

Demand Analysis

Introduction:

A product or service is said to have demand when 3 conditions are satisfied.

- ⇒ Desire on the part of the buyers.
- ⇒ Willingness to pay for it.
- ⇒ Ability to pay the specified price for it.
- ⇒ Unless all these conditions are fulfilled, the product is not said to have any demand.

formula's

$\text{Demand} = \text{Desire} + \text{Willingness} + \text{Ability}$ to buy at a particular market.

Demand Function:

Demand function is a function which describes a relationship between variable and its determinants. It describes how much quantity of goods is bought at alternative prices of goods and related goods, alternative income levels and alternative values of other variables affecting demand.

Mathematically, the demand function for a product can be expressed as follows

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$Q_d = f(P, I, T, P_r, E_p, E_I, S_p, A, O)$

The below factors are known as determinants of demand.

P = Price of a product

I = Income of the consumer

T = Tastes and preferences of the consumer

P_r = Price of related goods

E_p = Expectations of future price

E_I = Expectations of future income

S_p = Size of population

A = Advertisement

O = other factors affecting demand

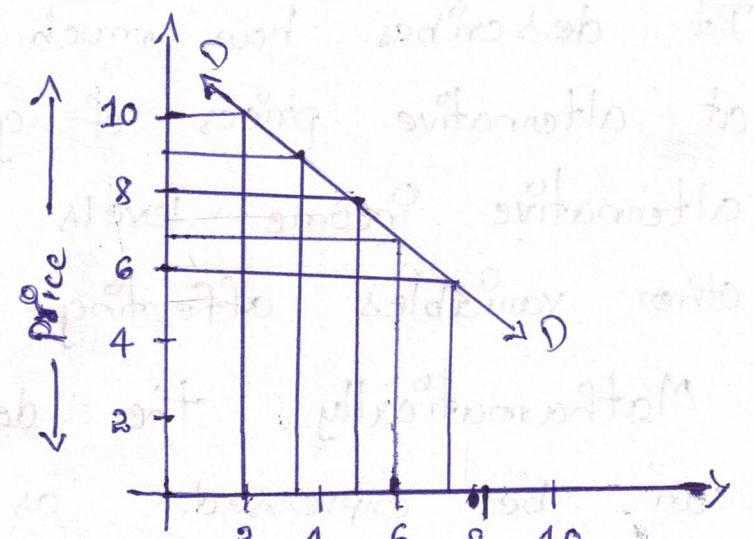
law of demand

Law of demand states that the relationship between 'Price' and 'Quantity' of demand. The relationship between price and demand is inverse.

The law of demand states that: Other things remaining the same, the amount of quantity demand rises with every fall in the price and vice versa.

Demand schedule: It is list of quantities of a commodity purchased by a consumer at different price.

| Price of Product (Rs) | Quantity demand (units) |
|-----------------------|-------------------------|
| 10 | 2 |
| 9 | 3 |
| 8 | 5 |
| 7 | 6 |
| 6 | 7 |



When price falls from Rs 10 to Rs 9, quantity demanded increases from 2 to 3, on the basis of demand schedule we can draw demand curve. The demand curve 'DD' slopes down from "Left to Right."

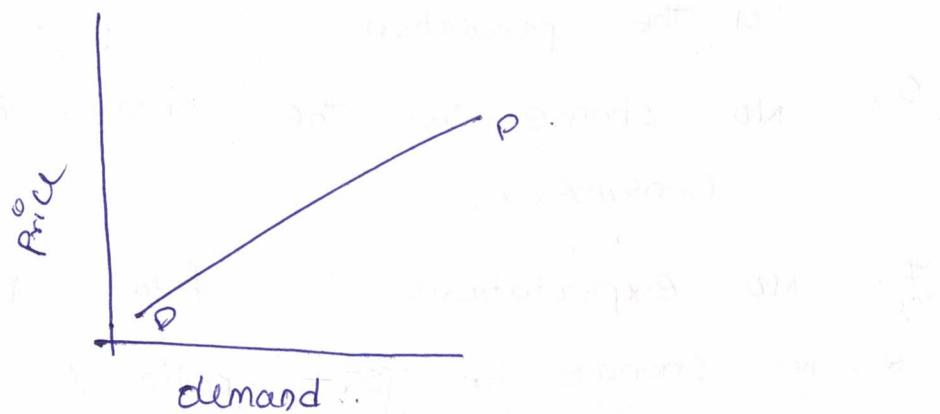
Law of demand - Assumptions :-

1. No change in consumer's income.
2. No change in Price of related products.
3. No change in consumers tastes & preferences.
4. No change in fashion.
5. No change in size, age - composition & sex ratio of the population.
6. No change in the range of good available to consumers.
7. No expectations of future price changes.
8. No change in govt policies.
9. No change in weather conditions.

law of demand - Exceptions :-

- ①. Giffen goods :- Robert giffen has made a study on expenditure pattern of workers in Ireland in the 19th century. In ~~this~~ his point of view the giffen goods, are exceptions to the law of demand.

Normally the working class in Ireland used to bring the class have potatoes & meat as daily consumption, potato being the main food. When there was an increase in the price of potatoes, the same quantity was consumed, as it was an essential item. to buy the same quantity of potato, more money had to be spent. As a result, less money was available for buying meat. Due to that the consumption of meat became less. Thus giffen has indicate this position as a 'Paradox' which is against to law of demand.



