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ROLE OF MATHEMATICS IN BUSINESS ECONOMICS

at One-Day Multi-Disciplinary National Conference on

"RECENT TRENDS AND ISSUES IN COMMERCE, ECONOMICS AND MANAGEMENT IN INDIA"

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Date : 30th March 2019

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Role of Mathematics in Business Economics

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Abstract: - *Every academic subject has its own standards by which it judges the merits of what researchers claim to be true. In the study of Physical Sciences it typically requires experimental verification. Economics there are two purposes to apply mathematics, one is the mathematical tools needed to make and understand economic arguments, the second one is, to make you comfortable talking about economics using the shorthand of mathematics. Economical decision in relation to use of resources and it's utility varies from time to time, individual to individual, Companies to Companies and Government policies respectively. In order to solve economic problems, mathematics in this field, provides solution with its method & concept in the sphere of mathematical science.*
Mathematics implementation in Business Economics helps optimum use of resources, and to evaluate profit position is completely scientific.

Introduction

Economics is the study to know the natural resources as well as our analysed study of allocating resources and distributing goods and services. Mathematics helps to understand the problem and to provide its solution with its number and symbols logically. Mathematics and its support of logical processes to solve and its models to analysis to study existing economic relationships, which helps economists study scenarios to seek no one can deny the importance of maths and economic because interrogative of economy varies the questioner and maths provides its solution with its algebra linear equation calculus & geometry etc.

Since economic concepts can be complex, it is important to use

care in representing data and relationships in isolation. Results can be misinterpreted based on the representation of data, hence representing with scientific reasoning help in decision making. The vast field of economics has many descriptions each one trying to discover a way to make clear what the economics covers.

Economical decision in relation to use of resources and its utility varies from time to time, individual to individual, Companies to Companies and Government policies respectively.

Resources surrounds, But fact that resources are limited and people have needs and wants,

which are unlimited. Mathematics used in economics where the resources like raw materials, labour, time, machine etc are limited.

Objectives of the Study

1. To study the application of Mathematics in Business Analysis.
2. To implementation of Mathematics in Business.

Methodology

The study is based on secondary data. The study refers the research reports, articles, Books, Journals and Websites. The use of Mathematical techniques in Business.

Some Application of Mathematics in Economics:

1. Functions

Terence Lim lists the following mathematical concepts as important to Economics, Calculus, Linear Algebra, Differential Equations.

Economists utilize mathematical models to analyse both micro and macroeconomics using supply and demand as the foundation (Baumol & Blinder, 2001). "Supply and demand are the most fundamental tools of economic analysis" (McAfee, p. 14). (Ref 4)

As Macroeconomic, is base for study of Gross Domestic Product, National Income, inflation, aggregate demand and aggregate supply, Employment / unemployment rate and prices in general.

Every part of the economy has an interrelationship with other parts of the economy. "a way of illustrating macroeconomic relationships and the effects of government policy changes" (Riley, 2006) ref 5.

Understanding, Rebecca Riley statements clearly indicates clear importance of macroeconomics at each and decision of government policy, which benefits business community at large giving free hand in development and growth of business and its profitable economy.

Use of Mathematical Models in Business Economics

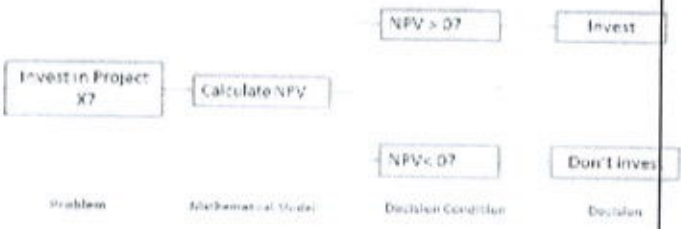
Mathematical models are used in the field of business. We will explore some of them here.

Decision Making

To make decisions is a crucial activity for businesses. It involves multiple participants with conflicting views. Decision making mathematical models can be of great use here. Such models use input variables, also a set of conditions to be fulfilled to help management get expected result base on decision.

One of the most common decision-making problem faced by any business is the investment decision, where it must decide whether to invest in a project or not. Businesses often use mathematical models that assess the potential valuation of the project against the investment to be made for making such decisions. Examples of such models are net present value (NPV), internal

rate of return (IRR), etc. A simple NPV model can be illustrated as below:



Models

Single Equation Models

The economic relationships we investigate through econometric models are of three types-

(i) Single equation.

(ii) Multiple equations.

(iii) Simultaneous equations.

Single Equation:

In a single equation relationship, there is a dependent or determined variable which is determined by one or more independent or variables. determining variables also called explanatory An econometrician starts his analysis of theory and facts by building or specifying a model - such a specification is also called formulation of 'maintained hypothesis'. This hypothesis is then tested with the help of statistical tests. First step in formulating an econometric model is to determine the dependent and explanatory variables. For example, we write a supply. function as S=f(P),q = quantity supplied of a commodity,

p = price of the commodity dependent on price. Hence Supply is a dependent variable and price is an explanatory variable. Explanatory variables are also termed as Regressor or Exogenous variable whereas dependent variables or endogenous variables. If the relationship between income and consumption is given C =f (Y)

where C = consumption Y =income.

