Project Title: Solving Inventory Inefficiencies Using SQL
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Overview:
The given dataset comprises 5 stores (labelled as S001, S002, S003, S004, S005) across 5 categories of products: Furniture, Groceries, Toys, Electronics and Clothing. Region-wise, weather, seasons and holiday/promotion data is also provided. All this covers a time period of 2 years and day-wise data is provided. SQL queries were written in Google Colab environment and Replit was used for creating dashboards. Five tables: Stores, Regions, Market Conditions, Inventory Facts and Products were created for analysing data well. To prevent duplicate values, Store ID and Region together was used as a composite primary key.

The following were **the main methods/calculations done to analyse given data** and the insights from them is also clearly mentioned:

1. Sales velocity=Units sold per category/Time period

This was done to categorize products into fast moving and slow moving goods. Based on the results obtained, we classify clothing, furniture, electronics as fast moving goods and toys, groceries as slow moving items in our dataset.
However, on calculating the inventory turnover ratio, we get clothing, groceries and furniture as fast moving items; groceries and toys as slow moving items.

2. Since lead times are not given, we did not assume any lead times for the products.
3. Stockouts are calculated according to category, region, stores, weather and seasons.

We employ a simple formula to calculate the stockout rate.
Stockout rate= No. of instances where inventory level< demand_forecasted/Total demand
Clothing items register the **highest rate of stockouts (15.90)** while **electronics items** the **lowest (13.61).**
S005 sees the maximum stockouts (15.12) while **S001 sees the minimum(14.53)**
Contrary to expectations, **weather conditions do not seem to affect stockout rates much** which suggests that every store is able to deliver their products irrespective of weather.
However, **winter season sees the highest stockout rate(16.08)** compared to autumn and spring.
Therefore stockouts are influenced mainly by **category of items, stores (suppliers) and the seasons.**

4. The average demand for clothing items increases significantly during **winter season** while that of groceries during the summer season. However, the other categories of items observe a stable demand across all seasons. Therefore, clothing items should be ordered more during winters and groceries during summer.
5. **All the categories bring in profits for the store**
6. **Clothing items** have the highest inventory turnover ratio indicating good sales and efficient inventory management compared to electronics goods which have the lowest ratio. In every region, clothing items are sold the most and bring in the greatest profits for the company.
7. The following logic was implemented to **calculate the reorder points for each product and the safety stock.**

A parameter called average daily demand was defined
Average daily demand= inventory level+units ordered-units sold for each product
Reorder point=average daily demand+Safety stock

Safety stock=Maximum daily sales by category-demand forecast

The products with **safety stock<units ordered are considered at high risk of stockouts** and must be replenished more regularly. **Most of these products come from S004,** so that is our most unreliable supplier.

8. Clothing items face significantly **higher competition in the market even after factoring in discounts**. Since it has the highest sales volume for the company, the company should advertise its clothing brands more. Stockouts are high in clothing items, so the company is losing potential revenue in this category.
9. **All items are evenly distributed across all regions** and they do not influence the stockout rate much.
10. Demand for all category items is high during winter, so the company should stock inventory levels with 1.5 times safety stock during this time to meet demand.

An inventory dashboard was created using Replit.

It displays few Key Performance Indicators which can be compared based on date ranges:

1. **Total Inventory Value:** Overall value of all goods sold
2. **Total Units Sold:** To number of items sold in a given time period
3. **Average stockout risk:** Percentage that indicates how often inventory level falls below reorder point
4. **Inventory Turnover:** How quickly inventory is sold and replaced
5. **Holiday/Promotions:** How much difference in sales during holiday/promotional period as compared to normal periods

There are 5 main tabs in the dashboard:

1. **Time Series Analysis**: Plots inventory levels against reorder points over time with adjustable time views and forecast toggles to track potential stock issues.

2. **Holiday Impact**: Shows category-wise changes in units sold and revenue during holidays and promotions.

3. **Regional Performance**: Compares sales and inventory across regions using bar charts and heatmaps to highlight geographic trends.

4. **Store Management**: Provides detailed analysis for individual stores, including inventory trends and sales distribution by product category.

5. **Seasonal & Advanced**: Displays seasonal inventory patterns and enables multi-dimensional analysis with tools like correlation matrices and category-region comparisons.

The dashboard includes **interactive filters** for date range, stores, categories, and regions.