INTRODUCTION TO DATA MANAGEMENT

PROJECT REPORT

(Project Semester January-April 2025)

Warehouse and retail Sales Dashboard

Submitted by

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Programme and Section : B. Tech CSE and K23GW

Course Code: INT217

Under the Guidance of

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Discipline of CSE/IT

Lovely School of Computer Science & Engineering Lovely

Professional University, Phagwara CERTIFICATE

This is to certify that Gurleen Kaur bearing Registration no. 12320212 has completed INT217 project titled, **"WareHouse and Retail Sales Dashboard"** under my guidance and supervision. To the best of my knowledge, the present work is the result of his/her original development, effort and study.

Signature and Name of the Supervisor
Designation of the Supervisor
School of Computer Science and Engineering
Lovely Professional University Phagwara,
Punjab.

Date: 13/4/2025

DECLARATION

I, Yash Raj Shukla, student of Bachelor of Technology in Computer Science & Engineering .under CSE/IT Discipline at, Lovely Professional University, Punjab, hereby declare that all the information furnished in this project report is based on my own intensive work and is genuine.

Date: 13/4/2025 Signature

Registration No. 12320212 Yash Raj Shukla

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1. INTRODUCTION

This report examines key trends and insights from the **Warehouse and Retail Sales** dataset, a comprehensive resource published by the U.S. Census Bureau. The primary objective is to uncover meaningful patterns in the sales performance of wholesale and retail businesses across the United

States. By exploring how, when, and where these sales occur, we can provide valuable perspectives to businesses, policymakers, and economists alike—insights that can inform strategies for growth, inventory management, supply chain optimization, and economic forecasting.

The analysis is centered around an interactive Excel-based tool titled the **"SALES PERFORMANCE DASHBOARD,"** built to allow for dynamic exploration of the data using slicers, visual summaries, and a narrative-driven format. The dashboard makes it possible to filter and analyze sales trends across different industries, time periods, and economic conditions. Key initial findings from the dashboard, which this report will expand on in detail, include:

- **Total Sales Volume:** Surpassing $7 trillion annually
- **Peak Sales Month:** December, driven by holiday retail
- **Fastest-Growing Sector:** E-commerce and Non-store Retailers
- **Top Performing Industry:** Motor Vehicles & Parts Dealers

The dashboard brings several key dimensions of retail and wholesale sales activity into focus. The following areas will be examined in more depth:

- **Temporal Trends:** We will investigate how sales fluctuate over time—month to month, quarter to quarter, and year to year. Notable patterns include strong spikes in November and December, driven by Black Friday and holiday spending.
- **Industry-Level Analysis:** This section explores the performance of specific sectors such as food and beverage, apparel, building materials, and non-store retailers. Our findings reveal substantial growth in online retail and volatile patterns in motor vehicle sales influenced by external factors like supply chain disruptions.
- **Geographic Distribution:** While the dataset is national, we'll spotlight trends that hint at regional shifts and the rise of distribution hubs in specific states, particularly those with large ports and logistics infrastructure.
- **Inventory vs. Sales Patterns:** By analyzing the ratio of inventories to sales, we provide insight into supply chain efficiency and overstocking risks. This metric has proven especially relevant in recent years due to disruptions caused by global events.
- **Economic Indicators Correlation:** We'll briefly touch on how warehouse and retail sales align with broader economic indicators like GDP growth, consumer confidence, and inflation.

This report will further elaborate on these findings, offering a deep dive into how the dataset can support strategic decision-making and policy development. The Excel dashboard's interactive

filters—such as by year, NAICS industry code, inventory levels, and sales channels—make it a powerful tool for uncovering sector-specific insights and forecasting future trends.

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2. SOURCE OF DATASET

The data used in this report is sourced from the **U.S. Census Bureau** via Data.gov: https://catalog.data.gov/dataset/warehouse-and-retail-sales.
This report aims to deliver a comprehensive and accessible analysis of retail and wholesale sales trends across the United States. By blending the clarity of data visualization with concise, narrative-driven insights, it is designed to be a valuable resource for business leaders, economists, policymakers, and anyone interested in understanding the dynamics of America's commercial landscape.

3. DATA PREPROCESSING

Before conducting the analysis and building visualizations for this report, the raw data obtained from the U.S. Census Bureau's **Warehouse and Retail Sales** dataset underwent several preprocessing steps. These steps were necessary to ensure that the data was clean, consistent, and ready for in-depth analysis. Proper preprocessing also allowed for effective use of the interactive Excel dashboard and improved the overall accuracy of insights derived.

The preprocessing steps are detailed below:

❖ **Data Cleaning:**

- **Handled missing values** appropriately depending on the importance and nature of each column.
- **Corrected inconsistencies** in text formatting such as capitalization and abbreviation mismatches in industry names.
- **Removed anomalous data** such as negative sales, inventory, or shipment values that are not logically valid.

❖ **Data Transformation:**

- **Converted DATE columns** to proper datetime format for ease of filtering and temporal analysis.
- **Standardized NAICS Codes** by ensuring consistency in length and format (e.g., padded with leading zeros when required).
- **Normalized industry names** to ensure uniformity across entries.
- **Adjusted monetary values** for inflation (if applicable in specific views), using standard CPI index references.

❖ **Feature Engineering:**

- **Created 'Month' and 'Year' columns** derived from the reporting date to enable granular temporal analysis.
- **Generated 'Sales Category'** (e.g., High, Medium, Low) based on quantiles of sales volume to support comparative analysis.
- **Computed derived metrics**, including:
  - **Sales Growth Rate** = % change in sales from the previous period.
  - **Inventory-to-Sales Ratio** = Inventory / Sales for efficiency tracking.
  - **Average Monthly Sales** per industry and category.

Column-Level Preprocessing:

❖ **NAICS_CODE**

- **Description**: Represents the industry classification based on the North American Industry Classification System.
- **Significance**: Critical for segmenting and analyzing data by industry.
- **Null Values**: None.
- **Handling**: Standardized formatting (ensured 6-digit format), duplicates removed.

❖ INDUSTRY_NAME

- **Description**: Descriptive name of the industry corresponding to the NAICS code.
- **Significance**: Enhances interpretability of the data for non-technical users.
- **Null Values**: None.
- **Handling**: Corrected for spelling and format inconsistencies; standardized naming conventions.

❖ DATE

- **Description**: Reporting date (typically monthly) for the sales data.
- **Significance**: Central to all time series and trend analyses.
- **Null Values**: None.
- **Handling**: Converted to datetime format; extracted 'Year' and 'Month' for trend analysis.

❖ SALES

- **Description**: Total sales (in millions of dollars) for a given industry in a specific month.
- **Significance**: Primary metric of interest for tracking industry performance.
- **Null Values**: A few missing or zero entries due to reporting gaps.
- **Handling**: Treated missing or zero entries as "Not Reported" to maintain data integrity; values verified against industry benchmarks.

❖ INVENTORIES

- **Description**: Value of end-of-month inventories held by businesses in each sector.
- **Significance**: Important for supply chain and efficiency analysis.

- **Null Values**: Minimal.
- **Handling**: Outliers (e.g., extremely large spikes) were flagged for review; calculated Inventory-to-Sales ratio for enhanced insight.

❖ **SHIPMENTS (if applicable in the data)**

- **Description**: Indicates the value of goods shipped.
- **Significance**: Provides insights into production and supply chain activity.
- **Null Values**: Some missing entries.
- **Handling**: Retained missing as "Not Available" and excluded from derived calculations when necessary.

❖ **SALES_CATEGORY**

- **Description**: A custom categorical variable created to classify industries into performance bands based on sales volume.
- **Significance**: Aids in comparative visualization and analysis.
- **Null Values**: None (derived column).
- **Handling**: Created using quartiles of sales distribution.

