Week 6 Monday Worksheet

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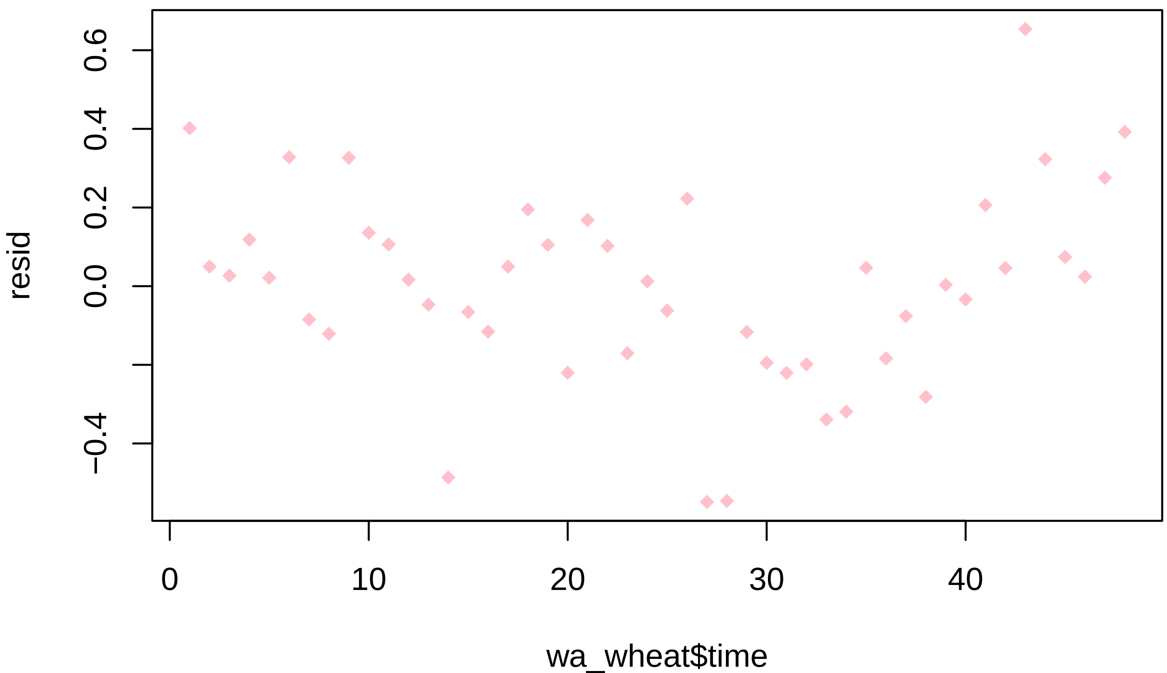
```
library(POE5Rdata)
```

```
##
## Attaching package: 'POE5Rdata'
## The following object is masked from 'package:datasets':
##
##     euro
```

```
data(wa_wheat)
names(wa_wheat)
```

```
## [1] "northampton" "chapman"     "mullewa"     "greenough"   "time"
```

```
model <- lm(chapman ~ time, data = wa_wheat)
resid <- model$residuals
plot(resid ~ wa_wheat$time, col = "pink", pch = 18)
```




```
library(tseries)
```