② Veblen goods: Demand for prestige goods will actually be demanded more with a rise in price. These goods are called "Veblen goods". Ex: Diamonds.

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③ speculative effect: law of demand does not operate in case of speculation demand. When there is a expectation of future rise in the price of a commodity, the demand will grow more & more even with a rising price. Ex: shares

④ Ignorance / Impulse buying: Sometimes, the quality of the commodity is judged by it's price. Consumers think that the product is superior if the price is high. As such, they buy more at a higher price.

⑤ Fear of scarcity: during the times of emergency or war people may expect shortage of a commodity at that time they may buy more even at a high price to keep stocks for the future

⑥ Necessaries: In case of essential commodities, the quantity demand will remain the same irrespective of the change in price.

Ex: Salt.

ELASTICITY OF DEMAND

Marshall introduce the concept of elasticity of demand. It explains the degree of relationship between the demand determinants and the quantity demanded. Elasticity of demand can be defined as "The rate of responsiveness in the demand of a commodity for a given changes in Price or any other determinants of demand".

Types of elasticity

- a) Price elasticity of demand (E_p)
- b) Income elasticity of demand (E_I)
- c) Cross elasticity of demand (E_c)
- d) Advertising elasticity of demand (E_A)
- e) Price elasticity of demand Refers "The rate of responsiveness in the demand of a commodity for a given changes in price and keeping other determinants are constant".

The relationship b/w 'price' & 'demand' is "inverse"

$$\text{Price elasticity of demand} = \frac{\text{Proportionate change in the quantity demand for a product 'x'}}{\text{Proportionate change in the price of 'x'}}$$

Simbally. The same is expressed as

$$E_p = \frac{(Q_2 - Q_1) / Q_1}{(P_2 - P_1) / P_1}$$

where

E_p = Price elasticity of demand.

Q_2 = Quantity demand after price change

Q_1 = " " before price change

P_1 = Price before change

P_2 = Price after change

(b) Income elasticity of demand (E_I) Refers

"The rate of responsiveness in the demand of a commodity for a given changes in income of consumer and keeping other determinants are constant"

Income elasticity normally "positive".

Income elasticity } Proportionate change in quantity
of demand } demand for a product 'X'
Proportionate change in income

The same is expressed as

$$E_I = \frac{(Q_2 - Q_1) / Q_1}{(I_2 - I_1) / I_1}$$

where

$E_I >$ Income elasticity of demand.

Q_1 = Quantity demand before change

$\theta_2 = n$ after change.

$I_1 = \text{Income before change}$

$I_2 > \text{Income after change}$

② Cross Elasticity of demand :- (E_c): refers "The rate of responsiveness in the demand of a commodity for a given change in price of related goods, which may be substitute or complement and keeping the other determinants constant"

It is positive for Substitutes & negative for Complements.

$$\text{Cross elasticity of demand} = \frac{\text{Proportionate change in quantity demanded for product } X}{\text{Proportionate change in price of product } Y}$$

$$E_C = \frac{(Q_2 - Q_1)/Q_1}{(P_{2y} - P_{1y})/P_{1y}}$$

where

E_g = cross elasticity demand.

Q_1 = Quantity demand before change.

θ_2 : Quantity demand after change.

Piy2 price before change

$P_2y = \text{Price after change in case of Product } y$

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- ④ Advertising Elasticity (EA) or refers "The rate of responsiveness in the demand of a commodity for a given change in advertisement expenditure & keeping other determinants constant".

It is always positive.

$$\text{Advertising elasticity} = \frac{\text{Proportionate change in quantity demand for product } X}{\text{Proportionate change in advertisement cost}}$$

The same is expressed as.

$$E_A = \frac{(Q_2 - Q_1)/Q_1}{(A_2 - A_1)/A_1}$$

where E_A = Advertising elasticity.

Q_1 = Quantity demand before change.

Q_2 = Quantity demand after change

A_1 = amount spent on advertising before change

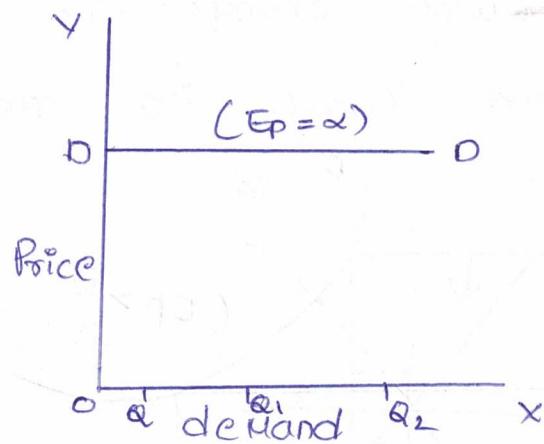
A_2 = Amount spent on advertising after change.

