Production and Inventory Optimization

Minimizing Costs and Maximizing Profitability

Objectives

- Minimize operational costs.
- Meet demand effectively across periods.
- Leverage promotional pricing for profitability.

Methodology

- **Model Definition:**
  - Decision variables for workforce, production, subcontracting, inventory, stockouts, and demand.
- **Objective Function:**
  - Minimize costs, including hiring, layoffs, overtime, subcontracting, and stockouts.
- **Constraints:**
  - Workforce balance.
  - Capacity and overtime limits.
  - Inventory and demand fulfillment.
- **Tools Used:**
  - Gurobi optimization.
  - Python for modeling and visualization.

Results Overview

- **Minimum Cost:** $422,660.00.
- **Total Revenue:** $640,000.00.
- **Profit:** $217,340.00.

Key Insights

- **Promotional Pricing:**
  - Boosted demand during promotional periods, increasing revenue.
- **Production Planning:**
  - Effective use of subcontracting and overtime to manage peaks.
- **Inventory Management:**
  - Maintained required levels to avoid stockouts while minimizing holding costs.

Visualizations

- **Aggregate Plan:**
  - Trends for production, inventory, demand, and stockouts.
- **Cost Breakdown:**
  - Contributions of different cost components to total expenses.

Conclusion

- **Summary:**
  - Integrated planning minimizes costs and maximizes profitability.
  - Scenario analysis highlights the impact of pricing strategies.
- **Next Steps:**
  - Implement optimized plans and refine model parameters regularly.

Thank you!!