**Chapter 2**

We assume that the normal error regression model is applicable. This model is:

where:

and , are parameters

are known constants

are independent

**Sampling Distribution of**

**Confidence Interval for**

C.I for

**Tests Concerning**

|  |  |  |  |
| --- | --- | --- | --- |
| 1. Hypothesis | | | |
|  |  |  | |
| 2. Test statistic | | | |
|  | | | |
| 3. Decision: Reject if | | | |
|  |  | |  |
| P-value: Reject if | | | |
| p-value= |  | |  |

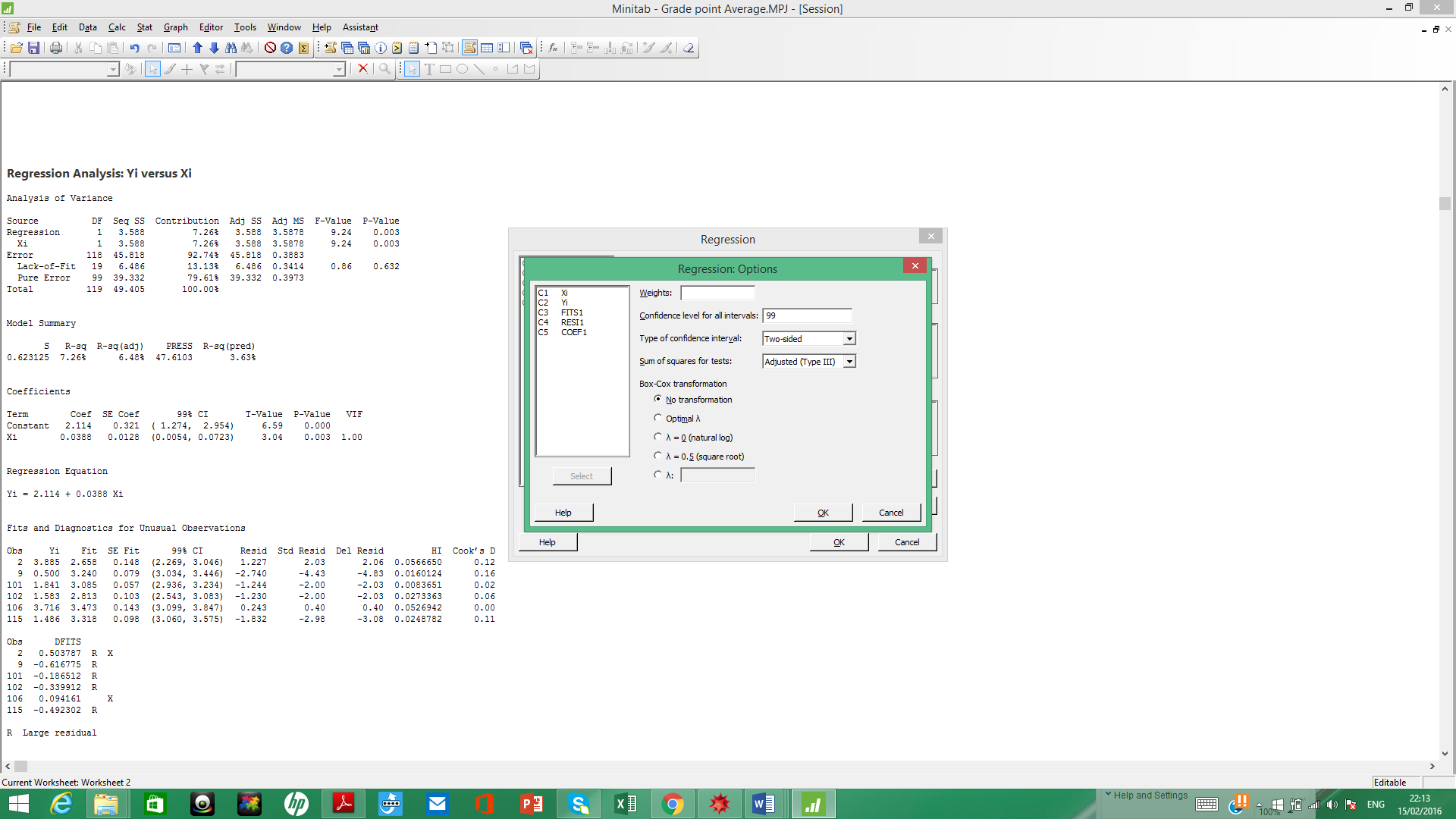
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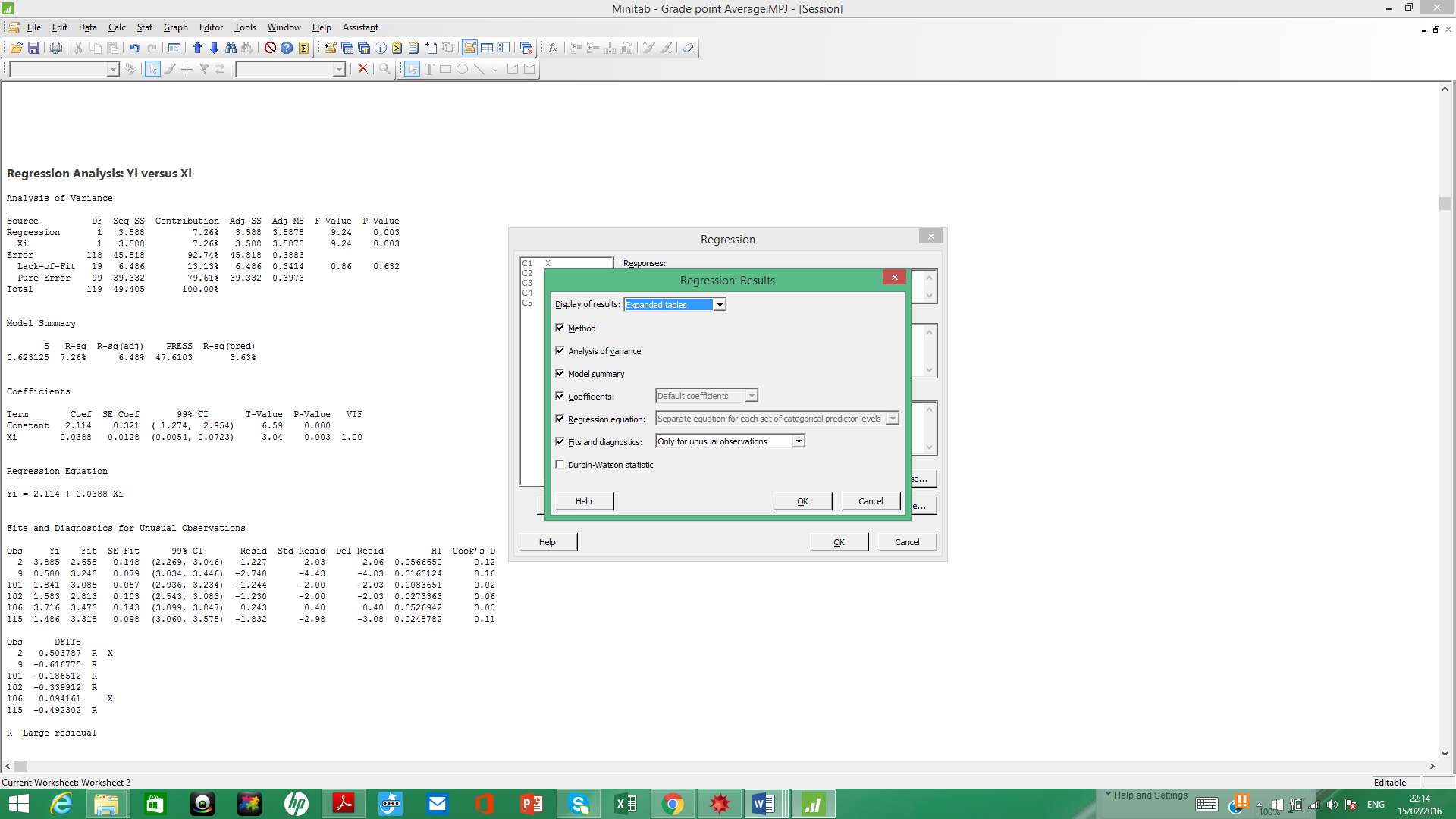
**Q2.4**. Refer to **Grade point average** Problem 1.19.

