A2-Q4

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1.

```
library(astsa)
temp <- tempr-mean(tempr)
temp2<-temp^2
trend<-time(cmort)
part14<-stats::lag(part,-4)
data <- ts.intersect(cmort,trend,temp,temp2,part,part14)
fit1<-lm(cmort~trend+temp+temp2+part,data = data)
fit2<-lm(cmort~trend+temp+temp2+part+part14,data = data)
summary(fit2)
```

```
##
## Call:
## lm(formula = cmort ~ trend + temp + temp2 + part + part14, data = data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -18.228  -4.314  -0.614   3.713  27.800
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  2.808e+03  1.989e+02  14.123  < 2e-16 ***
## trend       -1.385e+00  1.006e-01 -13.765  < 2e-16 ***
## temp        -4.058e-01  3.528e-02 -11.503  < 2e-16 ***
## temp2        2.155e-02  2.803e-03   7.688 8.02e-14 ***
## part         2.029e-01  2.266e-02   8.954  < 2e-16 ***
## part14       1.030e-01  2.485e-02   4.147 3.96e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.287 on 498 degrees of freedom
## Multiple R-squared:  0.608,  Adjusted R-squared:  0.6041
## F-statistic: 154.5 on 5 and 498 DF,  p-value: < 2.2e-16
```

```
AIC(fit1)/nrow(data)-log(2*pi)
```

```
## [1] 4.722898
```

```
BIC(fit1)/nrow(data)-log(2*pi)
```

```
## [1] 4.773167
```

```
AIC(fit2)/nrow(data)-log(2*pi)
```

```
## [1] 4.692916
```

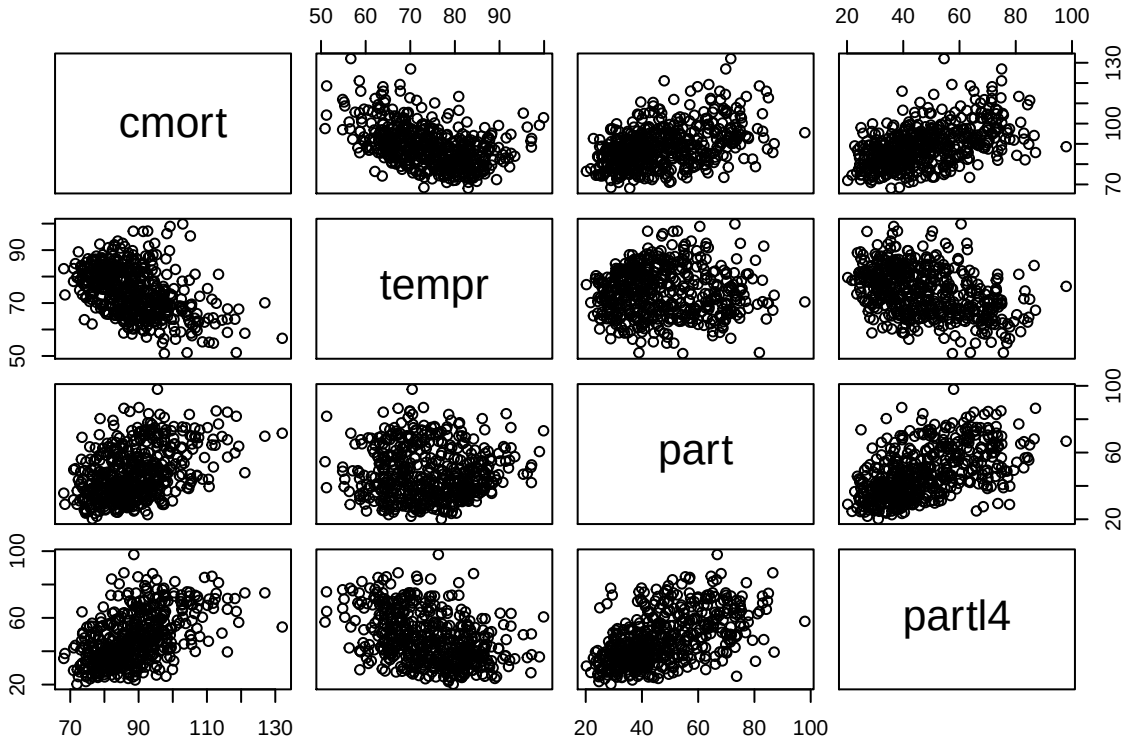
```
BIC(fit2)/nrow(data)-log(2*pi)
```

```
## [1] 4.751563
```

According to the result, the p-value of P_{t-4} is less than 0.05. By comparing the AIC and BIC of two models, add P_{t-4} to the regression have smaller AIC and BIC, so P_{t-4} is significant to the regression.

2.

```
data2 <- ts.intersect(cmort,tempr,part,partl4)
pairs(data2)
```




```
cor(data2)
```

```
##             cmort      tempr       part     partl4
## cmort   1.0000000 -0.4369648  0.4422896  0.5209993
## tempr  -0.4369648  1.0000000 -0.0148241 -0.3990848
## part    0.4422896 -0.0148241  1.0000000  0.5340505
## partl4  0.5209993 -0.3990848  0.5340505  1.0000000
```

According to the result, the correlation of M_t and P_{t-4} is higher than the correlations of M_t and P_t, , which means the relationship of M_t and P_{t-4} is more appropriate.