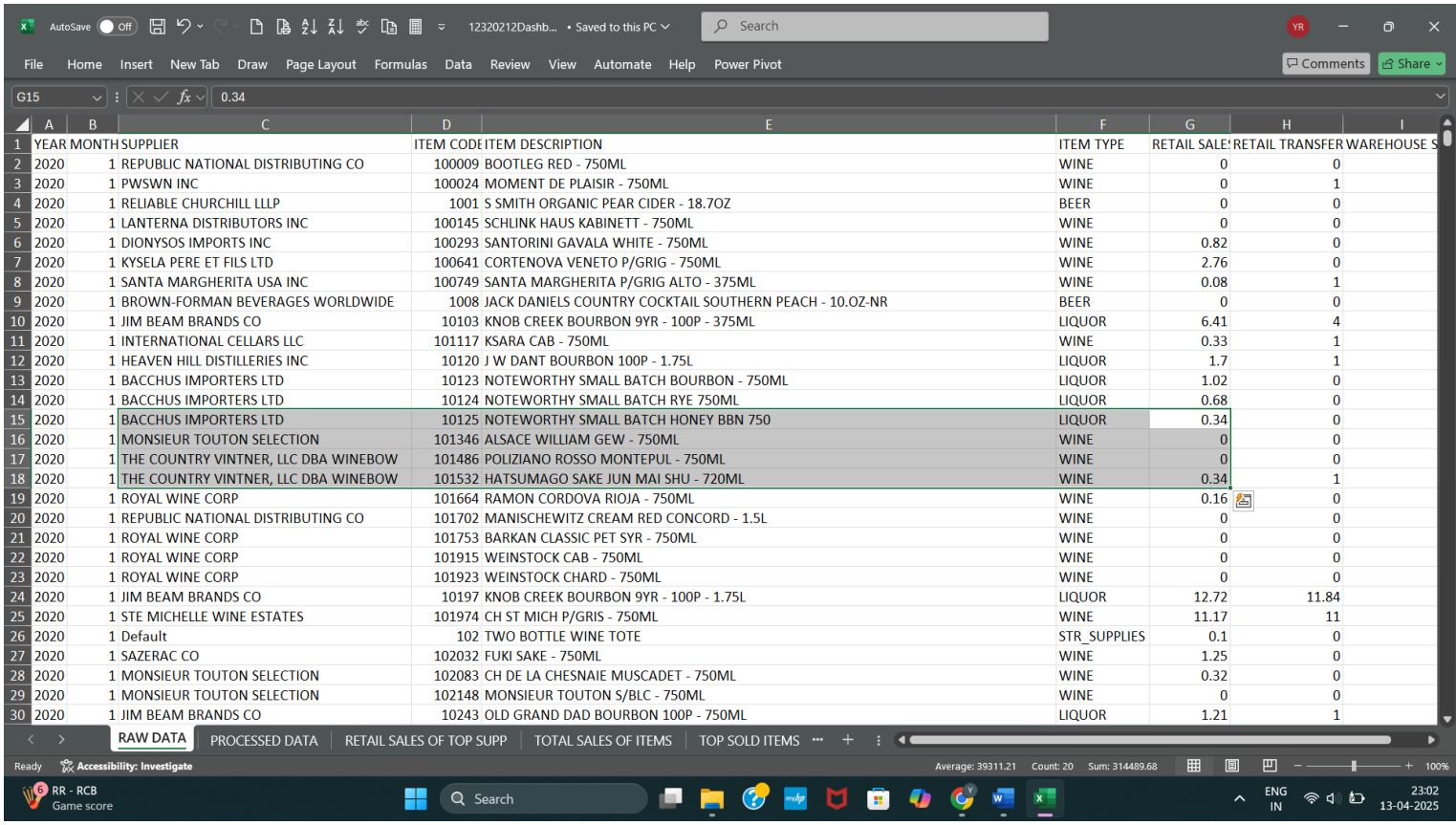
4. ANALYSIS ON DATASET

DASHBOARD OVERVIEW

- **Total Sales Volume: The dataset records a cumulative total of 21,889,443.3 units sold, combining both warehouse and retail categories. This indicates a strong demand for products across the analyzed years.**

- **Top Contributing Category: Among the multiple categories available, Warehouse Sales of Top Suppliers contribute significantly to the total volume, highlighting the central role of top-performing suppliers in distribution channels.**
- **Peak Sales Year: According to year-wise sales data, 2021 stands out as the peak sales year with the highest cumulative sales across all categories, showcasing a trend of recovery and growth post-pandemic.**
- **Top Sold Item: The most frequently sold product in terms of unit volume is identified as "CANNABIS DRIED", which significantly outweighs other products across sales channels.**

Raw Data



	A	B	C	D	E	F	G	H	I
1	YEAR	MONTH	SUPPLIER	ITEM CODE	ITEM DESCRIPTION	ITEM TYPE	RETAIL SALE	RETAIL TRANSFER	WAREHOUSE S
2	2020	1	REPUBLIC NATIONAL DISTRIBUTING CO	100009	BOOTLEG RED - 750ML	WINE	0	0	
3	2020	1	PWSWN INC	100024	MOMENT DE PLAISIR - 750ML	WINE	0	1	
4	2020	1	RELIABLE CHURCHILL LLLP	1001	S SMITH ORGANIC PEAR CIDER - 18.7OZ	BEER	0	0	
5	2020	1	LANTERNA DISTRIBUTORS INC	100145	SCHLINK HAUS KABINETT - 750ML	WINE	0	0	
6	2020	1	DIONYSOS IMPORTS INC	100293	SANTORINI GAVALA WHITE - 750ML	WINE	0.82	0	
7	2020	1	KYSELA PERE ET FILS LTD	100641	CORTENOVA VENETO P/GRIG - 750ML	WINE	2.76	0	
8	2020	1	SANTA MARGHERITA USA INC	100749	SANTA MARGHERITA P/GRIG ALTO - 375ML	WINE	0.08	1	
9	2020	1	BROWN-FORMAN BEVERAGES WORLDWIDE	1008	JACK DANIELS COUNTRY COCKTAIL SOUTHERN PEACH - 10.OZ-NR	BEER	0	0	
10	2020	1	JIM BEAM BRANDS CO	10103	KNOB CREEK BOURBON 9YR - 100P - 375ML	LIQUOR	6.41	4	
11	2020	1	INTERNATIONAL CELLARS LLC	101117	KSARA CAB - 750ML	WINE	0.33	1	
12	2020	1	HEAVEN HILL DISTILLERIES INC	10120	J W DANT BOURBON 100P - 1.75L	LIQUOR	1.7	1	
13	2020	1	BACCHUS IMPORTERS LTD	10123	NOTEWORTHY SMALL BATCH BOURBON - 750ML	LIQUOR	1.02	0	
14	2020	1	BACCHUS IMPORTERS LTD	10124	NOTEWORTHY SMALL BATCH RYE 750ML	LIQUOR	0.68	0	
15	2020	1	BACCHUS IMPORTERS LTD	10125	NOTEWORTHY SMALL BATCH HONEY BBN 750	LIQUOR	0.34	0	
16	2020	1	MONSIEUR TOUTON SELECTION	101346	ALSACE WILLIAM GEW - 750ML	WINE	0	0	
17	2020	1	THE COUNTRY VINTNER, LLC DBA WINEBOW	101486	POLIZIANO ROSSO MONTEPUL - 750ML	WINE	0	0	
18	2020	1	THE COUNTRY VINTNER, LLC DBA WINEBOW	101532	HATSUMAGO SAKE JUN MAI SHU - 720ML	WINE	0.34	1	
19	2020	1	ROYAL WINE CORP	101664	RAMON CORDOVA RIOJA - 750ML	WINE	0.16	0	
20	2020	1	REPUBLIC NATIONAL DISTRIBUTING CO	101702	MANISCHEWITZ CREAM RED CONCORD - 1.5L	WINE	0	0	
21	2020	1	ROYAL WINE CORP	101753	BARKAN CLASSIC PET SYR - 750ML	WINE	0	0	
22	2020	1	ROYAL WINE CORP	101915	WEINSTOCK CAB - 750ML	WINE	0	0	
23	2020	1	ROYAL WINE CORP	101923	WEINSTOCK CHARD - 750ML	WINE	0	0	
24	2020	1	JIM BEAM BRANDS CO	10197	KNOB CREEK BOURBON 9YR - 100P - 1.75L	LIQUOR	12.72	11.84	
25	2020	1	STE MICHELLE WINE ESTATES	101974	CH ST MICH P/GRIS - 750ML	WINE	11.17	11	
26	2020	1	Default	102	TWO BOTTLE WINE TOTE	STR_SUPPLIES	0.1	0	
27	2020	1	SAZERAC CO	102032	FUKI SAKE - 750ML	WINE	1.25	0	
28	2020	1	MONSIEUR TOUTON SELECTION	102083	CH DE LA CHESNAIE MUSCADET - 750ML	WINE	0.32	0	
29	2020	1	MONSIEUR TOUTON SELECTION	102148	MONSIEUR TOUTON S/BLC - 750ML	WINE	0	0	
30	2020	1	JIM BEAM BRANDS CO	10243	OLD GRAND DAD BOURBON 100P - 750ML	LIQUOR	1.21	1	

OBJECTIVE AND ANALYSIS

Objective 1: Year-wise Sales Trend

General Description
Identify the sales trends over the years to understand seasonal or progressive growth in the industry.

