ELASTICITY OF DEMAND

[Academic Script]

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Introduction:

The most powerful tools of economics for analyzing the way market forces determine price and production in a competitive market are—Demand and Supply analysis. Before embarking into learning of theory of 'Elasticity of Demand' one needs to have clear understanding of 'Demand' and its determinants.

Demand

The term demand reflects consumer behavior. It shows how much a consumer is willing to buy at a given income, price and time. A mere want is not demand in economics. It can be defined as;

"It is the amount of goods and services consumers are willing and able to buy at a given period of time"

Determinants of Demand

Demand is affected by many variables but according to economists the six principle variables that influence the quantity demanded of a good or service are;

Price of the good or service
The income of consumers
Prices of related goods and services
Taste and preferences of consumers
Future expected prices of the good or service
The number of consumers in the market

Demand Functions

Generalized Demand function: The relation between the quantity demanded and the above mentioned six affecting factors is referred to as the generalized demand function. It shows how all the six variables jointly determine the quantity demanded. In order to discuss the individual effect of any one of the six variables has on the quantity demanded we can change just that variable and explain its influence on demand keeping all other variables constant.

Ordinary Demand function

Traditionally economists have referred to ordinary demand function as simply 'demand function'. It shows the relation between the quantity demanded and price of the product when all other variables affected demand are held constant at specific values. This demand function is derived from the generalized demand function. Thus a demand function expresses the quantity demanded as a function of price of the product only holding constant the effects of income, consumer taste, price of related goods, number of consumers and expected prices.

DEMAND SCHEDULE

Demand schedule is a table showing the list of possible product prices and corresponding quantities demanded. A hypothetical table is shown in the visual.

DEMAND CURVE

A demand curve is a graph showing the relation between quantity demanded and price when all other factors variables influencing price are held constant.
A demand curve is highly influenced by the consumer behavior. A hypothetical demand curve is shown in the visual.

THE LAW OF DEMAND

The law of demand presents the functional relationship between price and quantity demanded. The statement of the law is as follows;
" the quantity demanded increases when price falls and quantity demanded decreases when price rises, other things remaining constant"
Thus price and quantity demanded are inversely related keeping other affecting variables constant.

Explanation

The inverse relationship between price and quantity demanded can be explained by two effects;
Substitution Effect: suppose when prices of a particular good rises, the consumer find its' substitutes comparatively cheaper and so they shift their demand to the substitute goods which leads to the decrease in the demand of the original good.
Income Effect: With the rise in price of goods or services, keeping money income constant ,the consumer's real income decreases i.e. their purchasing power decreases. Thus this leads to the decrease in the quantity demanded.

Change in demand

Demand can change because of any of the six influencing factors. Accordingly these changes can be categorized into two types;
Change in quantity demanded
Change in demand or Shift in demand

Change in quantity demanded

When demand changes because of change in price keeping other variables constant, it is termed as change in quantity demanded. Here the demand moves along the same curve. With the increase in price when quantity demanded decreases, the point on demand curve moves upwards and it is termed as contraction of demand.
Similarly with the decrease in price when quantity demanded increases, the point reflecting demand on the curve moves downwards which is termed as expansion of demand.

Change in demand

Keeping price constant when demand changes due to other variables i.e. income, taste and preference, etc. it is termed as change in demand. Here at the same price due to change in any of the five factors, the demand too changes and one can see that the whole demand curve shifts either towards left or right. Leftward shift is termed as Decrease in demand and rightward shift as Increase in demand.

ELASTICITY OF DEMAND

Introduction

By now we have been introduced to demand and factors affecting it. But for a businessman it is not enough to know that demand for a product decreases with the increase in prices or decrease in income. As a person in market place making real price decision, the business person needs to know the quantitative impact of price change on quantity demanded.

Thus in the most real world situations economist and business analysts cannot just get away by saying "if we raise our prices our sales will fall OR if income rises this quarter then our demand will increase". The question that needs to be answered is "By how much". To measure this we use the concept "ELASTICITY".

'Elasticity' is the measure of responsiveness of one variable to the change in another

Demand Elasticity

'Demand Elasticity is the measure of responsiveness or sensitivity of quantity demanded to the change in its determinants'.

Thus it measures the effect of a change in any factor affecting demand on the total consumption expenditure on a product

Mathematically demand elasticity can be presented as shown in the visual

Not only management of private firms but decision makers within the government have to have an idea of how responsive people in the real world will be with the change in price. The concept of demand elasticity provides managers, economists and policy makers with a

framework for understanding why consumers in some markets are extremely responsive to change in price or other determinants of demand while it is not so in other markets.

