Inventory Forecasting Project – Report

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1. What is the core business problem and why does it matter?

The hotel chain operates multiple bars across different locations. They face two common inventory problems:

- **Stockouts** — popular items run out, leading to lost sales and unhappy guests.
- **Overstocking** — too much inventory of slow-moving items, which increases storage costs, leads to wastage (especially for perishable items), and blocks cash flow.

Solving this problem is very important because:

- It directly improves customer satisfaction.
- Reduces inventory holding costs.
- Makes the bar operations more efficient and profitable.
- Allows managers to plan purchases better.

Better inventory = happier customers + lower costs.

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2. What assumptions did you make? Why?

Since we are working with historical data, I made the following assumptions:

- The recent 30 days of sales data reflect the current demand patterns.
- Future demand will be similar to past patterns, with some random fluctuations.
- Demand is approximately normally distributed for simulation purposes.
- We forecast demand for the next **7 days**, which is a reasonable short-term period for hotels to plan inventory.
- A **safety stock factor of 1.5** is used to account for demand variability and avoid stockouts.

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3. What model did you use and why did you choose it? Why not others?

I used a **simple moving average + safety stock model**:

- Take the average daily consumption over the last 30 days.
- Multiply it by the forecast horizon (7 days).
- Add safety stock based on recent demand variability.

I chose this approach because:

- It is simple, transparent, and easy for hotel managers to understand.
- Requires very little data preparation.
- Works well for short-term forecasting with high variability.

I didn't use advanced models like ARIMA, Prophet, or machine learning models because:

- They require more historical data, complex tuning, and sometimes overfit with limited data.
- In real-world hotel operations, managers prefer easy-to-explain and maintainable solutions.

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4. How does your system perform? What would you improve?

Performance:

- The system recommends appropriate par levels based on recent sales.
- It prevents stockouts in most cases, while avoiding overstocking.
- The simulation shows how many days stockouts could still happen with current par levels.

Improvements for the future:

- Include seasonality (weekends, holidays, events).

- Consider lead times for supplier orders.
- Use better simulation techniques (e.g. Monte Carlo with demand variability).
- Incorporate pricing, promotions, and events to fine-tune forecasts.
- Allow managers to adjust safety stock factor based on item criticality.

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5. How would this solution work in a real hotel?

1. Each bar manager would upload daily consumption data into the system.
2. The system would run the forecast automatically every week.
3. The system outputs:
    - Recommended order quantities.
    - Updated par levels for each item.
4. Managers place orders accordingly and monitor stock levels.
5. Over time, the system keeps adjusting based on latest data.

Benefits:

- Easy to use.
- Prevents running out of important items.
- Reduces wasted storage and spoilage.
- Helps standardize inventory decisions across multiple hotel locations.

6.What would break at scale? What would you track in production?

Potential issues at scale:

- Data quality problems (missing or incorrect sales data).
- Different consumption patterns across locations.

- Sudden demand spikes (events, festivals, weather).
- Supply chain disruptions (delayed deliveries).

In production, I would track:

- Forecast accuracy (compare forecast vs actual consumption).
- Stockout incidents.
- Overstocking levels.
- Lead time performance from suppliers.