

# Vendor Performance Analysis Report

## Business Problem:

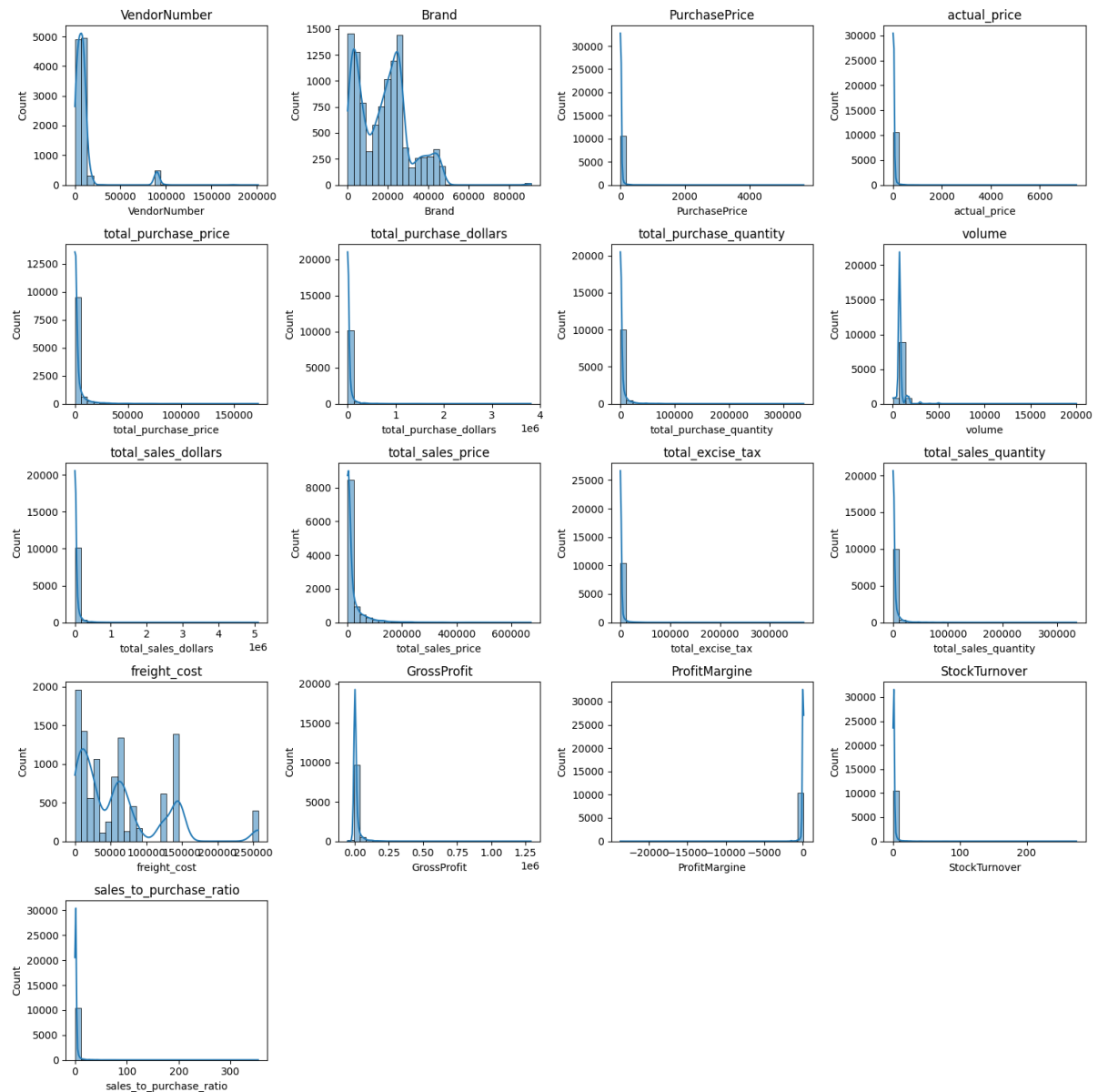
Effective inventory and sales management are critical for optimizing profitability in a business. Proper analysis is required in order to reduce losses and identify the inefficient links. The goal of this project is to:

1. Identify underperforming brands that need promotional or pricing adjustments.
2. Determine the top vendors contributing to sales.
3. Determine top brands contributing to sales.
4. Identify the maximum contributing vendors.
5. Getting insights into inventory management through key indicators.

