Inventory Optimization Project Report

Urban Retail Co. – Summer Projects '25

June 23, 2025

1. Project Objectives

Urban Retail Co. is facing serious inefficiencies in inventory operations. These include frequent stockouts, overstocking, inaccurate forecasts, and lack of insight into promotions and seasonal trends. The objective of this project is to:

- Design a normalized SQL database schema for retail inventory analytics.

- Extract actionable insights using advanced SQL queries.

- Build KPIs to monitor inventory health, reorder thresholds, turnover, and promotion effectiveness.

- Visualize findings using a data-driven dashboard.

2. Entity Relationship Diagram (ERD)

The following ER diagram outlines the relationship among the core tables used in this project:
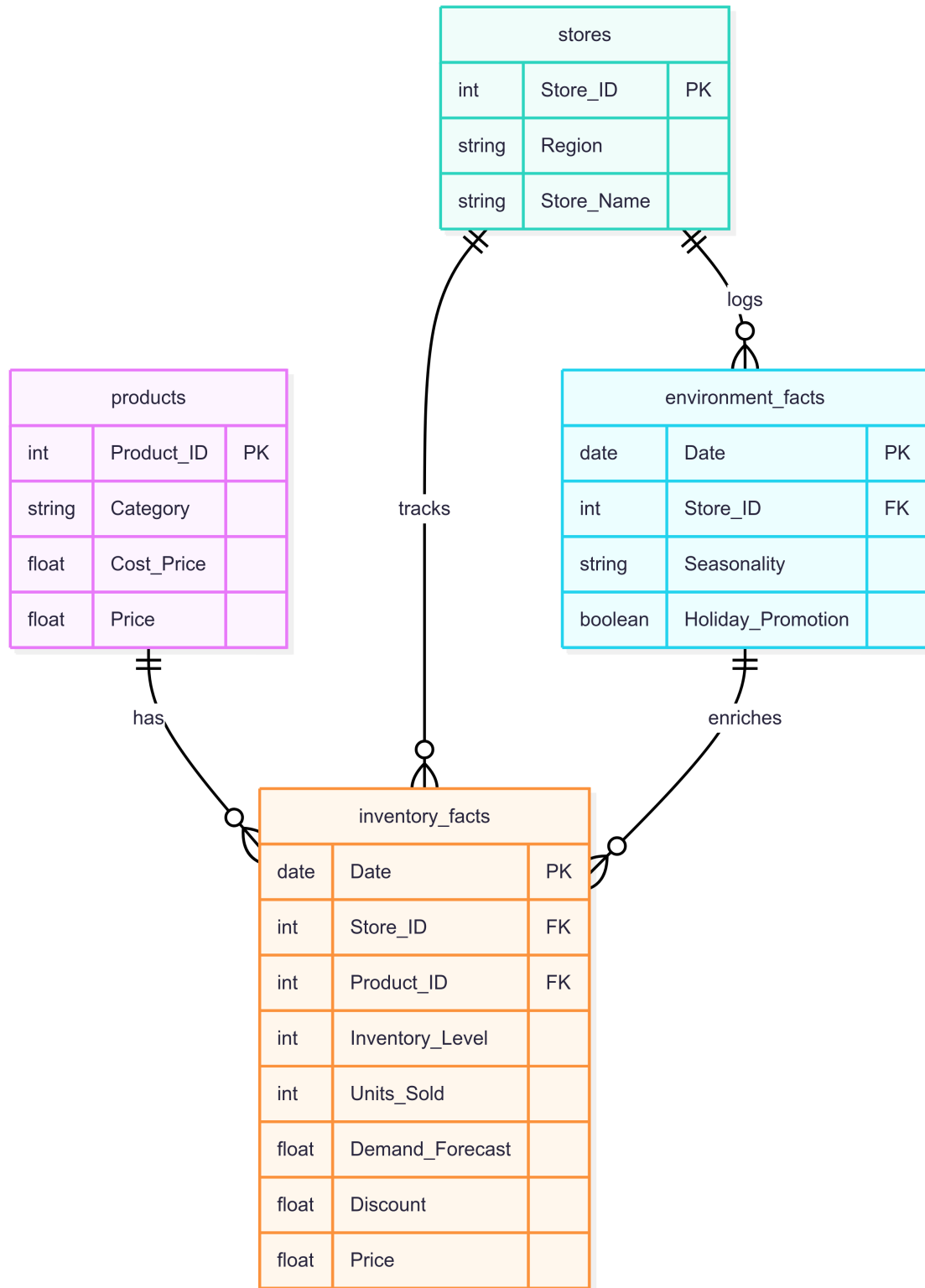
Figure 1: Entity Relationship Diagram for Inventory Database

3. Key SQL Insights

The project uses analytical SQL scripts to extract several inventory metrics:

1. **Inventory Health Dashboard:** Highlights understocked and overstocked items by region and category.

2. **Forecast Accuracy:** Compares historical demand forecast with actual sales to compute error rates.

3. **Reorder Point Optimization:** Recommends reorder points using average sales and volatility.

4. **Seasonal Trends:** Shows demand shifts across seasons for each product category.

5. **Promotion Impact:** Measures uplift in units sold and revenue during promotional periods.

6. **Data Completeness:** Ensures data spans all stores and dates for reliable analysis.

