REVIEW OF RESEARCH
ISSN: 2249-894X
IMPACT FACTOR : 5.2331(UIF)
VOLUME - 7 | ISSUE - 5 | FEBRUARY - 2018

MATHEMATICS PLAYS A VITAL ROLE IN ECONOMICS:
(A study with Different Perspective)

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ABSTRACT:

When one studies economics for the first time, one will probably never come across any equation or calculation other than the simple mathematics. There are much to read around basic concepts and understanding the various aspect of market, economy, business and simple understanding of price, supply demand and costs etc.

But as we indulge further into this subject, we realize there is more to it than just a theory and talk. Beside what better way of explaining the concept of prices, quantity of goods sold and costs without referring to numerical examples? As students wanting to further their education in economics, it rather helps to know your math.

There are basically two purpose of applying mathematics in economics, the first is, this make us comfortable talking about the economics by using short hand of economics and the second is, in economics there are certain mathematical tools which are needed to understand economic arguments. Mathematics helps and allow the economists to the meaningful and reliable propositions about wide ranging difficult subjects which could less easily expressed.

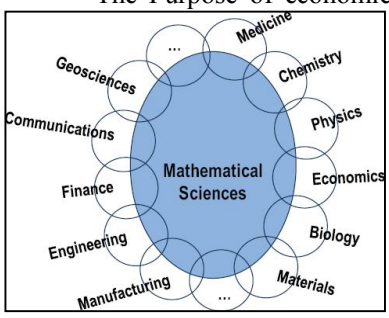
The purpose of this research paper is to provide a brief knowledge of mathematics which are commonly used in the field of economics. The major focus of the study is the application of mathematics which plays a vital role in the economic field as well as in the research process.

KEYWORDS: *studies economics , simple mathematics , market, economy, business.*

INTRODUCTION :

Economics is all about the economic problems their identification, explaination & possible solutions. Economics is the study and evaluation of economic problems. Economics is a social science. It does not only describe that what is going on in the economy but at the same time it explains how the economy operates and to make predictions about what may happen to specific economic variable if certain things take place.

The Purpose of economic activities is to satisfy maximum possible ends by sacrificing minimum possible resources. Mathematics is the basic to any application of economics to different areas like prices, unemployment, providing guidelines to the firms etc. Application of mathematics provides concrete form to economics relationship and laws and made it more practical. Use of mathematics helps in proper understanding of the relationship and in deriving certain result. Now a days mathematics is a very important tool to make economic analysis. Mathematics helps us to give a better understanding about the different economic condition. out of the vast use of mathematics in economics, in this study we will try to find out the



different possibilities of application and check the relationship between economic and mathematics. Though both the subject are totally different but after this we will be able to understand how they are inter related with each other.

OBJECTIVE OF THE STUDY :-

- To study the different application of mathematics in economics theories and concept.
- To observe the relationship between the two completely different subjects that is mathematics & economics.
- To study the different tools which are used in mathematical economics.

RESEARCH METHODOLOGY :-

The study is based on secondary data. This study is done with the help of different articles, books, research repents, websites and journal. The use of different techniques and tools of mathematics in economics are explained through illustrations.

Source Application of Mathematics in Economies :-

1) Calculus:-

The marginal concept of economic analysis is easily amenable to the method of calculus. Suppose Y=Y (X). Then by may of marginal concept we they to find out what is the impact of Y because of an additional change in X. In calculus notation, it reads $\frac{dy}{dx}$. lets see the economic interpretation of use of $\frac{dy}{dx}$. the $\frac{dy}{dx}$ measures the hope of the curve plotting the function Y=Y (X). The 'Slope' in mathematical sense is the concept of marginalism in economic sense. Thus if Y=Y (X), then $\frac{dy}{dx}$ stands for the change in Y as a result of a unit change in X, i.e. marginal Y & of X let us give some illustration.

$\frac{dD}{dP}$ = Marginal demand of price, when D = D (P)
$\frac{dS}{dA}$ = Marginal sales of advertisement, when S = S (A)
$\frac{dR}{dA}$ = Marginal revenue of output, when R = R (Q)
$\frac{dC}{dQ}$ = Marginal cost of output, when C = C (Q)

