APPLICATION OF ROTATIONAL RESIDUALS FOR NORMAL DIAGNOSTICS IN REGRESSION ANALYSIS : A SIMULATION STUDY

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To test the normality of observations it is a common practice to use graphical methods such as normal probability plot, and hypotheses tests such as Anderson–Darling, Shapiro–Wilk, Kolmogorov–Simirnov etc. All these methods are supported by independently and identically distributed observations.

To diagnose the normal errors in regression analysis, ordinary residuals are utilized. Tests designed for independently and identically distributed observations are valid asymptotically when applied using ordinary residuals under homoscedastic and uncorrelated disturbances. However these tests are applied, despite the failure of assumptions to validate their use. Jensen and Ramirez (1999) showed that such misuse may be critical, and considered linearly recovered errors (rotational residuals) as a remedial measure. Theil (1965) also introduced linear unbiased scaled disturbance estimators to correct for the heteroscedastic correlated, and singular features of the ordinary residuals.

In this simulation study, MINITAB – MACRO was developed to find linearly recovered errors, having the requisite properties. A multiple regression model having multi-collinearity among regressors was created to obtain correlated residuals. The normal probability plot was drawn, and Anderson–Darling test, Shapiro–Wilk test, and Kolmogorov–Simirnov test were applied for ordinary residuals. The tests confirmed the normality of the residuals, although the residuals are correlated. Therefore the applicability of the tests is questionable, and hence the recovered errors were simulated. The recovered errors were uncorrelated, and hence the diagnostic tests can be applied. This study reveals that the users of conventional diagnostics would be misdirected into reliance on normal theory if they use correlated ordinary residuals.

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