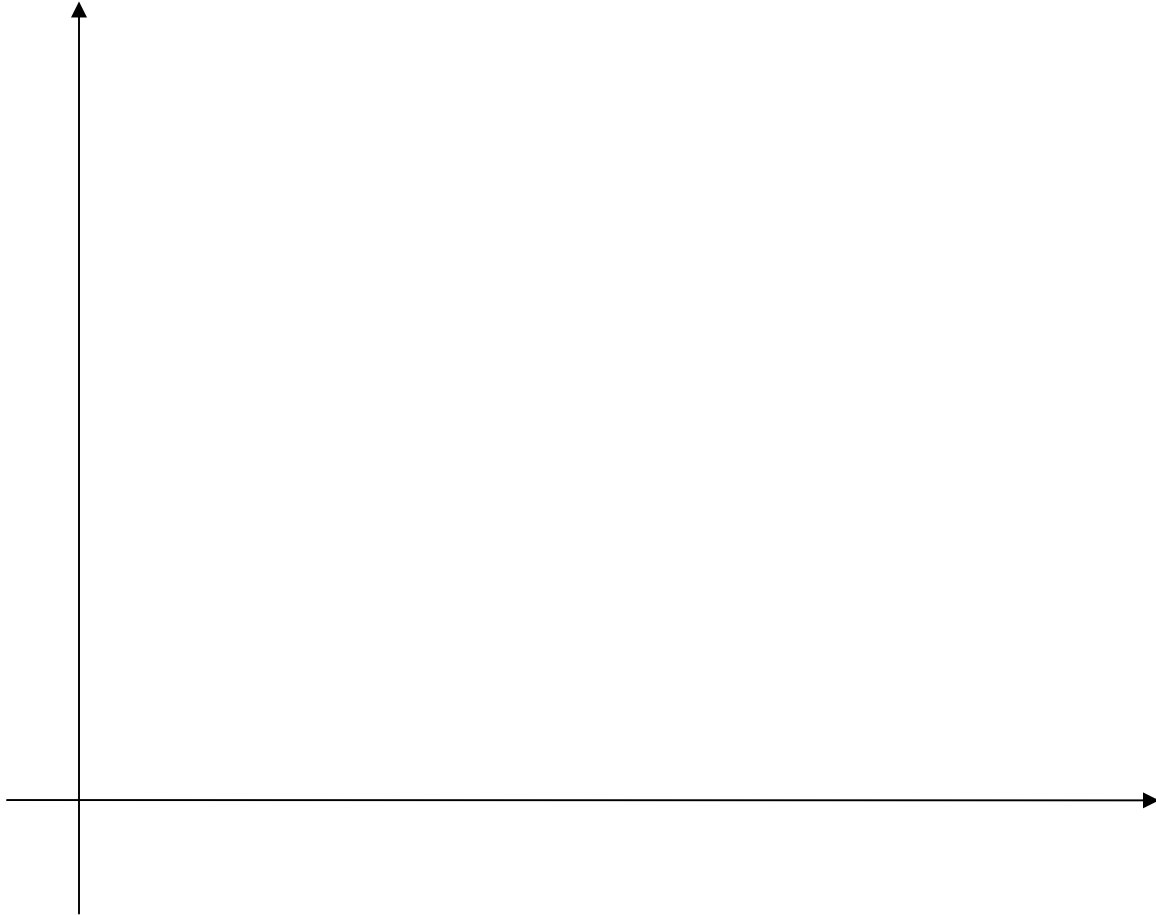
(response is Y)



7. (4 + 5 + 5 + 6 = 20 Marks) The Baker's Candy Company has been in business for three years. The quarterly sales data for the company are shown as follows:

Quarter	1	2	3	4	5	6	7	8	9	10	11	12
Sales	2800	3100	4000	2900	2900	3300	4100	3000	3000	3600	4400	3100

a. Plot this data set and based on your graph identify the time series components exist.



b. We fit the linear and quadrate tend model for the data, see Figures 1 and 2. Report MAPE, MAD and MSD for both models and select the best model. Based on the results you get do you think that these two models are suitable? Explain.

