

## stk310 PRACTICAL ASSIGNMENT A3

Consider again the information regarding the 26 music videos from Practical Assignments A1 and A2 given in the file videos.csv on clickUP. Let  $Y$  be the file size in MB and let  $X$  be the song length in seconds. Use `proc reg` in SAS (and also `proc iml` where necessary) as well as the `lm` function in R to answer the following questions. Do not round off values taken from the SAS or R output, but give them exactly as they appear.

### Question 1

Consider the two-variable regression model  $Y_i = \beta_1 + \beta_2 X_i + u_i$  with  $u_i \sim NID(0, \sigma^2)$ . From Practical Assignment A2 it follows that the fitted ordinary least squares (OLS) regression model obtained for the 26 music videos is  $\hat{Y}_i = -9.19848 + 0.11314X_i$ .

- Calculate 90% confidence intervals for  $\beta_1$  and  $\beta_2$ .
- Use a  $p$ -value to test whether the mean file size for a song is 0 MB when the song's length is zero seconds.
- Using the relevant confidence interval from Question 1(a), test at a 10% significance level whether the mean file size increases with 0.07 MB for an increase of one second in song length.
- Calculate a test statistic value and determine critical value(s) to test at a 10% significance level whether the mean file size increases with 0.07 MB for an increase of one second in song length.
- Calculate and use a  $p$ -value to test whether the mean file size increases with 0.07 MB for an increase of one second in song length.
- Calculate a 95% confidence interval for  $\sigma^2$ .
- Set up an analysis of variance (ANOVA) table and use the  $p$ -value of an  $F$  test to test whether the slope parameter is statistically significant.
- Calculate a 95% confidence interval for the mean file size of a music video of 184 seconds.
- Calculate a 95% confidence interval for the file size of the video Apie by Chris Chameleon.
- Calculate a 95% confidence interval for the file size of the video Moto Mono Loco by María Elena Walsh.



### Question 2

Fit an OLS regression model through the origin.

### Question 3

Consider the exponential regression model  $Y_i = \beta_1 X_i^{\beta_2} e^{u_i}$ . Applying a double-log transformation gives the linear regression model,  $Y_i^* = \alpha + \beta_2 X_i^* + u_i$ , with  $Y_i^* = \ln Y_i$ ,  $\alpha = \ln \beta_1$  and  $X_i^* = \ln X_i$ , and where  $u_i$  is the stochastic error term. Use OLS regression to calculate the percentage increase in the mean file size for a 1% increase in the song length.