Measurements of Elasticity (or) Types of Price Elasticity:

The elasticity is measured in the following ways:

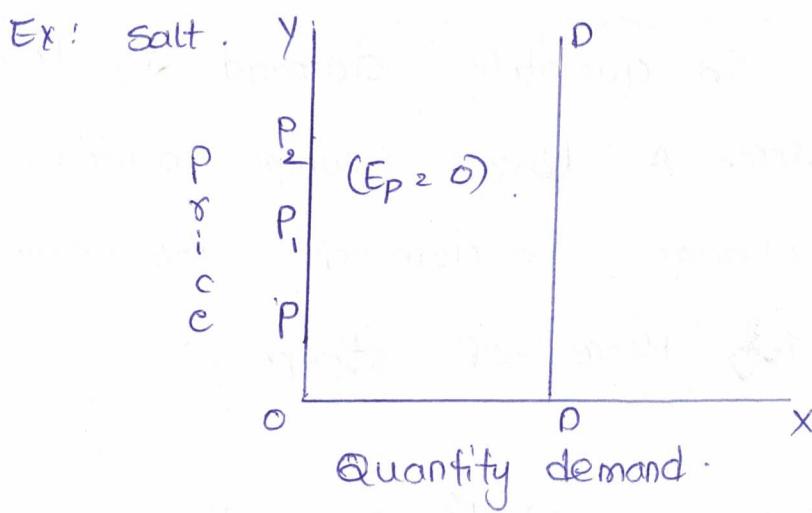
- (a) Perfectly elastic demand ($E_p = \infty$): It implies that a small change in price leads to an infinite change in demand. It is called "perfectly elastic demand".

The shape of demand curve is horizontal.



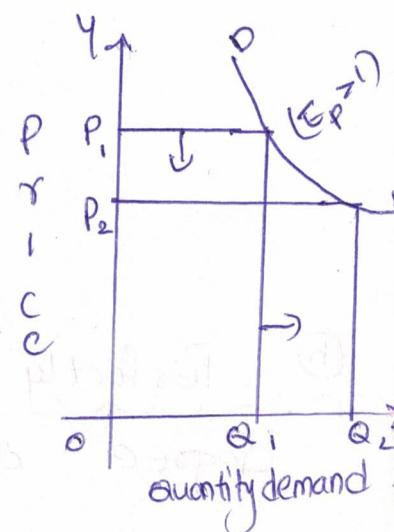
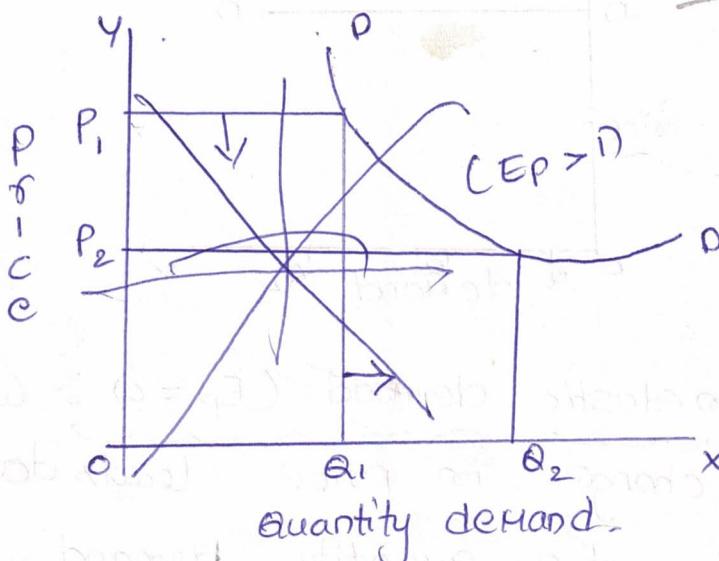
- (b) Perfectly inelastic demand ($E_p = 0$): where a significant degree of change in price leads to a little or no change in the quantity demand, then the elasticity is said to be "perfectly inelasticity".

The shape of demand curve is vertical.



The concepts of perfectly elastic, perfectly inelastic demand do not manifest in real life.

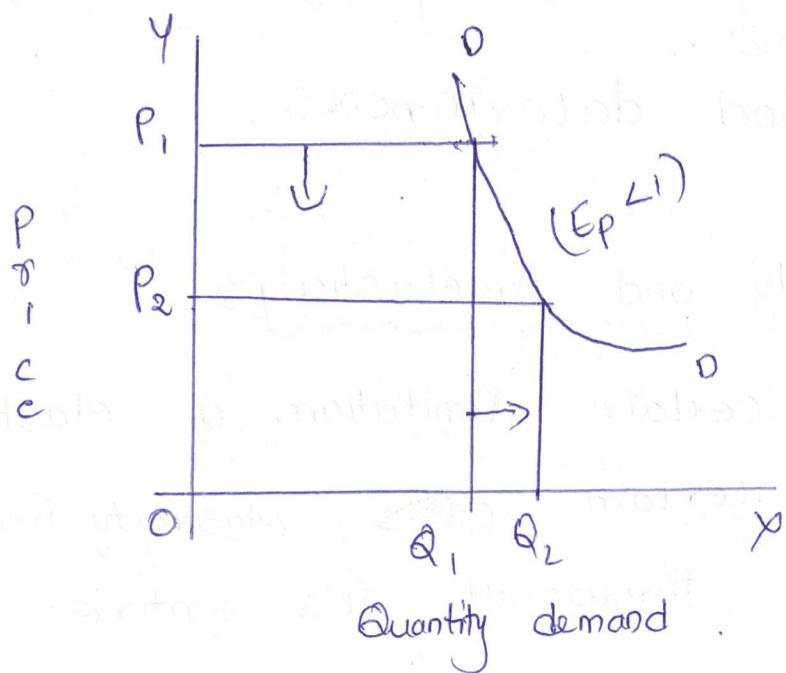
(c) Relative elastic demand ($E_p > 1$) :- In this case the proportionate change in quantity demand is greater than that of price. A small change in price leads to a large change in demand. The shape of demand curve is more of flat.