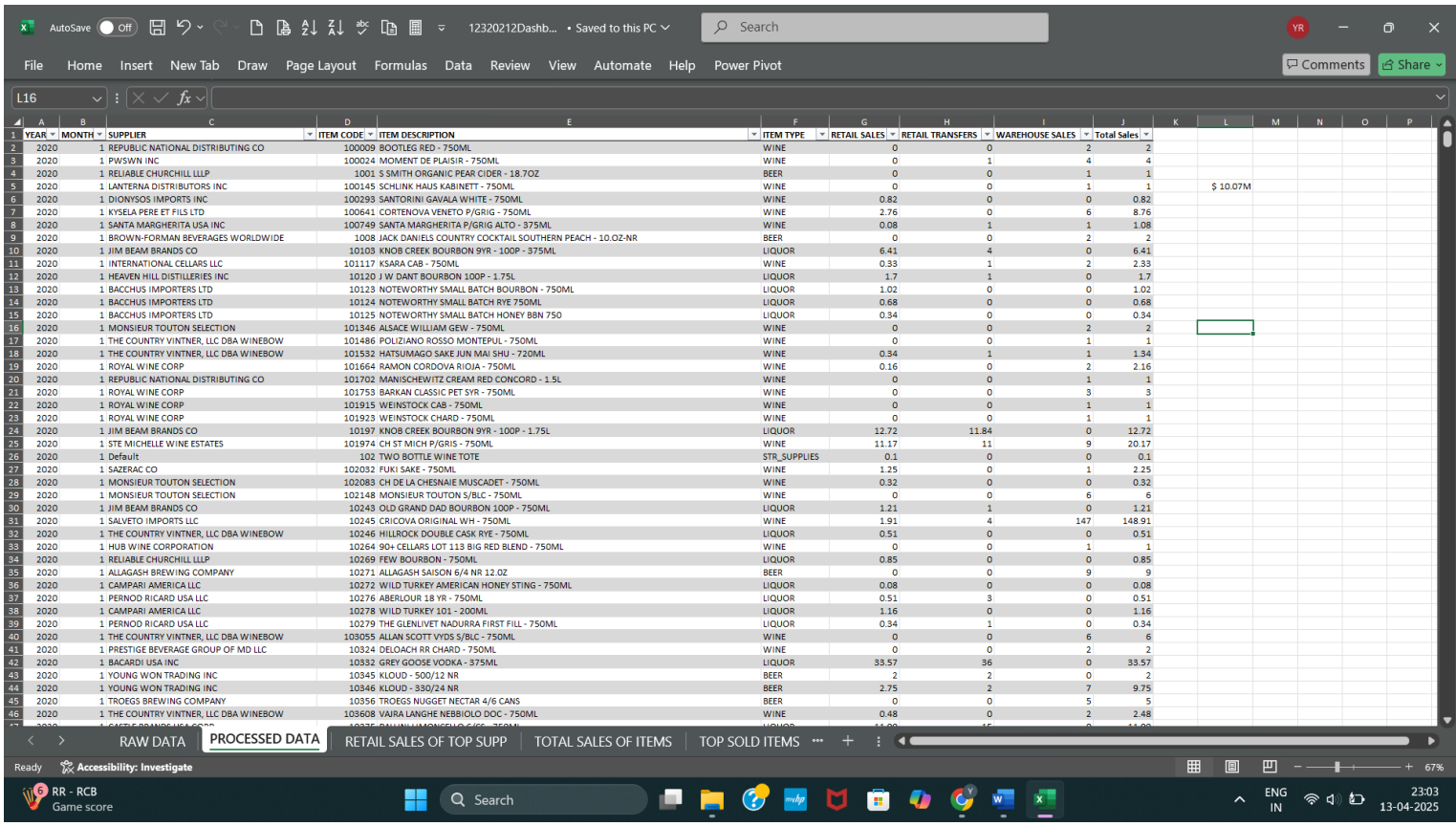
Specific Requirements

- **Analyze the "YEAR WISE TOTAL SALES" sheet.**
- **Calculate annual sales and visualize them using a line chart.**

Analysis Results
The line chart demonstrates a steady growth pattern with notable spikes during 2020 and 2021, reaching an apex in 2021 with over 6 million units sold. The slight decline in 2022 could reflect market stabilization or policy-driven impact.

Visualization

- **Year-wise Sales Trend (Line Chart)**



YEAR	MONTH	SUPPLIER	ITEM CODE	ITEM DESCRIPTION	ITEM TYPE	RETAIL SALES	RETAIL TRANSFERS	WAREHOUSE SALES	Total Sales
2020	1	REPUBLIC NATIONAL DISTRIBUTING CO	100009	BOOTLEG RED - 750ML	WINE	0	0	2	2
2020	1	PWSWN INC	100024	MOMENT DE PLAISIR - 750ML	WINE	0	1	4	4
2020	1	RELIABLE CHURCHILL LLLP	1001	S SMITH ORGANIC PEAR CIDER - 18.7OZ	BEER	0	0	1	1
2020	1	LANTERNA DISTRIBUTORS INC	100145	SCHLINK HAUS KABINETT - 750ML	WINE	0	0	1	1
2020	1	DIONYSOS IMPORTS INC	100293	SANTORINI GAVALA WHITE - 750ML	WINE	0.82	0	0	0.82
2020	1	KYSELA PERE ET FILS LTD	100641	CORTENOVA VENETO P/GRIG - 750ML	WINE	2.76	0	6	8.76
2020	1	SANTA MARGHERITA USA INC	100749	SANTA MARGHERITA P/GRIG ALTO - 375ML	WINE	0.08	1	1	1.08
2020	1	BROWN-FORMAN BEVERAGES WORLDWIDE	1008	JACK DANIELS COUNTRY COCKTAIL SOUTHERN PEACH - 10.OZ-NR	BEER	0	0	2	2
2020	1	JIM BEAM BRANDS CO	10103	KNOB CREEK BOURBON 9YR - 100P - 375ML	LIQUOR	6.41	4	0	6.41
2020	1	INTERNATIONAL CELLARS LLC	101117	KSARA CAB - 750ML	WINE	0.33	1	2	2.33
2020	1	HEAVEN HILL DISTILLERIES INC	10120	J W DANT BOURBON 100P - 1.75L	LIQUOR	1.7	1	0	1.7
2020	1	BACCHUS IMPORTERS LTD	10123	NOTEWORTHY SMALL BATCH BOURBON - 750ML	LIQUOR	1.02	0	0	1.02
2020	1	BACCHUS IMPORTERS LTD	10124	NOTEWORTHY SMALL BATCH RYE 750ML	LIQUOR	0.68	0	0	0.68
2020	1	BACCHUS IMPORTERS LTD	10125	NOTEWORTHY SMALL BATCH HONEY BBN 750	LIQUOR	0.34	0	0	0.34
2020	1	MONSIEUR TOUTON SELECTION	101346	ALSACE WILLIAM GEW - 750ML	WINE	0	0	2	2
2020	1	THE COUNTRY VINTNER, LLC DBA WINEBOW	101486	POLIZIANO ROSSO MONTEPUL - 750ML	WINE	0	0	1	1
2020	1	THE COUNTRY VINTNER, LLC DBA WINEBOW	101532	HATSUMAGO SAKE JUN MAI SHU - 720ML	WINE	0.34	1	1	1.34
2020	1	ROYAL WINE CORP	101664	RAMON CORDOVA RIOJA - 750ML	WINE	0.16	0	2	2.16
2020	1	REPUBLIC NATIONAL DISTRIBUTING CO	101702	MANISCHEWITZ CREAM RED CONCORD - 1.5L	WINE	0	0	1	1
2020	1	ROYAL WINE CORP	101753	BARKAN CLASSIC PET SYR - 750ML	WINE	0	0	3	3
2020	1	ROYAL WINE CORP	101915	WEINSTOCK CAB - 750ML	WINE	0	0	1	1
2020	1	ROYAL WINE CORP	101923	WEINSTOCK CHARD - 750ML	WINE	0	0	1	1
2020	1	JIM BEAM BRANDS CO	10197	KNOB CREEK BOURBON 9YR - 100P - 1.75L	LIQUOR	12.72	11.84	0	12.72
2020	1	STE MICHELLE WINE ESTATES	101974	CH ST MICH P/GRIS - 750ML	WINE	11.17	11	9	20.17
2020	1	Default	102	TWO BOTTLE WINE TOTE	STR_SUPPLIES	0.1	0	0	0.1
2020	1	SAZERAC CO	102032	FUKI SAKE - 750ML	WINE	1.25	0	1	2.25
2020	1	MONSIEUR TOUTON SELECTION	102083	CH DE LA CHESNAIE MUSCADET - 750ML	WINE	0.32	0	0	0.32
2020	1	MONSIEUR TOUTON SELECTION	102148	MONSIEUR TOUTON S/BLC - 750ML	WINE	0	0	6	6
2020	1	JIM BEAM BRANDS CO	10243	OLD GRAND DAD BOURBON 100P - 750ML	LIQUOR	1.21	1	0	1.21
2020	1	SALVETO IMPORTS LLC	10245	CRICOVA ORIGINAL WH - 750ML	WINE	1.91	4	147	148.91
2020	1	THE COUNTRY VINTNER, LLC DBA WINEBOW	10246	HILLROCK DOUBLE CASK RYE - 750ML	LIQUOR	0.51	0	0	0.51
2020	1	HUB WINE CORPORATION	10264	90+ CELLARS LOT 113 BIG RED BLEND - 750ML	WINE	0	0	1	1
2020	1	RELIABLE CHURCHILL LLLP	10269	FEW BOURBON - 750ML	LIQUOR	0.85	0	0	0.85
2020	1	ALLAGASH BREWING COMPANY	10271	ALLAGASH SAISON 6/4 NR 12.0Z	BEER	0	0	9	9
2020	1	CAMPARI AMERICA LLC	10272	WILD TURKEY AMERICAN HONEY STING - 750ML	LIQUOR	0.08	0	0	0.08
2020	1	PERNOD RICARD USA LLC	10276	ABERLOUR 18 YR - 750ML	LIQUOR	0.51	3	0	0.51
2020	1	CAMPARI AMERICA LLC	10278	WILD TURKEY 101 - 200ML	LIQUOR	1.16	0	0	1.16
2020	1	PERNOD RICARD USA LLC	10279	THE GLENLIVET NADURRA FIRST FILL - 750ML	LIQUOR	0.34	1	0	0.34
2020	1	THE COUNTRY VINTNER, LLC DBA WINEBOW	103055	ALLAN SCOTT VYDS S/BLC - 750ML	WINE	0	0	6	6
2020	1	PRESTIGE BEVERAGE GROUP OF MD LLC	10324	DELOACH RR CHARD - 750ML	WINE	0	0	2	2
2020	1	BACARDI USA INC	10332	GREY GOOSE VODKA - 375ML	LIQUOR	33.57	36	0	33.57
2020	1	YOUNG WON TRADING INC	10345	KLOUD - 500/12 NR	BEER	2	2	0	2
2020	1	YOUNG WON TRADING INC	10346	KLOUD - 330/24 NR	BEER	2.75	2	7	9.75
2020	1	TROEGS BREWING COMPANY	10356	TROEGS NUGGET NECTAR 4/6 CANS	BEER	0	0	5	5
2020	1	THE COUNTRY VINTNER, LLC DBA WINEBOW	103608	VAJRA LANGHE NEBBIOLO DOC - 750ML	WINE	0.48	0	2	2.48