Types of demand Elasticity

Economists have identified three main types of demand elasticity;

Price elasticity of demand

Income elasticity of demand

Cross-elasticity of demand

Price Elasticity of Demand

'Price' is one of the important determinants of demand that affects the quantity demanded. Price elasticity of demand measures the relationship between price and quantity demanded for a particular commodity.

Price elasticity of demand is defined as " a measure of the responsiveness of demand to the change in price".

Thus price elasticity of demand shows the relative amount by which the quantity demanded will change in response to the change in price of a particular commodity. Price elasticity of demand is represented by Ed and the formula is shown in the visual

Negative sign

According to the theory of demand price and quantity demanded are inversely related to each other and so the co-efficient of price elasticity of demand shows a negative sign (-ve). Price elasticity is a relative amount as it is the ratio of two percentages i.e the ratio of

percentage change in quantity demanded and percentage change in its price. Thus the absolute value is to be considered and not the algebraic one and the negative sign just reflects the inverse relation between price and quantity demanded.

Types of Price Elasticity

Greater the numerical value of price elasticity greater is the demand responsiveness to price change. Similarly smaller the numerical value of price elasticity smaller the demand responsiveness to price change Due to varying responsiveness of demand to change in price of a commodity economists have categorized price elasticity into 5 types. They are:

Elastic demand (e>1)
Inelastic demand (e<1)
Unitary elastic demand (e=1)
Perfectly elastic demand (e=∞)
Perfectly inelastic demand (e=0)

Elastic Demand (e>1)

When percentage change in quantity demanded is more than percentage change in its price then such a demand is termed as elastic

Elastic demand is also termed as 'more elastic' demand or 'relatively elastic' demand.

From the diagram in the visual one can see that QQ' is greater than PP' which shows that change in demand is greater than change in price

Inelastic Demand (e<1)

When percentage change in quantity demanded is less than percentage change in price then such a demand is termed as inelastic demand

Inelastic demand is also termed as 'less elastic' demand or 'relatively inelastic' demand.

In the diagram shown in the visual QQ' is less than PP' which shows that change in demand is less than change in price.

Unitary Elastic Demand (e=1)

When the percentage change in quantity demanded is proportionate or equal to the percentage change in price then such a demand is termed as unitary elastic demand.

In the diagram shown in the visual QQ'=PP' that change in quantity demanded is equal to change in price.

Perfectly Elastic Demand (e=∞)

When an insignificant or extremely small change in price causes an extraordinary larger change in the demand then it is termed as perfectly elastic demand.

Here a slight rise in price renders the demand zero and a slight fall in price raises the demand to infinity.

It is a case of complete responsiveness

Perfectly Inelastic Demand (e=0)

Irrespective of any change in price, if the quantity demanded remains constant then such a demand is termed as perfectly inelastic demand.

Thus in this type of elasticity change in price fails to bring about any

change in the quantity demanded. It is also termed as zero elasticity and is a case of total unresponsiveness

The last two types are considered as extreme elasticities of demand

Measurements of Price Elasticity

There are three methods to measure price elasticity of demand;

a) Percentage or Ratio method
b) Total outlay method
c) Point method or geometric method

Percentage or Ratio Method

An accurate figure of price elasticity can be obtained by this method. It is also termed as ratio method as price elasticity in this method is calculated by ratio of percentage change in demand and percentage change in price of a commodity

If Q is the quantity demanded and ΔQ is change in quantity demanded and P is price and ΔP is the change in price then symbolically price elasticity is presented as :

$$ep = \frac{\Delta Q}{Q} \times \frac{P}{\Delta P}$$

Or

$$= \frac{\% \Delta Q}{\% \Delta P}$$

Total outlay method

In this method to find out whether demand is elastic or not, the total outlay or the total expenditure of the consumer is considered.

Total outlay= price X quantity (purchased or sold)

Unit Elastic Demand (e=1):

When the total outlay remains constant irrespective of change in price, then it is unit elastic demand

Relatively Elastic Demand (e>1):

With the rise in price if the total outlay falls and vice versa then it is relatively elastic demand

Relatively inelastic demand (e<1):

With the rise in price total outlay rises and with fall in price outlay falls, it is termed as relatively inelastic demand.

The table given in the visual the total outlay method becomes more clear.