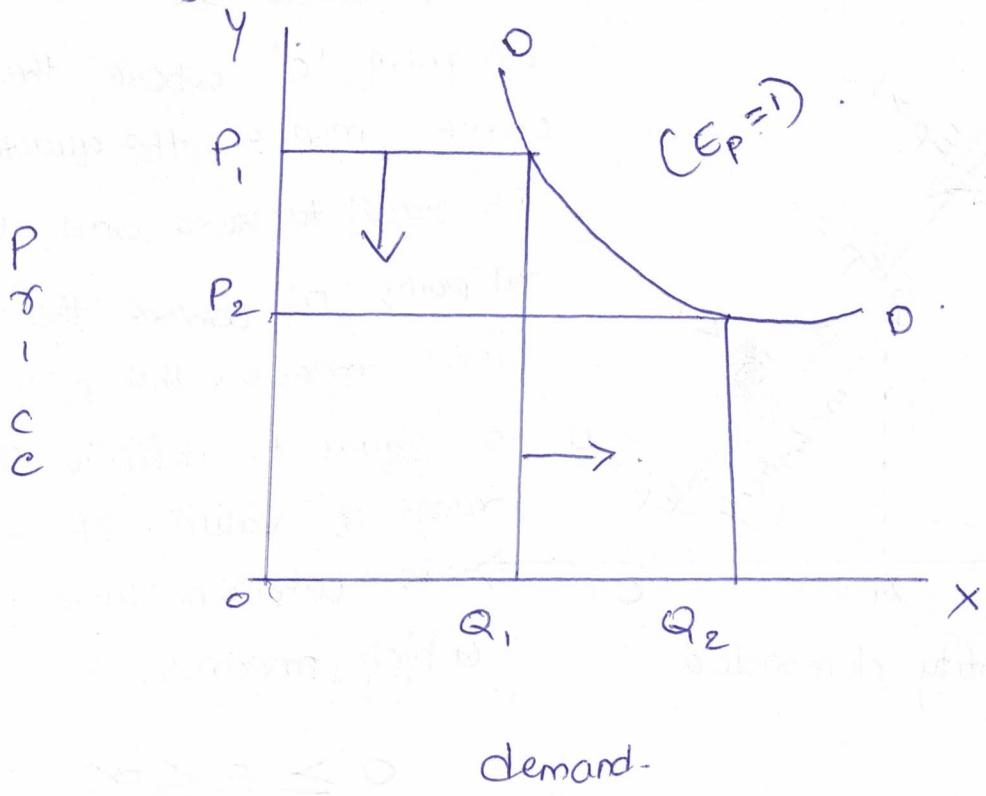
Ex:- Bank interest rate

(d) Relatively inelastic demand ($E_p < 1$) :- In this case, the proportionate change in quantity demand is lesser than that of price. A large change in price leads to small change in demand. The shape of demand curve is more of steep.

Ex:- Public utility like electricity, consumption, water charges, rail transport.



② unity elasticity: ($E_p = 1$) :- IF the proportionate change in quantity demand is exactly same as the change in price, the demand is said to be "unity elasticity of demand". The shape of demand curve is "rectangular hyperbola".



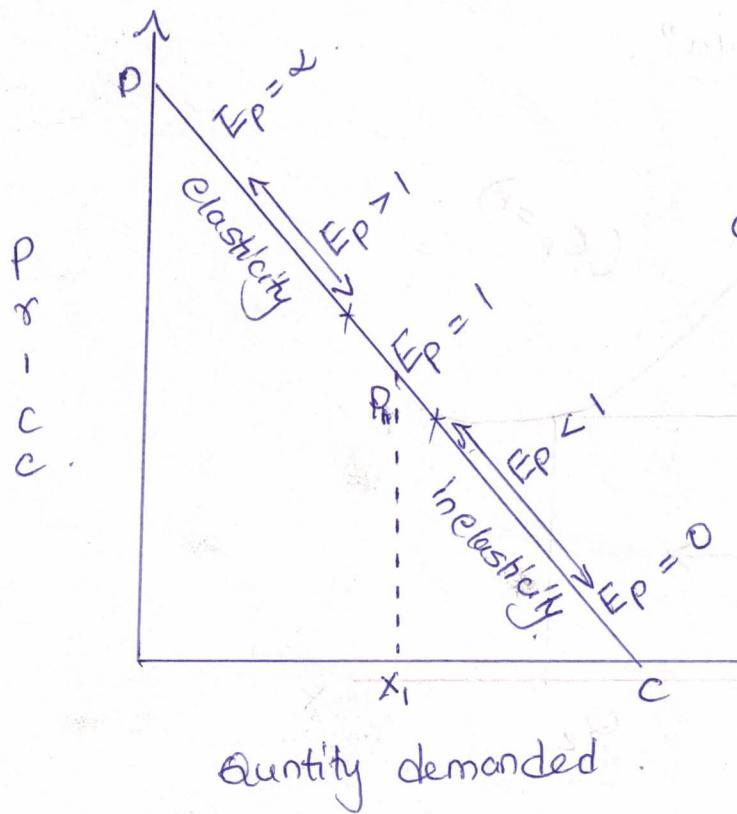
Factor governing demand write demand determinants.

