A2-Q1

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2023/2/16

1.

```
y <- c(9.8,11.0,13.2,15.1,16.0)
t <- 1:5
model1 <-lm(y~t)
summary(model1)
```

```
##
## Call:
## lm(formula = y ~ t)
##
## Residuals:
##     1     2     3     4     5
##  0.08 -0.37  0.18  0.43 -0.32
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   8.0700     0.4120   19.59 0.000291 ***
## t             1.6500     0.1242   13.28 0.000922 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3929 on 3 degrees of freedom
## Multiple R-squared:  0.9833, Adjusted R-squared:  0.9777
## F-statistic: 176.4 on 1 and 3 DF,  p-value: 0.0009224
```

```
model2 <-lm(log(y)~t)
summary(model2)
```

```
##
## Call:
## lm(formula = log(y) ~ t)
##
## Residuals:
##         1         2         3         4         5
## -0.007731 -0.021939  0.030661  0.035418 -0.036409
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  2.16039    0.03859   55.98 1.26e-05 ***
## t            0.12972    0.01164   11.15  0.00155 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.03679 on 3 degrees of freedom
## Multiple R-squared:  0.9764, Adjusted R-squared:  0.9686
## F-statistic: 124.3 on 1 and 3 DF,  p-value: 0.001546
```

According to compare the R squared and adjusted R squared of two model, model 1 ($y = \beta_0 + \beta_1^t$) has higher value of R squared and adjusted R squared than that of model 2($\log(y) = \log \beta_0 + \beta_1 t$). Therefore, model 1 fit the data best

2.

```
model3 <- lm(y~t+I(t^2))
summary(model3)
```

```
##
## Call:
## lm(formula = y ~ t + I(t^2))
##
## Residuals:
##        1        2        3        4        5
##  0.20857 -0.43429  0.05143  0.36571 -0.19143
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  7.62000    0.96531   7.894   0.0157 *
## t            2.03571    0.73563   2.767   0.1095
## I(t^2)      -0.06429    0.12029  -0.534   0.6465
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4501 on 2 degrees of freedom
## Multiple R-squared:  0.9854, Adjusted R-squared:  0.9707
## F-statistic: 67.34 on 2 and 2 DF,  p-value: 0.01463
```

```
anova(model1,model3)
```

```
## Analysis of Variance Table
##
## Model 1: y ~ t
## Model 2: y ~ t + I(t^2)
##   Res.Df     RSS Df Sum of Sq      F Pr(>F)
## 1      3 0.46300
## 2      2 0.40514  1  0.057857 0.2856 0.6465
```

According to compare the R squared and adjusted R squared of model 1 and model 3, the values are similar (model 3 slightly higher than model 1). According to ANOVA, the p-value is larger than 0.05, so model 1 is better.