Point Elasticity or Geometric Method

Under this method geometrically price elasticity is calculated at any point on the demand curve

The method considers the inverse relationship between price and quantity demanded presented using a demand curve. The demand curve used for point estimation of price elasticity is a linear demand curve with its extreme points touching both the axis as shown in the visual.

The elasticity at any point on the linear demand curve is calculated as

the ratio of the lower segment of the curve below the given point to the upper segment of the curve above the given point

$$\text{Point elasticity} = \frac{\text{Lower segment of the curve}}{\text{Upper segment of the curve}}$$

In this method if the if the ratio of the lower segment to the upper segment is 1 then it is unit elastic demand. At point B

$$\frac{BD'}{BD} = 1$$

If the point of which the elasticity is to be calculated is towards the lower side of the curve like points C, M their elasticity is relatively less and if the points like A,N which are towards the upper side of the curve, their elasticity is relatively more. The diagram in the visual would make it more clear.

Income Elasticity of Demand

Just like price, other determinants of demand like income, related goods too affect quantity demanded. The responsiveness on demand due to change in them is also measured as that of price

A direct relationship exists between the level of consumer's income and the quantity demanded

Income Elasticity of demand can be defined as..

"the ratio of percentage change in quantity demanded to the

percentage change in income”

Income elasticity can be measured by following formula

$$\text{Income elasticity} = \frac{\text{Percentage change in demand}}{\text{Percentage change in income}}$$

Symbolically it is presented as:

$$e_y = \frac{\%\ \Delta Q}{\%\ \Delta Y}$$

Where ΔQ is change in quantity demanded and

ΔY is change in income

Types of Income Elasticity:

The effect of change in income on the quantity demanded vary from product to product just as price. Accordingly income elasticities are as follows;

a) Unitary income elastic ($e_y=1$)
b) Income elasticity greater than 1 ($e_y>1$)
c) Income elasticity less than 1 ($e_y<1$)
d) Zero income elasticity ($e_y=0$)
e) Negative income elasticity ($e_y<0$)

Unitary income elasticity of Demand (ey=1):

When percentage change in quantity demanded is equal to percentage change in income, it is termed as unitary income elasticity.

Symbolically it is represented as:

$$e_y = \frac{\%\Delta Q}{\%\Delta Y} = 1$$

Income Elasticity Greater than 1 (ey>1):

Demand is income elastic or income elasticity is greater than 1 if the percentage change in quantity is greater than percentage change in income

Symbolically it is represented as:

$$e_y = \frac{\%\Delta Q}{\%\,\Delta Y} > 1$$

Income Elasticity Less than 1 (ey<1):

Demand is termed as income inelastic or less than 1 if the percentage change in quantity demanded is less than percentage change in income of the consumer

Symbolically it can be represented as:

$$e_y = \frac{\%\ \Delta Q}{\%\ \Delta Y} < 1$$

Zero Income Elasticity ($e_y=0$):

Sometimes any change in the income does not affect the quantity demanded of a particular product at all. The demand of such a product is zero income elastic

Symbolically it is represented as :

$$e_y = \frac{\%\ \Delta Q}{\%\ \Delta P} = 0$$

Negative Income Elasticity ($e_y<0$):

When rise in income of a consumer actually reduces the demand of a particular product, then such a product it said to have a negative income elastic demand.

Usually inferior goods(Giffen goods) are negatively income elastic. When consumers of such product have a rise in their income, they tend to purchase lesser and lesser of inferior goods and move towards superior goods.

Symbolically it is represented as :

$$e_y = \frac{\%\ \Delta Q}{\%\ \Delta P} < 0$$

Cross Elasticity of Demand

Having discussed the effect of price and income on the quantity demanded and the ways to measure them we now move to understand how price of related goods affect the demand of a particular good.

Cross elasticity of demand measures the degree of responsiveness of demand of a commodity to the change in price of another related commodity (whether a substitute or complementary good)

Thus cross elasticity measures the extent to which the price of a substitute or complementary good affects the demand of a particular good

Cross elasticity of demand between goods A&B can be presented as

$$\text{Cross elasticity of AB} = \frac{\text{Percentage change in demand of A}}{\text{Percentage change in price of B}}$$

Symbolically is presented as :

$$e_{AB} = \frac{\Delta Q_A}{Q_A} \div \frac{\Delta P_B}{P_B}$$

Types of Cross Elasticity

From business people to planners the concept of cross elasticity of

demand is equally important as that of price and income elasticity. Following are the three types of cross elasticity;

a) Positive Cross Elasticity of Demand
b) Negative Cross Elasticity of Demand
c) Zero Cross Elasticity of Demand

