

Functional form

A functional form refers to the algebraic form of a relationship between a dependent variable and regressors or explanatory variables.

The simplest functional form is the linear functional form, where the relationship between the dependent variable and an independent variable is graphically represented by a straight line.

Other useful functional forms in regression analysis include:

1. Semi-log. Either the dependent variable or the independent variables are transformed using the natural logarithm transformation.
2. Double-log. Variables are transformed using the natural logarithm transformation.
3. Reciprocal. Independent variables (one or more) are represented as the reciprocal (that is, for variable x , the transformation is $1/x$).

These functional forms allow the analyst to represent a wide range of shapes.

Interpretation

The interpretation of coefficients is different in alternative functional forms. In the following formulations Y represents the dependent variable, x the independent variable, a is the y -intercept, b is the slope coefficient, $\ln(y)$ and $\ln(x)$ represent the natural logarithm of y and x , respectively, and e is an error term.

(1) Linear: $y = a + b x + e$

In this functional form b represents the change in y (in units of y) that will occur as x changes one unit.

(2) Semi-log: $\ln(y) = a + b x + e$

In this functional form b is interpreted as follows. A one unit change in x will cause a $b(100)\%$ change in y , e.g., if the estimated coefficient is 0.05 that means that a one unit increase in x will generate a 5% increase in y .

(3) Double-log: $\ln(y) = a + b \ln(x) + e$

In this functional form b is the elasticity coefficient. A one one percent change in x will cause a $b\%$ change in y , e.g., if the estimated coefficient is -2 that

means that a 1% increase in x will generate a -2% decrease in y .