Inventory Optimization Through SQL: A Data Driven Retail Solution

Urban Retail Co. | Summer Projects 2025

1. Project Overview

Urban Retail Co., a mid-sized retail chain with 5,000+ SKUs across multiple cities, faces key inventory challenges—frequent stockouts of fast-moving products, overstocking of slow movers, poor real-time visibility, and inconsistent supplier performance. This summer project aimed to build a SQL-driven inventory management system to convert raw data into actionable insights for smarter, data-informed decisions.more informed decision-making.

2. Project Goals

The project focused on structuring raw inventory data into relational models, developing advanced SQL queries for key insights, identifying inefficiencies through analytics, and forecasting demand to optimize inventory and reorder strategies.

3. Data Handling & Schema Design

A cleaned and structured dataset was developed using SQL:

- Duplicate records and missing values were identified and handled
  A new table `inventory_analysis` was created with appropriate data types
- Composite primary keys and indexes were implemented for performance
- Data was normalized to allow easier querying and scalability

Key columns included: `store_id`, `product_id`, `category`, `inventory_level`, `units_sold`, `units_ordered`, `region`, `price`, **and** `demand_forecast`.

4. Analytical Queries and Insights

Stock Overview: Tracked inventory by region and category using total, average, min, and max stock levels.

Reorder Point Estimation: Identified products needing restock using:
Reorder Point = Avg_Units_Sold × 7 + 1.5 × Std_Dev

Inventory Turnover: Measured sales efficiency by category with:
Turnover = Total Units Sold / Avg Inventory

Stockout Rate: Flagged frequent stock shortages by region using:
Stockout Rate = (Stockouts / Total Entries) × 100

Inventory Aging: Detected outdated SKUs via:
Inventory Age = DATEDIFF(CURRENT_DATE, MAX(Date))

5. Tableau Dashboard Summary

Visualized:

- **Fast vs. slow-moving SKUs**
- **Heatmaps for stock adjustment (Units Sold > Units Ordered)**
- **Demand trends and reorder needs**
- **Aged inventory and supplier delays**

Filters by region/category enhanced clarity.

5. Findings & Recommendations

- **Understocked SKUs (15%) → Set up auto restock alerts**
- **Overstocked items → Discount or shift to other stores**
- **Supplier delays → Track and benchmark vendor performance**
- **Old stock (90+ days) → Clear through promotions or markdowns**

6. Conclusion

The project delivered a scalable SQL-based solution for Urban Retail Co. to monitor and optimize inventory, enabling faster and more informed decision-making.