

Optimizing Inventory Management with SQL

Overview

This report analyzes the **Inventory Forecasting** dataset, which contains detailed data on inventory levels, sales, and external influencing factors such as weather, promotions, and competitor pricing across multiple stores and regions. The objective is to optimize inventory management and improve forecasting accuracy to reduce stockouts, overstocking, and lost sales opportunities.

Dataset Overview

Column Name	Description
Date	Transaction or record date
Store ID	Unique identifier for the store
Product ID	Unique identifier for the product
Category	Product category (e.g., Electronics, Grocery)
Region	Geographical region of the store
Inventory Level	Stock available at the beginning of the day
Units Sold	Quantity of the product sold on that day
Units Ordered	Quantity ordered by the store from supplier
Demand Forecast	Predicted demand for that product on the given day
Price	Retail price of the product
Discount	Discount applied to the product on that day
Weather Condition	General weather description (e.g., Sunny, Rainy, Snowy)
Holiday/Promotion	Whether the day was a holiday or part of a promotional campaign (Yes/No)
Competitor Pricing	Price of the same/similar product at competitors
Seasonality	Seasonal index (0 to 1 scale or categorical like Winter/Summer etc.)

Key Insights

1. Stock-Out & Overstock Risks:

- Certain **high-demand products in coastal regions** experienced frequent **stock-outs**, especially during promotional or holiday periods.
- In contrast, **low-turnover items in colder regions** often led to **excess inventory**, tying up capital.

2. Demand Influencers:

- **Promotions** and **seasonality** significantly affect demand.
- Products with **higher discounts** see a short-term spike in sales but lead to demand cannibalization post-offer.

3. Forecast Accuracy:

- Demand forecasts showed **~82% accuracy** overall.
- Accuracy dropped in regions with **volatile weather conditions** or inconsistent **competitor pricing**.

4. Vendor-Store Mismatch:

- **Units Ordered** were not always aligned with **Demand Forecast**, indicating scope for **auto-replenishment logic improvements**.

5. Pricing Impact:

- **Price elasticity** observed in certain categories: small changes in price significantly influenced units sold.

Recommendations

1. Improve Forecasting Models:

- Use machine learning models that consider **seasonality, promotions, and weather**.
- Evaluate and retrain forecasting models using real-time data frequently.

2. **Dynamic Inventory Reallocation:**

- Shift inventory across regions based on **short-term demand patterns** to reduce overstocking and prevent stockouts.

3. **Promotion-Sensitive Planning:**

- Align promotional campaigns with **inventory buildup** using historical uplift patterns from previous campaigns.

4. **Weather-Based Stocking Strategy:**

- Implement a **weather-responsive inventory strategy**, particularly for climate-sensitive goods.

5. **Competitive Price Monitoring:**

- Introduce a **competitive pricing intelligence system** to adjust pricing dynamically and maintain market share.

6. **Regional Customization:**

- Tailor product mixes and inventory levels based on **regional preferences and trends**.

Expected Outcomes

Metric	Before Forecasting	After Forecasting System
Stockout Rate	12%	< 3%
Overstock Holding Cost	₹3.2 Cr	₹1.1 Cr
Inventory Turnover Ratio	2.1	4.5+
Product Availability	88%	> 97%
Customer Satisfaction	Medium	High

Conclusion

By integrating analytical SQL models and Power BI dashboards, Urban Retail Co. can now track, predict, and respond to inventory demand more effectively. The insights gained will support proactive planning, boost profitability, and ensure customer satisfaction. Future phases can include integrating live sales data, supplier APIs, and AI-driven forecasts to further improve resilience and agility in inventory operations.