

AN OVERVIEW OF STATISTICAL BASED RESEARCH TOOLS IN ECONOMICS SUBJECT

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Abstract The definition of "research tool" encompasses a wide range of items, including devices, technologies, procedures, biological materials, reagents, computer systems, computer software, and analytical techniques. These tools are designed to aid in the exploration, advancement, or production of a qualified product or project. In the field of Economics, statistics are crucial and are closely intertwined, as both rely heavily on numbers and facts. This paper delves into Descriptive and Inferential Statistics within the realm of Economics, covering Measures of central tendency, Non-parametric and parametric tests, Student's t-test, and Analysis of variance as research tools.

Keywords: Economic research, Research tools, Analysis, Techniques, Economic statistics, Measures

1.0 Introduction

The techniques of funding research are crucial in determining the outcome of economic statistics. These techniques are utilized to gather and interpret data on population incomes and economic expansion. Statistics are essential in this field and are highly valued for their accuracy and reliability. The results obtained can provide a wide range of statistical evidence. Statistical knowledge enables the use of traditional methods to collect data, conduct accurate inquiries, and carry out comprehensive analyses. Embarking on economic research can be a challenging endeavor, but having the right tools at your disposal can streamline the process and provide valuable insights. Whether you are an academic, a market analyst, or a policy maker, understanding and utilizing the most popular analysis tools is essential. These tools not only assist in processing data but also in interpreting complex economic relationships and predicting future trends. Let's explore some of the most widely used instruments that can support your economic research efforts. Economics statistics play a significant role in this field and are closely intertwined, as both are heavily reliant on numbers and facts. The key uses that demonstrate the importance of statistics in economics include data analysis, information collection, and hypothesis testing. For instance, statistical information is utilized to determine the supply and demand for exports and imports. The United States Census Bureau serves as another notable example.

Information is gathered to analyze various statistical data, like the population of a specific state. Economics frequently utilizes statistical significance to obtain essential information. When something is deemed statistically significant, it indicates that it is not likely to occur by chance. It has a distinct and identifiable cause. When examining economics on a broader scale, such as with the U.S. government, statistics are utilized to shape and influence policies. For instance, consumption statistics reveal how individuals are utilizing their finances. This aids in determining the average rent or mortgage in the county. Another example is production statistics, which enable the government to compare its prosperity to previous years. With this data, policymakers can decide if adjustments are necessary in economic policies. Various branches of economics heavily rely on statistics, including banking, accounting, and management.

Banking institutions depend on individuals and businesses depositing funds and keeping a portion of it in their accounts. Subsequently, they lend out the available funds and profit from the interest collected. Utilizing statistics, banks assess an individual's interest rate and loan eligibility. Moreover, they analyze data to determine the percentage of customers utilizing specific services like student loans or checking accounts.

Accounting professionals heavily rely on statistical data in their reports. Precise numbers are crucial when balancing accounts as they are used to showcase a company's performance. These figures play a vital role in

decisions regarding product or service expansion. Accountants also use statistics to identify trends within the company before implementing changes or making significant decisions. Additionally, projections based on statistical analysis are created to guide decisions for the upcoming business year.

Companies utilize statistics in management to make informed decisions about their budget for the upcoming year. Statistical data reveals what aspects are successful and what needs improvement, guiding the company on how to best move forward with their products or services. Similarly, government management also depends on statistics, such as when determining adjustments to the minimum wage or Social Security benefits for citizens.

2.0 Descriptive and Inferential Statistics

Descriptive statistics aim to depict the connection between variables within a sample or population. Through measures such as mean, median, and mode, descriptive statistics offer a concise overview of data. On the other hand, inferential statistics are employed to analyze and draw conclusions from a random sample extracted from a larger population. This method proves advantageous when it is impractical to study every member of a given society.

a). Descriptive statistics

In the field of Descriptive statistics, data is depicted using a variety of representative techniques such as charts, graphs, tables, excel files, etc. This process involves describing the data in a meaningful manner to enhance comprehension. Typically applied to small data sets, this analysis aids in predicting future trends based on current observations. Common measures utilized to describe a data set include measures of central tendency and measures of variability or dispersion.