Point Elasticity and Arc elasticity of demand.

There are certain limitations of elasticity of demand. In certain cases, elasticity for a given demand curve throughout its entire length will not be the same i.e.

① Perfectly elastic ② Perfectly inelastic ③ Unity elasticity

The following figure shows the changing elasticity at different points of a demand curve.



It can be seen that elasticity at point 'C' where the demand curve meets the quantity axis is equal to zero and elasticity at point 'D' where the demand curve meets the price axis is equal to infinity. Thus the range of value of elasticity is between zero & infinity which means.

$$0 \geq e \leq \infty$$

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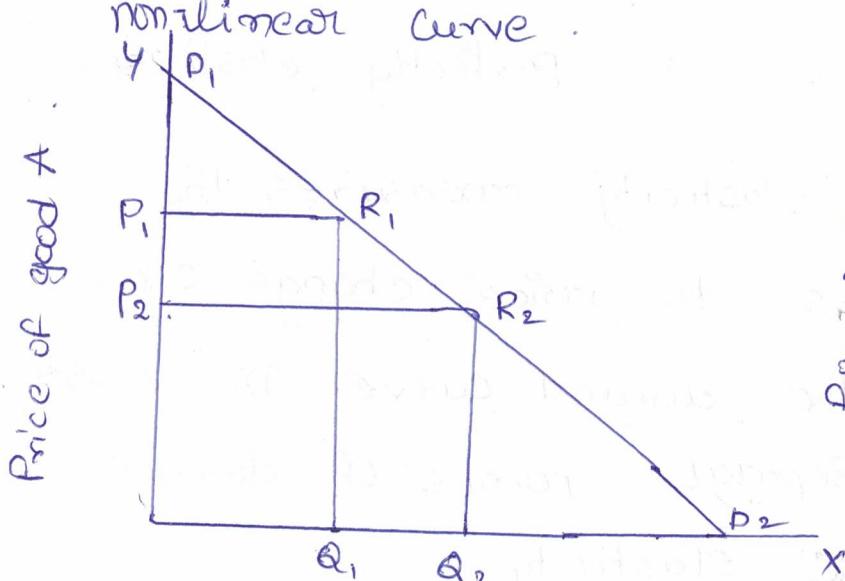
Point elasticity The point elasticity is defined as the proportionate change in quantity demand resulting from a very small change in price of that commodity. It is expressed as.

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

The elasticity computed at a single point on the demand curve for an infinite small changes in price is called "point elasticity".

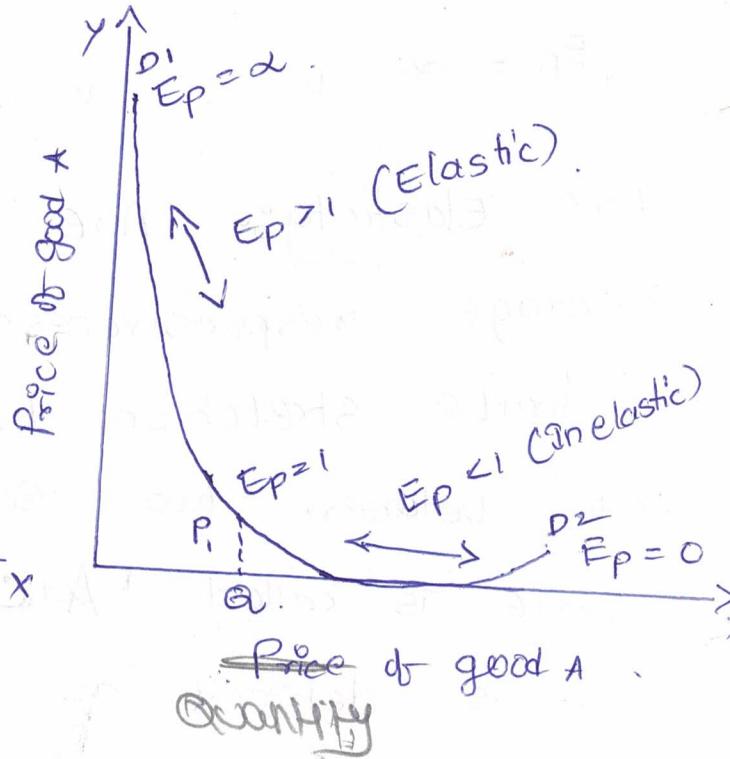
Point elasticity can be drawn in linear and

non-linear curve.



Quantity of good A.

Point elasticity where the demand curve is linear.



Point elasticity where the demand curve is not linear.

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And where the demand curve touches the horizontal axis $E_p = 0$ thus the range of values of elasticity are $0 \leq E_p \leq \alpha$. To the right of P_1 , the demand is said to be inelastic ($0 < E_p < 1$) and to the left of P_1 , the demand is said to be elastic ($1 < E_p < \alpha$).