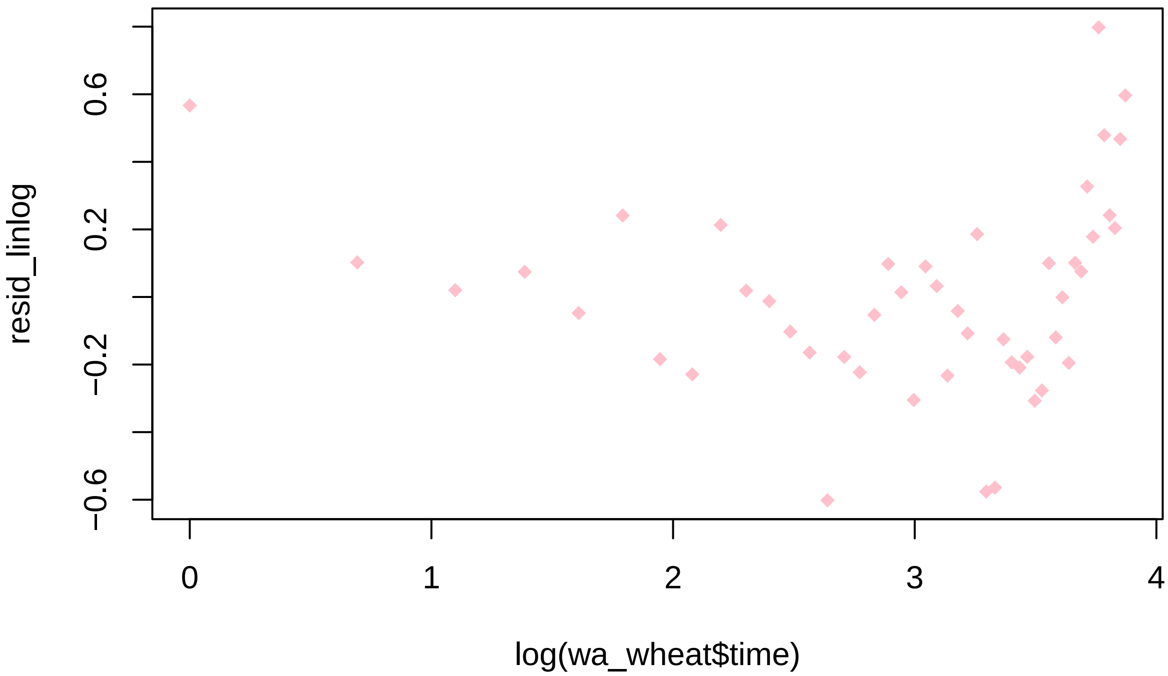
```
## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo
```

```
jarque.bera.test(resid)
```

```
##
##  Jarque Bera Test
##
## data:  resid
## X-squared = 0.27878, df = 2, p-value = 0.8699
```

We fail to reject the null hypothesis. The residuals are distributed normally “enough”.

```
model_linlog <- lm(chapman ~ log(time), data = wa_wheat)
resid_linlog <- model_linlog$residuals
plot(resid_linlog ~ log(wa_wheat$time), pch = 18, col = "pink")
```




```
jarque.bera.test(resid_linlog)
```

```
##
##  Jarque Bera Test
##
## data:  resid_linlog
## X-squared = 1.9248, df = 2, p-value = 0.382
```

Part C

```
summary(model)
```

```
##
## Call:
## lm(formula = chapman ~ time, data = wa_wheat)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.54867 -0.13341  0.01884  0.12265  0.65391
##
```

```
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 0.677595   0.072527   9.343 3.38e-12 ***
## time        0.016114   0.002577   6.253 1.21e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2473 on 46 degrees of freedom
## Multiple R-squared:  0.4595, Adjusted R-squared:  0.4477
## F-statistic:  39.1 on 1 and 46 DF,  p-value: 1.207e-07
```

```
summary(model_linlog)
```

```
##
## Call:
## lm(formula = chapman ~ log(time), data = wa_wheat)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.60158 -0.18636 -0.00671  0.12126  0.79795
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.52870    0.14723   3.591 0.000798 ***
## log(time)    0.18551    0.04813   3.855 0.000358 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2925 on 46 degrees of freedom
## Multiple R-squared:  0.2441, Adjusted R-squared:  0.2277
## F-statistic: 14.86 on 1 and 46 DF,  p-value: 0.0003581
```

When comparing R2 the linear model explains more of the variance in chapman than the linear log model. When we look at the jbtest, the linlog model has a lower pvalue. this means the errors are distributed less normally than the errors in the linear model. talk about plots. plot the fitted equations against the data. You guys make the claims, here is the evidence.

Question 4

```
m1_b0 <- 3.446
m1_b1 <- -0.001459
m1_yhat <- m1_b0 + m1_b1 * (10 - 35)^2
m1_yhat
```

```
## [1] 2.534125
```

```
m2_b0 <- 1.4276
m2_b1 <- 0.5343
m2_yhat <- m2_b0 + m2_b1 * log(10)
m2_yhat
```

```
## [1] 2.657871
```

```
m1_marg <- 2 * m1_b1 * (10 - 35)
m1_marg
```

```
## [1] 0.07295
```

```r
m2_marg <- m2_b1 / 10
m2_marg
```

```
## [1] 0.05343
```

part c

$$\lambda_1 = 2 \cdot \beta_1 \cdot (EXPER - 35) SE(\lambda_1) = \sqrt{Var(\lambda_1)} = \sqrt{Var(2 \cdot \beta_1 \cdot (EXPER - 35))}$$