## Data Insights:

In this project, a Python script was developed to automate the data ingestion and processing pipeline using pandas, os, and SQLAlchemy. First, all CSV files from the specified folder were read and loaded into an SQLite database (inventory.db) as individual tables. Using SQL queries, a new table vendor\_sales\_summary was generated by joining purchase, sales, price, and freight-related data. This summary table captures important metrics such as total sales, purchase costs, freight charges, and quantities. The data was then cleaned — missing values were handled, text fields were trimmed, and data types were corrected. Additional performance indicators like gross profit, profit margin, stock turnover, and sales-to-purchase ratio were calculated and added to the dataset. The final cleaned summary was saved back to the database for use in further analysis and visualization. The following is the analysis of the vendor\_sales\_summary table.

	count	mean	std	min	25%	50%	75%	max
VendorNumber	10692.0	1.065065e+04	18753.519148	2.00	3951.000000	7153.000000	9552.000000	2.013590e+05
Brand	10692.0	1.803923e+04	12662.187074	58.00	5793.500000	18761.500000	25514.250000	9.063100e+04
PurchasePrice	10692.0	2.438530e+01	109.269375	0.36	6.840000	10.455000	19.482500	5.681810e+03
actual_price	10692.0	3.564367e+01	148.246016	0.49	10.990000	15.990000	28.990000	7.499990e+03
total_purchase_price	10692.0	2.673815e+03	8308.046831	0.39	44.580000	309.495000	1714.237500	1.729617e+05
total_purchase_dollars	10692.0	3.010669e+04	123067.799627	0.71	453.457500	3655.465000	20738.245000	3.811252e+06
total_purchase_quantity	10692.0	3.140887e+03	11095.086769	1.00	36.000000	262.000000	1975.750000	3.376600e+05
volume	10692.0	8.473605e+02	664.309212	50.00	750.000000	750.000000	750.000000	2.000000e+04
total_sales_dollars	10692.0	4.223907e+04	167655.265984	0.00	729.220000	5298.045000	28396.915000	5.101920e+06
total_sales_price	10692.0	1.879378e+04	44952.773386	0.00	289.710000	2857.800000	16059.562500	6.728193e+05
total_excise_tax	10692.0	1.774226e+03	10975.582240	0.00	4.800000	46.570000	418.650000	3.682428e+05
total_sales_quantity	10692.0	3.077482e+03	10952.851391	0.00	33.000000	261.000000	1929.250000	3.349390e+05
freight_cost	10692.0	6.143376e+04	60938.458032	0.09	14069.870000	50293.620000	79528.990000	2.570321e+05
GrossProfit	10692.0	1.213238e+04	46224.337964	-52002.78	52.920000	1399.640000	8660.200000	1.290668e+06
ProfitMargine	10692.0	-inf	NaN	-inf	13.324515	30.405457	39.956135	9.971666e+01
StockTurnover	10692.0	1.706793e+00	6.020460	0.00	0.807229	0.981529	1.039342	2.745000e+02
sales_to_purchase_ratio	10692.0	2.504390e+00	8.459067	0.00	1.153729	1.436894	1.665449	3.529286e+02



