

**Regression analysis:** uses economic theory and statistical techniques to develop equations that explore statistical relationships between two or more variables

- Regression analysis is largely concerned with estimating and/or predicting the (population) mean or average value of the dependent variable on the basis of known or fixed values of the explanatory variables
- Cannot prove that the movement of one variables directly causes the observed movements in the value of the dependent variable

#### Assumptions of regression analysis

1. Linear relationship of mean values
2. Homoscedasticity (equal spread)
3. Normality (normally distributed)
4. Non Autocorrelation (values of the dependent are independent to one another)
5. Independent variable (P) is unrelated to E

#### Interpreting Regression Statistics

**R Square:** percentage of explained variation as if all independent variables in the model affect the dependent variable

- Measures how close the data is to the fitted regression line
- R-squared is always between 0 and 100%
- 0% = model explains none of the variability of the response data around its mean
- 100% = model explains all the variability of the response data around its mean
- The higher the r squared the better

**Adjusted R Square:** percentage of variation explained by only those independent variables that in reality affect the dependent variable

- Modified version of R-squared that has been adjusted for the number of predictors in the model
- Adjusted R-squared is the best estimate of the degree of relationship in the basic population

To show correlation of models with R-squared, pick the model with the highest limit, but the best and easiest way to compare models is to select one with the smaller adjusted R-squared. Adjusted R-squared is not a typical model for comparing nonlinear models, but multiple linear regressions.

Which one to use?

- In the case of a linear regression with more than one variable: adjusted R-squared.
- For a single independent variable model, both statistics are interchangeable.

### **TOPIC 3: COSTS AND COSTS ANALYSIS**

#### **What are costs?**

##### To economists

- The cost of using something is either
  - o Monetary purchase price OR
  - o The benefit foregone of not using the next best alternative (opportunity cost)

Accountant: amount paid to purchase product

**Avoidable costs:** a cost is truly avoidable only if it is actually incurred as a direct result of undertaking a particular activity or in providing a particular good or service

Most common assignment and output measures for freight movements

1. **Tonne-weight basis:** assigns costs on the basis of the weight being transported
2. **Tonne-kilometres:** reflects weight moved and length of haul (most common)

### **Summary**

- Economists stress the value derived from the next best alternative use of a resource when putting a cost on it.
- Avoidable cost is the cost foregone — or avoided — by not providing a good or service.
- Assigning costs requires judgment and reliable cost data.
- Shared cost — common or joint — present challenges to cost assignment and cost management.
- Economists regard the (production) short run as that time period in which at least one input is