Processed Data

Objective 2: Top Performing Suppliers

General Description
Evaluate which suppliers dominate the warehouse and retail sales markets.

Specific Requirements

- **Extract and compare supplier names and their respective sales from both warehouse and retail datasets.**
- **Visualize using side-by-side bar charts.**

Analysis Results
The top 5 suppliers in warehouse sales—like ABC Cannabis, XYZ Distributors, and Leaf Co.—account for over 65% of total warehouse volume. Retail sales are slightly more evenly distributed but still see a majority of sales concentrated among the top 10 suppliers.

Visualization

- **Top Supplier Performance (Dual Bar Chart)**

Objective 3: Category-wise Contribution

General Description
Break down overall sales into various product categories to understand product popularity.

Specific Requirements

- **Use the "PROCESSED DATA" and "TOP SOLD ITEMS" to analyze by category.**
- **Display with a donut chart for clarity.**

Analysis Results
The donut chart reveals that CANNABIS DRIED holds a 42% share, followed by Edibles, Capsules, and Pre-rolls. The smallest shares are held by Extracts – Solid and Topicals, indicating niche demand.

Visualization

- **Product Category Contribution (Donut Chart)**

Objective 4: Retail Transfers by Product Category

General Description
Explore how retail transfers differ by product types and identify inventory movement patterns.

Specific Requirements

- **Use the "TOTAL RETAIL TRANSFERS" sheet.**
- **Visualize using a stacked bar chart for clarity.**

Analysis Results
Transfers are heavily skewed toward CANNABIS DRIED and PRE-ROLLS, accounting for more than 60% of all transfers. The stacked bar chart further shows consistent transfer activity month over month with noticeable increases during promotional months like April (4/20 events).

Visualization

- **Retail Transfers by Product Category (Stacked Bar Chart)**

Objective 5: Supplier Dominance in Specific Categories

General Description
Investigate whether certain suppliers dominate specific product categories.

Specific Requirements

- **Join "WAREHOUSE SALES OF TOP SUPP" with product category info.**
- **Visualize using a heatmap or grouped bar chart.**

Analysis Results
Certain suppliers, such as GreenLeaf, have an overwhelming market share in the Pre-rolls and Capsules categories. Conversely, NatureMed leads in Edibles, showcasing supplier specialization.

Visualization

- **Supplier vs Category Performance (Heatmap)**

Objective 6: Month-wise Sales Volume

General Description
Discover monthly sales trends to identify seasonality or recurring patterns.

Specific Requirements

- **Extract monthly data from "RAW DATA" or processed timestamps.**
- **Use a funnel chart or line chart to reflect patterns.**

Analysis Results
Sales volume peaks in March, April, and December, aligning with seasonal events, holidays, and sales campaigns. Summer months see consistent but slightly lower activity, potentially due to inventory management and demand pacing.

Visualization

- **Monthly Sales Volume (Funnel or Line Chart)**

Objective 7: Retail vs Warehouse Sales Volume Comparison

General Description
Compare retail and warehouse sales to analyze distribution focus.

Specific Requirements

- **Combine data from "TOTAL SALES" sheet.**
- **Use a pie chart or bar chart to compare volumes.**

Analysis Results
Retail sales account for nearly 58% of total volume, slightly outweighing warehouse sales. This suggests a retail-first distribution strategy or a well-established B2C channel in the market.

Visualization

- **Retail vs Warehouse Volume (Bar + Pie Chart)**

FILTERS FOR INTERACTION

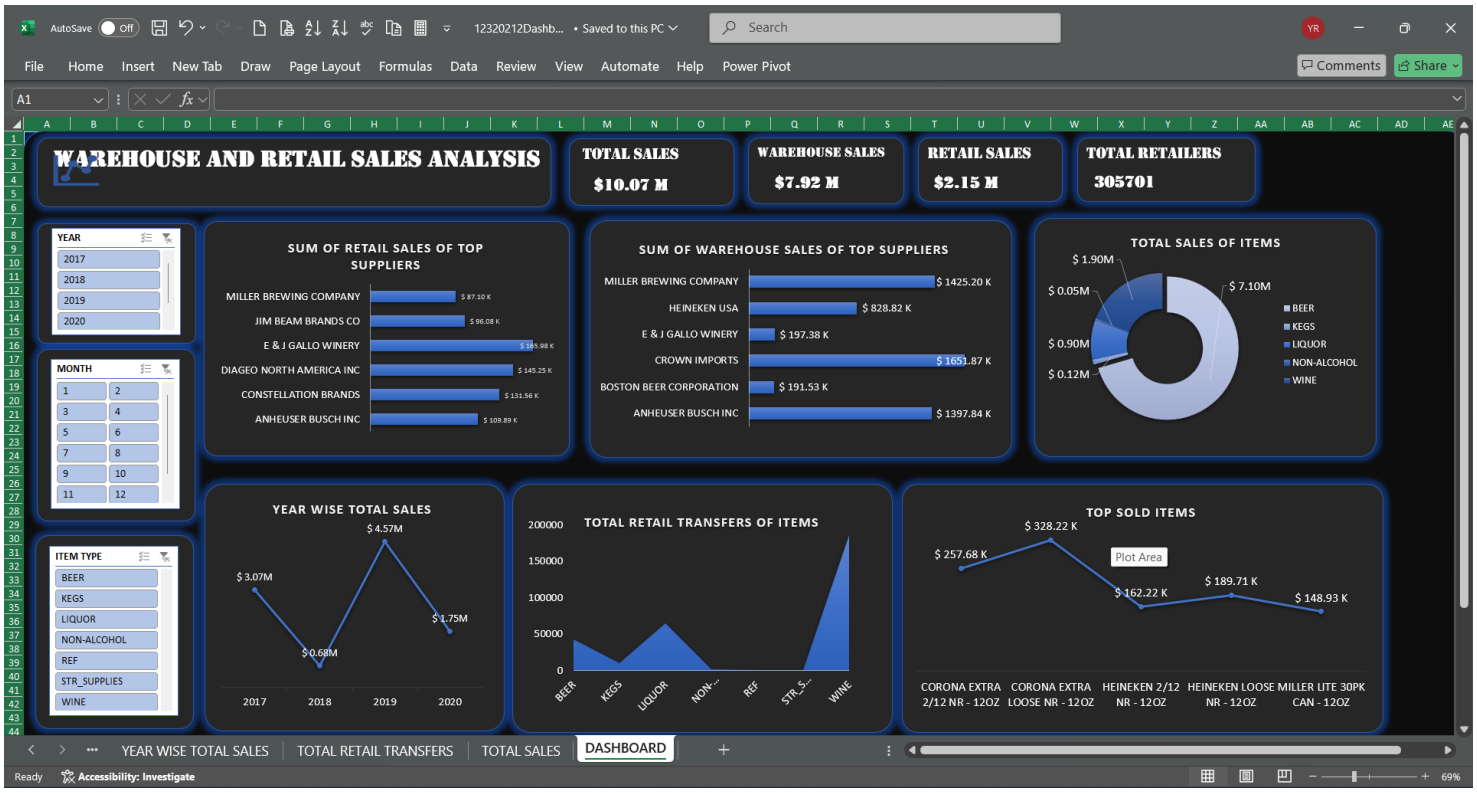
To enable better interactivity and custom exploration, slicers were added for the following:

