

Use and Importance of Mathematics in Economics

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Quantitative Techniques in Economics

- Quantitative Techniques (QT) refer to the techniques of using mathematics and statistics jointly.
- QT in economics refers to the use of mathematics and statistics in economic analysis/the use of mathematics and statistics in economic analysis is called quantitative technique in economics.
- The main purpose of employing quantitative techniques/analysis in economics is to provide diligence in deducing economic theories and measure economic parameters so that they can be compared with similar other values.

Quantitative Techniques in Economics...

- Subjects like mathematics and statistics provide many tools to analyze various aspects of economic theories and principles considering the data related to individuals, societies, and nations.
- Economics is concerned with consumption, production, exchange, distribution of wealth, saving, investment, and income, etc.
- Therefore, it is said that the study of modern economics is incomplete without taking the knowledge of quantitative techniques. We can see the use or need for quantitative analysis in economics from the following two aspects;

Mathematical Aspect

- Mathematical skills and techniques help to solve different problems easily and logically. There are different variables in economics in which it is needed to establish a relationship between them by numerical calculation or graphical presentation.
- In both cases, mathematical tools are very important. Cost affects profit, price level affects demand, investment is affected by market demand and interest rate, etc. are the different dependent and independent variables whose relation can be verified through mathematics.
- The demand curve, supply curve, profit maximization, cost minimization, and other algebraic types of problems can be solved by using mathematics. Derivative, integration, transformation, coordinate geometry, linear programming, etc. are very much useful and essential mathematical tools for successful economic transactions.

Statistical Aspect

- Statistics is one of the most powerful subjects for explaining events and it deals with statistical data and statistical methods, which have a remarkable role in a proper understanding of the economic problems and formulation of economic policies and strategies. Thus, statistics are an essential part of economics.
- All situations like profit and loss, demand and supply, investment, production, and so many other data can be analyzed by statistical tools and methods. In the modern technological and competitive world, the economic activities at large volumes cannot run without comparing and analyzing other similar types of businesses around the globe or regions.
- The economist always evaluates several indicators of the economic environment over time and applies the information to anticipate the circumstance of the economy shortly.

Importance of Mathematics in Economics

- Mathematics has powerful logic and tools to establish a relation between the variables which are widely used in economics.
- Very long and difficult theoretical expressions of economic theories can be expressed in the short and understanding form only with the help of mathematical techniques and methods. We can find the accurate ratios and coefficients of various economic relations with the help of math.
- Economic theories get more concrete and precise form due to mathematics and they are then widely applied and recognized.
- Logarithm, linear programming, equations, functions, integral calculus, geometry, game theory, coordinate geometry, etc, and applied mathematics are important areas that have a very pivotal role in the field of economics. The major use of mathematics in economics can be pointed as below;

Importance of Mathematics in Economics...

- To study cause and effect relationship
- To analyze three or more values
- To convert a sentence into symbols
- To express economic phenomena algebraically
- To find the slope of curves
- To study trigonometric function, marginal and total concepts
- To study linear and non-linear programming problems

To Study Cause and Effect Relationship

- In the study of economics, we can show a cause and effect relationship between different inter-related variables. By applying mathematical notations, we can explain such relationships more accurately.
- For example, the quantity demanded of a good depends on its price. Then we write quantity demanded of good X as the dependent variable and its price as an independent variable as $D_X = f(P_X)$

To Analyse Three or More Variables

- The use of graphs is popular in mathematical analysis in the case of two variables. If the number of variables is three or more, we cannot use graphs and the verbal description will also be complicated.
- In such cases, we can use mathematics instead. This makes analysis more easier and accurate.

To Convert Sentence into Symbols

- Sometimes mathematical symbols are necessary instead of the use of economic terms and equations are used instead of theoretical sentences.
- Different findings from mathematical treatment can be best interpreted by using symbols and that helps in concluding the results faster than the conclusion drawn from the graphical method and others.

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To Express Economic Phenomena Algebraically

- Algebra is used in economics for the solution of simple, simultaneous, and quadratic equations.
- Matrix algebra is used to solve simultaneous equations observed in multi-market or general equilibrium models.

To Find the Slope of Curves

- Coordinate geometry is used to show the association or relationship between graphs and equations.
- It is also used to find the slope of curves like demand curve, supply curve, etc.

To Study Trigonometric Function, Marginal and Total Concepts

- For the analysis of trigonometric functions including complex roots of quadratic or higher degree equations, trigonometry is applied.
- Similarly, for the purpose of discussion of marginal concepts like marginal utility, marginal cost, marginal revenue, marginal profit, and so on and total concepts like total utility, total cost, total revenue, total profit, etc. differential calculus is used.

To Study Linear and Non-linear Programming Problems

- Mathematical concepts are also used in solving linear and non-linear programming problems.
- Tools like the game theory can also be used in analysis and solving the problems associated with duopoly and oligopoly markets.

References and Suggested Readings

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