Nonlinear Regression

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Nonlinear regression is a regression in which the dependent or criterion variables are modeled as a non-linear function of model parameters and one or more independent variables. There are several common models, such as Asymptotic Regression/Growth Model, which is given by:

\[ b_1 + b_2 \times \exp(b_3 \times x) \]

Logistic Population Growth Model, which is given by:

\[ b_1 / (1 + \exp(b_2 + b_3 \times x)) \]

Asymptotic Regression/Decay Model, which is given by:

\[ b_1 - (b_2 \times (b_3 \times x)) \]

The reason that these models are called nonlinear regression is because the relationships between the dependent and independent parameters are not linear.

This test in SPSS is done by selecting "analyze" from the menu. Then, select "regression" from analyze. After this, select "linear from regression," and then click on "perform nonlinear regression."

There are certain terminologies in nonlinear regression which will help in understanding nonlinear regression in a much better manner. These terminologies are as follows:

**Model Expression** is the model used, the first task is to create a model. The selection of the model in is based on theory and past experience in the field. For example, in demographics, for the study of population growth, logistic nonlinear regression growth model is useful.

**Parameters** are those which are estimated. For example, in logistic nonlinear regression growth model, the parameters are b1, b2 and b3.

**Segmented model** is required for those models which have multiple different equations of different ranges, equations are then specified as a term in multiple conditional logic statements.

**Loss function** is a function which is required to be minimized. This is done by nonlinear regression.
Assumptions

The data level in must be quantitative, the categorical variables must be coded as binary variables.

The value of the coefficients can be correctly interpreted, only if the correct model has been fitted, therefore it is important to identify useful models.

A good choice of starting points can lead to a desirable output, a poor choice will make the output misleading.

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