UNIT 1

What is the scope of engineering economics?

Engineering Economics is a subject of vital importance to Engineers. This subject helps one understand the need for the knowledge of Economics for being an effective manager and decision maker. It offers wide opportunities in developing countries like India. An engineering aspirant can perform the following roles:

1. Demand analysis and forecasting
2. Production and cost analysis
3. Product policy, sales promotion, and marketing strategy
4. Profit management
5. Capital management
6. Pricing decisions, policies, and practices

Microeconomics vs. Macroeconomics: What's the Difference?

Economics is divided into two different categories: microeconomics and macroeconomics. Microeconomics is the study of individuals and business decisions, while macroeconomics looks at the decisions of countries and governments.

While these two branches of economics appear to be different, they are actually interdependent and complement one another. Many overlapping issues exist between the two fields.

KEY TAKEAWAYS

- Microeconomics studies individuals and business decisions, while macroeconomics analyzes the decisions made by countries and governments.
- Microeconomics focuses on supply and demand, and other forces that determine price levels, making it a bottom-up approach.
- Macroeconomics takes a top-down approach and looks at the economy as a whole, trying to determine its course and nature.

- Investors can use microeconomics in their investment decisions, while macroeconomics is an analytical tool mainly used to craft economic and fiscal policy.
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Microeconomics involves several key principles including (but not limited to):

- **Demand, Supply, and Equilibrium**: Prices are determined by the theory of supply and demand. Under this theory, suppliers offer the same price demanded by consumers in a perfectly competitive market. This creates economic equilibrium.
- **Production Theory**: This principle is the study of how goods and services are created or manufactured.
- **Costs of Production**: According to this theory, the price of goods or services is determined by the cost of the resources used during production.
- **Labor Economics**: This principle looks at workers and employers, and tries to understand the pattern of wages, employment, and income.

WHAT IS DEMAND THEORY?

Demand theory is an economic principle relating to the relationship between consumer demand for goods and services and their prices in the market. Demand theory forms the basis for the demand curve, which relates consumer desire to the amount of goods available. As more of a good or service is available, demand drops and so does the equilibrium price.

Understanding Demand Theory

Demand is simply the quantity of a good or service that consumers are willing and able to buy at a given price in a given time period. People demand goods and services in an economy to satisfy their wants, such as food, healthcare, clothing, entertainment, shelter, etc. The demand for a product at a certain price reflects the satisfaction that an individual expects from consuming the product. This level of satisfaction is referred to as utility and it differs from consumer to consumer. The demand for a good or service depends on two factors: (1) its utility to satisfy a want or need, and (2) the consumer's ability to pay for the good or service. In

effect, real demand is when the readiness to satisfy a want is backed up by the individual's ability and willingness to pay.

KEY TAKEAWAYS

- Demand theory describes the way that changes in the quantity of a good or service demanded by consumers affects its price in the market,
- The theory states that the higher the price of a product is, all else equal, the less of it will be demanded, inferring a downward sloping demand curve.
- Likewise, the more demand that occurs, the greater the price will be for a given supply.
- Demand theory places primacy on the demand side of the supply-demand relationship.

The law of demand introduces an inverse relationship between price and demand for a good or service. It simply states that as the price of a commodity increases, demand decreases, provided other factors remain constant. Also, as the price decreases, demand increases. This relationship can be illustrated graphically using a tool known as the demand curve.

The demand curve has a negative slope as it charts downward from left to right to reflect the inverse relationship between the price of an item and the quantity demanded over a period of time.

DEMAND FUNCTION

A demand function is a mathematical equation which expresses the demand of a product or service as a function of the its price and other factors such as the prices of the substitutes and complementary goods, income, etc.

A demand functions creates a relationship between the demand (in quantities) of a product (which is a dependent variable) and factors that affect the demand such as the price of the product, the price of substitute and complementary goods, average income, etc., (which are the independent variables).

INVERSE DEMAND FUNCTION

A [supply and demand](#) graph is typically plotted such that quantity is on x-axis and price is on y-axis but the demand function we defined above has price (P) as an independent variable and quantity (Q) as an independent variable.

Exceptions to The Law of Demand

There are two exceptions to the Law of Demand. Giffen and Veblen goods are exceptions to the Law of Demand. However, they are extreme cases and can be quite difficult to prove. But economists generally agree that there are rare cases where the Law of Demand is violated.

The Law of Demand states that the quantity demanded for a good or service rises as the price falls, ceteris paribus (or with all other things being equal). Therefore, the Law of Demand is an inverse relationship between price and quantity demanded.

