Non - Linear Optimisation

When business performance cost or profit functions become too complex for simple linear models to be useful, exploration of non linear functions is a standard practice in BA. Although the predictive nature of exploring for mathematical expression to denote a trend or establish a forecast falls mainly in the predictive analytics step of BA, the use of the non linear function to optimise a decision can fall in the prescriptive analytics step.

To overcome the limitations and be more inclusive in the use of large data, marketer can apply regression software. Curve-cutting software can be used to generate predictive analytic models that can also be utilised to aid in making prescriptive analytic decisions.

For purposes of illustration SAS Software will be used to fit data to curves. Suppose that a resource allocation decision is being faced whereby one must decide how many computer servers a service facility

Should purchase to optimise the firm's cost of running the facility. The fiem's predictive analytics effort has shown a grocoth trend. A new facility is called for if cost can be minimised.

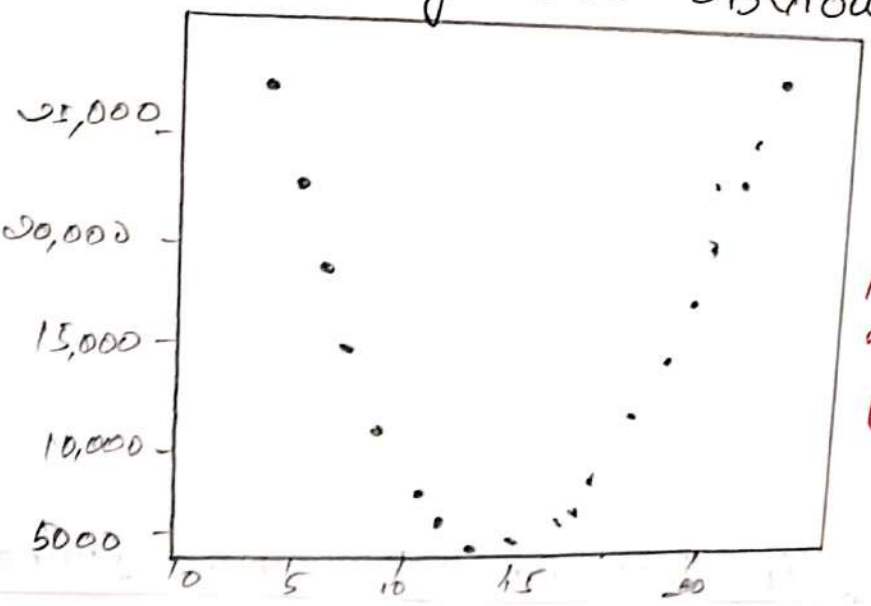
The firm has a history of setting up large and small service facilities and has collected 20 data

Sl.No	Server	Cost
1	1	2754
2	2	2753
3	3	2752
4	4	2751
5	5	2750
6	6	2749
7	7	
8	8	2748
9	9	2747
10	10	2746
11	11	2745
⋮	⋮	⋮
20	20	2742

Fig) Data for SAS curve fitting

In this Server problem, the basic data has U-shaped function. This is a classic Shape for most cost functions in business

In this problem it represents the balancing of having too few servers Although this is an overly Simplified example with little and nicely ordered data for clarity purposes, in big data Situations, cost functions are considerably less obvious.



(Fig) Server problem Data Cost function

APPLICABILITY OF OPTIMISATION TO THE BUSINESS PROBLEM

1) Decision Space

What decisions, trade-offs and interaction between possible decisions are required to solve the problem

2) Definable objectives

What are the objectives we are trying to maximise, minimise or meet.

These may include maximum profit minimum cost, maximum throughput or volume, maximum ROIC, and a target blend quality.

3) Limitations

Recognising business realities are critical in defining maginal versus average profitability

4) Minimum Level of complexity

This may include time, inventory Channels, marketing events, inputs and Working capital policies

Pros of optimisation:-

1) Provides an optimal answer with opportunity values.

2) Great for making complex decisions and yields better insights and higher feasibility.

Cons of optimisation

1) Challenging problems can take significant time to find the best answer.

2) Older generation software packages require specialised knowledge to write math Equations

3) In olden days, people saw Optimisation as a black box as equation were difficult to manage.

SIMULATION

Simulation models often incorporate a graphical representation of the system in great detail. It is literally a digital mock-up: marketers Simulation consist in building a digital replica of the system under Study with as much detail in each of its elements are required As an example, simulation has been widely used in redesign of layouts. With a Simulation model it is possible to represent in detail

Ap where the different sections of a plant are located, their equipment their process times, the movements of the different parts and batches the maintenance modules, breakdown etc.

APPLICATION OF SIMULATION MODELLING

1). Ecology

Assessment of the natural changes in environment and their impact on Organizations, industries and human life

2) Business Process Improvement

Workforce optimization, Capacity planning, inventory control,

assessment of process alternatives, bottleneck identification analysis

3) Airports

parking-lot shuttles, ticketing Security, terminal transportation, food court traffic, baggage handling gate assignments, airplane deicing

4) ports

Truck and train traffic, vessel traffic, port management, container Storage, capital investments.

5) Criminal-justice System

probation and parole operations, prison utilization and capacity.