4. KPI Summary Table (Sample Data)

Based on a sample dataset of 100K+ inventory transactions, the following KPI summary was generated by category:

Table 1: KPI Summary by Category

Category	Inventory	Units Sold	Forecast	Price	Discount
Clothing	154.02	123.33	143.57	85.14	5.02
Electronics	150.71	118.87	141.07	62.46	4.98
Furniture	154.78	122.49	142.33	49.99	4.98
Grocery	153.96	123.24	142.89	27.47	4.97
Personal Care	154.26	123.17	142.82	33.65	4.95
Toys	154.55	122.96	142.70	35.23	4.99

5. KPI Dashboard Mock-up

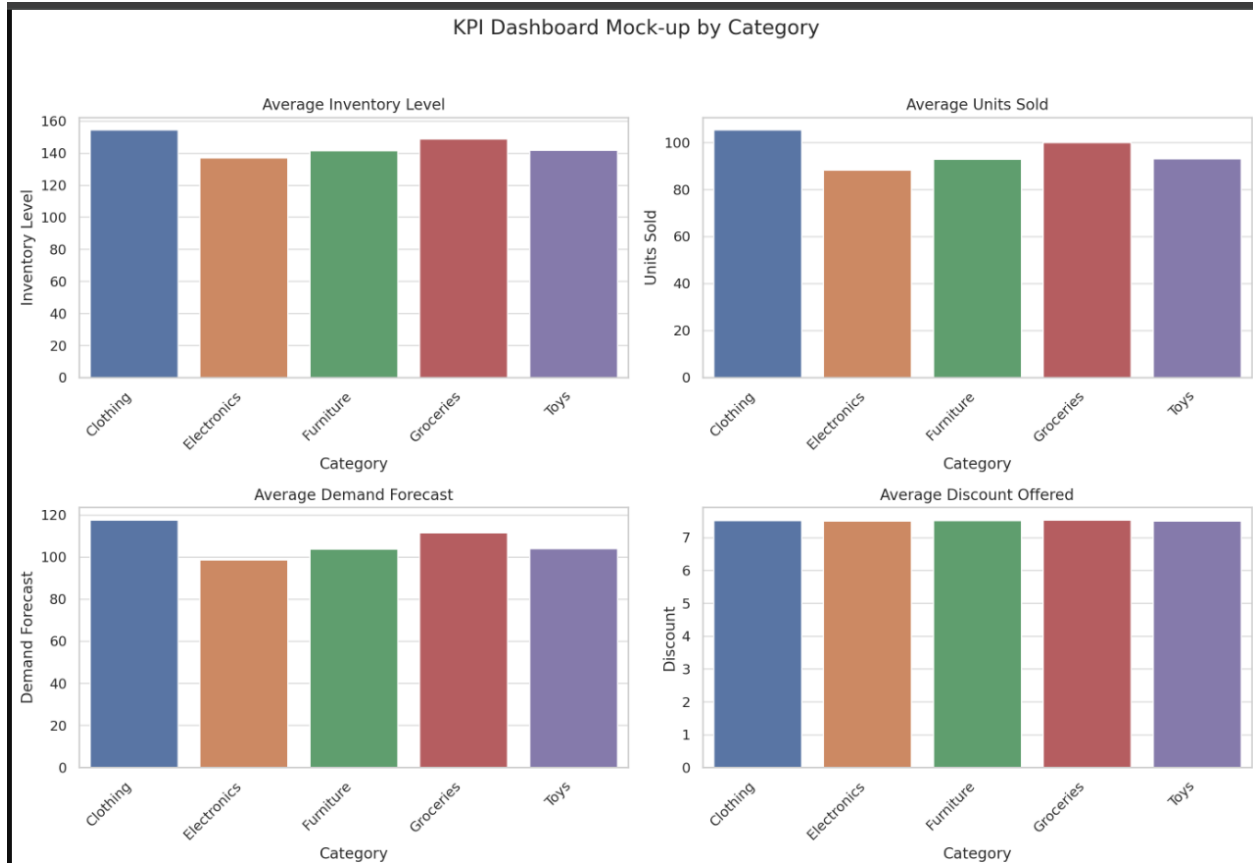The chart below visualizes key performance indicators across different product categories:
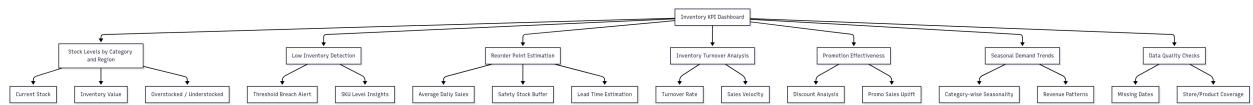
Figure 2: Inventory KPI Dashboard (Sample Data)

Figure 3: Mock-Up Inventory KPI Dashboard

6. Recommendations

Based on SQL insights and dashboard findings, we recommend:

- **Reorder Thresholds:** Automate reorder alerts using lead time and demand variability.

- **Promotion Planning:** Focus promotions on high-lift categories; track uplift metrics per event.

- **Seasonal Stocking:** Adjust inventory levels for seasonal peaks, especially in electronics and clothing.

- **Data Quality:** Ensure timely and complete entry of warehouse and POS data.

- **Supplier Evaluation:** Monitor delivery performance to reduce stockout risk.

- **Dashboards for Managers:** Integrate real-time KPI dashboards in store-level decision-making.

7. Conclusion

The implemented SQL-based analytics system offers a scalable and actionable approach to optimizing inventory. Through robust data modeling and performance tracking, Urban Retail Co. can enhance product availability, reduce holding costs, and increase operational agility across all regions and categories.