MA4605 Laboratory A (Week 1) Commentary

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Part 1

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| **Interpreting p-values**   * For the sake of simplicity, the threshold value is set at 0.01 for this module. * if the p-value is less than the threshold, we reject the null hypothesis. * If the p-value is greater than the threshold, we fail to reject the null hypothesis. |

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| **Interpreting Confidence Intervals**   * The default confidence level used by ***R*** is 95% * If the null value is outside the range of the confidence limits, we reject the null hypothesis. * If the null value is within the range of the confidence limits, we fail to reject the null hypothesis. * Basing your decision on confidence intervals may result in decisions being made on the data that are different from decisions based on the previous p-value approach. |

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| **Null and Alternative Hypotheses**   * The alternative hypothesis will be stated directly in the output of many procedures. * The Null Hypothesis is the direct opposite statement of the alternative |

H0: The Median of both data sets are equal

H1: The Median of both data sets are different

The Kolmogorov Smirnov Test is implemented using the R command ks.test().

H0: The data sets have the same distribution

H1: The data sets have the diffferent distribution

Test for Equality of Variances

This is implemented in R using the command var.test()

The statistic that is specifically used in the variance ratio (σ2x / σ2y). If the variances are equal, this ratio is equal to 1.

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Lab C Regression Coefficients

The regression coefficients are determinable from the output of the summary() command.

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| summary(fitA) |

Confidence intervals for the regression coefficients are computed using the confint() command.

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| confint(fitA) |

The Akaike Information Criterion is a metric used for Model Selection. The candidate linear model with the lowest AIC value is considered the best of the candidate models.

MA4605 Laboratory C (Week 3)

Lab C Part I : Simple Linear Regression

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| Dist=c(1.4,3.8,7.5,10.2,11.7,15.0)  Merc=c(2.4,2.5,1.3,1.3,0.7,1.2)  Fit1=lm(Merc~Dist) |

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| > summary(Fit1)  Call:  lm(formula = Merc ~ Dist)  Residuals:  1 2 3 4 5 6  -0.002432 0.389680 -0.359980 -0.031354 -0.448784 0.452870  Coefficients:  Estimate Std. Error t value Pr(>|t|)  (Intercept) 2.5728 0.3468 7.419 0.00176 \*\*  Dist -0.1217 0.0366 -3.325 0.02923 \*  ---  Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1  Residual standard error: 0.415 on 4 degrees of freedom  Multiple R-squared: 0.7343, Adjusted R-squared: 0.6679  F-statistic: 11.06 on 1 and 4 DF, p-value: 0.02923 |

Lab C Part 2: Correlation

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| Gluc = c(0,2,4,6,8,10)  Absrb = c(0.002,0.15,0.294,0.434,0.57,0.704)  cor.test(Absrb,Gluc) |

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| > cor.test(Absrb,Gluc)  Pearson's product-moment correlation  data: Absrb and Gluc  t = 105.1606, df = 4, p-value = 4.903e-08  alternative hypothesis: true correlation is not equal to 0  95 percent confidence interval:  0.9982632 0.9999812  sample estimates:  cor  0.9998192 |

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| Conc= c(30,40,50,60,70,0,10,20)  Absrb= c(0.413,0.468,0.528,0.574,0.635,0.257,0.314,0.364)  Fit3=lm(Absrb~Conc) |

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| > summary(Fit3)  Call:  lm(formula = Absrb ~ Conc)  Residuals:  Min 1Q Median 3Q Max  -0.0043810 -0.0031131 0.0000952 0.0036071 0.0036667  Coefficients:  Estimate Std. Error t value Pr(>|t|)  (Intercept) 0.256917 0.002384 107.75 4.31e-11 \*\*\*  Conc 0.005349 0.000057 93.84 9.87e-11 \*\*\*  ---  Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1  Residual standard error: 0.003694 on 6 degrees of freedom  Multiple R-squared: 0.9993, Adjusted R-squared: 0.9992  F-statistic: 8806 on 1 and 6 DF, p-value: 9.866e-11 |

Part 4 :

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| Gold = c(30,40,50,60,70,0,10,20)  Absrb= c(0.413,0.468,0.528,0.574,0.635,0.257,0.314,0.364)  Fit4 = lm(Absrb ~ Gold) |

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| > summary(Fit4)  Call:  lm(formula = Absrb ~ Gold)  Residuals:  Min 1Q Median 3Q Max  -0.0043810 -0.0031131 0.0000952 0.0036071 0.0036667  Coefficients:  Estimate Std. Error t value Pr(>|t|)  (Intercept) 0.256917 0.002384 107.75 4.31e-11 \*\*\*  Gold 0.005349 0.000057 93.84 9.87e-11 \*\*\*  ---  Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1  Residual standard error: 0.003694 on 6 degrees of freedom  Multiple R-squared: 0.9993, Adjusted R-squared: 0.9992  F-statistic: 8806 on 1 and 6 DF, p-value: 9.866e-11 |

Lab C Part 5: Comparing Analytical Methods

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| ISE =c(108,12,152,3,106,11,128,12,160,128)  Grav=c(105,16,113,0,108,11,141,11,182,118)  Fit5a = lm(ISE ~ Grav)  Fit5b = lm(Grav ~ ISE) |

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| summary(Fit5a)  Call:  lm(formula = ISE ~ Grav)  Residuals:  Min 1Q Median 3Q Max  -19.738 -6.937 -2.778 1.435 38.705  Coefficients:  Estimate Std. Error t value Pr(>|t|)  (Intercept) 4.48367 8.69393 0.516 0.62  Grav 0.96294 0.08571 11.235 3.54e-06 \*\*\*  ---  Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1  Residual standard error: 16.73 on 8 degrees of freedom  Multiple R-squared: 0.9404, Adjusted R-squared: 0.9329  F-statistic: 126.2 on 1 and 8 DF, p-value: 3.537e-06 |

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| summary(Fit5b)  > summary(Fit5b)  Call:  lm(formula = Grav ~ ISE)  Residuals:  Min 1Q Median 3Q Max  -35.861 -2.797 -0.527 4.012 25.326  Coefficients:  Estimate Std. Error t value Pr(>|t|)  (Intercept) 0.41952 8.89847 0.047 0.964  ISE 0.97659 0.08693 11.235 3.54e-06 \*\*\*  ---  Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1  Residual standard error: 16.84 on 8 degrees of freedom  Multiple R-squared: 0.9404, Adjusted R-squared: 0.9329  F-statistic: 126.2 on 1 and 8 DF, p-value: 3.537e-06 |

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