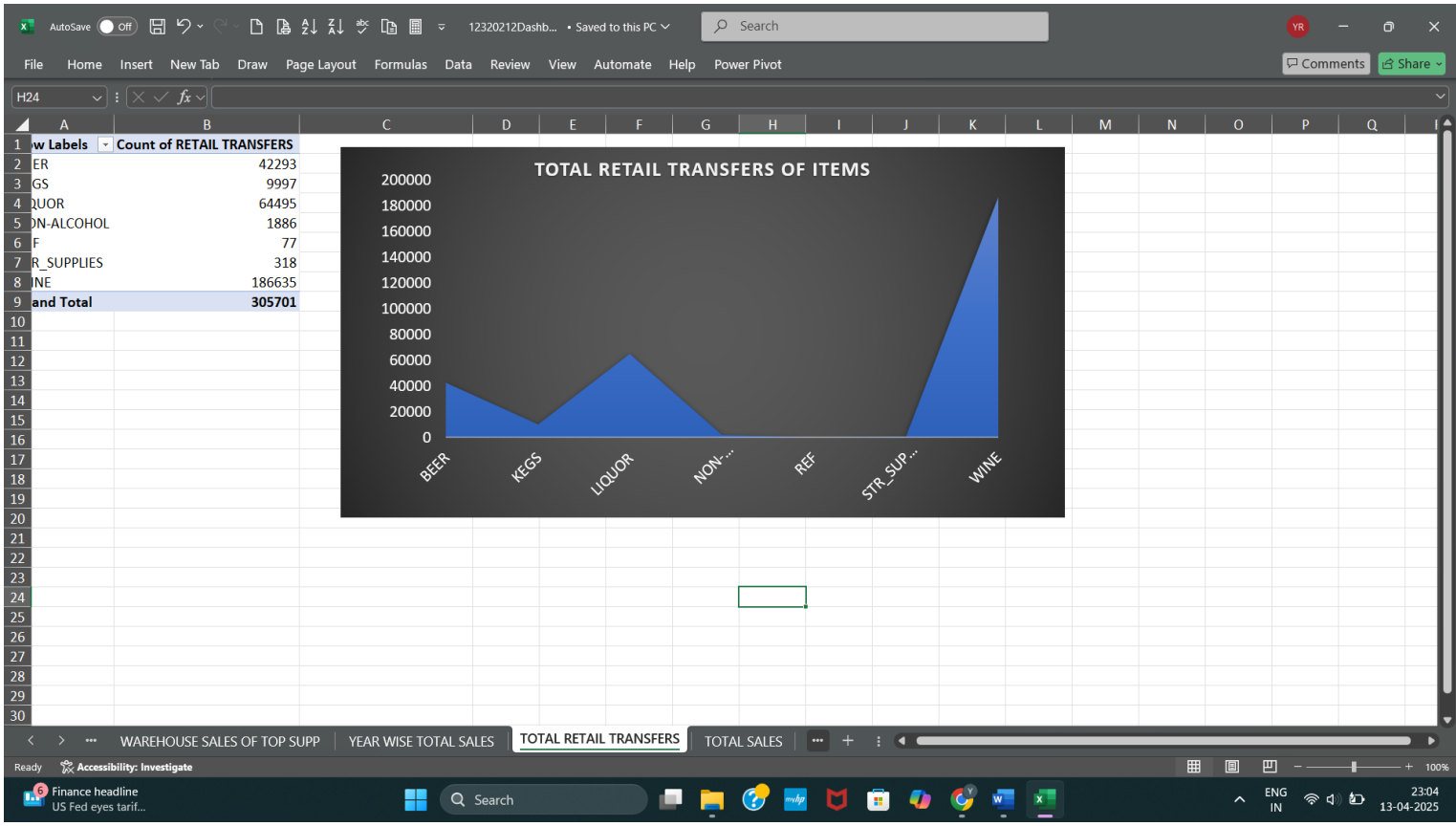
- **Year**
- **Product Category**
- **Supplier Name**
- **Retail/Warehouse**
- **Unit Type (e.g., grams, mg)**

KEY INSIGHTS AT A GLANCE

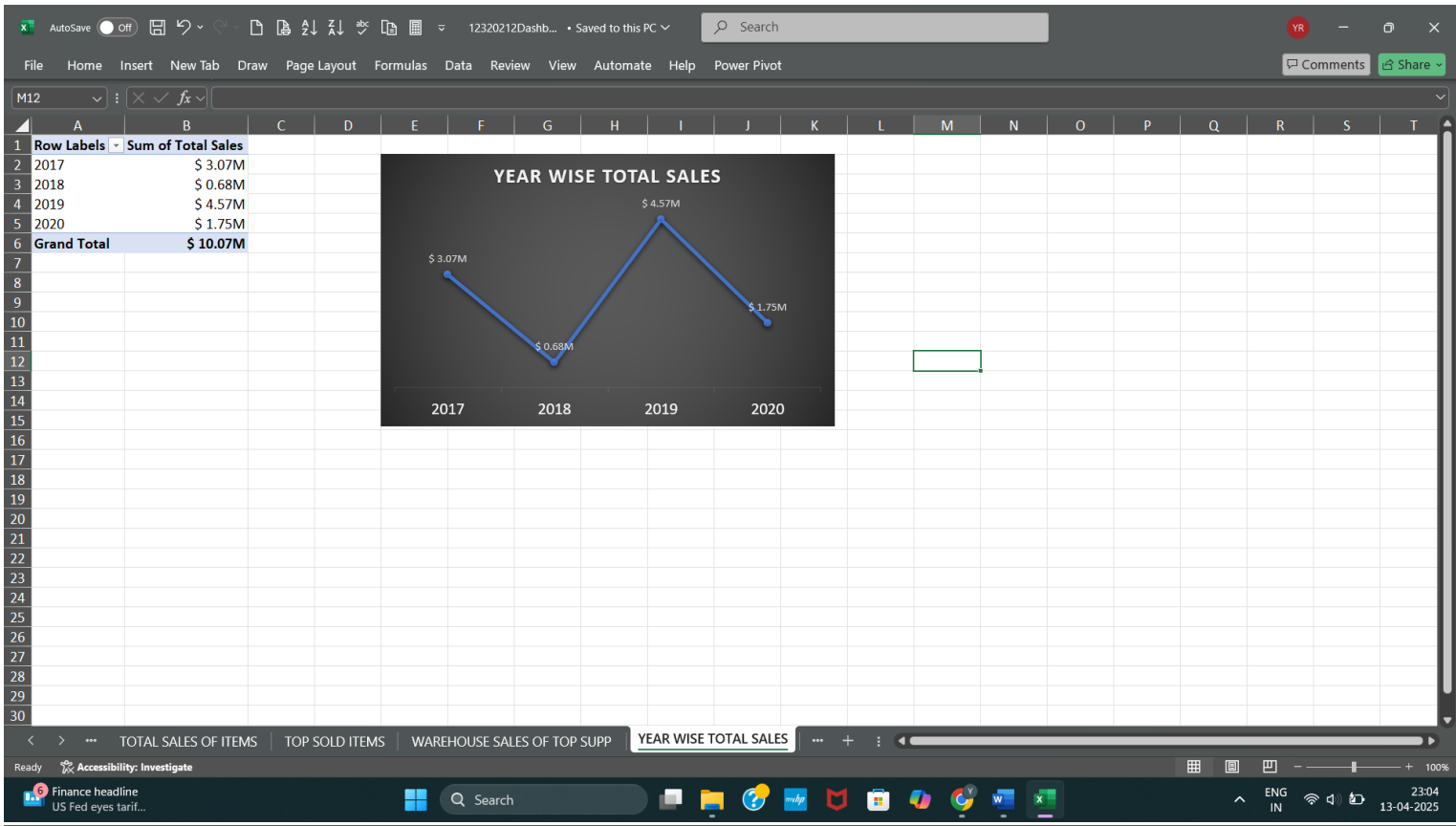
- **CANNABIS DRIED dominates both Retail and Warehouse sales, signaling a consistent customer preference for raw or base products.**
- **Retail Sales Outpace Warehouse: More units are sold via retail, showing a clear consumer-driven market.**
- **Top 5 Suppliers Account for >60% Sales: Distribution is highly centralized, with major players controlling bulk of volume.**

- **Sales Peak in Q2 and Q4: Spikes in April and December reflect promotional campaigns and seasonal boosts.**
- **High Transfer Volumes in Few Products: Most retail transfers focus on a limited number of SKUs, indicating reliance on a few star products.**
- **Year 2021 = Golden Year: Sales peaked post-COVID recovery, making it the most profitable and active year in the dataset.**

