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Optimization of Profits of a Super Mart

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Abstract

This paper addresses the issue of finding maximum profit for a super mart using a known mathematical model known as Linear Programming, it is one of the most used techniques as well as reliable. Based on data collected and the interactions the LPP has given a solution to the mart which maximizes the profit.

Introduction

Linear programming is the branch of applied mathematics that deals in particular class of business-related problems for optimization. It contains a linear objective function which is to be optimize (maximize or minimize) subject to a certain number of constraints. Use of linear programming technique in a business is to maximize the total profits, minimize the total costs, arranging best time to start or finish the project etc. This is one of the best mathematical techniques for finding best optimal solution to a company.

The major goal of this paper is to maximize profit of the super mart.

Steps of Linear Programming Formulation

- Determine the objective of the problem
- Identify decision variables and conditions involved
- Formulate objective function
- Formulate constraints
- Express the non-negativity constraints
- Check whether all the conditions are satisfied

The general form of LPP is,

$Z= c_1x_1 + c_2x_2 +\ldots+ c_nx_n$

Subject to constraints,
$a_{11}x_1+ a_{12}x_2+\ldots+ a_{1n}x_n$ ($\leq, =, \geq$) b_1
$a_{21}x_1+ a_{22}x_2+\ldots+ a_{2n}x_n$ ($\leq, =, \geq$) b_2

and so on…

Where $x_1, x_2, \ldots\ldots, x_n \geq 0$

Standard form of a Linear programming problem for solving by simplex method is -

(i) Using slack and surplus variables to express all constraints as equation.
(ii) The right-hand side of each Constraints are always non-negative if not multiply both sides of that constraints by -1.
(iii)The objective function should be of maximization type if not multiply both sides by -1

Data Presentation and analysis-

Taken various brands of chips under two sizes i.e., ₹20 and ₹10 among various flavors and have taken out profit margins among both the sizes. Hence will Maximize the profit using LPP.
It was found that,
Profit margin in ₹10 Packet = ₹2.5
Profit margin in ₹20 Packet = ₹5

Below is the Monthly stock of different brands under ₹10,

Flavor	Available stock
Lay's	8500
Kurkure	7500
Haldiram's	6500
Mad Angles	4000
Too Yum	3000

Similarly, stock of ₹20 pack as follows,

Flavor	Available stock
Lay's	6500
Kurkure	4500
Haldiram's	4000
Mad Angles	3000
Too Yum	2400

The reason of choosing the said brands is because it is consumed country wide and are major brands.

Model Formulation

Hence According to situation,
Maximize

x_1	x_2
2.5	5

Maximize $z = 2.5\ x_1 + 5\ x_2$
Subject to constraints,
$\mathbf{x_1 + x_2 \leq 15{,}000}$
$\mathbf{x_1 + x_2 \leq 12{,}000}$
$\mathbf{x_1 + x_2 \leq 10{,}500}$
$\mathbf{x_1 + x_2 \leq 7000}$
$\mathbf{x_1 + x_2 \leq 5400}$
$\mathbf{x_1 \geq 710}$
(Here, x_1 and x_2 are the number of packets of ₹10 and ₹20 respectively)

Interpretation of result

Using the software Tora, the solution is found (simplex & Graphical method)-

$x_1 = 710$

$x_2 = 4690$

The model indicates that optimum result is derived from the data collected so maximum profit for mart is ₹25225 and the number of packets of ₹10 is 710 and ₹20 is 4690.

Conclusion

From the above discussion we can conclude that maximum profit for mart is ₹25225 and the number of packets of ₹10 is 710 and ₹20 is 4690 and if the company is able to sell the amount of packets suggested then they could earn maximum profit.

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