**a. Obtain a 99 percent confidence interval for . Interpret your confidence interval. Does it include zero? Why might the director of admissions be interested in whether the confidence interval includes zero?**

Solution:

By using Minitab:





**Regression Analysis: Yi versus Xi**

Analysis of Variance

Source DF Seq SS Contribution Adj SS Adj MS F-Value P-Value

Regression 1 3.588 7.26% 3.588 3.5878 9.24 0.003

Xi 1 3.588 7.26% 3.588 3.5878 9.24 0.003

Error n-2=118 45.818 92.74% SSE=45.818 MSE=0.3883

Lack-of-Fit 19 6.486 13.13% 6.486 0.3414 0.86 0.632

Pure Error 99 39.332 79.61% 39.332 0.3973

Total 119 49.405 100.00%

Model Summary

S R-sq R-sq(adj) PRESS R-sq(pred)

0.623125 7.26% 6.48% 47.6103 3.63%

Coefficients

Term Coef SE Coef 99% CI T-Value P-Value VIF

Constant 2.114 0.321 ( 1.274, 2.954) 6.59 0.000

Xi 0.0388 0.0128 **(0.0054, 0.0723)** 3.04 **0.003** 1.00

Regression Equation

Yi = 2.114 + 0.0388 Xi

99% C.I for :

**Interpret your confidence interval. Does it include zero? No**

**Why might the director of admissions be interested in whether the confidence interval includes zero?**

If the C.I of include zero, then can tack zero and

**b. Test, using the test statistic t\*, whether or not a linear association exists between student's ACT score (X) and GPA at the end of the freshman year (Y). Use a level of significance of 0.01 State the alternatives, decision rule, and conclusion.**

1. Hypothesis

2. Test statistic

3. Decision: Reject if , 2.61814

Then reject

**c. What is the P-value of your test in part (b)? How does it support the conclusion reached in part (b)?**

p-value= 0.003<0.01, then we reject .

Q2.5. Refer to **Copier maintenance Problem** 1.20.

**a. Estimate the change in the mean service time when the number of copiers serviced increases by one. Use a 90 percent confidence interval. Interpret your confidence interval.**

90% C.I for :

**b. Conduct a t test to determine whether or not there is a linear association between X and Y here; control the a risk at 0.01. State the alternatives, decision rule, and conclusion. What is the P-value of your test?**

1. Hypothesis

2. Test statistic

3. Decision: Reject if ,

Then reject

p-value=

, then we reject .

**c. Are your results in parts (a) and (b) consistent? Explain.**

Yes, the C.I of does not include zero, and we reject .

**d. The manufacturer has suggested that the mean required time should not increase by more than 14 minutes for each additional copier that is serviced on a service call. Conduct a test to decide whether this standard is being satisfied by Tri-City. Control the risk of a Type I error at 0.05. State the alternatives, decision rule, and conclusion. What is the P-value of the test?**

1. Hypothesis

2. Test statistic

3. Decision: Reject if ,

Then reject

p-value=

, then we reject .

**Q2.6. Refer to Airfreight breakage Problem 1.21.**

,

,

**a. Estimate with a 95 percent confidence interval. Interpret your interval estimate.**

95% C.I for :

**b. Conduct a t test to decide whether or not there is a linear association between number of times a carton is transferred (X) and number of broken ampules (Y). Use a level of significance of 0.05. State the alternatives, decision rule, and conclusion. What is the P-value of the test?**

1. Hypothesis

2. Test statistic

3. Decision: Reject if ,

Then reject

p-value=

, then we reject .

Analysis of Variance

Source DF Seq SS Contribution Adj SS Adj MS F-Value P-Value

Regression 1 160.000 90.09% 160.000 160.000 72.73 0.000

Xi 1 160.000 90.09% 160.000 160.000 72.73 0.000

Error 8 17.600 9.91% 17.600 2.200

Lack-of-Fit 2 0.933 0.53% 0.933 0.467 0.17 0.849

Pure Error 6 16.667 9.38% 16.667 2.778

Total 9 177.600 100.00%

Model Summary

S R-sq R-sq(adj) PRESS R-sq(pred)

1.48324 90.09% 88.85% 25.8529 85.44%

Coefficients

Term Coef SE Coef 95% CI T-Value P-Value VIF

Constant 10.200 0.663 (8.670, 11.730) 15.38 0.000

Xi 4.000 0.469 (2.918, 5.082) 8.53 0.000 1.00

Regression Equation

Yi = 10.200 + 4.000 Xi

**H.W:**

**Q2.7 Refer to Plastic hardness Problem 1.22.**

**a. Estimate the change in the mean hardness when the elapsed time increases by one hour. Use a 99 percent confidence interval. Interpret your interval estimate.**

**b. The plastic manufacturer has stated that the mean hardness should increase by 2 Brinell units per hour. Conduct a two-sided test to decide whether this standard is being satisfied; use . State the alternatives, decision rule, and conclusion. What is the P-value of the test?**