2) Partial Derivatives :-

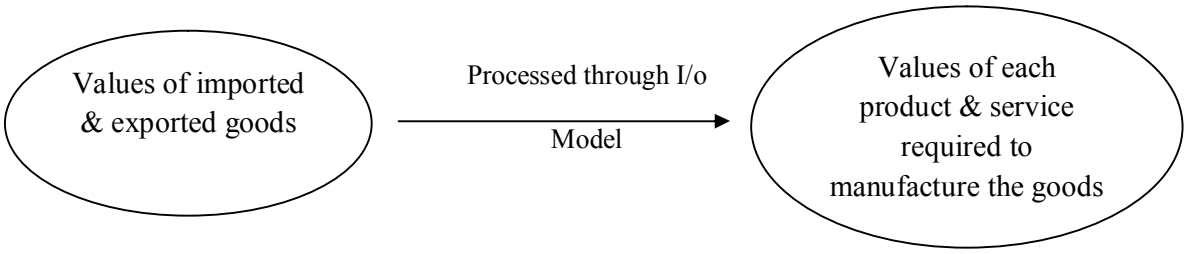
So for we have considered a function of one independent variable. However in economies often use encounter a function of several independent variables. for example, demand of product on the part of a consumer depends on the price of the product, the price of other related goods, consumer's income, consumer's wealth, consumer's taste and so on. When the prices of goods changes, the effect on the quantity demanded of the goods can only be analysed if all other variable are hold constant. The functional relationship that we get between the quantity demanded of a product and its own price is called partial function (a function of one variable when all other variable being constant). The process of differentiation can be applied to the partial function also. The derivative of partial function is known as the partial derivative of the original function and is denoted by $\frac{dy}{dxi}$ or $fi(X)$ or . It may be noted that the partial derivatives are the functions of variables entering into the original function $f(x)$.

3) Input Output Model :-

Economists are fond of using models. A model is a structure of relationship stated in form, functional or tabular. Likewise we talk about input output model. Input-output technique is another very popular technique of economic analysis, though it is not an optimization one. This technique is useful in the context of various level planning and projection. At the micro level of a corporate unit, Input output model lies at the root of and use method of demand forecasting.

Matrix is basic of understanding the rationale use of input output. Such a model essentially states the value of technological relationship, which exists between sectors. In other codes a distinction is made between endogenous and exogenous variables. Using this method we can stipulate a change in the exogenous variable and use the model to determine the system of equation, using technological relationships, to determine the changes to be made to sustain the new level of autonomous variable.

Input - Output Methodology



I/o model is a mathematical technique for standing the prod structure of an economy on the assumption of mutual interdependencies of the I/o analysis is to calculate the output levels in various industries that would be required by particular levels of demand for find goods.

4) Linear Programming :-

Linear programming had its beginning in the input output method of analysis developed by the economist ww leontif. George B Dantzig, a famous mathematician is responsible for the present & useful development of Linear programming.

Linear Programming may be defined as a method of determining an optimum programme of inter dependent activities in a view of available resources to maximize or minimize an objective function. A mathematician might be were technical & he way define linear programming as a method of optimizing a linear objective function subject to certain linear constraints. Linear programming has helped to bridge the gap between abstract economic theory and in managerial decision making in practice also.

5) Elasticity :-

The elasticity theory refers to the responsiveness of demand and supply due to changes in price. The product means that any change in price of a product that result in the changes of demand & supply of a particular product. If the product is inelastic, then the changes in price do not affect the changed in the demand & supply of a particular product which can be noticeable.

Demand is the decreasing function of price and the "Elasticity of demand"is defined as the ratio of proportionate change in the quantity demanded to a proportionate change in price". symbolically it can be written as-

$$e^d = \frac{dq}{dp}$$

where P is price and Q is qty demanded for good.

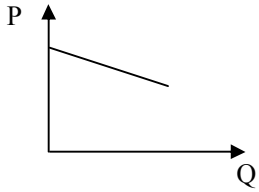
6) Economic Model

Mathematics are the immense use of various techniques which are used in the field of economics. Prof. P.C. mahalanob, a famous economist & mathematician has given a good model of economy in second five year plan. In this model, sect oral targets are fixed only with the help of mathematical model like input output model & linear programming. Mathematics in reparative technique to calculate "Formation of Capital" and interest rates as well. Thus, in most to the fields of economies, mathematics is useful.

7) Slope :-

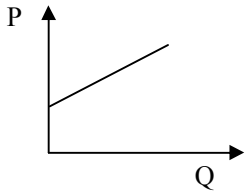
The concept of slope is very important in economics because, slopes are used to measure the rate at which the changes are going to take place. Graphically the value of dy/dx is the slope of a curve. Slope means that unit change in x, the dependent variable will result in change in y by the amount of b.

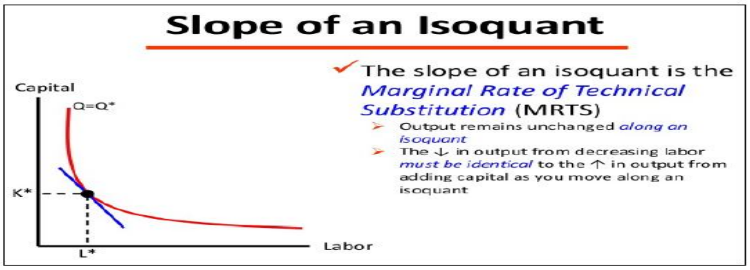
Slope shows both steepness & direction. It can be written as slope =
change in y/change in x = rise / run.
An example of the use of use of slope in economies.
Demand might be represented by a linear demand function as
Q (d) = a-bp
a(d) represents the demand for a good
P represent the price of that good. It can be seen how sensitive demand is to a change in price.