### Negative and Zero values:

**Gross Profit:** Indicate potential loss may be because of selling the product at a cost less than the purchase price.

**Profit Margin:** Has a minimum of negative infinity, indicating where revenue is 0

**Total Sales Quantity and Sales Dollars:** Some products show zero sales, indicating they were bought but never sold.

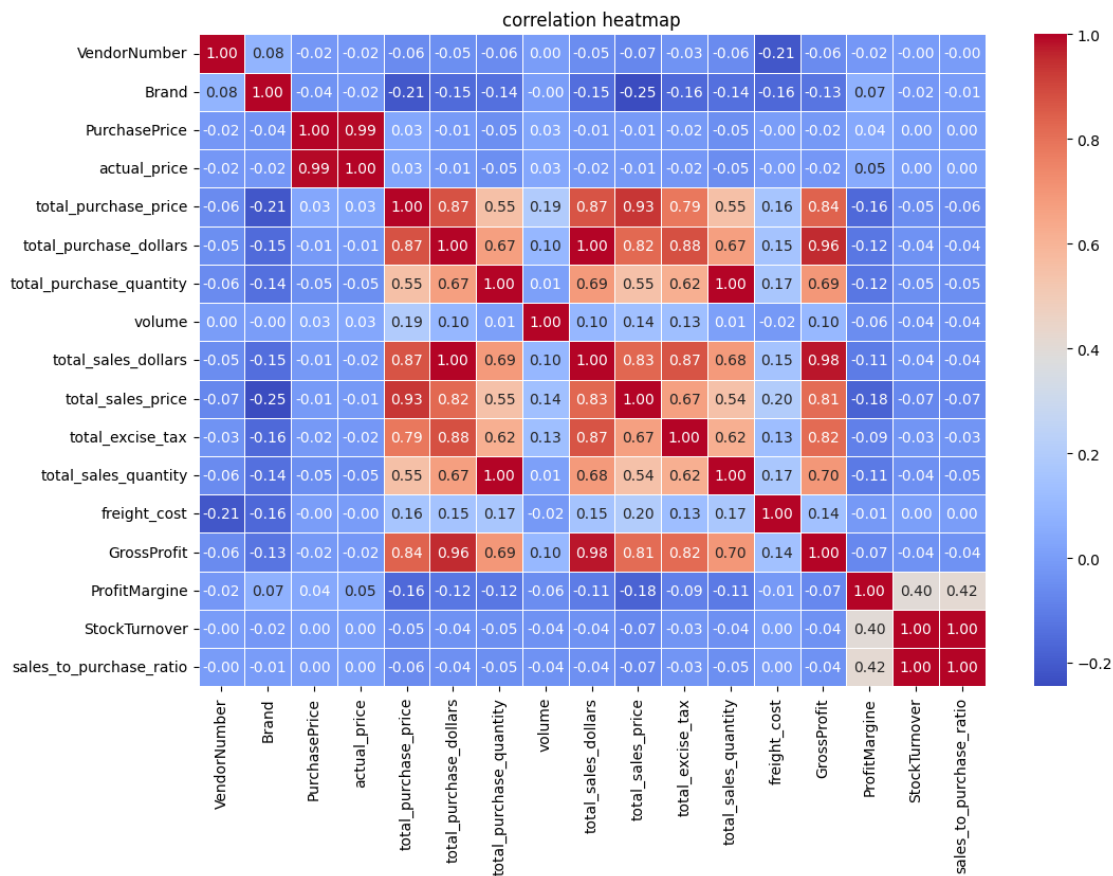
### Data Filtering:

where gross profit>0

and profit margin>0

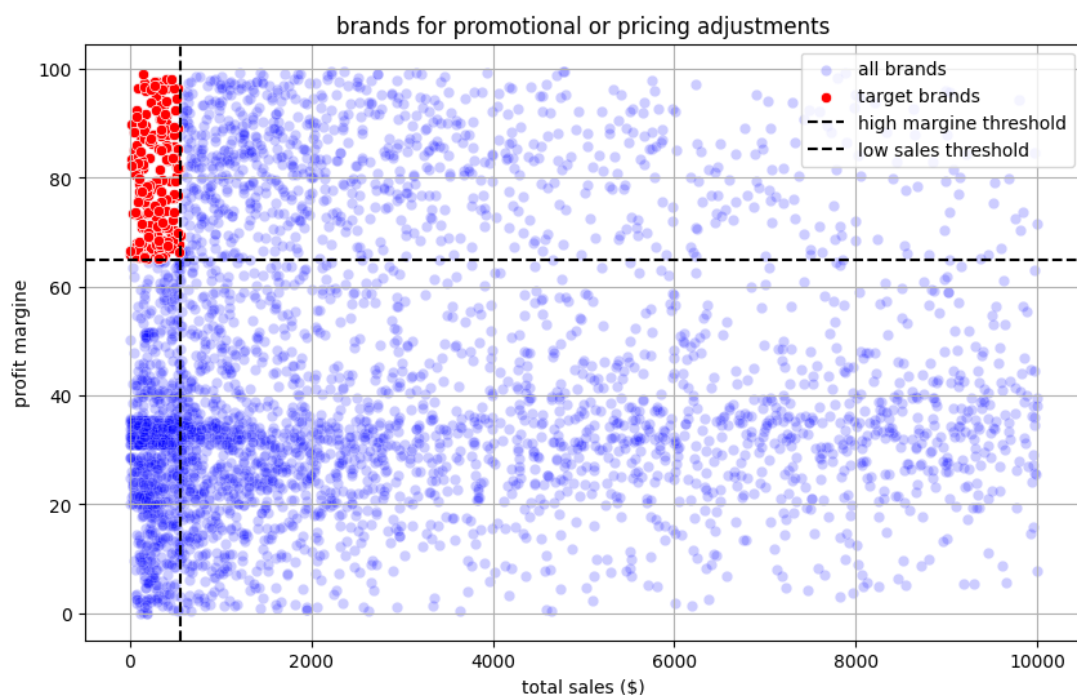
and total\_sales\_quantity>0

### Correlation Insights:

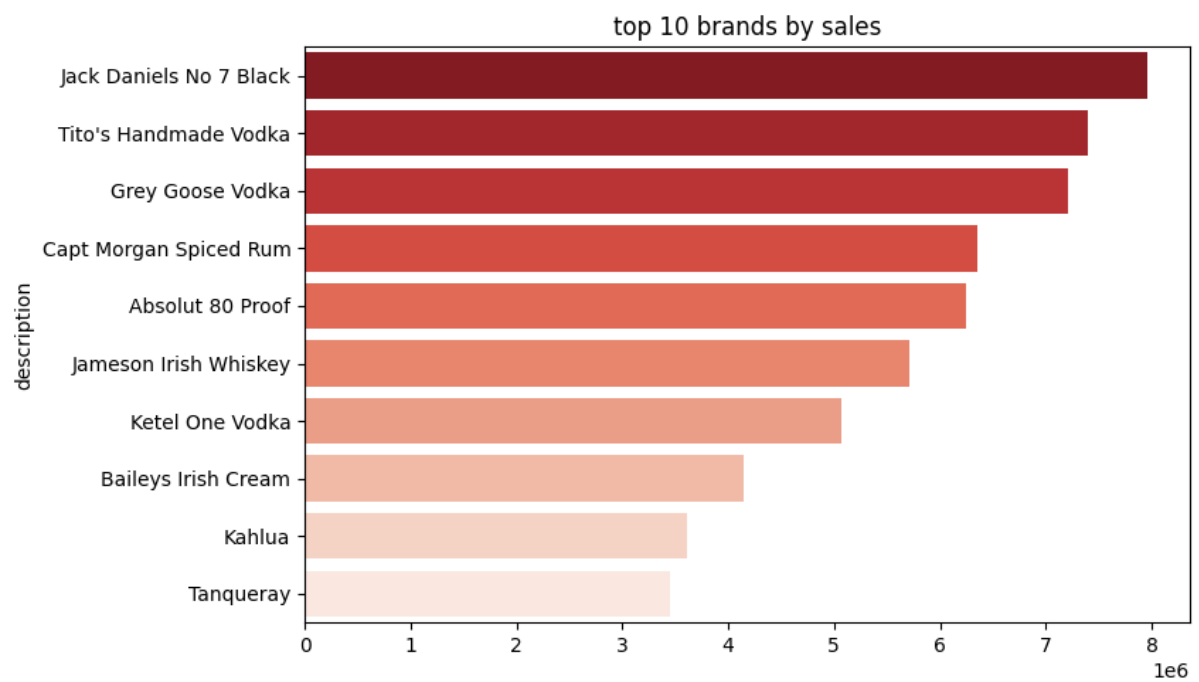
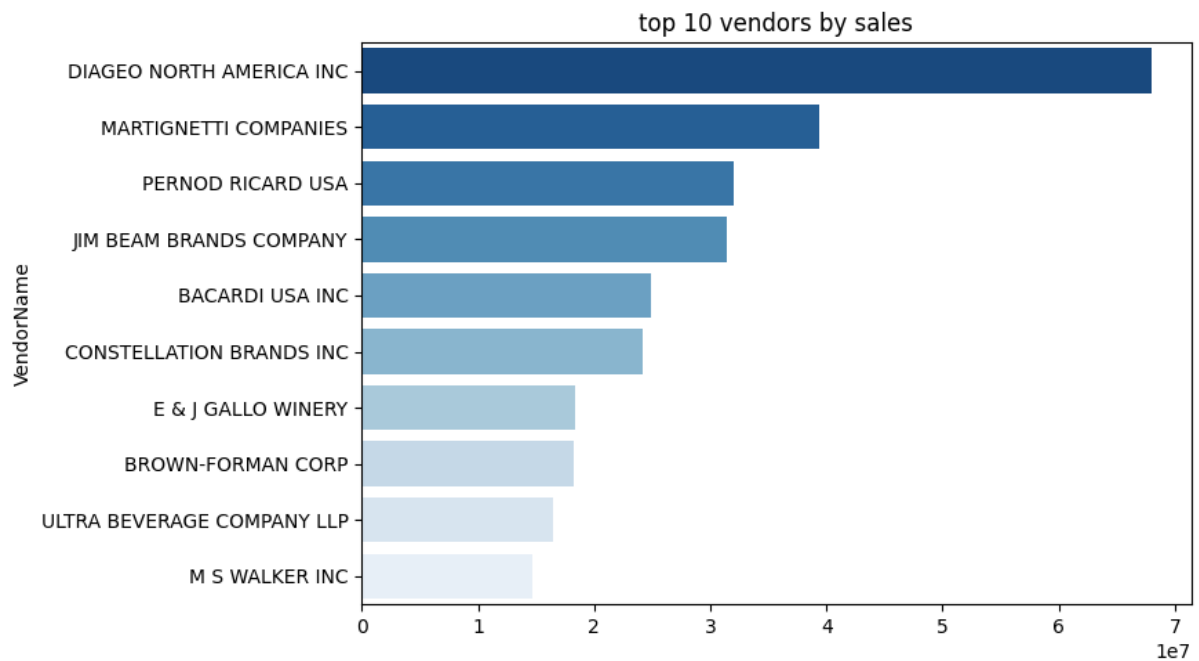