Giffen Goods

A Giffen good is considered to be an exception to the Law of Demand. The unique features of a Giffen good results in quantity demanded increasing when there is an increase in price. As stated earlier, the Law of Demand states that the quantity demanded should decrease with an increase in price (the inverse relationship).

Sir Robert Giffen observed that when the price of bread increased, the low-paid British workers in the early 19th century purchased

more bread and not less of it. This phenomenon is a direct contradiction to the Law of Demand.

The reason given for this is that these British workers consumed a diet of mostly bread and when the price of bread went up they were compelled to spend more on a fixed quantity of bread. Therefore, they could not afford to purchase as much meat as before. They substituted bread for meat to maintain their intake of food and calories.

<u>ELASTICITY OF DEMAND</u>

Demand for a good is said to be "elastic" if a small change in price causes people to demand a lot more or a lot less of the good. Demand for a good is "inelastic" if a small change in prices causes people to make no change or almost no change in how much they demand of that good.

Perfectly Inelastic Demand (Ped = 0)

If the co-efficient of price elasticity of demand = zero, demand is perfectly inelastic i.e. demand does not vary with a change in price

- A perfectly inelastic demand curve is an extreme case for it implies that consumers are willing and able to pay any price for the product. If supply falls, equilibrium market price can rise without any contraction in the quantity demanded

Price — Demand, S3, P1, S2, P2, S1, P3

ELASTICITY OF SUPPLY: TYPES, METHODS AND FACTORS

The **law of supply** states the direct relationship between the price of a product and quantity supplied of the product. ... The degree or extent of change in the quantity supplied of a product in response to change in the price of the product is known as the **elasticity of supply**.

The law of supply states the direct relationship between the price of a product and quantity supplied of the product.

In simple words, if the price of a product increases, the quantity supplied for the product also increases.

On the other hand, if there is fall in the price of a product, then the quantity supplied of the product would also decrease.

Following are different types of elasticity of supply:

i. Perfectly Elastic Supply:
Refers to a situation when the quantity supplied completely increases or decreases with respect to proportionate change in the price of a product.

ii. Relatively Elastic Supply:
Refers to a condition when the proportionate change in the quantity supplied is more than proportionate change in the price of a product.

iii. Relatively Inelastic Supply:
Refers to a condition when the proportionate change in the quantity supplied is less than proportionate change in the price of a product.

iv. Unit Elastic Supply:

Refers to a situation when the proportionate change in the quantity supplied is equal to the

Proportionate change in the price of a product. The numerical value of unit elastic supply is equal to one ($e_s=1$).

v. Perfectly Inelastic Supply:
Refers to a situation when the quantity supplied does not change with respect to proportionate change in price of a product. In such a case, the quantity supplied remains constant in all the instances of change in price.

Methods of Measuring Elasticity of Supply:
Apart from determining the elasticity or inelasticity of supply, an organization needs to estimate the numerical value of elasticity of supply for making various business decisions.

The numerical value of elasticity of supply can be measured with the help of the following methods:
i. Proportionate Method:
Refers to one of the important methods of measuring elasticity of supply. In this method, elasticity of supply can be calculated by dividing the percentage change in quantity supplied with the percentage change in price of a product.

The formula used for calculating elasticity of supply through proportionate method is as follows:
e_s = Percentage change in quantity supplied/Percentage change in price
Percentage change in quantity supplied = New quantity supplied (ΔS)/Original quantity supplied (S)

Percentage change in price = New price (ΔP)/original Price (P)

The symbolic representation of elasticity of supply is as follows:

$e_S = \Delta S/S : \Delta P/P$

$e_S = \Delta S/S * P/\Delta P$

$e_S = \Delta S/\Delta P * P/S$

Change in quantity supplied (ΔS) is the difference between the new quantity supplied (S) and original quantity supplied(S).

It can be calculated by the following formula:

$\Delta S = S_1-S$

Similarly, change in price is the difference between the new price (P) and original price (P).

It can be calculated by the following formula:

$\Delta P = P_1 - P$

For example, quantity supplied of a product increases from 1000 units to 1500 units and price changes from Rs. 50 to Rs. 55 per unit.