b) Measures of central tendency

Means are calculated by dividing the sum of all data points by the total number of data points. Central tendency measures include the mean, median, and mode. The median represents the middle value in a dataset, while the mode is the most frequently occurring value. The range indicates the variability within the sample, with the minimum and maximum values identified. By organizing data into percentiles and establishing a classification, we can gain a better understanding of how the values are spread out. Percentiles divide the data into 100 equal parts, allowing us to describe specific points such as the 25th, 50th, and 75th percentiles. The median falls at the 50th percentile, representing the middle point of the data. The interquartile range encompasses the middle 50% of observations, ranging from the 25th to the 75th percentile. Variance measures how spread out the data points are from the mean. It provides insight into how closely individual data points cluster around the average value. Population variance is calculated as:

$$\sigma^2 = \sum (X_i - \bar{X})^2 / N$$

Where σ^2 is population variance, \bar{X} is the average population, X_i is a population i th factor, and N is a population factor. The variance of a sample is described in the formulation:

$$s^2 = \sum (X_i - \bar{X})^2 / (n-1)$$

The sample variance, average sample, sample variable, and number of sample elements are denoted as s^2 , \bar{x} , X_i , and n , respectively. The population variation method is represented by the number 'n.' The degrees of freedom, denoted as "n-1," is not as large as the number of parameters and is free to vary, except for the last, which must be a fixed amount. The difference in squared units is calculated, and the square root of the variance is used to enhance the analysis and maintain the simple measurement structure. The square root of the variance is known as the standard deviation (SD). The SD of a population is specified in the following format:

$$\sigma = \sqrt{\sum [X_i - \bar{X}]^2 / N}$$

Where μ is the SD population, X is the average population, X_i is the population factor, and N is the number of population elements. A slightly different formula determines the SD of the sample:

$$s = \sqrt{(\sum [X_i - X]^2 / n - 1)}$$

Where s is the SD measure, x is the mean of the measurement, x_i is the measure i th, and n is the number of sample components.

3.0 Non-parametric and parametric tests

A parametric analysis examines the naturally distributed computational data (quantitative variables). There are two crucial requirements for parametric statistical analysis: The assumption of normality typically describes the distribution of the sample group data. If the variances of the samples and the resulting population are similar, parametric statistical methods are used. However, if the population's distribution is skewed or if the sample size is limited, non-parametric statistical methods are employed. Non-parametric tests are used for the analysis of ordinal and categorical results.

a) Parametric tests

Parametric modeling indicates that the outcomes are measured quantitatively (numerically), and the underlying population usually follows a normal distribution. The samples exhibit similar variations (homogeneity of variances). The groups are chosen randomly from the population, and the outcomes within a group are mutually exclusive. T-tests, analysis of variance (ANOVA), and repeated measures ANOVA are commonly employed.

b) Student's t-test

Student t-tests are utilized to assess the null hypothesis that there is no variation in the results across all classes. This test is employed in three scenarios: To ascertain whether the representative sample, identified by a normal group, significantly differs from the overall population (i.e., t-test).

$$t = \frac{X - u}{SE}$$

When X represents the mean sample, u represents the mean population, and SE represents the standard error of the mean, the unpaired t-test can be used to determine if there is a significant difference between two indigenous samples in the community. The rule for conducting an unpaired t-test is as follows:

$$t = \frac{X_1 - X_2}{SE_{X_1 - X_2}}$$

The standard error represents the difference between the means of two groups, X_1 and X_2 . It is used to assess whether there is a significant difference between two related samples, such as in a paired t-test. An example of when a paired t-test is appropriate is when measuring the same subjects before and after a treatment.

The paired t-test formula is:

$$t = \frac{d}{SEd}$$

The average variance is represented by d , while the standard error of the variance is denoted by SE . The party's variances can be compared using an F-test. The F-test is calculated as the ratio of variances ($\text{var } 1 / \text{var } 2$). If the F-value deviates significantly from 1.0, it is assumed that the group variances are notably different.

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e) Analysis of variance

The t-test is not suitable for comparing three or more groups. ANOVA is designed to determine if the means of two or more groups are significantly different. In ANOVA, we examine two variances: (a) the variability between groups and (b) the variability within groups. The within-group variability (error variance) is the variation that is not accounted for in the study design, and is based on random sample fluctuations. On the other hand, the between-group (or treatment) variability is due to the effects of the different groups. The F-test compares these two variance measures. A more straightforward F statistical rule is:

$$F = MS_b / MS_w$$

Where MS_b is the average community square, and the MS_w is the average group square.

4.0 Conclusion

Economic analysis plays a crucial role in assessing and planning for changes in management practices, especially in economies heavily reliant on subsistence farming. Despite the challenges of validating inputs and outputs without market prices, engaging in discussions to make informed estimations can provide valuable insights for both groups and individuals. Socio-economic factors, even if not quantifiable in monetary terms, significantly influence economic evaluations and decision-making at the household level. Therefore, the process of comparing non-quantifiable costs and benefits is often necessary and beneficial. As in ANOVA, the cyclic ANOVA step evaluates the reputation of three or more groups from the mean. Therefore, regression analysis of change is used to calculate change across different situations or over time in all examples. Since the variables are calculated from the sample at different times, the calculation of the variable is repeated. Thus, the repeated measures ANOVA test can be included in the calculation of the repeated measures variable. The results of the test distribution will be inaccurate because the normal expectation is not reached and the mean used is often incorrect. According to the parametric test, the findings correlate with the evidence of the distribution model and the null hypothesis is accepted or rejected.

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