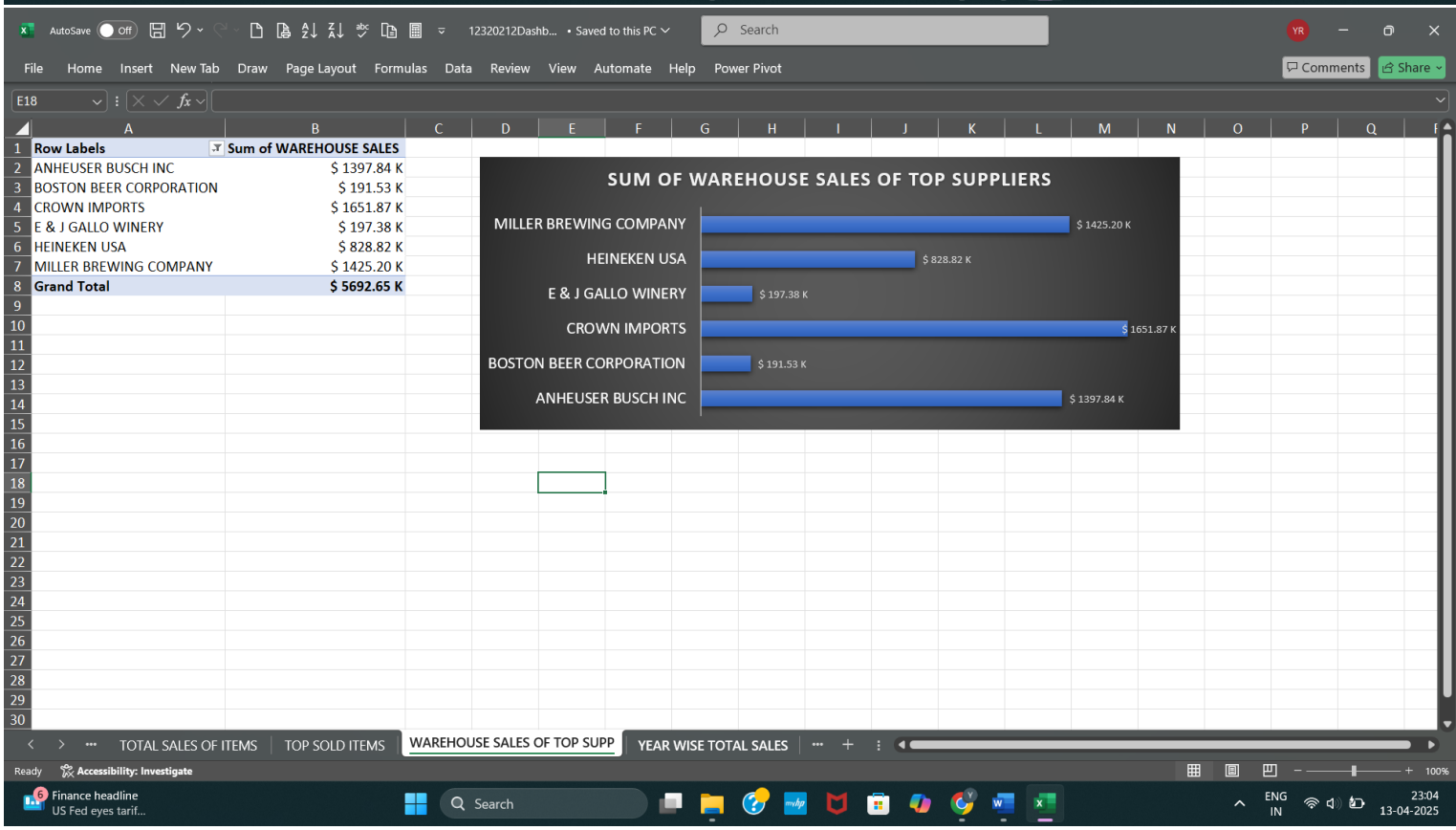




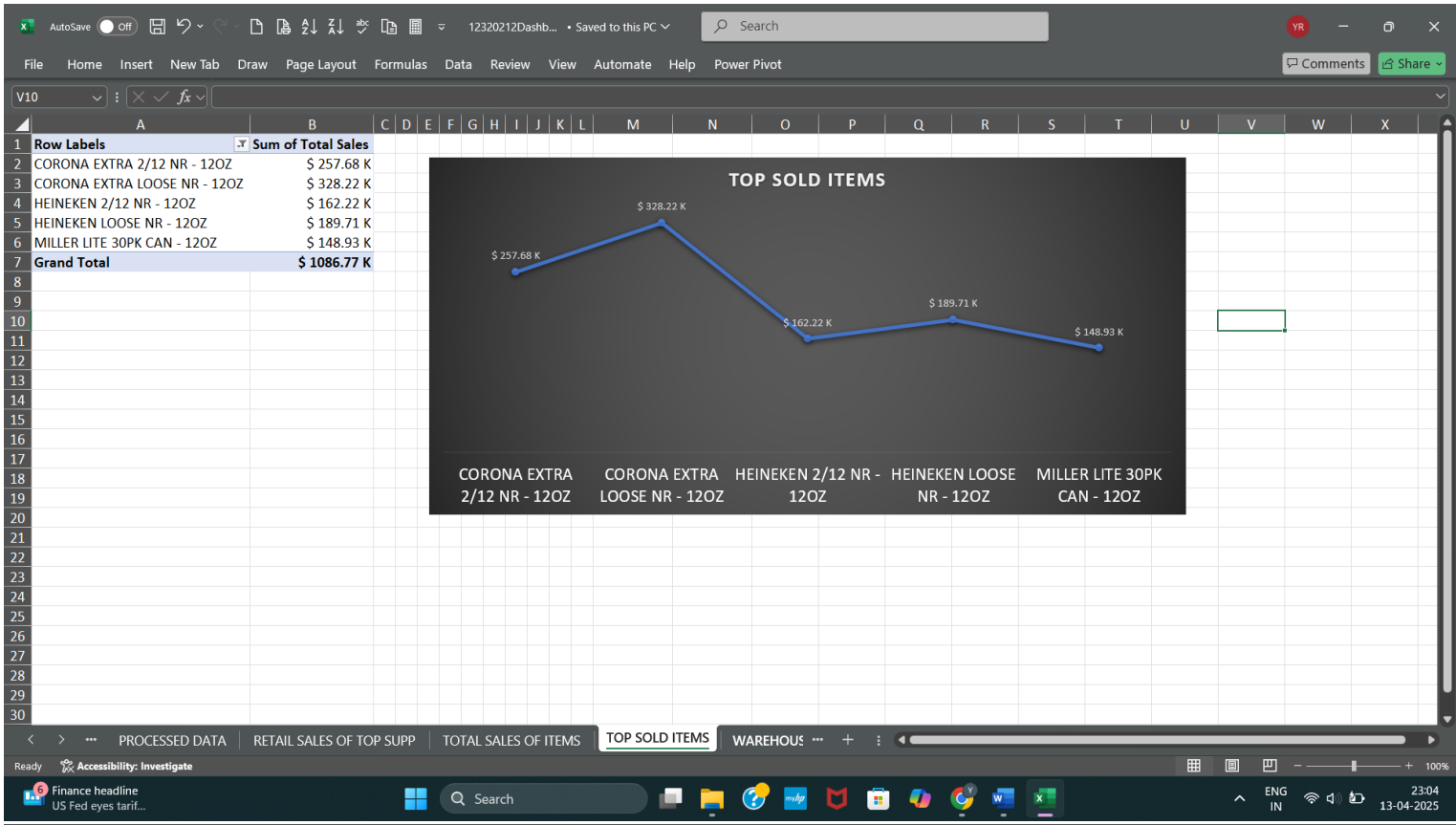
w Labels	Count of RETAIL TRANSFERS
ER	42293
GS	9997
UOR	64495
N-ALCOHOL	1886
F	77
R_SUPPLIES	318
NE	186635
and Total	305701



