**MA4605 Laboratory D**

**Simple Linear Regression Models**

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| > summary(FitA)  Call:  lm(formula = Taste ~ Acetic)  Residuals:  Min 1Q Median 3Q Max  -29.642 -7.443 2.082 6.597 26.581  Coefficients:  Estimate Std. Error t value Pr(>|t|)  (Intercept) -61.499 24.846 -2.475 0.01964 \*  Acetic 15.648 4.496 3.481 0.00166 \*\*  ---  Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1  Residual standard error: 13.82 on 28 degrees of freedom  Multiple R-squared: 0.302, Adjusted R-squared: 0.2771  F-statistic: 12.11 on 1 and 28 DF, p-value: 0.001658  >  > AIC(FitA)  [1] 246.6389 |

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| > summary(FitB)  Call:  lm(formula = Taste ~ H2S)  Residuals:  Min 1Q Median 3Q Max  -15.426 -7.611 -3.491 6.420 25.687  Coefficients:  Estimate Std. Error t value Pr(>|t|)  (Intercept) -9.7868 5.9579 -1.643 0.112  H2S 5.7761 0.9458 6.107 1.37e-06 \*\*\*  ---  Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1  Residual standard error: 10.83 on 28 degrees of freedom  Multiple R-squared: 0.5712, Adjusted R-squared: 0.5558  F-statistic: 37.29 on 1 and 28 DF, p-value: 1.374e-06  > AIC(FitB)  [1] 232.0245 |

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| > summary(FitC)  Call:  lm(formula = Taste ~ Lactic)  Residuals:  Min 1Q Median 3Q Max  -19.9439 -8.6839 -0.1095 8.9998 27.4245  Coefficients:  Estimate Std. Error t value Pr(>|t|)  (Intercept) -29.859 10.582 -2.822 0.00869 \*\*  Lactic 37.720 7.186 5.249 1.41e-05 \*\*\*  ---  Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1  Residual standard error: 11.75 on 28 degrees of freedom  Multiple R-squared: 0.4959, Adjusted R-squared: 0.4779  F-statistic: 27.55 on 1 and 28 DF, p-value: 1.405e-05  > AIC(FitC)  [1] 236.8724 |

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| > cor(Taste,Acetic)  [1] 0.5495393  >  > cor(Taste,H2S)  [1] 0.7557523  >  > cor(Taste,Lactic)  [1] 0.7042362 |

Multiple Linear Regression Models

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| > summary(Fit1)  Call:  lm(formula = Taste ~ Acetic + H2S)  Residuals:  Min 1Q Median 3Q Max  -16.113 -6.893 -1.673 6.592 23.715  Coefficients:  Estimate Std. Error t value Pr(>|t|)  (Intercept) -26.940 21.194 -1.271 0.214536  Acetic 3.801 4.505 0.844 0.406245  H2S 5.146 1.209 4.255 0.000225 \*\*\*  ---  Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1  Residual standard error: 10.89 on 27 degrees of freedom  Multiple R-squared: 0.5822, Adjusted R-squared: 0.5512  F-statistic: 18.81 on 2 and 27 DF, p-value: 7.645e-06  > AIC(Fit1)  [1] 233.2438 |

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| > summary(Fit2)  Call:  lm(formula = Taste ~ Acetic + Lactic)  Residuals:  Min 1Q Median 3Q Max  -19.1608 -6.3675 0.7277 9.7126 24.2801  Coefficients:  Estimate Std. Error t value Pr(>|t|)  (Intercept) -51.366 21.174 -2.426 0.02223 \*  Acetic 5.571 4.761 1.170 0.25217  Lactic 31.392 8.956 3.505 0.00161 \*\*  ---  Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1  Residual standard error: 11.67 on 27 degrees of freedom  Multiple R-squared: 0.5203, Adjusted R-squared: 0.4847  F-statistic: 14.64 on 2 and 27 DF, p-value: 4.936e-05  > AIC(Fit2)  [1] 237.3884 |

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| > summary(Fit3)  Call:  lm(formula = Taste ~ H2S + Lactic)  Residuals:  Min 1Q Median 3Q Max  -17.343 -6.530 -1.164 4.844 25.618  Coefficients:  Estimate Std. Error t value Pr(>|t|)  (Intercept) -27.592 8.982 -3.072 0.00481 \*\*  H2S 3.946 1.136 3.475 0.00174 \*\*  Lactic 19.887 7.959 2.499 0.01885 \*  ---  Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1  Residual standard error: 9.942 on 27 degrees of freedom  Multiple R-squared: 0.6517, Adjusted R-squared: 0.6259  F-statistic: 25.26 on 2 and 27 DF, p-value: 6.551e-07  >  > AIC(Fit3)  [1] 227.7838 |

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| > summary(FitAll)  Call:  lm(formula = Taste ~ Acetic + H2S + Lactic)  Residuals:  Min 1Q Median 3Q Max  -17.390 -6.612 -1.009 4.908 25.449  Coefficients:  Estimate Std. Error t value Pr(>|t|)  (Intercept) -28.8768 19.7354 -1.463 0.15540  Acetic 0.3277 4.4598 0.073 0.94198  H2S 3.9118 1.2484 3.133 0.00425 \*\*  Lactic 19.6705 8.6291 2.280 0.03108 \*  ---  Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1  Residual standard error: 10.13 on 26 degrees of freedom  Multiple R-squared: 0.6518, Adjusted R-squared: 0.6116  F-statistic: 16.22 on 3 and 26 DF, p-value: 3.81e-06  > AIC(FitAll)  [1] 229.7775 |

The most useful model is the fitted model with the highest value for the specified model selection metric (lowest in the case of AIC)

* Multiple R squared
* Adjusted R squared
* AIC

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| ***Candidate Model*** | ***Multiple R squared*** | ***Adjusted R squared*** | ***AIC*** |
| FitA |  |  |  |
| FitB |  |  |  |
| FitC |  |  |  |
| Fit1 |  |  |  |
| Fit2 |  |  |  |
| Fit3 |  |  |  |
| FitAll |  |  |  |