In such a case, the elasticity of supply would be as follows:

P_1 = Rs. 55, P = Rs. 50, S_1 = 1500 units, S = 1000 units

Therefore, $\Delta S = S_1 - S = 1500 - 1000 = 500$ units and $\Delta P = P_1 - P = $ Rs. 55 $-$ Rs. 50 = Rs. 5

$e_S = 500/5 * 50/1000 = 0.5$ (less than unit)

According to this method, if the numerical value of elasticity of supply is more than one, it represents relatively elastic supply. On the other hand, if the numerical value of elasticity of supply is less than one, then the elasticity of supply would be relatively inelastic. Apart from this, if the numerical value of elasticity of supply is equal to one, it would represent unitary elastic supply.

ii. Point Method:

Refers to the method in which elasticity of supply is measured at a particular point on the supply curve. In such a case, to measure the elasticity of supply, a tangent needs to be drawn along with the demand curve.

The calculation of elasticity of supply at a particular point would be clearer with the help of Figure-20:
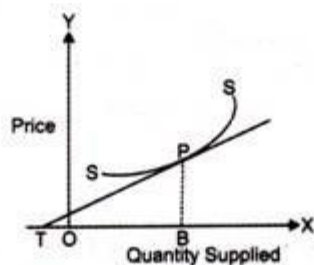
Figure-20: Measuring Point Elasticity of Supply

In Figure-20, TF tangent is drawn from the point P to measure elasticity of supply. This tangent meets X axis at T point. Another vertical line from P is intersecting X-axis at B point.

Now, we can calculate elasticity of supply at point P as under:

$e_s = TB/OB$

Factors Determining Elasticity of Supply:

The numerical value of elasticity of supply is different for different situations. The elasticity of supply is influenced by a number of factors.

Some of the factors that determine the elasticity of supply are as follows:

i. Nature of a Good:

Acts as a major determinant that influence the elasticity of supply. Goods, such as antiques and old wines, cannot be reproduced in the same form; therefore, the supply of such goods remains constant. Similarly, in case of perishable goods

such as vegetables, fruits, and other eatables, the supply would be inelastic.

This is because the supply of perishable goods cannot be increased or decreased easily. On the contrary, in case of durable goods, such as furniture and electric appliances, the supply would be elastic as their supply can be increased or decreased quickly.

ii. Production Technology:
Refers to the level of technology that helps in determining the elasticity of supply. The supply of a good produced by using higher level technology is faster with respect to the change in its price.

iii. Time Period:
Affects the elasticity of supply to a larger extent. In short-run, elasticity of supply is low while in the long run elasticity of supply is more. Therefore, changes in prices do not affect the supply of a good immediately. If the price remains high for a longer period, only then suppliers prefer to increase the supply of product.

iv. Scale of Production:
Puts a significant impact on the elasticity of supply. In case of small-scale production of goods, the supply would be inelastic and vice versa. For example, if an organization has a large scale production of soaps, then an increase in the price of soaps would increase the supply of soaps without any time lag.

v. Agricultural Products:
Act as a major determinant of elasticity of supply in case of agricultural products. The supply of agriculture products, such as fruits, vegetables, and food grains, depends on natural factors, including ram, humidity, and sunlight. Therefore, the

production of agricultural products cannot be increased or decreased easily. Consequently, the supply of these products is relatively inelastic.

Price and Output Determination under Perfect Competition

Perfect competition refers to a market situation where there are a large number of buyers and sellers dealing in homogenous products.

Moreover, under perfect competition, there are no legal, social, or technological barriers on the entry or exit of organizations.

In perfect competition, sellers and buyers are fully aware about the current market price of a product. Therefore, none of them sell or buy at a higher rate. As a result, the same price prevails in the market under perfect competition.

Demand under Perfect Competition:
Demand refers to the quantity of a product that consumers are willing to purchase at a particular price, while other factors remain constant. A consumer demands more quantity at lower price and less quantity at higher price. Therefore, the demand varies at different prices.

Supply under Perfect Competition:
Supply refers to quantity of a product that producers are willing to supply at a particular price. Generally, the supply of a product increases at high price and decreases at low price.