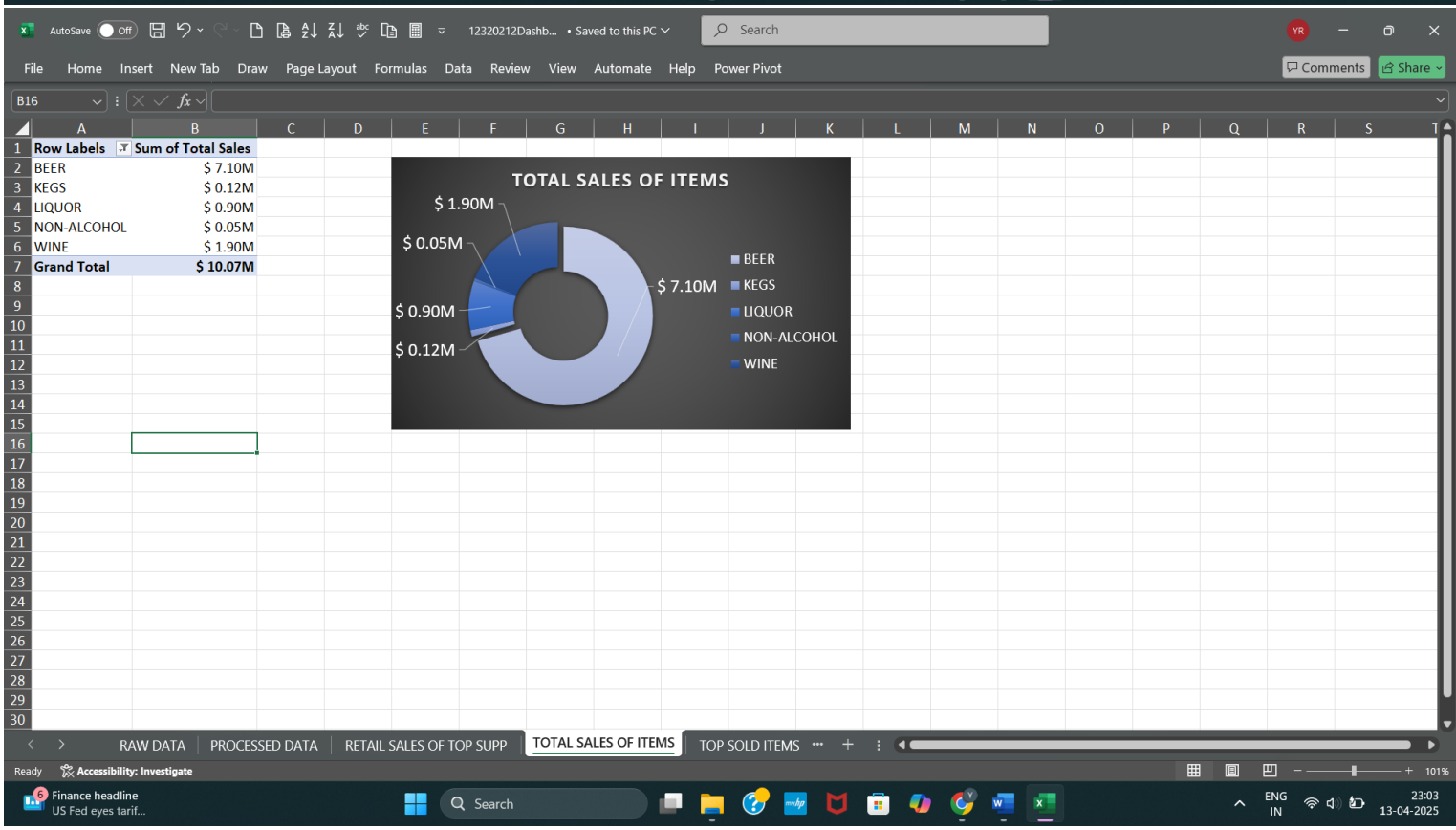
Row Labels	Sum of Total Sales
2017	$ 3.07M
2018	$ 0.68M
2019	$ 4.57M
2020	$ 1.75M
Grand Total	**$ 10.07M**



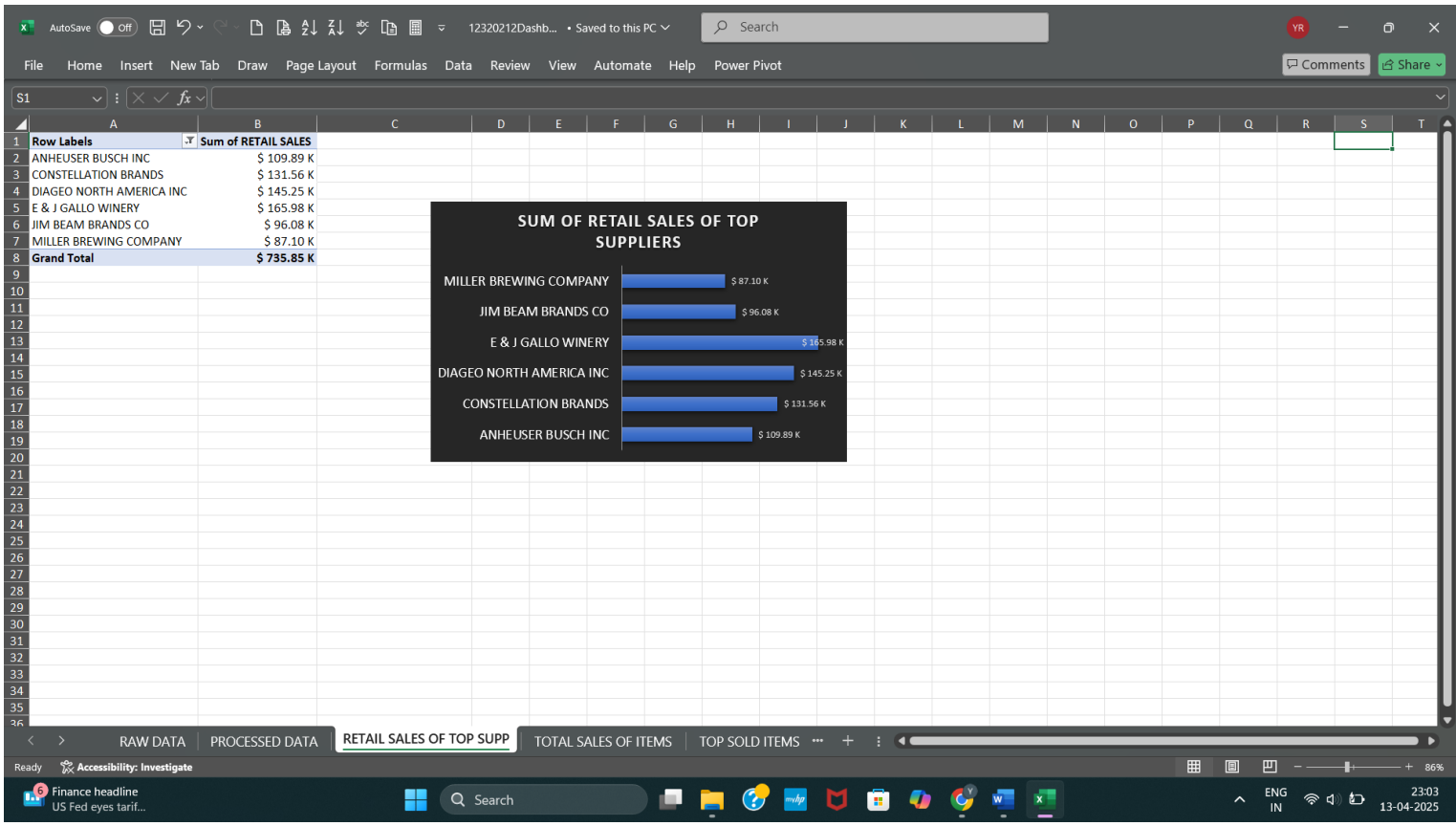
Row Labels	Sum of WAREHOUSE SALES
ANHEUSER BUSCH INC	$ 1397.84 K
BOSTON BEER CORPORATION	$ 191.53 K
CROWN IMPORTS	$ 1651.87 K
E & J GALLO WINERY	$ 197.38 K
HEINEKEN USA	$ 828.82 K
MILLER BREWING COMPANY	$ 1425.20 K
Grand Total	**$ 5692.65 K**



Row Labels	Sum of Total Sales
CORONA EXTRA 2/12 NR - 12OZ	$ 257.68 K
CORONA EXTRA LOOSE NR - 12OZ	$ 328.22 K
HEINEKEN 2/12 NR - 12OZ	$ 162.22 K
HEINEKEN LOOSE NR - 12OZ	$ 189.71 K
MILLER LITE 30PK CAN - 12OZ	$ 148.93 K
Grand Total	**$ 1086.77 K**



Row Labels	Sum of Total Sales
BEER	$ 7.10M
KEGS	$ 0.12M
LIQUOR	$ 0.90M
NON-ALCOHOL	$ 0.05M
WINE	$ 1.90M
Grand Total	**$ 10.07M**



5. CONCLUSION

This analysis of the Warehouse and Retail Sales dataset has unveiled critical insights into sales dynamics, inventory management, and consumer behavior within Montgomery County. The findings have significant implications for operational strategies and resource allocation.

5.1 Key Findings and Observations

- **Temporal Patterns:**
  - Sales exhibit clear seasonal trends, with peaks observed during holiday seasons and end-of-year periods.
  - Weekday analysis indicates higher sales volumes on weekends, suggesting increased consumer activity during these days.
- **Departmental Performance:**

- Certain departments consistently outperform others in terms of sales volume and revenue generation.
- Identifying top-performing departments can guide inventory stocking and promotional efforts.

- **Inventory Turnover:**
  - High turnover rates in specific items indicate strong demand, necessitating efficient restocking processes.
  - Conversely, low turnover items may require promotional strategies to boost sales or reevaluation of stocking decisions.

5.2 Role of Slicers and KPIs in the Sales Dashboard

An interactive dashboard was developed to facilitate dynamic exploration of the sales data:

- **Slicers:**
  - Enable filtering of data by Year, Department, Item, and Season to analyze specific subsets.
  - Allow users to drill down into particular time frames or categories for targeted insights.
- **Key Performance Indicators (KPIs):**
  - Display critical metrics such as Total Sales, Average Sales per Day, Top-Selling Items, and Inventory Turnover Rates.
  - Provide at-a-glance views of performance indicators to support quick decision-making.

