is said 'intercept' of the regression model and β is called the slope i.e.;

$$\beta = \frac{\partial Y_t}{\partial X_t}$$ [Effect upon Y_t in response to the change in X_t while other variables are remaining unchanged]

BASIC ASSUMPTIONS OF THE TWO-VARIABLE LRM

OR

BASIC ASSUMPTIONS OF THE LEAST SQUARE ESTIMATES

Before estimating the parameters involved in the ~~model~~ LRM, we are to take into account some assumptions — some of them refer to the distribution of random variable, some refer to the relationship between random variables U_t and explanatory variables and some refer to the relationship between explanatory variables themselves. We will group these assumptions into two broad categories—

(i) Stochastic assumptions

(ii) Other assumptions.

The stochastic assumptions are related to the characteristics of the distribution of random variable.

ASSUMPTIONS :

Following are the main assumptions of the least square estimates of the LRM.

① U_t is a real random variable.

This means that the value which U_t may assume in any one period depends on chance.

② The mean value of U_t in any particular period is zero i.e., $E(U_t) = 0 \ \forall t$.

This means that for each value of X_t, U_t may assume various values — some may be greater than zero, some be smaller than zero, but if we consider all the possible values of U_t for any given value of X_t. this would have an average value equal to zero.

③ The variance of U_t is constant in every period i.e., $Var(U_t) = E(U_t^2) = \sigma_u^2 \ \forall \ t$.

This means that for all values of X_t, U_t's will show the same dispersion around their mean.

④ The variable U_t has a normal distribution:

This means that U_t is normally and independently distributed with zero mean and constant variance. σ_u^2 i.e.,

$$U_t \sim N(0, \sigma_u^2)$$

⑤ The explanatory variables are non-stochastic and fixed in the hypothetical process of repeated sampling:

It means that X_t's are a set of fixed values in the hypothetical process of repeated sampling.

⑥ The random terms of different observations $(U_t, U_{t'})$ are independent. This means that all the covariances of U_t with any $U_{t'}$ are equal to zero. i.e.,

$$Cov(U_t, U_{t'}) = E(U_t U_{t'}) = 0 \ \forall \ t \neq t'.$$

$$\boxed{\begin{aligned} Cov(u_t, u_{t'}) &= E\left[\{u_t - E(u_t)\}\{u_{t'} - E(u_{t'})\}\right] \\ &= E\left[\{u_t - 0\}\{u_{t'} - 0\}\right] \\ &= E(u_t\, u_{t'}) \end{aligned}}$$

$$\begin{aligned} Cov(X, X) &= E\left[\{X - E(X)\}\{X - E(X)\}\right] \\ &= E\left[X^2 - X E(X) - E(X).X + \{E(X)\}^2\right] \\ &= E\left[X^2 - 2E(X)\,X + \{E(X)\}^2\right] \\ &= E(X^2) - 2E(X)\,E(X) + \{E(X)\}^2 \\ &= E(X^2) - 2\{E(X)\}^2 + \{E(X)\}^2 \\ &= E(X^2) - \{E(X)\}^2 \\ &= Var(X) \end{aligned}$$

(7) The explanatory variables are uncorrelated with random disturbance term.

i.e., $Cov(X_t, u_t) = 0 \quad \forall\, t$.