Equilibrium under Perfect Competition:
As discussed earlier, in perfect competition, the price of a product is determined at a point at which the demand and supply curve intersect each other. This point is known as

equilibrium point. At this point, the quantity demanded and supplied is called equilibrium quantity.
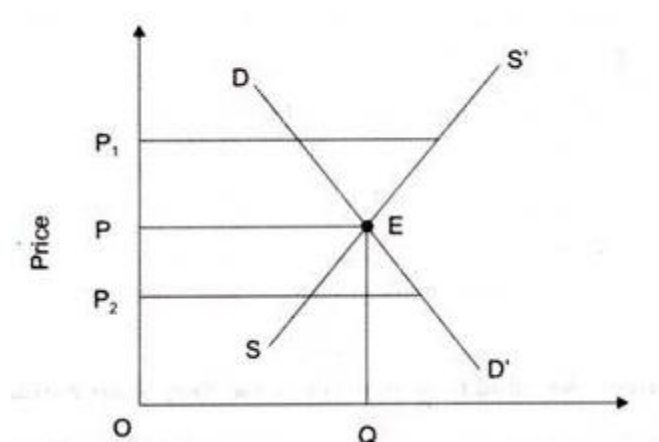
Theory of production

The **Theory of Production** explains the principles by which a business firm decides how much of each commodity that it sells (its "outputs" or "products") it will **produce**. And how much of each kind of labor, raw material, fixed capital goods, etc., that it employs (its "inputs" or "factors of **production**")

Theory of production, in economics, an effort to explain the principles by which a business firm decides how much of each commodity that it sells (its "outputs" or "products") it will produce, and how much of each kind of labour, raw material, fixed capital good, etc., that it employs (its "inputs" or "factors of production") it will use. The theory involves some of the most fundamental principles of economics. These include the relationship between the prices of commodities and the prices (or wages or rents) of the productive factors used to produce them and also the relationships between the prices of commodities and productive factors, on the one hand, and the quantities of these commodities and productive factors that are produced or used, on the other.

However much of a commodity a business firm produces, it endeavours to produce it as cheaply as possible. Taking the quality of the product and the prices of the productive factors as given, which is the usual situation, the firm's task is to determine the cheapest combination of factors of production that can produce the desired output. This task is best understood in terms of what is called the production function, *i.e.*, an equation that expresses the relationship between the quantities of factors employed and the amount of product obtained. It states the amount of product that can be obtained from each and every combination of factors. This relationship can be written mathematically as $y = f(x_1, x_2, \ldots, x_n; k_1, k_2, \ldots, k_m)$. Here, y denotes the quantity of output. The firm is presumed to use n variable factors of production; that is, factors like hourly paid production workers and raw materials, the quantities of which can be increased or decreased. In the formula the quantity of the first variable factor is denoted by x_1 and so on. The firm is also presumed to use m fixed factors, or factors like fixed machinery, salaried staff, etc., the quantities of which cannot be varied readily or habitually. The available quantity of the first fixed factor is indicated in the formal by k_1 and so on. The entire formula expresses the amount of output that results when specified quantities of factors are employed. It must be noted that though the quantities of the factors determine the quantity of output, the reverse is not true, and as a general rule there will be many combinations of productive factors that could be used to produce the same output. Finding the cheapest of these is the problem of cost minimization.

LAW OF VARIABLE PROPORTIONS.

The law of variable proportions states that as the quantity of one factor is increased, keeping the other factors fixed, the marginal product of that factor will eventually decline. ... Fixed Amount of Other Factors: Secondly, there must be some inputs whose quantity is kept fixed.

The law of variable proportions holds good under the following conditions:

1. <u>Constant State of Technology</u>: First, the state of technology is assumed to be given and unchanged. If there is improvement in the technology, then the marginal product may rise instead of diminishing.
2. <u>Fixed Amount of Other Factors</u>: Secondly, there must be some inputs whose quantity is kept fixed. It is only in this way that we can alter the factor proportions and know its effects on output. The law does not apply if all factors are proportionately varied.
3. <u>Possibility of Varying the Factor proportions</u>: Thirdly, the law is based upon the possibility of varying the proportions in which the various factors can be combined to produce a product. The law does not apply if the factors must be used in fixed proportions to yield a product.

Law of Return to Scale and It's Types (With Diagram)

The law of returns to scale explains the proportional change in output with respect to proportional change in inputs.

In other words, the law of returns to scale states when there are a proportionate change in the amounts of inputs, the behavior of output also changes.

On the basis of these possibilities, law of returns can be classified into three categories:
i. Increasing returns to scale

ii. Constant returns to scale

iii. Diminishing returns to scale

1. Increasing Returns to Scale:
If the proportional change in the output of an organization is greater than the proportional change in inputs, the production is said to reflect increasing returns to scale.

2. Constant Returns to Scale:
The production is said to generate constant returns to scale when the proportionate change in input is equal to the proportionate change in output.

3. Diminishing Returns to Scale:
Diminishing returns to scale refers to a situation when the proportionate change in output is less than the proportionate change in input.