* Coheres:

$E_p > 0$, the demand is perfectly inelastic.

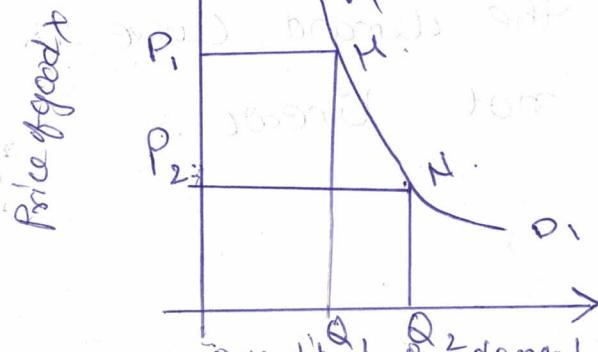
$E_p = 1$ in market called Unity elasticity.

$E_p = \alpha$, u perfectly elastic.

Arc Elasticity or Arc elasticity measures the average responsiveness to price change over a finite stretch on the demand curve. The elasticity between two separate points of demand curve is called 'Arc' elasticity.

It is defined as

$$\text{Arc } E_p = \frac{\Delta Q}{\Delta P} \cdot \frac{(P_1 + P_2)/2}{(Q_1 + Q_2)/2}$$



* Point elasticity is more precise than Arc elasticity concept.

Significance of Elasticity of demand

① To fix the Price of factors of Production we have to pay rent, wages, interest, Profits and price for the factors of production. Now the question is how much do we have to pay for each of these factors. The elasticity here depends on demand and supply of the product.

Ex: Where the labour is organized or unionized, the labour is said to be in elastic. Similarly in village demand for labour is elastic.

② Price fixation: If there is no competition, in other words, in the case of a monopoly the manufacturer is free to fix his price. where there are close substitutes, the product is such that its consumption can be postponed. It can not be put to alternative uses and so on, then the price of the product can not be fixed very high.

③ Government policies:

④ Tax policies: The finance minister uses elasticity concept to identify the various products & service where the tax can be levied, and where relief can be extended to bring about the desired changes in the production, consumption, savings etc.

(b) Rising bank deposits: If govt wants to mobilise larger deposits from the customers, it proposes to give the rates of fixed deposits marginally & vice versa.

(c) Public utility: Govt uses the concept of elasticity in fixed fixing charges for public utilities such as elasticity tariffs: water charges, rail transports and so on.

(d) Revaluation or devaluation of currencies: The govt has to study the impact of revaluation on the interests of the exporters & importers.

(e) Formulate government policy: If the product is such that the demand is inelastic, the govt would like to exercise close control over the matter relating to its supply & demand.

(f) Forecasting demand: Income elasticity is used to forecasting demand for a particular product / service. The impact of changing income levels on the demand of the product can be assessed with the help of income elasticity.

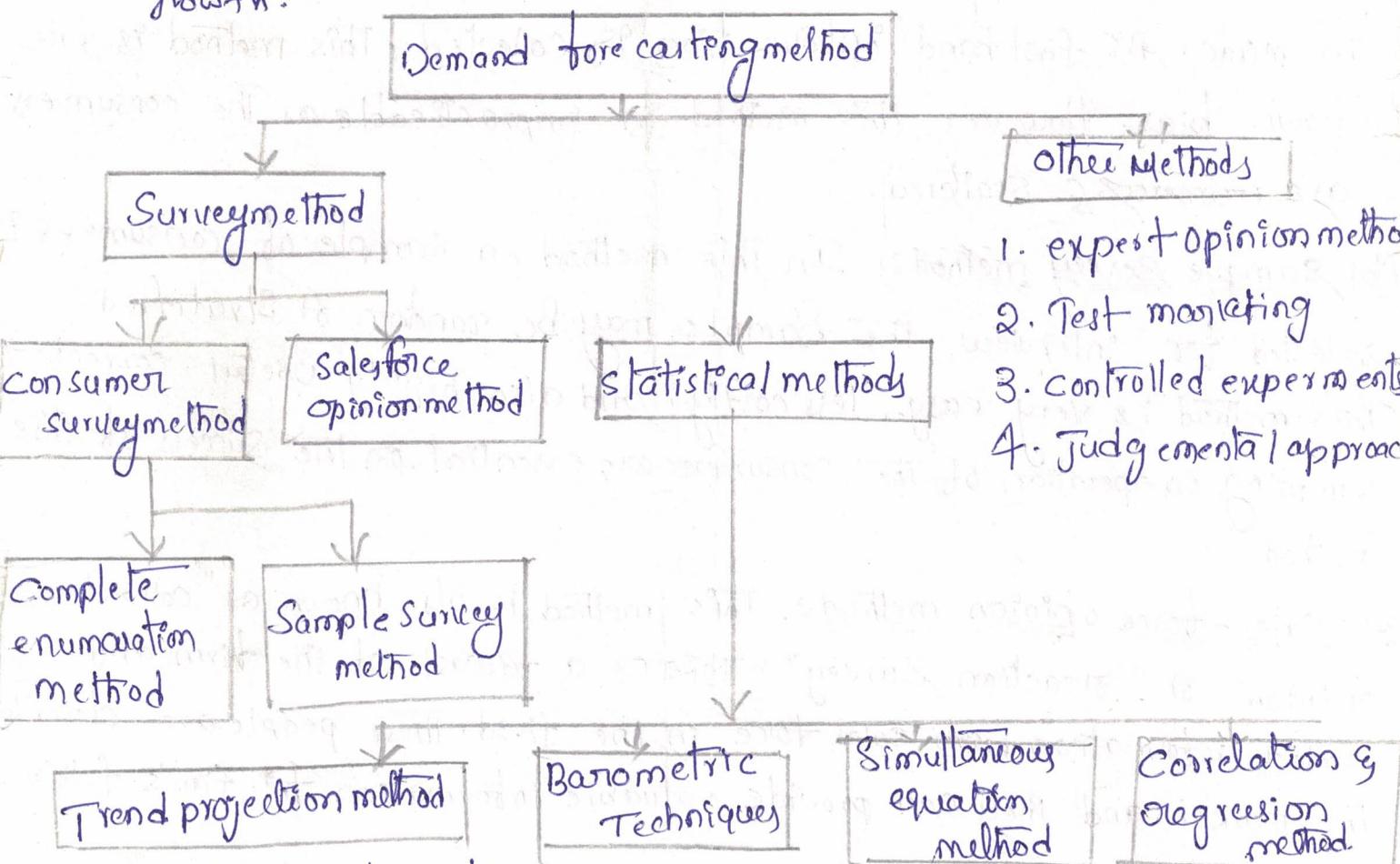
(g) Planning the levels of output & price: The knowledge of price elasticity is very useful to producers. They can evaluate whether a change in price will bring in adequate revenue or not. In general, for items whose demand is elastic, it would benefit him to change relatively more price & vice versa.