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- c. Predict the quarterly sale for the **next second quarter** of the **next year** for both linear and quadrate models.
- d. Comment on the developed quarterly seasonal indexes for each quarter. Note that the seasonal length is 4. Compare the accuracy of the seasonal decomposition model with previous linear and quadrate models. Which model we will suggest to be used to predict the sales for the coming seasons. Also use MAPE, MAD and MSD for the comparison

Figure 1
Trend Analysis for Sales

Linear Trend Model
 $Y_t = 3036.36 + 48.2517 * t$

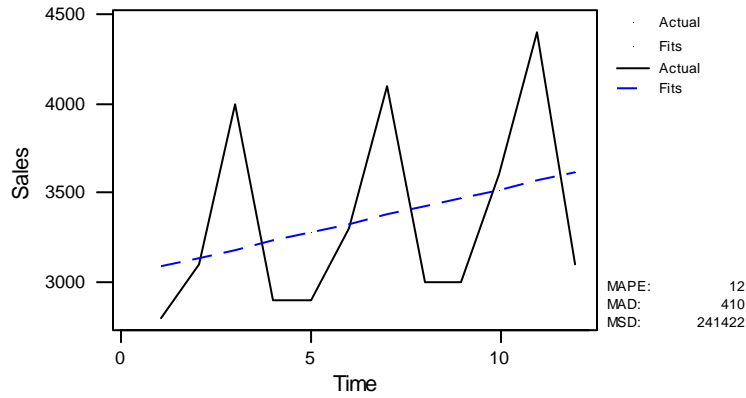


Figure 2
Trend Analysis for Sales

Quadratic Trend Model
 $Y_t = 2954.55 + 83.3167 * t - 2.69730 * t^2$

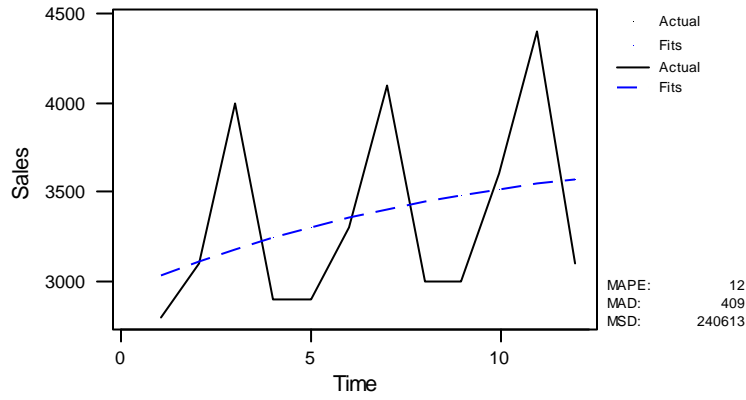
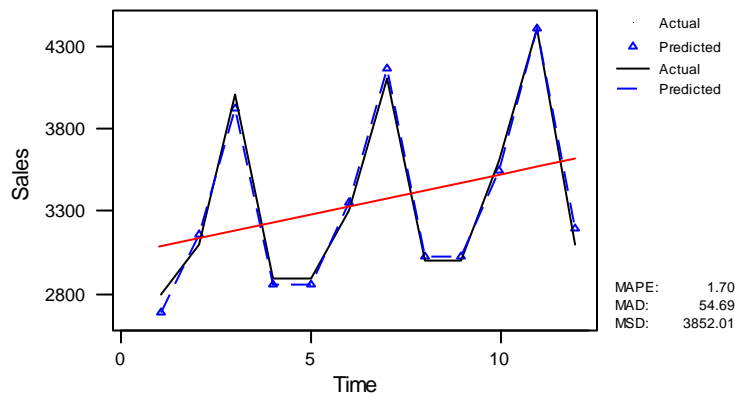


Figure 3

Decomposition Fit for Sales



Time Series Decomposition

Seasonal Indices

Period	Index
1	0.872336
2	1.00911
3	1.23302
4	0.885534

8. (4 + 5 + 6 = 15 Marks) The following values represent advertising rates paid a company that advertises either on a radio or on TV.

Years	2000	2001	2003
Radio	SR 10000	12000	15000
% on Radio	40	35	30
TV	SR 30000	40000	55000

- a. Determine the simple index for each type of advertisement using 2000 as the base year.
- b. Find the unweighted aggregate index for the two type of advertisement using 2000 as the base year.
- c. Construct a Laspeyres index number using 2000 as the base year.