

MATU9D2 : PRACTICAL STATISTICS

Spring 2017

PRACTICAL 8

- Minitab
- Handout 2 of 2

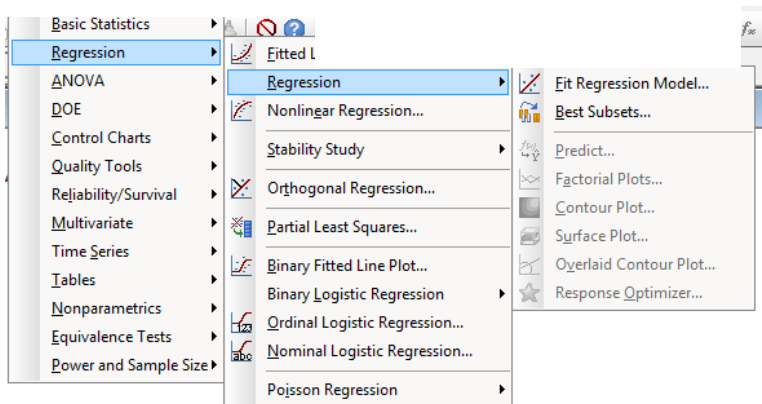
In this Practical you will learn to

1. Test Correlation
2. Perform simple linear regression (& validate assumptions)
3. Perform multiple linear regression

THERE ARE TWO SECTIONS IN THESE NOTES:

1. **INSTRUCTIONS ON HOW TO PERFORM TASKS USING MINITAB.**
2. **A LIST OF EXERCISES TO DO USING THE ABOVE COMMANDS**

Using Minitab to examine relationships between Quantitative variables –
 Having plotted the data and used correlation to examine the relationships we will use the following menus in the rest of this workshop.



PART 1 : SIMPLE LINEAR REGRESSION

In many cases we will not only be interested in the association between variables but we will want to define the relationship. This will allow us to use the model to predict future values.

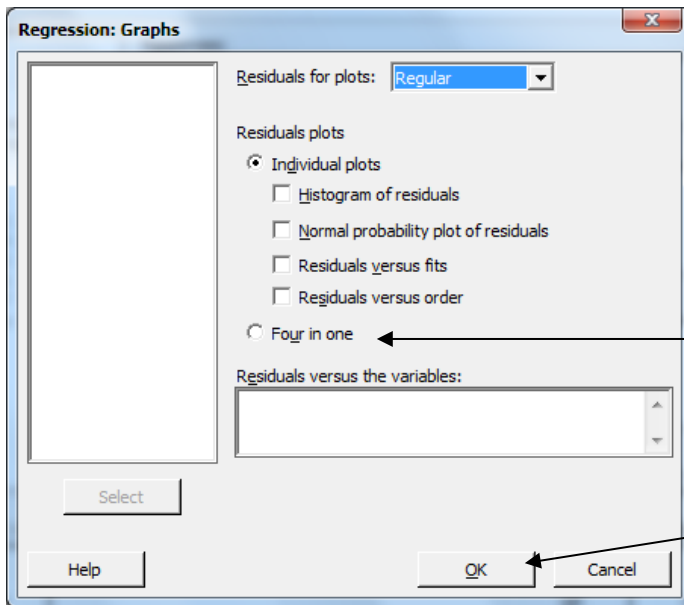
You should always validate the assumptions of normality and constant variance using the Residual Plots.

Simple Linear Regression

Select the Stat menu then Regression then Fit Regression Model (as above)
 Then the following dialogue box will appear

 A screenshot of the 'Regression' dialog box in Minitab. The dialog box has a list of variables on the left (C1 Age, C2 Years, C3 Weight, C4 Height, C5 Chin, C6 Forearm, C7 Calf, C8 Pulse, C9 Systol, C10 Diastol). The 'Responses' field contains 'Systol'. The 'Continuous predictors' field contains 'Age-Pulse'. The 'Categorical predictors' field is empty. At the bottom, there are buttons for 'Model...', 'Options...', 'Coding...', 'Stepwise...', 'Select', 'Help', 'Graphs...', 'Results...', 'Storage...', 'OK', and 'Cancel'. Four numbered annotations point to specific parts of the dialog box:

1. Select the Y (points to the 'Responses' field containing 'Systol')
2. Select the X variable Or X variables (if more than one) (points to the 'Continuous predictors' field containing 'Age-Pulse')
3. Always draw Residual plots (see first dialogue box on next page) (points to the 'Graphs...' button)
4. Click OK (points to the 'OK' button)