Demand Forecasting

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Introduction:

A forecast is a prediction or estimation of a future situation. All business decisions are based on some forecast at the level of future economic activity in general and the demand for the firm's products in particular. The aim of economic forecasting is to reduce the risk that the firm faces in its short-term operational decision making and in planning for its long-term growth.



a) Trendline by observation

b) least-squares method

c) moving average method

d) Time series analysis

1) Survey method:

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Under this method, information about the consumer require and opinions of experts are collected by interviewing them. This method is also called as "Qualitative method". Survey method can be divided into following.

(i) Consumer Survey method: In this method, the consumers are contacted personally to know about their plans & preferences regarding the consumption of the product. Consumer Survey method may be undertaken in following ways. Those are,

(a) complete enumeration method:- Under this method, all the consumers of the products are interviewed based on which forecast is made. As firsthand information is collected, this method is free from bias. However this method is impracticable as the consumers are numerous & scattered.

(b) sample Survey method:- In this method, a sample of consumers is selected for interview. The sample may be random or stratified. This method is very easy, less costly, and also highly useful. Correct sampling co-operation of the consumers are essential for the success of this method.

2) Sales-force opinion method: This method is also known as "collective opinion" or "Reaction Survey". This is a forecast of the firm and collect information from sales force in the field. These people are closer to the market and they can provide valuable information for firm's future sales projection.

Advantages:

1. This method is simple and straightforward. It involves minimum statistical work. Therefore there is no much need for special technical skills.

2. This method is less cost
3. It is realistic as it is based on personal first hand knowledge of salesman.
4. It is useful in sales of new products.

disAdvantage s

1. It is almost completely subjective if the Sales man has personal prejudices. Then the forecast will be Biased.
2. It is useful only period of one year.
3. Sales man may not be aware of changes that effects future demand.

3.1 experts opinion methods [Other methods]

Under this method apart from Salesman & Consumers, distributor & outside experts may also be used for forecasting.

Advantages:

1. Forecast can be made relatively quick & cheaply.
2. In the case of new production products data may not be available. It may be difficult to collect, in such case this method is useful.

Disadvantages:-

1. Opinion are subjective and hence not satisfactory.
2. Good and bad estimates are given equal weight.

2) Test marketing:

Means releasing the product on a test basis in a well chosen limited but representative market. Based on results of test marketing, the manufacturer can assess the state of success for his product, if launch in the wider market.

Ex:- Automobile industry maintain a panel of customers who give feedback on the style and design and specification of the new models.

Advantages:

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- The acceptability of the product can be judged in a limited market.
- Before entering the market, the correction can be made, if necessary, thus the failure can be avoided.
- The customer psychology is considered in this method and the method and the product and services are redesigned on the opinions of customer.

disadvantages :-

- It reveals the quality of the product to the competitors before it is launched in the wider market.
 - It is not always easy to select a representative market.
 - It may also be difficult to extrapolate the feedback received from the representative market.
- 3) Controlled experiments: In this method, the company can experiment different homogeneous markets releasing its product with different types of appeal such as diff prices, packaging, models and soon.

Advantages:

→ This method is used to know the effect of a change in some determinant like price, product design, advertising, packaging etc.

Disadvantages:

- It is costly and time consuming.
→ If it fails in one market, it may affect other market also.

4) Judgemental approach:

When none of the above methods are directly related to the given product or service, the management has no alternative other than using its own judgement.

