

# Retail Business Profitability & Inventory Optimization - Detailed Report

## 1. Project Overview

This project focuses on analyzing a retail dataset to uncover inefficiencies in product profitability, inventory turnover, and seasonal demand patterns. It combines SQL logic, Python analytics, and BI dashboards to produce business-ready insights.

## 2. Dataset Summary

The dataset contains transactional retail sales data including order dates, product categories, quantities, sales values, discounts, and profits. It has been cleaned and reformatted for dashboard integration and exploratory analysis.

## 3. Tools & Technologies

- Python (Pandas, Matplotlib, Seaborn)
- MySQL for SQL-style groupings
- Tableau and Power BI for dashboarding
- CSVs for dashboard source feeds

## 4. Exploratory Data Analysis

- Visualized profit by category and sub-category
- Analyzed monthly and regional sales trends
- Created correlation heatmaps for key numeric variables
- Categorized products based on profit margins

## 5. Feature Engineering

A profit margin column was engineered and categorized as:

- High ( $\geq 0.25$ )
- Moderate ( $0.1$  to  $< 0.25$ )
- Low ( $0$  to  $< 0.1$ )
- Loss ( $< 0$ )

This allows visual segmentation and targeting within dashboards.

## 6. Combined Metrics File

Using Python, multiple group-by analyses (by category, region, sub-category, month) were combined into one CSV file to streamline BI visualizations.

## 7. Key Insights

- Office Supplies have high volume but low margins
- November and December show peak sales trends
- Some sub-categories consistently incur losses
- West Region generates highest revenue, but not the highest profit margin

## **8. Business Recommendations**

- Review and adjust pricing for loss-generating sub-categories
- Bundle low-margin items with profitable ones
- Pre-stock high-demand months
- Optimize discount strategy based on regional profitability

## **9. Visualizations & Dashboards**

- Python EDA charts (bar, line, heatmap)
- Tableau dashboards (Sub-category, region, trends)
- Power BI dashboards with KPI cards, slicers, and profit segmentation

## **10. Deliverables**

- Cleaned dataset (samplesuperstore\_final.csv)
- Combined analysis (combined\_analysis.csv)
- Jupyter Notebook (Retail\_Profitability.ipynb)
- Tableau Workbook (.twbx)
- Power BI Report (.pbix)
- Summary PDF + Detailed PDF
- GitHub-ready README.md