

APM 630 Regression Analysis

Project #6 – Weighted Least Squares

Data: WLS.xls

There is considerable variation among individuals in their perception of what specific acts constitute a crime. To get an idea of factors (age and family income) that influence this perception, a sample of 45 college students were given the following list of acts and asked how many of these they perceived as constituting a crime, including: aggravated assault, armed robbery, arson, atheism, auto-theft, burglary, civil disobedience, communism, drug addiction, embezzlement, forcible rape, gambling, homosexuality, land fraud, Nazism, payola, price fixing, prostitution, sexual abuse of child, sex discrimination, shoplifting, striking, strip mining, treason, vandalism, etc. The survey variables are:

- $Y = \text{CRIMES}$ – number of items considered as a crime
- $X_1 = \text{AGE}$ – student's age (year)
- $X_2 = \text{INCOME}$ – student's family income (\$1000)

Assignment:

1. Apply the OLS model to fit the data: $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + e$
2. Conduct a residual analysis for the above model (SPEC test), and obtain the OLS residuals
3. Compute the variance (VAR) of the OLS residuals by the following groups and use $1/\text{VAR}$ as the weight for each group:

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IF X2<40 THEN G=1;  
ELSE IF X2>=40 AND X2<60 THEN G=2;  
ELSE IF X2 >=60 THEN G=3;
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4. Apply WLS to the model, and conduct a residual analysis for the WLS model (with SPEC test).
5. Compare the OLS model and WLS model in terms of coefficient estimates, standard errors of the coefficient, and residual plots.
6. Use the ACOV options in **PROC REG** to estimate the asymptotic covariance matrix of the estimates under the hypothesis of heteroscedasticity. Compare the HCCM standard errors of the coefficients against the OLS standard errors of the coefficients.