III Statistical method:

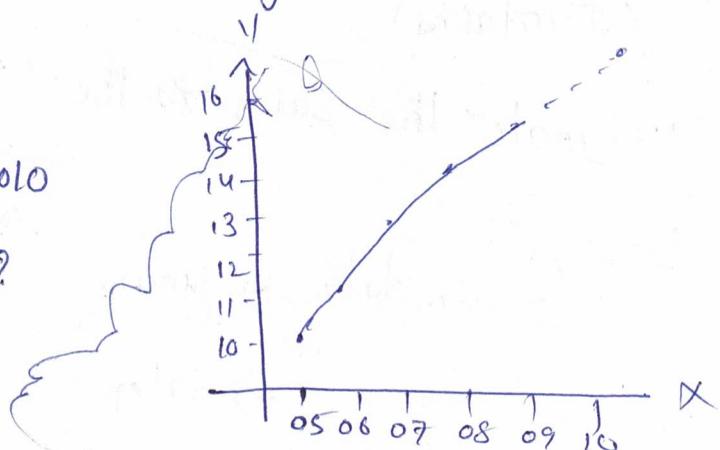
Statistical method is used for long run forecast. In this method, statistical and mathematical techniques are used to forecast demand. This relies on the past data. This method is useful for existing companies.

i. Trend projection method: - These are generally based on analysis of past sales patterns. This method is used since the sales data of the firms under consideration relate to different time periods that it is a time series data. There are ~~five~~^{four} main techniques of mechanical extrapolation.

(a) Trend line by observation: - This method of forecasting trend is elementary, easy and quick. It involves merely the plotting of actual sales data on a chart and then estimating observation where the trend line lies. The line can be extended towards a future period and corresponding sales forecast is read from the graph.

e.g:-

| Year | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|-------|--------|--------|--------|--------|--------|------|
| Sales | 10,000 | 12,000 | 13,000 | 18,000 | 16,000 | ? |



(b) Least Squares Method:— This technique uses statistical formulae to find the trend line which "best fits" the available data. The trend line in the estimating equation, which can be used for forecasting demand by extrapolating the line for future and reading the corresponding values of sales on the graph.

$$S = x + y(T)$$

x and y have been calculated from past data, to find out x and y , the following normal equations have to be stated and solved.

$$\sum S = Nx + y \sum T$$

$$\sum ST = x \sum T + y \sum T^2$$

where, S = sales

T = the year or number

n = number of years

Ex: Year 2002 2004 2006 2008 2010

Sales 75 84 92 98 88
(in lakhs)

estimate the sales for the year 2012 and 2014

Sol:

Given data, \rightarrow years

\rightarrow Sales

(in lakhs)

The Least Squares method is a statistical procedure to find the best fit for set of data points by minimising the sum of the off deviation residuals of points from the plotted curve.

| <u>year</u> | <u>sales (₹)</u> | <u>Yearno (t)</u> | <u>ST</u> | <u>T²</u> |
|-------------|------------------|-----------------------|-------------------|----------------------|
| 2002 | 75 | 1 | 75 | 1 |
| 2004 | 84 | 3 | 252 | 9 |
| 2006 | 92 | 5 | 460 | 25 |
| 2008 | 98 | 7 | 686 | 49 |
| 2010 | 88 | 9 | 792 | 81 |
| | | | | |
| | $\sum S = 437$ | $\sum t = 25$ | $\sum ST = 21265$ | $\sum T^2 = 165$ |

$$\Rightarrow 437 = 5x + 25y$$

$$21265 = 25x + 165y$$

$$x = 77.4, y = 2.$$

$$\Rightarrow 2012 \quad x + y(t) \Rightarrow 77.4 + 2(12) = 99.4 \text{ lakh units}$$

$$\Rightarrow 2014 \quad x + y(t) \Rightarrow 77.4 + 2(13) = 103.4 \text{ lakh units}$$

(C) moving average method :-

This method is based on the assumption that the future is the average of past achievement. Hence based on past achievements, future is predicted. When demand is stable this method can provide good forecasts.

| Ex3: | year | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|------|-------|--------|--------|--------|-------|--------|------|
| | Sales | 101000 | 11,000 | 121000 | 14000 | 131000 | ? |

$$\Rightarrow \frac{10,000 + 11,000 + 12,000 + 11,000}{5} = 11,800$$

$$\Rightarrow 12,000$$

(d) Time Series analysis:-

This is an extension of linear regression, which attempts to build seasonal and cyclical variations into the estimating equation. ~~The validity of this method rests on the assumption that past data can be used to predict future sales.~~

$$Sales = a(trend) + b(season) + c(cyclical) + d.$$

where a, b and c are constants calculated from the past data
 d = Erratic sales / disturbed sales

2) Barometric methods:- Under this method, present events are used to predict the direction of change in future. This is done with the help of economic and statistical indications.

Ex:- A rise in stock prices indication a good economic condition on the basis of which business managers can formulate their strategies. Also, long holiday provision to software exports is an indicator for future rise in export of software.

3) Regression and correlation method:- Correlation method is used to indicate the nature of relationship b/w two variables such as sales and Advertising expenditure.

increase in price and decrease in demand.

(27)

(16)

(8).

of the correlation. the word

2. Business planning:— demand forecasting helps in demand planning based on future activities to be taken up.

Ex: entrepreneurs may plan their export, sales, production targets on the basis of future demand.

3. Competitive edge