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Demand, Supply, Market Equilibrium and Elasticity

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1. Theory of Demand

The term demand has a precise meaning in economics. It refers to the willingness and ability of buyer to purchase different quantities at different prices during a specified period of time. Demand in economics must be effective (effective demand). This means that an actual demand will arise for a product only when consumer has both willingness to buy and ability to buy (purchasing power) a particular product.

Basically demand relates the quantities purchased at different prices. Price is an important determinant of demand, yet the influences of other factors cannot be under estimated.

The theory of demand describes the demand and its determinants. The demand for a particular good or service is determined by a host of factors such as the price of the good, prices of other related goods, consumer's income, consumers' expectations on future prices and incomes, government net taxes, social, demographic and cultural factors, geographic and climate factors, advertisement, and so on.

The relationship between demand and its determinants can be described using an equation.

QDX = f (PX, P1…Pn, Y, EX, TNET, SDC, GC, AD) Where,

QDx = demand quantity of X production

f = functional notation

Px = price of X product

P1..Pn = price of 1 to n number of related products

Y = consumer income

Ex = consumers' expectations on future price and income

TNET = government taxes

SDC = social, demographic and cultural factors

GC = geographical and climate factors

AD = advertisements

The relationship between demand quantity and its determinants can be positive or negative. For example the relation between price of the product and the quantity demanded is negative in general while the relationship between consumer income and demand quantity is positive. These factors can operate simultaneously to determines the quantities that the consumer purchases. To understand the influence of a single factor on demand quantity more precisely, we have to assume that the factors determining demand other than the factor we are going to examine remain unchanged during the period of study. This is known as the 'ceteris paribus' assumption in economic analysis of the market.

2. The Law of Demand

The law of demand states the relationship between the quantity demanded and the price of the product while the other factors affecting to the demand remain unchanged. There is an inverse relationship between the price and quantity

demanded. Therefore the law of demand can be defined as 'ceteris paribus, higher the price lower the quantities demanded and lower the price higher the quantities demanded'

P↑→QD↓ (ceteris paribus)

P↓→QD↑ (ceteris paribus)

The law of demand can be explained using a schedule (demand table), a graph (demand curve) or an equation (demand equation).

Demand schedule / table

A demand schedule is one way of showing the relationship between the price and quantity demanded of a product. It is the tabular presentation of the law of demand. It specifies the units of a good or a service that consumers are willing and able to purchase at alternative prices during a given period of time.

Eg.

P (Rs.)	Qd (units)
10	300
20	200

Demand curve / graph

Demand curve is the graphical presentation of the law of demand. Due to the inverse relationship between the price and quantity demanded of a product, the demand curve will slope downward from left to right. That means the demand curve is having a negative slope

Demand equation

The equational presentation of the law of demand is called as demand equation. It shows the relationship between these two variables, price (independent variable) and quantity demanded (dependent variable) in an equational from.

Qd = a – bp

Qd = Quantity demanded

P = Price of the product

a = Intercept (Maximum quantity demanded when the price is zero)

b = Slope of the demand curve

Using a demand equation, a demand schedule and a demand curve can be prepared. Further, demand equation can be constructed using the data given in a demand schedule.

Why the demand curve slopes downwards? There are two main reasons to justify the negative relationship between price and quantity demanded.

- The income effect
- The substitution effect

  ▪ Income Effect

  When the price of a product changed, the real income (the purchasing power) of the consumers is changed. Therefore, the number of units that can be purchased from his money income will be changed. For example, when a commodity's price falls, the purchasing power of an individual increases, though the money income remains unchanged. And it allows him to purchase more of units. This is known as income effect.

  ▪ Substitution Effect

  When a commodity's price falls, it is cheaper in the market with related to the other substitute products. Thus, an individual normally purchases more of this good since he is likely to substitute it for the other goods whose price has not changed. For example, when coffee price fall, and the tea price is unchanged, more coffee and less tea will be purchased. This is called as substitution effect.

3. The movement along the demand curve and the shift of the demand

Movement along the demand curve

A change in the commodity's price result in a movement along the existing demand curve and it is called as a change in Quantity Demanded.

An increase in quantity demanded due to a decrease in price is called "Extention of demand", and it is given by a downward movement along the same demand curve. A decrease in quantity demanded when the price increased, is known as "Contraction of demand", and it can be illustrated by upward movement along the existing demand curve.

Shift of the demand

A shift of the demand curve is classified as a change in demand. The demand curve shifts when variables other than the price of the commodity changed.

Favorable change in other factors leads to shift the demand curve rightward (outward) and it is called "Increase in Demand". When other factors changed unfavorably to the product, there will be leftward shift in the demand curve and it is called as "Decrease in Demand".

