Session Outline

Basic Tools of Economic Analysis and Optimization Techniques

Derivatives of various functions
Optimization techniques
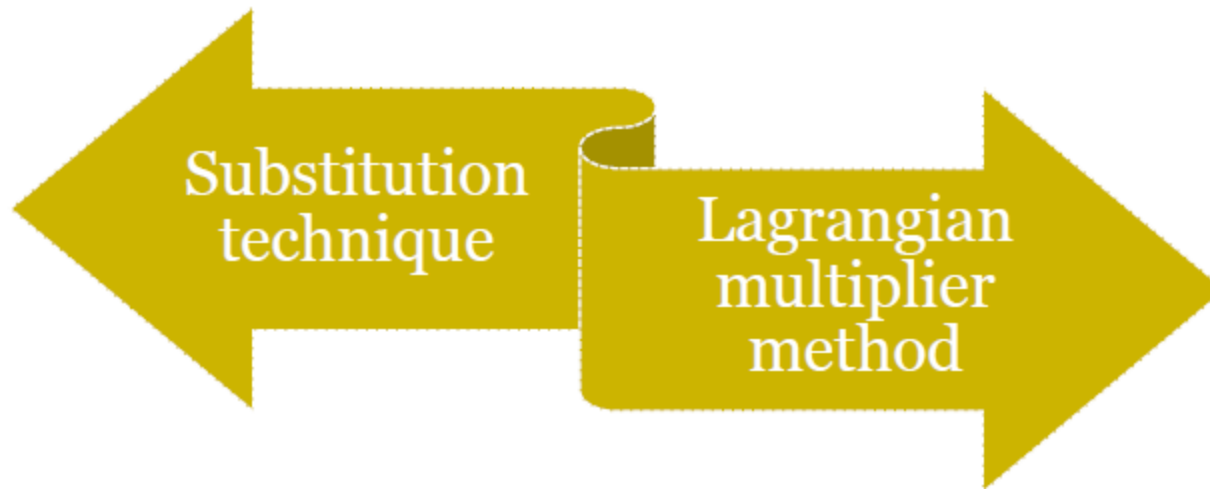Constrained optimization
Regression Technique

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Constrained Optimization

The techniques used for achieving a target under constrained situations or conditions is called constrained optimization

Substitution technique

Lagrangian multiplier method

Source : Managerial Economics; D N Dwivedi, 7th Edition

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Substitution Technique

Applied to the Problem of Profit Maximization and Cost Minimization

For Profit Maximization

- One of the variable is expressed in the terms of other variable and solve the constraint equation for obtaining value of one variable.
- The value obtained is substituted in the objective function, which is maximized and solved for obtaining value of the other variable.

Source : Managerial Economics; D N Dwivedi, 7th Edition

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For Cost Minimization

1. The constrained equation is expressed in terms of any one of the two goods, the variables ;
2. This equation obtained from step 1 is substituted in the objective function.

Source : Managerial Economics; D N Dwivedi, 7th Edition

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Lagrangian Multiplier Method

Method of solving constrained optimization problems

| It involves | Combining of objective function and the constrained equation | Solving by using partial derivative method |

Steps for Cost Minimization:

The problem is converted into a Lagrangian function and the constrained equation is set equal to zero.

The equation is then multiplied with λ and the results is added to the objective function.

Source : Managerial Economics; D N Dwivedi, 7th Edition

Regression

Nature of the managerial problem and use of functions
Method of formulating a function
Estimation of a linear function : A simple regression technique
Multivariate regression
Tests in multivariate regression estimates

Source : Managerial Economics; D N Dwivedi, 7th Edition

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Regression

A statistical technique used to qualify the relationship between interrelated economic variables.

Used in physical and social studies, where problem of specifying the relationship between two or more variables is involved.

Estimation of the coefficients of the independent variables.

Measurement of the reliability of the estimated coefficients

Source : Managerial Economics; D N Dwivedi, 7th Edition

Nature of Managerial Problem : An Example

Suppose a Manager spending Money on advertisement to promote sale of his Firm's product.

Sales has been increasing but not continuously.

Manager's problem is to find an answer to:

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Nature of Managerial Problem : An Example

Is there a Positive relationship between advertisement expenditure and total sales?

If Yes , then what is the measure of this relationship or what is the quantitative response of sales to an increase in advertisement expenditure

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Nature of Managerial Problem : An Example

Year	Ad Expenditure	Sales
1995	5	45
1996	8	50
1997	10	55
1998	12	58
1999	10	58
2000	15	72
2001	18	70
2002	20	85
2003	21	78
2004	25	85

Nature of Managerial Problem : An Example

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1995	5	45
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Nature of Managerial Problem : An Example

A more clear and certain answer to these question can be found by plotting the sales data against the advertisement expenditure.

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Nature of Managerial Problem : An Example

For a Manager the requirement is to know the exact relationship between advertisement expenditure and sales for future planning.

Scatter Diagram does not answer this.

This question can be answered by Regression Techniques

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Method of Formulating a Function

Formulation of a hypothesis

- It is done on the basis of the observed relationship between two or more facts or events of real life.

Translating the hypothesis into a function

- Suppose a hypothesis, the sales growth is a function of ad-expenditure, this hypothesis can be translated into a mathematical function

$$Y = A + Bx$$

where, Y = sales, X = ad-expenditure and A and B are constants.

Source : Managerial Economics; D N Dwivedi, 7th Edition

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Formulation of Hypotheses

Hypotheses is a postulate, an untested proposition regarding the relationship between any two or more variables of the real world phenomena.

It shows only a probability of the event and serves as a guide for future action, cannot predict result of an action.

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Formulation of Hypotheses

"Sales growth is a positive function of advertisement expenditure"

This hypotheses suggests that if a firm spend money on advertisement , its sale will most probably increase.

It does not convey the approximate increase in the sale for a given advertising expenditure.

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Formulation of Hypotheses

Hypotheses needs to be converted into Mathematical equation or stated in the form of an estimable function.

Second Step: Translating the Hypotheses into a Function

Translate verbal hypotheses into the form of estimable function.

To formulate, the relationship between the dependent and independent varibles need to be specified and stated in the form of an equation.

Second Step: Translating the Hypotheses into a Function

The form of equation can be linear or non linear depending on the relationship.

Hypotheses can be translated as:

Y = a + bX
Where Y = Sales, X = Advertising Expenditure, a and b are constant.

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Second Step: Translating the Hypotheses into a Function

The constant 'a' is the intercept, it gives the quantity of sales without advertisement, when X = 0.

Constant 'b' is the coefficient of Y in relation to X- Gives the measure to increase in sales due to a certain increase in advertisement expenditure.

Second Step: Translating the Hypotheses into a Function

The task of analyst is to find the values of constant 'a' and 'b'

-Rudimentary Method
-Mathematical Method- Regression Technique

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Second Step: Translating the Hypotheses into a Function

-Rudimentary Method- Example

Session Summary

▪Optimization Technique involves technique of maximizing total revenue, techniques of optimizing output &minimizing average cost & maximization of profit function

▪Functional Relationship between Economic Variables states the relationship between a quantity, a value or a rate that changes according to the changes in their determinants

Session Summary

▪ Slope is the rate of change in the dependent variable as a result of changes in the independent variables.

▪ The techniques used for maximizing output under constrained situations is called constrained optimization

▪ Constrained optimization uses substitution technique and Lagrangian multiplier method

Session References

Managerial Economics; D N Dwivedi, 7th Edition