Positive Cross Elasticity of Demand (Substitute):
Substitute goods reflect positive cross elasticity of demand. Positive cross elasticity of demand is the ratio of percentage increase(decrease)in the demand of A to the percentage increase(decrease) in the price of B

$$e_{AB} = \frac{\text{Percentage increase in demand of A}}{\text{Percentage increase in price of B}}$$

Example; With the rise in price of coffee ,the consumers of coffee find tea relatively cheaper and so shift to tea. Thus with the rise in price of coffee the demand of tea rises

Negative Cross Elasticity of Demand (Complementary)
Complementary goods reflect negative cross elasticity between them. Negative cross elasticity of demand is the ratio of percentage increase(decrease) in demand of A to the percentage decrease(increase) in price of B

$$e_{AB} = \frac{\text{Percentage increase in demand of A}}{\text{Percentage decrease in price of B}}$$

Example: Petrol and petrol car as complementary goods. With rise in price of petrol, there is a fall in demand for petrol cars.

Zero Cross Elasticity of Demand

If two products are not at all related or zero relation exists between them then these goods are said to have zero cross elasticity. Thus when price of one product have no effect on the demand of another, then it is termed as zero cross elasticity

Example: price of cars and demand for books have no relation between them and so have zero cross elasticity of demand.

Average Revenue, Marginal Revenue & Elasticity of Demand:

Let us now discuss the relationship between Average revenue(AR), Marginal revenue(MR) and elasticity of demand(Ed) . Firstly we shall define the above concepts which would then facilitate us in understanding the interrelationship between them.

Total Revenue (TR)

Total revenue is the product of the total quantity sold (Q) and the price per unit (P).

Average Revenue (AR);

Average revenue is the per unit of output sold.

Marginal revenue (MR):

Marginal revenue is the addition in the total revenue by selling one additional unit of output.

AR, MR & Ed

With the rise in quantity sold and fall in price when total revenue (TR) rises, then it is elastic demand

With the rise in quantity sold and fall in price when total revenue (TR) falls, then demand is inelastic.

The relationship between AR, MR, Ed is graphically presented in the visual and is explained as under;

When MR is +ve in the diagram, from the quantity 0 to 60, the TR is rising with fall in price in diagram A. thus demand is elastic.

When MR is –ve at any quantity above 60, the TR decreases with price fall. The demand here is inelastic

When MR is 0 and TR is maximum, elasticity is unitary at 60.

Determinants of Elasticity of Demand

Determinants of elasticity of demand constitute those factors which affect the elasticity of a product. The three main determinants are as follows;

a) Existence of substitute
b) Length of time allowed for adjustment
c) Share of the product in the consumer's budget

Existence of Substitute

The number of substitutes and also their closeness affects the elasticity of demand. Larger and closer the substitutes available, more is the elasticity of demand and vice-versa.

The reason is if price of product having good substitute rises, the consumer will reduce its consumption and shift to the substitute. Thus the demand of the original product falls. Reverse reaction would happen if the product had no or less close substitute

Length of time allowed for adjustment

Longer the time allowed for adjustment of the change, more is the demand elasticity and shorter the time allowed for adjustment, lesser is the demand elasticity.

This can be explained as when long period is available for adjustment to the change in price of a commodity, the consumer has enough time to change either the pattern of consumption or search for closer substitutes. This makes the demand for that product elastic. Similarly shorter the time available for adjustment, lesser would be the elasticity.

Share of the product in consumer's budget

It is also observed that price elasticity is directly related to the share of consumer's income spent on that product. Thus milk takes a larger share of a housewife's kitchen as compared to salt and so former is comparatively more elastic than the later one

Importance of Elasticity of Demand

The measurement of demand responsiveness is not only important for

the businessmen but also for the policy makers

Using the elasticity theories now the managers can decide whether to opt for a price rise or to go for "BUY ONE GET TWO FREE" to raise their revenues. Thus concepts of elasticity of demand guide the businessmen in deciding pricing strategies considering the type of product, income of consumer and price of related goods.

The fiscal policy framers while preparing the budget or making any policy, always have to keep in mind how much the taxes or the subsidies are going to affect the demand or supply of the goods and services. Necessities, luxuries, comforts, durables, perishable goods, etc all have different elasticity so would be differently affected by price cuts or hikes.