STA 3180 Statistical Modelling: Regression

1. Given a linear regression model, $y = \beta 0 + \beta 1x1 + \beta 2x2 + \varepsilon$, where x1 and x2 are independent variables, calculate the coefficient of determination (R2) for the model.

Solution: R2 = 1 - (SSres/SStot)

2. Given a linear regression model, $y = \beta 0 + \beta 1x1 + \beta 2x2 + \varepsilon$, where x1 and x2 are independent variables, calculate the adjusted R2 for the model.

Solution: Adjusted R2 = 1 - (1-R2)(n-1)/(n-k-1), where n is the number of observations and k is the number of independent variables.

3. Given a linear regression model, $y = \beta 0 + \beta 1x1 + \beta 2x2 + \varepsilon$, where x1 and x2 are independent variables, calculate the standard error of the estimate.

Solution: Standard error of the estimate = sqrt(SSres/(n-k-1))

4. Given a linear regression model, $y = \beta 0 + \beta 1x1 + \beta 2x2 + \varepsilon$, where x1 and x2 are independent variables, calculate the t-statistic for the coefficient of x1.

Solution: t-statistic = $\beta 1/SE(\beta 1)$, where $SE(\beta 1)$ is the standard error of the coefficient of x1.

5. Given a linear regression model, $y = \beta 0 + \beta 1x1 + \beta 2x2 + \varepsilon$, where x1 and x2 are independent variables, calculate the F-statistic for the model.

Solution: F-statistic = (SSreg/k)/(SSres/(n-k-1)), where SSreg is the sum of squares due to regression and SSres is the sum of squares due to residuals.

6. Given a linear regression model, $y = \beta 0 + \beta 1x1 + \beta 2x2 + \varepsilon$, where x1 and x2 are independent variables, calculate the p-value for the coefficient of x1.

Solution: p-value = 2*(1-tcdf(abs(t-statistic),n-k-1)), where tcdf is the cumulative distribution function of the t-distribution.

7. Given a linear regression model, $y = \beta 0 + \beta 1x1 + \beta 2x2 + \varepsilon$, where x1 and x2 are independent variables, calculate the confidence interval for the coefficient of x1.

Solution: Confidence interval = $[\beta 1 - t*SE(\beta 1), \beta 1 + t*SE(\beta 1)]$, where t is the critical value from the t-distribution with n-k-1 degrees of freedom and a confidence level of 95%.

8. Given a linear regression model, $y = \beta 0 + \beta 1x1 + \beta 2x2 + \varepsilon$, where x1 and x2 are independent variables, calculate the coefficient of correlation between x1 and y.

Solution: Coefficient of correlation = sqrt(R2).