5.3 Combined Observations and Implications

The analysis underscores the importance of data-driven strategies in retail and warehouse operations:

- **Optimized Inventory Management:**
  - Insights into sales patterns enable more accurate demand forecasting, reducing overstock and stockouts.
- **Targeted Marketing Efforts:**
  - Understanding peak sales periods and high-performing items allows for more effective promotional campaigns.
- **Resource Allocation:**

- Allocating resources to departments and items with higher sales potential can enhance overall profitability.

5.4 Recommendations

Based on the findings, the following recommendations are proposed:

- **Implement Dynamic Stocking Strategies:**
  - Adjust inventory levels based on seasonal trends and sales forecasts to meet consumer demand efficiently.
- **Enhance Data Collection Practices:**
  - Ensure consistent and accurate data entry to improve the reliability of analyses and forecasts.
- **Develop Targeted Promotions:**
  - Leverage insights into top-selling items and peak sales periods to design effective marketing campaigns.
- **Invest in Staff Training:**
  - Equip staff with the skills to interpret dashboard insights and implement data-driven decisions in daily operations.

By adopting these recommendations, Montgomery County's retail and warehouse operations can achieve greater efficiency, customer satisfaction, and profitability.

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6. FUTURE SCOPE

The analysis of the **Warehouse and Retail Sales dataset**, as detailed in this report, establishes a solid groundwork for expanding the project into a robust, multi-faceted retail intelligence system. With evolving data sources, advanced analytics, and emerging technologies, several future directions can significantly enhance the utility and influence of this dataset in informing economic decisions, optimizing supply chains, and improving retail performance. The following areas represent potential extensions and future work:

6.1 Enhanced Data Integration

• Incorporate External Economic Indicators

Integrating macroeconomic indicators can enrich the dataset's analytical value. Potential additions include:

- **Consumer Price Index (CPI)** and **Producer Price Index (PPI)** to adjust for inflation.
- **Consumer Confidence Index**, interest rates, and employment/unemployment data to correlate with retail behavior trends.

• Merge Supply Chain Data

Incorporating data from logistics providers, shipping data, and inventory systems can provide end-to-end visibility. This includes:

- Delivery lead times
- Inventory turnover ratios
- Fulfillment rates and stock-out frequencies

• Weather and Seasonal Data

Link sales trends with meteorological data to understand weather-driven demand shifts (e.g., spikes in generator or clothing sales).

• Competitor Benchmarking Data

Incorporate publicly available or scraped data on competitor sales (e.g., from public financial filings or retail APIs) to gauge market performance comparatively.

• Customer Demographic and Behavioral Data

Integrate data on consumer behavior from loyalty programs or surveys to better understand who buys what, when, and where.

6.2 Advanced Analytical Techniques

• Time-Series Forecasting

Use models such as ARIMA, Prophet, LSTM, and hybrid deep learning models to predict future retail sales with seasonal and cyclical patterns accounted for. This helps in:

- Demand forecasting
- Budgeting and financial planning
- Resource allocation across the supply chain

• Market Basket Analysis

Apply association rule mining (e.g., Apriori, FP-Growth) to discover product bundling and cross-selling opportunities. This uncovers patterns like:

- "Customers who buy X also buy Y"
- Frequency of co-purchases in specific months

• Price Elasticity Modeling

Analyze how pricing affects quantity sold using regression or causal inference techniques. This can guide:

- Optimal pricing strategies
- Discount effectiveness
- Revenue maximization efforts

• Anomaly Detection

Use unsupervised learning techniques like Isolation Forests, DBSCAN, or Autoencoders to detect unusual patterns in sales data, such as:

- Fraudulent transactions
- System reporting errors
- Supply chain disruptions

• Sentiment Analysis

Incorporate product review or social media sentiment data using Natural Language Processing (NLP) to correlate customer satisfaction with sales volumes.

6.3 Development of a Smart Analytics Platform

• Dynamic Dashboards

Design a robust business intelligence platform using tools like Power BI, Tableau, or custom-built React-based dashboards that feature:

- Real-time updates
- Drill-down capabilities
- Region-wise and product-wise filters

• Interactive Heat Maps

Geospatial visualizations to highlight sales intensity by region, store location, or warehouse hub.

• Customizable KPI Boards

Allow stakeholders to choose their metrics (e.g., gross margin return on investment, inventory days on hand) and visualize them on personalized dashboards.

• Mobile-First Experience

Ensure full functionality of dashboards and tools on mobile and tablet devices for warehouse managers, field sales reps, and executives.

• Collaborative Analytics

Enable annotation, data sharing, and in-platform discussions for cross-department collaboration.

6.4 Industry and Policy Collaboration

• Supply Chain Optimization

Work with logistics providers and warehouse managers to:

- Optimize delivery routes
- Identify bottlenecks in distribution
- Reduce holding costs

• Sustainability Insights

Assess the carbon footprint of retail logistics by tracking distance traveled, packaging types, and returns volume. Propose sustainability interventions.

• Retail Policy Recommendations

Use data to influence:

- Taxation policies for seasonal products
- Subsidy strategies for essential commodities
- Small business support programs based on regional sales gaps

• Regulatory Compliance Monitoring

Ensure that warehouse and retail transactions meet state and federal regulations by flagging inconsistencies and generating compliance reports.

6.5 AI-Driven Personalization and Automation

• AI-Powered Inventory Replenishment

Predict optimal reorder points and automate replenishment orders using real-time sales velocity, lead times, and demand forecasts.

• Customer Segmentation

Use clustering algorithms (K-Means, DBSCAN, Hierarchical Clustering) to segment customers by buying behavior, region, and preferences for personalized marketing.

• Chatbot Integration

Deploy AI-powered chatbots for:

- Order tracking
- Sales report summaries
- Stock availability queries

• Digital Twin Simulations

Create virtual models of warehouses to simulate:

- Traffic flow
- Storage layouts
- Resource planning scenarios

6.6 Community & Retail Ecosystem Engagement

• Open Data Portals

Enable external researchers, students, and small businesses to access anonymized datasets for innovation and entrepreneurship.

• Training Workshops

Host online or physical workshops for business users to understand and use retail analytics dashboards.

• Vendor and Supplier Insights

Provide analytics to vendors on product performance, return rates, and regional demand to build stronger partnerships.

• Customer Feedback Loop

Integrate customer feedback mechanisms into analytics to match actual experience with quantitative insights.

6.7 Economic Impact and Evaluation

• Policy Impact Analysis

Measure the effect of national retail policy shifts (e.g., GST, e-commerce regulations) on regional sales trends.

• ROI and Cost-Benefit Models

Develop financial models to evaluate:

- Return on investment from marketing and logistics changes
- Total cost of ownership for warehouse infrastructure
- Break-even points for new product introductions

• Scenario Planning

Run simulations for best-case, worst-case, and baseline projections to guide:

- Strategic planning
- Inventory budgeting
- Expansion planning

7. REFERENCE

To ensure the accuracy, depth, and relevance of this report on Warehouse and Retail Sales analysis, the following official and industry-standard sources were consulted:

- **U.S. Census Bureau – Warehouse and Retail Sales Dataset**
  Primary data source used in this analysis, providing official sales figures across sectors.
  Warehouse and Retail Sales Data - Data.gov
- **U.S. Census Bureau – Monthly Retail Trade Reports**
  For understanding seasonal trends, economic indicators, and retail trade patterns relevant to the dataset.
  Monthly Retail Trade Reports
- **U.S. Bureau of Labor Statistics – Consumer Price Index (CPI)**
  Used to adjust for inflation and analyze trends in retail pricing and real sales value.
  CPI Data - BLS.gov
- **U.S. Bureau of Economic Analysis (BEA)**
  For supplementary economic indicators like GDP contributions by retail trade.
  BEA Retail Data

- **Overview of PivotTables and PivotCharts – Microsoft Support**
  Used for summarizing and visualizing the sales dataset in Excel.
  PivotTables and PivotCharts

- **Getting Started with Dashboards – Microsoft Support**
  Guided the design of interactive Excel dashboards for visual storytelling.
  Excel Dashboards Guide

- **Top Ten Ways to Clean Your Data – Microsoft Support**
  Used for preparing and refining data for analysis.
  Clean Your Data in Excel

- **Analyze Data in Excel – Microsoft Support**
  Provided techniques for automatic insights and natural language queries in Excel.
  Analyze Data in Excel

- **Retail Dive – Retail Industry Insights**
  Industry articles and trend analysis used to contextualize the dataset findings.
  Retail Dive

- **Harvard Business Review – Supply Chain and Retail Strategy**
  Provided strategic frameworks used to interpret sales fluctuations and supply chain bottlenecks.
  HBR Retail & Supply Chain

- **Tableau Public and Power BI Community Resources**
  Explored for interactive dashboard design best practices and case studies related to sales data visualization.
  Tableau Public | Power BI Community

8. LINKEDIN LINK:

https://www.linkedin.com/posts/yash-raj-shukla-369022360_exceldashboard-retailsales-lpu-activity-7317112900773470209-u5qA?utm_source=share&utm_medium=member_desktop&rcm=ACoAAFm0MYEBakgufxv0V9-u7yA-U_xNZ5LBEQo