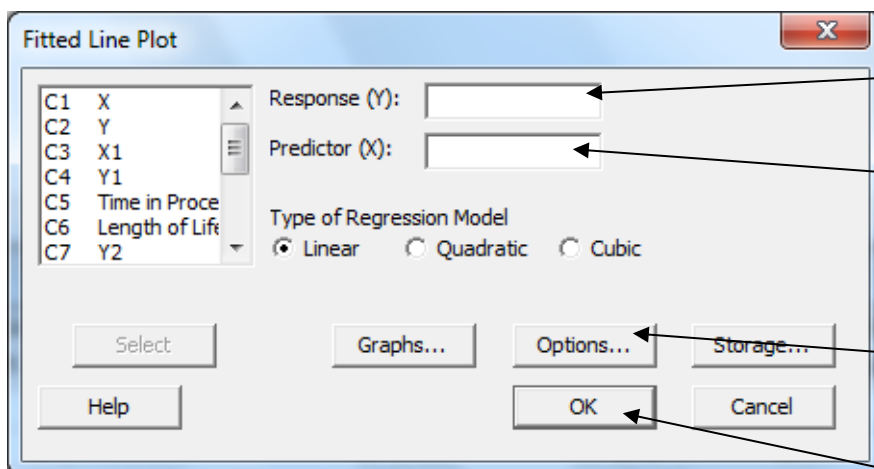


3.1 Select Four in One

3.2 Click OK

Graph including Fitted Line

Select the Stat menu then Regression then Fitted Line Plot – the following dialogue box will appear:



1. Select Y variable

2. Select X variable

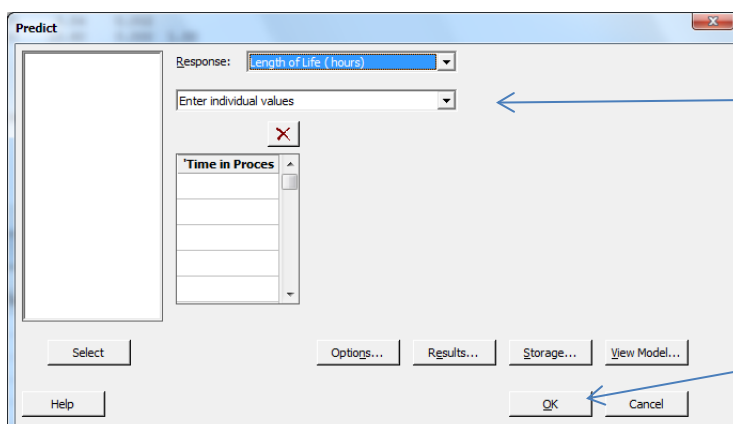
3. Select if require CI's or PI's

4. Click OK

Prediction using Regression Model

Firstly, 'do the regression' then

Select the Stat menu then Regression then Predict then enter the individual values or column of values for which you want a prediction.



1. Choose either individual values or column of

2. Click OK

EXERCISES

1. Take the data given below and construct a scatter diagram.

x	10	12	14	16	18	20	22	24	26	28
y	25	24	22	20	19	17	13	12	11	10

- Is the correlation equal to zero? (See Practical 7, Minitab automatically gives the p value for this two tailed test when you ask for the correlation).
 - Find the regression line of y on x for the data and estimate the error variance
 - Add the fitted line (regression line) to your graph.
 - Is the slope equal to zero?
 - Are the assumptions valid?
2. A farmer wishes to predict the number of tons per acre of crop which will result from a given number of applications of fertiliser. Data has been collected and is shown below:

Fertiliser applications	1	2	4	5	6	8	10
Tons per acre	2	3	4	7	12	10	7

- Plot the data
- Find a suitable regression relationship to help the farmer in making the prediction.
- Predict the number of tons per acre will result from 7 fertiliser applications.
- Calculate a 95% Confidence Interval for the mean yield given 7 fertiliser applications
- Calculate a 95% Prediction Interval for the yield given an individual farmer applies fertiliser 7 times.
- Are the assumptions valid?

3.

Y	10	12	15	17	19	22	24	27	29	30
X ₂	1	1	2	2	3	4	4	5	5	6
X ₃	10	9	8	7	6	5	4	3	2	1

- Use the data given above to find the regression relationship between Y and X₂.
- Use the data given above to find the regression relationship between Y and X₃.
- Use the data given above to find the regression relationship between Y and X₂ and X₃. (Put both X₂ and X₃ in the 'Predictors' box)
- From your answer to part (c) test each of the coefficients to find if they are non-zero.
- Discuss your results.