

## MA4605 Laboratory D

### Simple Linear Regression Models

```
> 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
```

```
> 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
```

```

> 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

```

```

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

```

## Multiple Linear Regression Models

```
> 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
```

```
> 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
```

```
> 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
```

```
> 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

<i><b>Candidate Model</b></i>	<i><b>Multiple R squared</b></i>	<i><b>Adjusted R squared</b></i>	<i><b>AIC</b></i>
FitA			
FitB			
FitC			
Fit1			
Fit2			
Fit3			
FitAll			