

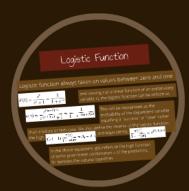
Logistic Regression

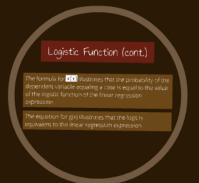
In statistics, logistic regression or logit regression is a type of regression analysis used for predicting the outcome of a categorical dependent variable based on one or more predictor variables. It is used in estimating empirical values of the parameters in a qualitative response model.

Logistic regression measures the relationship between a categorical dependent variable and one or more independent variables, which are usually, by using probability scores as the predicted values of the dependent variable.









Logistic Regression

Logistic regression can be binomial or multinomial. Binomial or binary logistic regression deals with situations in which the observed outcome for a dependent variable can have only two possible types.

In binary logistic regression, the outcome is usually coded as "0" or "1", as this leads to the most straightforward interpretation.

The logit of success is then fit to the predictors using linear regression analysis. The predicted value of the logit is converted back into predicted odds via the inverse of the natural logarithm, namely the exponential function.

Assumption

- Lack of Multicollinearity

Logistic Function

Logistic function always takes on values between zero and one

$$F(t) = \frac{e^t}{e^t + 1} = \frac{1}{1 + e^{-t}}$$

and viewing t as a linear function of an explanatory variable x), the logistic function can be written as

$$\pi(x) = \frac{e^{(\beta_0 + \beta_1 x)}}{e^{(\beta_0 + \beta_1 x)} + 1} = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x)}}$$

This will be interpreted as the probability of the dependent variable equalling a "success" or "case" rather

than a failure or non-case. We also define the inverse of the logistic function, the logit $g(x) = \ln \frac{\pi(x)}{1 - \pi(x)} = \beta_0 + \beta_1 x$, and equivalently $\frac{\pi(x)}{1 - \pi(x)} = e^{(\beta_0 + \beta_1 x)}$

In the above equations, g(x) refers to the logit function of some given linear combination x of the predictors, 'In' denotes the natural logarithm

Logistic Function (cont.)

The formula for $\pi(x)$ illustrates that the probability of the dependent variable equaling a case is equal to the value of the logistic function of the linear regression expression.

The equation for g(x) illustrates that the logit is equivalent to the linear regression expression.

Logistic Regression Model (cont.)

