Module 03 – Production Modeling

Exploratory Data Analysis

A chart with numbers and a bar chart

AI-generated content may be incorrect.

Model Formulation

MIN:

50.39P1 + 46.86P2 + 51.86P3 + 49.85P4 + 1.07(B1+B2)/2+ 1.07(B2+B3)/2+ 1.07 (B3+B4)/2

Constraints:

Production level for quarter 1 🡪 P1 <= 459

Production level for quarter 2 🡪 P2 <= 377

Production level for quarter 3 🡪 P3 <= 439

Production level for quarter 4 🡪 P4 <= 527

Ending Inventory for quarter 1 🡪 B1+P1-494 >= 49

Ending Inventory for quarter 2 🡪 B2+P2-180 >= 18

Ending Inventory for quarter 3 🡪 B3+P3-451>= 45

Ending Inventory for quarter 4 🡪 B4+P4-723 >= 72

P= Units Produced

B= Beginning Inventory

Model Optimized for Cost Reduction

A spreadsheet with numbers and prices

AI-generated content may be incorrect.

Explanation

The model analyzes inventory and production costs over four periods, balancing production with fluctuating demand to minimize total costs. Beginning inventory, units produced, and demand determine the ending inventory each period, ensuring sufficient stock while avoiding excessive carrying costs. Production costs vary based on unit costs, while carrying costs depend on average inventory levels. The total cost of $86,843.73 reflects the combined production and storage expenses, suggesting an optimized strategy to efficiently meet demand while controlling expenses.

Model with Stipulation

By removing the production capacity constraint, the model allows large-scale production in earlier periods, leading to a buildup of excess inventory. This results in no production in later periods, as earlier stockpiling meets demand. While this reduces production-related fluctuations and prevents shortages, it significantly increases inventory carrying costs.

If carrying costs were also removed, the model would favor large-scale early production without penalty, further distorting real-world feasibility.

This highlights a key limitation of models: while they provide optimization frameworks, they rely on constraints to remain realistic. Over-simplified models can lead to impractical strategies, such as excessive early production without considering storage limitations, cash flow issues, or operational efficiency.