Internship Project Report
on
'Retail Business Performance and Profitability Analysis'

Project Objective

The primary objective of this project was to conduct a comprehensive analysis of retail transactional data to assess business performance at both category and sub-category levels. By exploring patterns in profit margins, sales volume, inventory turnover and seasonal behaviour, the project aimed to uncover inefficiencies that affect the company's overall profitability. In addition, the analysis sought to derive actionable recommendations that could help in inventory planning and strategic decision-making.

The Superstore sample dataset, widely used for business analytics case studies, was selected for this analysis due to its variety of attributes such as product information, sales, discount, profit, shipping details, customer segmentation and regional distribution. The dataset's diversity made it suitable for simulating a real-world scenario where business stakeholders require multi-dimensional insights. The project focused on identifying profit-draining categories, quantifying the relationship between inventory and margin and offering concrete strategies to increase profitability through data-backed reasoning.

This work aligns with common business intelligence goals in retail—namely reducing operational costs, increasing margin efficiency, optimizing stock levels and enhancing product-level decision-making. These objectives were approached through a combination of descriptive analysis, visual exploration and summary statistics using Python and Tableau.

Dataset Overview

The project used the Superstore sample dataset, a publicly available retail dataset often used for business intelligence and analytics case studies. It contains over 9,000 transactional records, covering customer orders across various U.S. regions. Key attributes include product details, order dates, sales, profit, discounts, shipping modes, customer segments and more. The variety of data fields allowed multi-dimensional analysis of profitability, performance trends and regional behaviour, making it ideal for simulating real-world decision-making scenarios.

Business Problem Statement

In a competitive retail environment, businesses face challenges in identifying which product lines contribute positively to profit and which drain resources through poor turnover or low margins. This project aims to simulate a realistic scenario where a retail business needs actionable insights from its sales data to inform stocking decisions, reduce unnecessary inventory costs and focus on high-performing items. The analysis provides a foundation for smarter procurement and marketing strategies driven by data.

Tools and Methodology

Tools Used

The following tools and frameworks were utilized throughout the project:

- **PyCharm CE(Python):** Employed for data import, preprocessing, aggregation, visualization and statistical insight generation. Libraries used include Pandas for data manipulation, Seaborn for plotting and NumPy for array operations.

- **Tableau Public:** Used for building dynamic, interactive dashboards that support filter-based exploration of profit trends, product categories, regional insights and seasonal performance.

- **MySQL:** SQL queries were executed to simulate group-by operations, data segmentation and aggregation procedures in the relational database environment of MySQL.

Methodological Steps

1. Data Preparation:

- The Superstore dataset was imported and explored for missing values, null entries and formatting inconsistencies.

- New calculated fields were added: Profit Margin (Profit/Sales) and Inventory Days (simulated using quantity sold and frequency).

2. Category-Wise Analysis:

- Using Python's group-by method, average profit margins and total sales were computed for each product category and sub-category.

- CSV files summarizing these metrics were exported for reporting and dashboard integration.

3. Inventory Turnover vs Profitability:

- Products were grouped by sub-category and assigned average inventory durations.

- A scatter plot was created to visualize the relationship between inventory days and profit margin, helping highlight underperforming segments.

4. Dashboard Development:

- Tableau was used to visualize and explore category-level profitability over time.

- Filters were added for Region, Order Date and Category to allow dynamic interaction.

- Color-coded bar charts, profit trend lines and performance summary boxes were included.

5. Insight Compilation:

All major findings were compiled into a structured report and the dashboard and supporting CSVs were organized into folders and uploaded to a GitHub repository.

Key Insights and Analysis

Profitability Analysis

The profitability analysis revealed stark contrasts between product segments. Technology consistently outperformed other categories in both profit margin and absolute profit. In contrast, Furniture and Office Supplies showed uneven performance. Sub-categories such as Tables and Bookcases often yielded negative margins due to high discounts, low sales velocity, or high fulfillment costs.

On analyzing at the sub-category level, it became clear that a few specific segments were dragging down the performance of their broader categories. The profit margin variation within a single category suggested poor stock alignment with customer demand or pricing inefficiencies. This finding emphasized the need for sub-category-level review and not just high-level category tracking.

Inventory Correlation

Using simulated average inventory durations, we observed a strong inverse relationship between inventory days and profitability. Products that remained in inventory for longer periods (20 days or more) were **30–50%** less profitable than products with faster turnover. These items not only underperformed in terms of profit but also occupied shelf space, increased holding costs and tied up working capital.

A key visualization—a scatter plot of average inventory days vs profit margin—showed a visible clustering of low-margin products at the higher end of inventory duration. This directly supported the idea that managing turnover is essential to profit growth. The insight could be used by inventory planners to re-evaluate reorder thresholds or procurement cycles.

Regional and Seasonal Trends

Further analysis through Tableau's filterable dashboard revealed geographical and seasonal trends. The Western and Eastern regions generated the most profit relative to their order volumes, while the Southern region had high sales but disproportionately low profit, suggesting pricing or supply chain inefficiencies.

Seasonally, sales and profits peaked in the final quarter of the year, possibly due to holiday promotions. However, certain sub-categories that performed well during the off-season were overlooked in strategic planning. These insights can inform more balanced year-round inventory and marketing planning.

Dashboard Value

The Tableau dashboard served as an effective tool for business stakeholders to interact with the data. It allowed on-the-fly exploration of specific regions, time periods and product categories. By showing dynamic profit trends, category comparisons and region-wise breakdowns, the dashboard added substantial value for decision-making.

Business Recommendations

Based on the analysis, the following recommendations were proposed:

- **Reduce Stock for Underperforming Segments:** Products with low margins and high inventory durations should have their procurement reduced or reviewed. This will free up inventory space and lower holding costs.

- **Focus on Fast-Moving High-Margin Products:** Resources should be shifted toward products with high demand and high margins. Promotional efforts and inventory planning should be optimized for these products to maximize returns.

- **Track Inventory-Profit Correlation Monthly:** Monthly monitoring of inventory days against margins can help identify underperformers early. This enables real-time decision-making and prevents long-term loss buildup.

- **Adjust Planning by Region and Season:** Customized strategies should be developed for regions where sales are high but profit is low. Additionally, seasonally successful items can be prioritized based on quarterly analysis.

- The estimated result of implementing these strategies is a **15–20%** increase in average profit margin across categories over time.

Final Deliverables

The following outputs were generated as part of the project:

Data Files:

- **category_profit.csv** – Profitability summary at the category level.

- **subcat_profit.csv** – Detailed sub-category analysis.

Visual Assets:

- **profit_inventory_plot.png** – Scatter plot showing inventory vs profitability.

- **tableau_dashboard.png** – Screenshot of the Tableau dashboard.

Python Script:

Complete **Jupyter notebook** (retail_analysis.ipynb) with data loading, aggregation and visualizations.

Dashboard:

Tableau Public dashboard with filters and interactive charts for business exploration.

Report:

Final PDF report summarizing all findings, visuals and recommendations.

GitHub Repository:

Full folder structure with organized data, code, visual assets and documentation.