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Question 1

**(a) Explain the following**

**Regression, Correlation and Causation**

* **Regression**

It measures the relationship between one variable (dependent variable y) and other variable (independent variable x) to estimate the mean (µ) of the population.

* **Correlation**

It measures the correlation or association (which we assume is linear) between two variables.

* **Causation**

It is also known as cause and effects. It actually shows that how one variable as impact on other.

**Adjusted R-square and R-square**

* **Adjusted R-square**

Adjusted R-square is use to check if adding more variable changes (improves) the regression model or it gives any significance to it.

* **R-square**

Also known as coefficient of determination. R-square measures the strength of the relationship between regression model and dependent variable (y)

**Applied and theoretical econometrics**

* **Applied econometrics**

It applies the theories of econometrics with the real-data and proves those theories for future forecasting and developing of the new theories.

* **Theoretical econometrics**

It uses probability, regression analysis and other statistical methods to assess the model of economics.

**Statistical and deterministic relationship**

* **Statistical relationship**

In statistical relationship we deal with the random or stochastic variables. Probability distribution has those variables.

* **Deterministic relationship**

This relationship also deals with the variables but the variables are not random.

**(b) what is the role of stochastic error term µὶ in regression analysis? What is the difference between the stochastic error term and the residual, ûὶ?**

It estimates the error in a regression model because a regression model can not always be accurate. In other words, it explains all of the variation in dependent variable with respect to independent variable which is unable to explained.

The distinct difference between the stochastic error term and residual is that the difference between mean value of observation and population where as residual is the difference between the mean values of observation and sample.

Question 2

**(a) discuss the reason for incorporating the disturbance term**

There are many reasons that’s why we incorporate the disturbance term in our regression model.

* **Other variables effecting:**

There are many variables that are affecting dependent variable (y) for example, corps yield has been affected by temperature, rainfall etc but in model

(y) has been affected by temperature (x) but there are other variables that can also affect the corps yield (y) so to adjust that error we use disturbance term (ui)

* **Unavailability of data:**

Sometimes we do not have the data of variables, so due to the unavailability of data we exclude that variable and use the disturbance term to adjust the error in the model.

* **Human behaviors:**

There is randomness in human behavior as well, for example income of a person is constant but his consumption of the income changes due to other variables. To cover this randomness in individual behavior the disturbance term uses in the model.

* **Poor proxy variables:**

In Friedman’s theory says that permanent consumption (y) as function of permanent income (x). let’s suppose we don’t have data of there variables s0 we use proxy variables such as current consumption and current income. That proxy variable will correct error in the model to cover that error the disturbance term is used.

**Data collection:**

The errors occur during the data collection usually adjusted with the help of error term in the model.

**(b) write down the assumptions of ordinary least square (OLS) method.**

There are few assumptions under these we can conduct OLS method:

1. The parameters of regression analysis are linear which means that it lies on a straight line.
2. The mean value of disturbance term ui is zero since these values are unknown so we assume that the value is zero.
3. Equal value of u, as we know that these values are unknown so we assume that the variance around the mean is a constant value.
4. The two continuous value of error term (ui, uj) and the given value of x (xi, xj) we assume that there is no correlation among them.
5. There will be no relationship between error term values and explanatory values.
6. The number of parameters that has to be estimated should be greater than the no. of observation (n).
7. The values of x in a sample has to be different from each other.
8. The explanatory variable should be the same in a regression model that will affect dependent variable it is called specification error.
9. There will be no high relationship between explanatory variables.

Question 3

**(a) explain the regression process on standardized variables.**

A variable is known as standardized variable when its mean value is subtracted from its actual value and divided by the standard deviation of that variable.

Since we know that the units of dependent and independent variables are affect the interpretation of a regression process to avoid that affect, we need to express the dependent and independent variables has standardized variables.

The interesting property of standardized variable is that its mean value is always 0 and standard deviation is always 1. Due to this property we do not consider the unit of dependent and independent variable so that is why we write the regression on standardized variable as below

Interpreting the above equation, we can say that standardized independent variable (xi\*) increases by 1 standard deviation, on average there will be increase of β₂\* standard deviation in standardized dependent variable.

**(b) How to measure the elasticity through the Log-Linear model?**

Log-linear model is when the value of dependent variable (y) changes into natural log while the value of independent variable remains in the same scale. We use these models when we think the variables have exponential growth relationship.

If we consider these models as exponential regression model

Yi = β1Xβ2 i eui (1)

We can express alternatively as

lnYi =lnβ1 +β2 ln Xi +ui (2)

ln=natural log

ln Yi = α+β2 ln Xi +ui (3)

Because equation 3 is collectively linear (including the variables and parameters) we can be estimated by OLS regression.

The important feature of log-log model is that its slop coefficient β2 measures the elasticity of Y with respect to X. so we can say that if Y represents the quantity demand and X is its unit price, β2 measures its price elasticity of demand.