This is typical downward sloping demand came which says that demand declines as price rises.
Supply can be represented by linear supply function as…….

Q (s) = a + bp
Q (s) represents the supply for a good.
P represents the price of that good.
It can be represented as -





This is typical upward sloping of supply cures which says supply rises as price rises.

8) Straight Line :-

In economies, straight line are the most commonly used in graphical presentation with two axis starting in a central point (the origin) with me of the axis denoting charges in a variable due to a change in second variable.

The linear function (ax+b when a,b in set of real numbers) is usually represented in a graph as straight live. This is important technique in demand supply analysis. For example the demand curve under perfect competition is straight line weight is expressed as "Linear equation" The demand

can also be written as
D = f (P) & D = 7 - P

Here P is the independent variable & D is dependent variable, and with a unit fall in price, demand rises by a unit. This is typical downward sloping demand came which says that demand declines as price rises. Straight line depreciation charges cost early throughout is appropriate when economic benefit from an asset are expected to be realized evenly over its useful life.

9. Demand – Supply model of pricing

Mathematics plays a vital role in Determination of price of commodity. A marketer always want fix the price of the commodity in that means which will be affordable by the consumers and it makes the effective profit with optimum utilization of resources mathematics help the manufacturer to determine the acurati price of the commodity. The d^ds^s model shows that have we can determine Equilibrium point where the price can be fixed. Demand & Supply model can be presented in mathematical equation to get the equibrium price & quantity. In this model it is assumed that both demand & Supply function are of liner type. And further assumptions such as the market should be prefect competition for sails in the market. This implies thus should be large no. of buyers of a Homogeneous product so that no single seller can influences over the price of the product. This model demand & Supply consist of the three equations, which are as under -

Qd = a – bp ---------- (1)
Qs = c + dp ---------- (II)
Qd = Qs ----------(III)

Where – Qd = quantity demand of a product
Qs = quantity Supply of a product
P = Price of the product

The above three equation unfuture a model. Here in this model, The things which are variable are price quantity demanded and quantity Supply. The objective is to obtain the price and quantities demanded and sold when the system obtain the equilibrium point. To find the equilibrium point we have to solve the above three equation simultaneously. Equation (I) describes that the Q^d is a decreasing function of price , is as the prive falls Q^d increases and increases. Equation-II describe Q^s is the increasing function of prive as price rises Q^s increase and vicl-versa . Equation III describes the equilibrium condition meaning that the price equatis the quantity- Demanded and quantity supplied will clear the Market .

Illustration – Suppose the demand & Supply function a commodity is given :-

Q^d = 100 – 20 P
Q^s = 5 + 15 P
Where -Q^d = Quantity Demanded
Q^s = Quantity supplied
For the equilibrium price the Q^d& Q^s should be equal thus we have $Q^d = Q^s$
100- 20 P = -5+15P
15P+20P = 100+5

35P = 105 $p + \frac{105}{35} = 3$

We get price of the commodity per unit is Rs-3. Now by putting the values of P is any of the equation we will get quantity demanded thus –

$Q^d = 100\text{-}20x3 = 40$
$Q^s = -5+15x3 = 40$

Thus , the equilibrium point of the commodity equal to Rs.-3 and equilibrium quantity sold and purchased is 40 units.

10) Break Even Analysis –

Break even point is that values of x (no.of units of the product sold) for which there is no profit and loss without mathematics it is quite different to understand that which perfect point the Break even points is. So qith the help of mathematics we can lasily understand about the Break even point. In Economics, the break even analysis is a major part units of cost function, Revenue function and profit function and it will lood to determine the break evenpoint .Now ,we will see the break even point with an example – For a new product, a manufactures spends Rs.- 1,00,000 on the inprestruction and the variable cost is Rs. 150 per unit of the product. The sale price per unit was fixed at Rs.- 200 we have to find cost function revenue function profit function and break even point.

So (a) let x be the number of units produce & sold the cost function c (x). fixed cost + variable cost = 1,00,000+150x

(b) Revenue function = Px = 200x

(c) Profit function p(x) = R (x) – c (x)
= 200x- (1,00,000+150x)
50x- 1,00,00

(d) Break even point P(x) = 0
50x – 1,00,000 = 0

$n = \frac{1,00,000}{50} = 2000$

Hince, x = 2000 is break even point

i.e. when 2000 units of the product are manufacture and sold, there will be no profit and loss.

So mathematics help to understand the different function like cost, revenue profit and break even point also is a systematic manner.

CONCLUSION :-

By the study of the above facts we can conclude that economical theories and concepts are incomplete without the application of mathematics. For understanding the economics theories & concepts it is very necessary to use mathematics in every point of time.

Now a days with the use of mathematical techniques a person can create interest about understanding the economics in a proper manner with different mathematical illustration. In conclusion we can now say that both the subject economies and mathematics are inter related with one another and the application of mathematics cannot be denied in the analysis of economies.

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