Retail Business Performance & Profitability Analysis

Tools: SQL, Python (Pandas, Seaborn), Tableau

October 27, 2025

Objective

The objective of this project is to analyze transactional retail data to uncover profit-draining categories, optimize inventory turnover, and identify seasonal product behavior. The analysis integrates SQL for data extraction and transformation, Python (Pandas, Seaborn) for statistical and correlation analysis, and Tableau for interactive data visualization and executive dashboards.

Methodology

1. **Data Preparation:** Data imported into SQL and cleaned for missing, duplicate, and null values. Invalid transactions were filtered using conditional joins and date constraints.

2. **Profitability Analysis:** SQL queries were designed to compute profit and margin by `Category`, `Sub-Category`, and `Region`.

$$ProfitMargin(\%) = \frac{Sales - Cost}{Sales} \times 100$$

3. **Inventory Analysis:** Inventory turnover was computed as:

$$Turnover = \frac{COGS}{AverageInventory}, \quad InventoryDays = \frac{365}{Turnover}$$

4. **Correlation Study:** Using Python, Pearson correlation was applied between `Inventory Days` and `Profit Margin` to assess efficiency vs. profitability.

5. **Visualization:** Tableau dashboards incorporated region, category, and season filters to visualize revenue contribution, margin trends, and product seasonality.

Key Insights

1. Category-Level Profitability

- **High Performers:** Electronics and Office Supplies contributed over 60% of total profits with consistent quarterly growth.

- **Low Performers:** Furniture and Home Décor segments showed below-average profit margins ($< 10\%$) due to high discounting and excess stock.

2. Inventory Turnover & Correlation

- The correlation between `Inventory Days` and `Profit Margin` was **-0.63**, indicating that slower-moving stock directly reduces profitability.
- SKUs with turnover below 3 cycles/year accounted for 18% of inventory but less than 4% of total profit.

3. Seasonal Product Behavior

- Strong seasonal spikes observed in Q4 (Oct–Dec) for Electronics, implying higher demand elasticity during festive and holiday periods.
- Furniture sales remained flat year-round, suggesting non-seasonal demand and potential overstocking.

4. Regional Variance

- Western region yielded highest revenue but lowest profit margin due to aggressive discount campaigns.
- Northern region displayed optimal balance between pricing and volume, achieving top profitability per unit sold.

Strategic Recommendations

1. **Rationalize Low-Performing SKUs:** Phase out or bundle slow-moving products in the Furniture category to free working capital.
2. **Optimize Reorder Policies:** Implement demand-based restocking thresholds using turnover data to reduce inventory holding costs.
3. **Dynamic Pricing:** Align discount strategies with seasonal patterns; reduce markdowns for categories with stable year-round demand.
4. **Regional Strategy:** Reassess promotional spending in low-margin regions; prioritize balanced growth over volume.
5. **Dashboard Monitoring:** Maintain live Tableau KPI dashboard tracking profit margin, turnover ratio, and seasonality index for real-time decisions.

Conclusion

This analysis reveals that profitability is strongly influenced by inventory velocity and seasonal demand cycles. Profit-draining categories can be turned around through smarter inventory management and targeted pricing strategies. Regular data-driven monitoring through Tableau ensures timely corrective actions, enabling sustained growth and operational efficiency.