4.13 Development of a Minitab Macro Program as a Remedy to Overcome Heteroscedasticity in Linear Regressions

Ms. A M C H Attanayake, Prof. (Mrs.) T K Hewapathirana
Department of Statistics & Computer Science, University of Kelaniya

ABSTRACT

Homoscedasticity in the disturbance terms that appear in a regression function is one of the key assumptions of ordinary least squares analysis. As the developed regression model relies heavily on the model assumptions, violation of the assumptions severely affects the importance of a regression model.

Transforming the response variable is one solution to overcome the problem of heteroscedasticity. Today most statistical packages use graphical methods to detect heteroscedasticity. Although a graphical method could be considered as a good starting point, no measure of reliability can be attached to inferences derived from a graphical method.

In this study we have developed a Minitab macro to detect heteroscedasticity present in the disturbance terms by the use of graphical as well as statistical methods including the popular White's General Heteroscedasticity test and how to solve the heteroscedasticity problem by applying the alternative form of the Box-Cox power transformation.

The alternative form of the Box-Cox transformation is given by:

$$V = \begin{cases} \left(Y^{\lambda} - 1\right) / \lambda \dot{Y}^{\lambda-1} & \lambda \neq 0 \\ \dot{Y} \ln(Y) & \lambda = 0 \end{cases}$$

Where $\ln \dot{Y} = n^{-1} \sum \ln Y_i$

Considering the stability of V for minor changes in the power parameter λ, the transformed variable, V is chosen for the analysis and useful values of λ were found to be in the range [-2, 2].

The program was developed using a Local macro structure and tested on Minitab version 14 and requires Microsoft Windows 2000 or XP operating system to implement this program. The developed macro was tested for many data sets and was found that the program is capable in handling the heteroscedasticity present in the error structure.