4.   Theory of Supply

The theory of supply explains the producers' side of the market. Supply refers to the quantities that the supplier is willing and able to supply at different prices during a specified period of time. From a business perspective cost of production is an important determinant of supply. Supply is determined by a number of factors including the following: price of the good, price of other related goods, cost of production, government policies, level of technology, climate and geographical conditions and so on.

The relationship between supply and its determinants can be described using an equation.

QSX   = f (Px, P1..Pn, Cp, Go, TNET, GC) where,

QSX   = Supply quantity of X product

f = functional notation

Px   = price of X product

P1..Pn   = price of 1 to n number of related products

Cp   = cost of production

Go   = government policies

TENT   = net government taxes

GC   = geographical and climate factors

5.   The Law of Supply

The relationship between the price and quantity supplied is known as the law of supply. Ceteris paribus, the law of supply states that higher the price, higher the quantity supplied and lower the price lower the quantity supplied.

P↑→ QS↑ (ceteris paribus)

P↓→ QS↓ (ceteris paribus)

The law of supply can be explained using a schedule (supply table), a graph (supply curve) or an equation (supply equation).

Supply Schedule

Supply schedule is the numerical presentation of the law of supply. It specifies the number of units of a good or a service that a producer is willing to supply at alternative prices over a given period of time

P (Rs.)	Qs (units)
10	200
15	350

Supply curve

The supply curve is the graphical presentation of the law of supply. The supply curve normally has a positive (upward) slope, due to the positive relationship between price and quantity supplied of a product.

Supply equation

The equational presentation of the law of supply is called as Supply equation. It shows the relationship between these two variables, price (independent variable) and quantity supplied (dependent variable) in an equational from.

$Qs = a + bP$

Qs	= Quantity supplied
P	= Price of the product
A	= Intercept (Maximum quantity supplied)
b	= Slope of the supply curve

6. The movement along the supply curve and the shift of the supply

Movement along the supply curve

A Change in the commodity's price results in a movement along the existing supply curve and it is defined as a change in quantity supplied. An increase in quantity supplied due to increase in price is called "Extension of Supply", and decrease in quantity supplied, due to a decrease in price is called "Contraction of Supply".

Shift of the supply

A shift of the supply curve is classified as a Change in Supply. Supply curve shifts when variables other than the price of the commodity change.

A supply curve shifts rightward when there are favorable changes in other factors affecting to supply, and it is called as "increase in Supply". "Decrease in supply" refers to inward (leftward) shift in the supply curve and it happens when there are unfavorable changes in the other factors affecting to supply.

7. Market Equilibrium

To understand how the free market determines the price, we must compare the desires   of consumers (demand) and producers (supply) to see whether the two plans are consistent. Market is said to be in equilibrium when the demand equals supply.

We can show such equilibrium by a demand and supply diagram in which we draw the demand and supply curve together. Notice that, for reasons already discussed the demand curve has a negative slope and the supply curve has a positive slope. In free market, price and quantity are determined by the intersection of the demand and supply curves.

The market condition where the quantity of a commodity that consumers are willing to purchase, exactly equals the quantity that producers are willing to supply is called as "Market Equilibrium".

Graphically equilibrium occurs at the intersection of the commodity's market demand and market supply curves. The price and quantity at which equilibrium exists are known as the equilibrium price and the equilibrium quantity.

Table 2.3 Determination of the Equilibrium Price and Quantity

Price per unit	Quantity Demanded	Quantity Supplied	Surplus/Shortage	Price Direction
7.00	70	40	Shortage	Rise
7.10	65	50	Shortage	Rise
7.20	60	60	Neither	Unchanged
7.30	55	70	Surplus	Fall
7.40	50	80	Surplus	Fall

Equilibrium price is the price that clears the market, since Qd = Qs at the price. At any price above the equilibrium price, there is an excess supply and any price below the equilibrium price, there is an excess demand.

8. Effects of Change in Demand or Supply on Equilibrium

A change in demand (shift of the demand curve) and / or a change in supply (shift of the supply curve) can change equilibrium price and quantity.

Leftward shift of the demand curve

- A fall in the demand for a commodity (a leftward shift of the demand curve) causes a decrease in both the equilibrium price and the equilibrium quantity.

Rightward shift of the demand curve

- A rise in the demand for a commodity (a rightward shift of the demand curve) causes an increase in both the equilibrium price and the equilibrium quantity.

Leftward shift of the supply curve

- A fall in the supply of a commodity (a leftward shift of the supply curve) causes an increase in the equilibrium price and a decrease in the equilibrium quantity.

Rightward shift of the supply curve

- A rise in the supply for a commodity (a rightward shift of the supply curve) causes a decrease in the equilibrium price an increase in the equilibrium quantity.

