

BOX-COX HOMOSCEDASTICITY PLOT

PURPOSE

Generates a Box-Cox homoscedasticity plot.

DESCRIPTION

Many statistical procedures (e.g., regression) make assumptions of constant variance relative to the value of an independent variable. For example, in regression it is assumed that the variance of the residuals does not depend on the value of the independent variable. This assumption is generally referred to as homogeneous variances or as homoscedasticity.

A Box-Cox homoscedasticity plot is a graphical technique for determining the Box-Cox transformation that yields the most constant variance of one variable relative to the values of a second variable.

The Box-Cox family is essentially the power-transformation family (adjusted to include log transformations). The form of the family is:

$$T(y) = \frac{y^\lambda - 1}{\lambda} \quad (\text{EQ 2-1})$$

There are various methods for measuring constant variance. The particular method DATAPLOT uses is to divide the first variable into groups with the same value for the second value. For a given value of lambda, the standard deviation is computed for each group. The statistic used is the ratio of the minimum standard deviation to the maximum standard deviation (this ratio will always be between 0 and 1). The plot then consists of this statistic on the vertical axis versus the lambda parameter on the horizontal axis. The lambda corresponding to the highest ratio is the appropriate transformation to use to provide the most constant variance.

This command only applies if there is replication in the second variable.

SYNTAX

BOX-COX HOMOSCEDASTICITY PLOT <y1> <y2> <SUBSET/EXCEPT/FOR qualification>

where <y1> is the dependent variable;

<y2> is the independent variable;

and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES

BOX-COX HOMOSCEDASTICITY PLOT Y1 Y2

NOTE

The number of observations in the 2 response variables must be equal.

DEFAULT

None

SYNONYMS

BOX-COX HOMOGENITY PLOT

BOX COX HOMOGENITY PLOT

BOX COX HOMOSCEDASTICITY PLOT

RELATED COMMANDS

LINES	=	Sets the types for plot lines.
CHARACTERS	=	Sets the types for plot characters.
BOX COX LINEARITY PLOT	=	Generates a Box-Cox linearity plot.
BOX COX NORMALITY PLOT	=	Generates a Box-Cox normality plot.
PLOT	=	Generates a data or function plot.

APPLICATIONS

Exploratory Data Analysis

IMPLEMENTATION DATE

94/2 (although earlier versions supported this command, the method used did not give informative results)

PROGRAM

```

SKIP 25
READ NELSON.DAT Y X1 X2
.
MULTIPLY 2 2; MULTIPLY CORNER COORDINATES 0 0 100 100
FIT Y X2
LINE SOLID BLANK; CHARACTER BLANK X
XTIC OFFSET 5
TITLE LINEAR FIT OF RAW DATA
PLOT PRED Y VS X2
.
TITLE BOX-COX HOMOSCEDASTICITY PLOT
X1LABEL LAMBDA; Y1LABEL HOMOSCEDASTICITY MEASURE
XTIC OFFSET 0
BOX-COX HOMOSCEDASTICITY PLOT Y X2
.
LET YTEMP = MAXIMUM YPLOT
RETAIN XPLOT SUBSET YPLOT = YTEMP
LET LAMBDA = XPLOT(1)
LET Y2 = (Y**LAMBDA - 1)/LAMBDA
FIT Y2 X2
TITLE LINEAR FIT OF TRANSFORMED DATA
X1LABEL; Y1LABEL; XTIC OFFSET 5
PLOT PRED Y2 VS X2
END OF MULTIPLY
    
```

