RETAIL BUSINESS PERFORMANCE & PROFITABILITY ANALYSIS

Introduction:

Retail businesses generate large volumes of transactional data, but high sales alone do not guarantee profitability. Poor inventory decisions, low-margin products, and lack of seasonal planning often lead to profit leakage.

This project focuses on analyzing retail sales data to evaluate business performance, identify profit-draining categories, analyze inventory efficiency, and understand seasonal sales behavior. The analysis aims to support data-driven decision-making for inventory optimization and profitability improvement.

Objective:

The primary objectives of this project are:

- To analyze sales and profit performance across product categories
- To identify categories and products that negatively impact profitability
- To study the relationship between inventory quantity and profit
- To identify seasonal patterns in profit trends
- To provide actionable business recommendations based on insights

Dataset Description:

The analysis uses a retail transactional dataset containing order-level sales information.
The dataset includes the following key attributes:

- Order Date
- Category
- Sub-Category
- Sales
- Profit
- Quantity
- Region

The raw dataset was cleaned and transformed before analysis to remove null values, ensure consistency, and standardize column formats.

Tools & technologies used:

- **SQL (SQLite)** – Data cleaning, transformation, and aggregation
- **Python (Pandas, Matplotlib/Seaborn)** – Correlation analysis and trend analysis
- **Power BI** – Interactive dashboard development and visualization
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Data cleaning & preparation (sql):

Data cleaning was performed using SQL to ensure reliable analysis. The following steps were applied:

- Removed records with null sales, profit, or quantity values
- Filtered out invalid quantity values
- Standardized column names for analysis consistency

A cleaned dataset (retail_clean.csv) was generated and used for further analysis in Python and Power BI.

PROFITABILITY ANALYSIS

Sales and Profit by Category:

Sales and profit were analyzed at the category level to compare revenue contribution and actual profitability.

Key Observation:

- Technology generates the highest profit among all categories
- Furniture shows comparatively lower profit despite reasonable sales volume

This indicates that higher sales do not always translate into higher profitability.

Profit Margin Analysis:

Profit margin was calculated to evaluate efficiency:

Profit Margin (%) = (Total Profit / Total Sales) × 100

Insights:

- Office Supplies has the highest profit margin, indicating efficient pricing and cost structure
- Furniture has the lowest profit margin, making it a profit-draining category

Inventory analysis (python):

The relationship between inventory quantity and profit was analyzed using correlation analysis and scatter plots.

Key Finding:

- Inventory quantity shows weak or inconsistent correlation with profit.
- Increasing inventory does not necessarily increase profitability

This suggests the presence of overstocking, where excess inventory locks capital without improving profit.

Seasonality analysis:

Monthly profit trends were analyzed to understand seasonal behavior.

Observations:

- Profit fluctuates significantly across months
- Certain periods show clear profit peaks, indicating seasonal demand

This highlights the importance of seasonal inventory planning rather than uniform stocking throughout the year.

Power bi dashboard:

An interactive Power BI dashboard was developed to visualize key insights.
The dashboard includes:

- Total Sales, Total Profit, and Profit Margin KPIs
- Sales and Profit comparison by category
- Profit Margin comparison across categories
- Monthly Profit Trend (seasonality)
- Inventory Quantity vs Profit analysis
- Filters for Region, Category, and Time

The dashboard enables stakeholders to explore performance dynamically and identify problem areas efficiently.

Key insights summary:

- High sales do not always result in high profit (Furniture category)
- Office Supplies is the most profitable and efficient category
- Overstocking does not guarantee increased profit
- Clear seasonal patterns exist in profit trends
- Inventory optimization can significantly improve profitability.

Conclusion:

This project demonstrates how data analytics can uncover hidden inefficiencies in retail operations. By integrating SQL, Python, and Power BI, the analysis provides a comprehensive view of profitability, inventory performance, and seasonal trends. The insights derived can help retail businesses make informed decisions to improve efficiency, reduce losses, and maximize profit.