9. Elasticity

Elasticity is basically the responsiveness of a variable to change in another variable. It provides a numerical measure to understand the degree of change of one variable on another.

Price Elasticity of Demand

Price elasticity of demand measures the responsiveness of the quantity demanded to a change in price of the good. We know that there exists a negative relationship between the price and quantity demanded – a higher price will lead to a lower quantity demanded and a lower price lead to a higher quantity demanded. But we do not know in what percentage the quantity demanded will change to a percentage change in price, the price elasticity provides such a measure.

Governments, business firms, supermarkets, and law courts all need a way to measure how responsive demand is to price changes. The price elasticity of demand is defined as the ratio of percentage change in quantity demanded to the associated percentage change in price.

The degree to which quantity demanded responds to changes in the product's own price is called the "price elasticity of demand".

It measures the percentage change in quantity demanded of a product to given change in the price of the product and it is calculated as follows.

Price elasticity of demand $\quad = \quad \dfrac{\text{Percentage change in quantity Demanded}}{\text{Percentage change in price}}$

$$PDE \quad = \quad \frac{\%\Delta Qd}{\%\Delta P}$$

$$PDE \quad = \quad \frac{\Delta Qd}{\Delta P} X \frac{P}{Qd}$$

Arc elasticity of demand

If we are measuring the responsiveness of demand to a large change in price, we can measure elasticity between two points on the demand curve; the resulting measure is called the arc elasticity of demand. We calculate the **arc elasticity of demand** from the percentage change in quantity relative to average quantity for the relevant range of output, and from the percentage price change relative to the average of the corresponding price range.

Point elasticity of demand

If we wish to measure the responsiveness of demand at one particular point in the demand curve, we can calculate a **point elasticity of demand**, without averaging price and quantity over a range.

Values of PED

The value of PED varies from zero to minus infinity. According to that value, PED can be divided in to five sub categories.

- If the value of PED = 0   Perfectly Inelastic Demand

- If the value of PED 0 < 1   Inelastic Demand

- If the value of PED = 1   Unitary Elastic Demand

- If the value of PED 1> ∞   Elastic Demand

- If the value of PED = ∞   Perfectly Elastic Demand

Table 2.4 Type of Elasticity of Demand

Type of Elasticity of demand	Elastic coefficient Quantity Change	Price Changes vs.	Type of Demand
Perfectly Elastic	PED = ∞	ΔQD, ΔP = 0	Horizontal
Elastic	PED 1>	ΔQD > ΔP	Relatively flat
Unitary Elastic	PED = 1	ΔQD = ΔP	Hyperbola
Inelastic	PED < 1	ΔQD < ΔP	Relatively Steep
Perfectly Inelastic	PED = 0	ΔQD = 0, ΔP	Vertical

The price elasticity of demand coefficient takes any value between zero and infinity. Since price and quantity demanded move in the opposite directions the demand elasticity coefficient takes the negative value. The negative sing is ignored when we make inferences / conclusions using demand elasticity coefficient.

There exist a close link between the slope of the demand curve and the price elasticity coefficient. The flatter the demand curve higher the elasticity coefficient and vice versa. The greater change in quantity demanded in comparison to a change in price will make the demand curve flatter. The greater change in price relative to the change in quantity demanded will make the demand curve steeper. On a rectangular hyperbola, the percentage change in both price and quantity demanded are equal and thus the elasticity coefficient is equal to one. Moreover, all five types of elasticity coefficients can be found on a downward sloping demand curve. Elasticity coefficient at the horizontal intercept is zero and that of the vertical intercept is infinity. At the mid-point of the demand curve the elasticity coefficient is equal to one. At the range in between the horizontal intercept and the mid-point the elasticity coefficient is less than one. The range between the mid-point and the vertical intercept of the demand curve, the elasticity coefficient is greater than one.

The Determinants of Price Elasticity of Demand

Price elasticity of demand of good is determined by a host of factors:

i. Availability of close substitutes

If consumer can find an acceptable substitute for a product whose price rises, the consumer will switch readily. For them the demand is more price elastic. On the other hand, if there are no close substitutes price elasticity tends to be inelastic. Vegetables, petrol, and electricity are examples for products with inelastic demand.

ii. Nature of the good

Necessities such as basic foodstuffs normally have relative inelastic demand curve. Because, consumers demand of those products responds very little to price changes. In contrast, many luxury goods such as hotel meal and foreign travel have rather elastic demand curves.

iii. Share of consumer's budget

Very inexpensive items that absorb very little portion of the consumer budget tend to have inelastic demand (for example: short distant buss travel, salt for household). Luxury item which usually absorb a greater part of the budget tend to have elastic demand (for example: purchasing decision of an expensive television set).

iv. Passage of time,

The time period is relevant because the demand for many goods is more elastic in the long run than in the short run. Consumers can find substitutes or change their behavior in the long run so that the good will have an elastic demand in the long run.

v. Habit forming goods

Goods such as cigarettes and drugs have inelastic demand. Preferences are such that habitual consumers of certain products become de-sensitive to price changes.

