Module 03 – Production Modeling

Exploratory Data Analysis

Tabe: The averages of each matrics in quarters are different

|  |  |  |  |
| --- | --- | --- | --- |
| Quarter | Average of capacity | Average of demand | Average of production\_cost |
| 1 | 468.00 | 592.00 | 46.67 |
| 2 | 478.00 | 594.00 | 56.61 |
| 3 | 593.00 | 701.00 | 51.50 |
| 4 | 487.00 | 565.00 | 51.89 |
| Grand Total | 506.50 | 613.00 | 51.67 |

Figure 1: Averages of each matrices over time

Model Formulation

1. *Decision Variables  
   Decision variables are the variables in an optimization model whose values are to be determined in order to achieve the best outcome according to the objective function..*

*“Units Produced” $C$11:$F$11 are Decision Variables*

1. *Objective Function  
   The objective function is a mathematical expression that defines the goal of the optimization model. It is formulated in terms of the decision variables and is either maximized or minimized, depending on the nature of the problem.*

*Objective Function, Monthly Total Cost , Min, =SUM(C23:F24)*

1. *Constraints*

*In the model the following Constraints are given:*

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1. *Units produced less than or equal max value*
2. *Ending inventory greater than or equal minimum inventory*

Model Optimized for Cost Reduction

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*Figure 2: Model*

*The model is recommending a minimum cost of*  105,556. 42 pounds. If the units produced in different quarters are Q1: 463, Q2: 593, Q3: 487 Q4: 468 with a carry cost of 1.54 and starting inventory 500.

Model with Stipulation

*In the second model, removing production capacity constraints and reducing carrying cost allows more flexible production scheduling—producing more in low-cost periods and less in expensive ones. This leads to a lower total cost (£102,168.75 vs. £105,556.42).*

*What’s happening:*

* *Cost minimization is achieved by shifting production to cheaper quarters.*
* *Less inventory is carried,*

*Fallbacks:*

* *No capacity limits may be unrealistic—factories*
* *Low carrying costs may not reflect true storage, risk, or obsolescence.*
* *May lead to infeasible plans in real life due to overreliance on flexible production.*