C is a dependent or explained variable and Y is independent or explanatory variable. The model states that consumption is dependent on or is a function of income. When we are studying the dependence of a variable on only a single explanatory variable as given above, the study. is known as the simple or, two variables, regression analysis. However, if we are studying the dependence of a variable on more than one variable it is known as multiple regression analysis. For example, if we consider demand for a commodity as dependent on its price, (Id) income of the person (Y) price of a competing commodity (Px) i.e. D= f (Pa, Y, P) it is a multiple regression analysis and there is more than one explanatory variable. In this model D is the dependent variable and Pa, Y and Px are independent or explanatory variables.

We begin our introduction to econometric methods by estimation of a single equation with only two variables, one dependent (Y) and the other independent variable (X). i.e. Y= f (X). The problem of single equation estimation is that of determining, estimates of the parameters of the equation. We assume that the given relation is linear i.e. we specify a linear model. It implies that Y or some transformation of Y can be expressed as a

linear function of X, or some transformation of X. Another meaning of linearity assumed here is that the relation is linear in parameters B's (that is the parameters are raised to the first power only).

Ordinary Least Squares:

We examine here Ordinary Least Squares (OLS) or Classical Least. Squares (CLS) method of estimation of parameters. The values obtained from application of this method are called 'estimators' and it is defined s a formula or a method of estimating some unknown parameter of the stated equation. An 'estimate is the numerical value resulting from the application of the formula to a given set of sample data. For example, if we write a relation as

$$Y = \beta 0 + \beta 1 X$$

Bo and S are parameters to be estimated. Once the estimates of (o and B are obtained we substitute them in the specified equation and then. obtain the estimate of Y for any given or known value of X.But we start with OLS method as it has certain advantages over other methods of estimate.

(i) The parameters of estimates obtained by this method have some optimal properties.

(ii) The computational procedure of OLS is fairly simple as compared with other econometric technique. (iii) Its data requirements are not excessive.

(iv) It can also be used (and has been used) in a wide range of economic relationships with fairly satisfactory results.

(v) In spite of presence of other elaborate econometric techniques, OLS is still most commonly employed method.

(vi) Many other econometric techniques of estimation involve the direct or modified application of OLS method.

Population Regression and Sample Regression:

At this point it is necessary to distinguish between a populations. regression function (PRF) and a sample regression function (SRF). The. expected value of Y that is the population value of Y or average value of Y depends on the X, values E (Y/X) = f (X. If we draw a line through various conditional averages of Y it is called population regression line. t is the locus of the conditional means of the dependent variable (Y) for. he fixed values of the explanatory variable (X). For each X, there is a population of Y values and a corresponding conditional average value. he regression line passes through these conditional means.

$$E (Y/ Xi) = f(X)$$

is known as population regression function (PRF) (for a two variable case). Let us assume or take a working hypothesis that this PRF is a linear function of X.

$$E (Y/Xi) = \beta 0 + \beta 1 X$$

where β0 and β1 are unknown but fixed parameters known as regression, co-efficient. We have to estimate β0 and β1 with the help of given values of Y & X we write,

$$Yi = \beta 0 + \beta 1 Xi + ui$$

where ui is the random or stochastic disturbance (as explained earlier) and

indicates the deviation of Yi from its average value, The given relation is a stochastic relation.

In most practical situations we have only sample Y values corresponding to some fixed X values. It is then obvious that we have to estimate PRF on the basis of sample information. Such an estimation in not likely to be accurate because of sampling fluctuation and sample regression line and population regression line may not coincide. The sample regression line is only an approximation of the lure population. regression. Hence, the sample regression function or the same relation. can be written as

$$\mathbf{Yi = \beta 0 + \beta 1\ Xi}$$

where ^ is read as 'hat' or 'cap'. The SRF in its stochastic form is

$$\mathbf{Yi = \beta 0 + \beta 1\ Xi + ei}$$

where e is the sample residual term analogous to uj in PRF. It can be regarded as an estimate of u. e, is introduced in SRF for the same reason. as ui is introduced in PRF. Our objective in regression analysis is to estimate PRF

$$\mathbf{Yi = \beta 0 + \beta 1\ Xi + ui}$$

On the basis of SRF

$$\mathbf{Yi = \beta 0 + \beta 1\ Xi + ei}$$

This is because econometric analysis is usually based on a single sample from some population. The problem is to find an estimation procedure so that β0 and β1 are as close to β0 and β1 respectively is possible though we never know true β0 and β1. There are several methods of constructing SRF, but in regression analysis the most extensively used method is OLS.

Conclusion:

Application of mathematics in Business Economics, give results which can help by both visual and graphical understanding of demand and supply, which in turn help decision making in relation to optimum use of resources and capital. Precise use of technology and analytical evaluation, guide business organisations to achieve policies in front running corporate or competitive business world.

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