Income Elasticity of Demand

Income elasticity of demand measures the relationship between a change in quantity demanded and a change in income. The basic formula for calculating the value of income elasticity is:

Income elasticity of demand = $\dfrac{\text{Percentage change in quantity Demand}}{\text{Percentage change in income}}$

$$YED = \frac{\%\Delta Od}{\%\Delta Y}$$

$$YED = \frac{\Delta Qd}{\Delta Y} \frac{X}{} \frac{Y}{Qd}$$

Though the value of PED is always negative, YED can have both positive and negative values and that values depend on the nature of the products concerned.

Normal goods

Normal goods have a positive income elasticity of demand. We make a distinction between normal necessities and normal luxuries (both have a positive coefficient of income elasticity).

Normal necessities

Necessities have an income elasticity of demand between 0 and +1. Demand rises with income, but less than proportionately. Often this is because we have a limited need to consume additional quantities of necessary goods as our real living standards rises. The class examples of this would be the demand for fresh vegetables, toothpaste and newspapers. Demand is not very sensitive at all to fluctuations in income. In this sense total market demand is relatively stable following changes in the wider   economic (business) cycle.

Normal Luxuries

Luxuries on the other hand are said to have an income elasticity of demand > + 1. (Demand rises more than proportionate to change in income). Luxuries are item we can (and often do) manage to do without during periods of below average income and falling consumer confidence. When incomes are rising strongly, the demand for luxury goods will grow. Conversely in a recession or economic slowdown, consumers will stop spending on luxury goods (demand will fall more than proportionately to change in income).

Inferior goods

Inferior goods have a negative income elasticity of demand. Demand falls as income rises. In a recession the demand for inferior products might actually grow.

Cross Elasticity of Demand

The responsiveness of quantity demanded of a product to changes in the prices of other related products is identified as cross price elasticity of demand. Normally, changes in the prices of substitutes and complements are taken into consideration.

The basic formula for calculating the value of cross elasticity of demand is:

Cross elasticity of demand   = Percentage change in quantity Demanded of X

Percentage change in price of Y

$$XED = \frac{\%\Delta QdX}{\%\Delta Py}$$

$$XED = \frac{\Delta QdX}{\Delta Py} \times \frac{Py}{QdX}$$

With cross price elasticity, an important distinction can be made between substitute products and complementary goods and services. Accordingly, the value of cross elasticity of demand can be either positive or negative and it depends on the nature of the products.

Substitutes: with substitute goods, an increase in the price of one good will lead to an increase in demand for the rival product. Cross price elasticity for two substitutes will be positive.

Complements: with goods that are in complementary demand, when there is a fall in the price of one product, it leads to an expansion in market demand for the other product. The cross price elasticity of demand for two complements is negative.

The stronger the relationship between two products, the higher is the co-efficient of cross-price elasticity of demand. For example with two close substitutes, the cross-price elasticity will be strongly positive. Likewise when there is a strong complementary relationship between two products, the cross-price elasticity will be highly negative. Unrelated products have a zero cross elasticity.

Price Elasticity of Supply (PES)

Price Elasticity of Supply = Percentage change in Quantity Supplied

Percentage change in price

$$PES = \frac{\%\Delta Qs}{\%\Delta P}$$

$$PES = \frac{\Delta Qs}{\Delta P} \times \frac{P}{Qs}$$

When PES =0, supply is perfectly inelastic

When PES < 1, then supply is price inelastic

When PES =1, supply is unitary elastic

When PES > 1, then supply is price elastic

When PES =∞, supply is perfectly elastic

What are the factors that affect Price Elasticity of Supply of a product?

- **Spare production capacity**

  If there is plenty of spare capacity then a business should be able to increase its output without a rise in costs and therefore supply will be elastic in response to change in price. The supply of goods and services is often most elastic in a

recession, when there is plenty of spare labor and capital resources available to step up output as the economy recovers.

- ## Stocks of finished products and components

  If stock of raw materials and finished products are at a high level then a firm is able to respond to change in demand quickly by supplying these stocks onto the market and supply will be elastic. Conversely when stocks are low, supplies force prices higher and unless stocks can be replenished, supply will be inelastic in response to a change in demand.

- ## The ease and cost of factor substitution

  If both capital and labor resources are occupationally mobile then the elasticity of supply for a product is higher than if capital and labor cannot easily and quickly be switched.

- ## Time period involved in the production process

  Supply is more price elastic in the long run and firm is allowed to adjust its production levels.