

BOOTSTRAPPING REGRESSION MODELS

Carina Nieves, Kean University; Reyes Matiel Ortiz Albino, University of Puerto Rico at Mayaguez; Dennis Rosario Román, University of Puerto Rico at Mayaguez

Linear regression is a technique used to investigate a possible relationship between a response variable and one or more independent variables. A typical regression function hypothesizes a linear relationship as in: $y_i = \beta_0 + \beta_1 x_i + \epsilon_i$, $i = 1, \dots, n$, where β_0 and β_1 are unknown constants to be estimated and ϵ_i represents a random deviation from the expected value $(\beta_0 + \beta_1 x_i)$ of y_i . In this paper we consider the case where the variance of y_i is an increasing function of x : $Var(y_i) = x_i^2 \sigma^2$. Weighted least squares is used to find estimates for the coefficients, β_0 and β_1 . Conventional and bootstrapping methods are used to estimate standard errors and confidence intervals for the regression coefficients. We considered three bootstrap methods. Pairs bootstrapping involves choosing random samples in pairs from the original data set. Stratified bootstrapping involves resampling the data in groups defined by the magnitude of x . Residuals bootstrapping involves calculating the residuals, $\hat{\epsilon}_i = y_i - (\hat{\beta}_0 + \hat{\beta}_1 x_i)$, resampling these, and computing a new y_i^* . Simulation experiments were used in order to evaluate the effectiveness of the different methods for obtaining standard errors and confidence intervals.