Frequently Asked Questions:

1. Why do we include error term in the regression model?
   Most of the relationships in real life situation are inexact. . So exact functional relations connecting the variables are inadequate descriptions of economic behavior. In other words there is always an element of uncertainty in any prediction of the system. To make inexact relations into exact, we introduce an error term in the regression model. This error term represents the sum effect of all those factors which influences the response variable but are not included in he model.
2. Why does the error occurs in the model ?

This error may be due to-

- the omission of relevant factors that could influence consumption , other than disposable income like wealth, varying tastes, or unforeseen events that induce household to consume more or less,
- measurement error, which could be the result of households not reporting their consumption or income accurately,
- Wrong choice of the functional form i.e. linear relationship between consumption and income, when the true relationship may be non-linear.

3. Define econometrics.

   Econometrics may be defined as the quantitative analysis of actual economic phenomena based on concurrent development of theory and observations related by appropriate method of inference.

   Econometrics gives empirical content to economic theory.

4. What is an econometric model?

   An econometric model consists of system of simultaneous equations connecting 'k' input variable or regressors (X) to 'm ' output variables(Y) called as the response variable or endogenous variable. Each of these output variables is presumed to be generated by so-called structural relationship that comprises of its inputs not only some of the k primary inputs(X) of the system but also some of the (m-1) out put variables(y) that are generated by other structural relationships.

5. How econometric model is connected o regression model?

   Ans. An econometric model containing only one output variable is called a regression model.

6. Define a regression curve.

   Ans. The locus of conditional expectation of Y given X=x is a function m(x) of x called regression curve. We represent a regression curve as $E(Y/X=x) = m(x)$ OR $Y = m(x) + \varepsilon$

7. Distinguish between population regression function and sample regression function.

   Ans. The model $Y = m(x) + \varepsilon$ is referred to as a population regression function. Estimate of this regression model using the sample data is the sample regression function.

8. What are exogenous variables and endogenous variables in econometrics? Give example.

   Ans. In the regression model the dependent variable or the response variable is called endogenous variable. The independent variables are called exogenous variables or regressors.

   For example the quantity demanded of a commodity in a market is a function of price. Here quantity demanded is endogenous variable because it is determined within the economic system and the price is exogenous variable because the price is determined from out side the economic system as the consumer has no control over the price of the commodity.

9. What are the different types of regression models?

Ans. The different types of regression model are

(i) simple linear regression model

(ii) Multiple linear regression model

(iii).Nonlinear regression model

(i) Multivariate linear regression model

10. Define simple linear regression model.

Ans. A simple linear regression model has one regressor (X) which influences the response variable (Y) and it has the representation

$Y= \alpha + \beta X + \varepsilon$, where α denotes the intercept term and β denotes the slope coefficient, ε is the disturbance term.

11. Describe multiple linear regression model.

Ans. In a multiple linear regression model there are two or more regressors (X_i's) influencing the dependent variable and has the representation

$Y=\beta_o + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k + \varepsilon$

Here Y is the observational vector, β_i's, i= 0, 1,2,..k arere gression coefficients, X_i's are regressors and ε is the unobservable error vector.

12. What are the basic assumptions on the simple linear regression model?

Ans. Standard regression analysis commences by making the following ideal assumptions.

(i) $E(\varepsilon_i) = 0, \quad \forall i \quad (no \quad specification \quad error);$ This insure that on the average we are on the true line.

(ii) $E(\varepsilon_i \varepsilon_j) = 0, \quad i \neq j \quad (absence \quad of \quad autocorrelation);$

(iii) $V(\varepsilon_i) = \sigma^2, \quad \forall i \quad (\text{homoscedasticity});$ This insures that every observation is equally reliable.

(iv) Either the regressor X is non stochastic i.e., X_i (i=1,2,..,n) are fixed in repeated samples or if the X_i are stochastic, then Cov(X_i, ϵ_i) =0, i=1,,2,...n.

(v) ϵ_i is normally distributed for each i.

13. What is the principle of least squares?

Ans. According to this principle the sum of squares of the deviations of the observations from their expectation is minimum.

i.e $$\sum_{i=1}^{n}(Y_i - \alpha - \beta X_i)^2 = \sum_{i=1}^{n}\varepsilon_i^2 \text{ is minimum}$$

We use least squares principle to estimate α and β.

14. Describe the role of coefficient of determination R^2 in regression.

Ans. The goodness of fit of the regression model may be judged by the quantity R^2 which is called coefficient of determination . It is defined by

$$R^2 = \frac{SSR}{SST} = \hat{\beta}^2 \frac{\sum_{i=1}^{n} x_i^2}{\sum_{i=1}^{n} y_i^2} = 1 - \frac{SSE}{SST}$$

$0<R^2<1$. R^2 represents the proportion of variation in the response variable Y explained by the regressors. Larger the value of R^2, model is a good fit.

For example if R^2=.83, this implies that 83% of the variation the response variable is explained by the regressor.

15. Define OLS residual.

Ans. The OLS residual is defined as $e = Y - \hat{Y}$.

Actual observation Y_i depart from the value predicted by the line of best fit,

$$e_i = Y_i - \hat{Y}_i, \quad i = 1,2,\ldots,n$$

16. State the properties of OLS estimators in simple linear regression.

Ans. Whenever the simple linear regression model satisfies the standard basic assumptions then OLS estimators of model parameters are unbiased, consistent, sufficient, efficient and asymptotically efficient estimators.