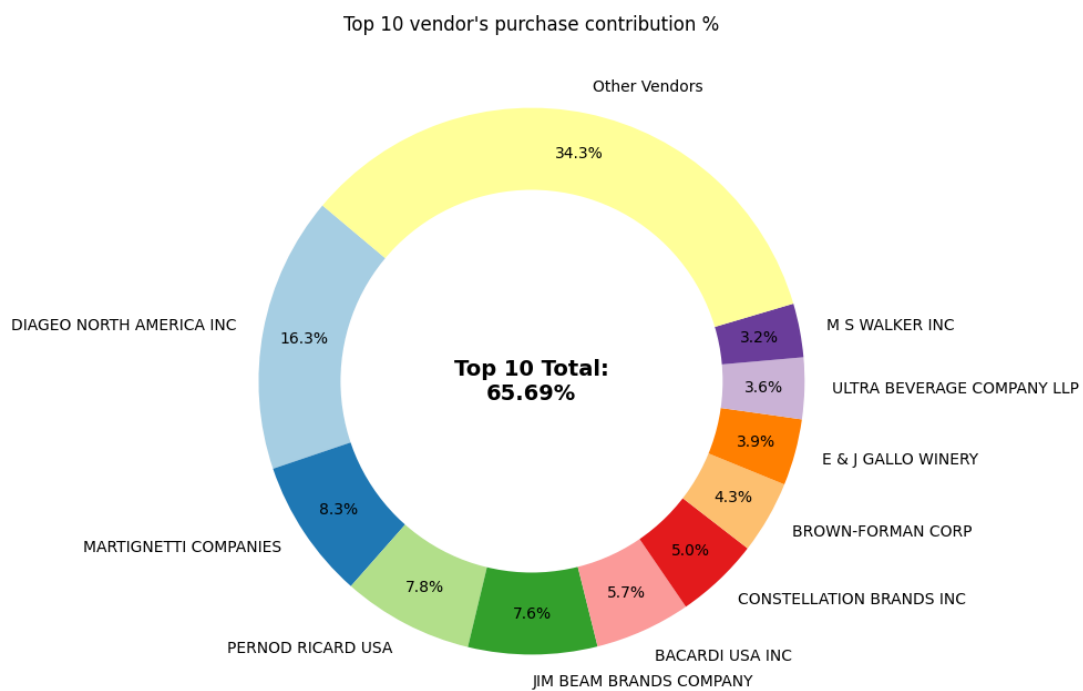
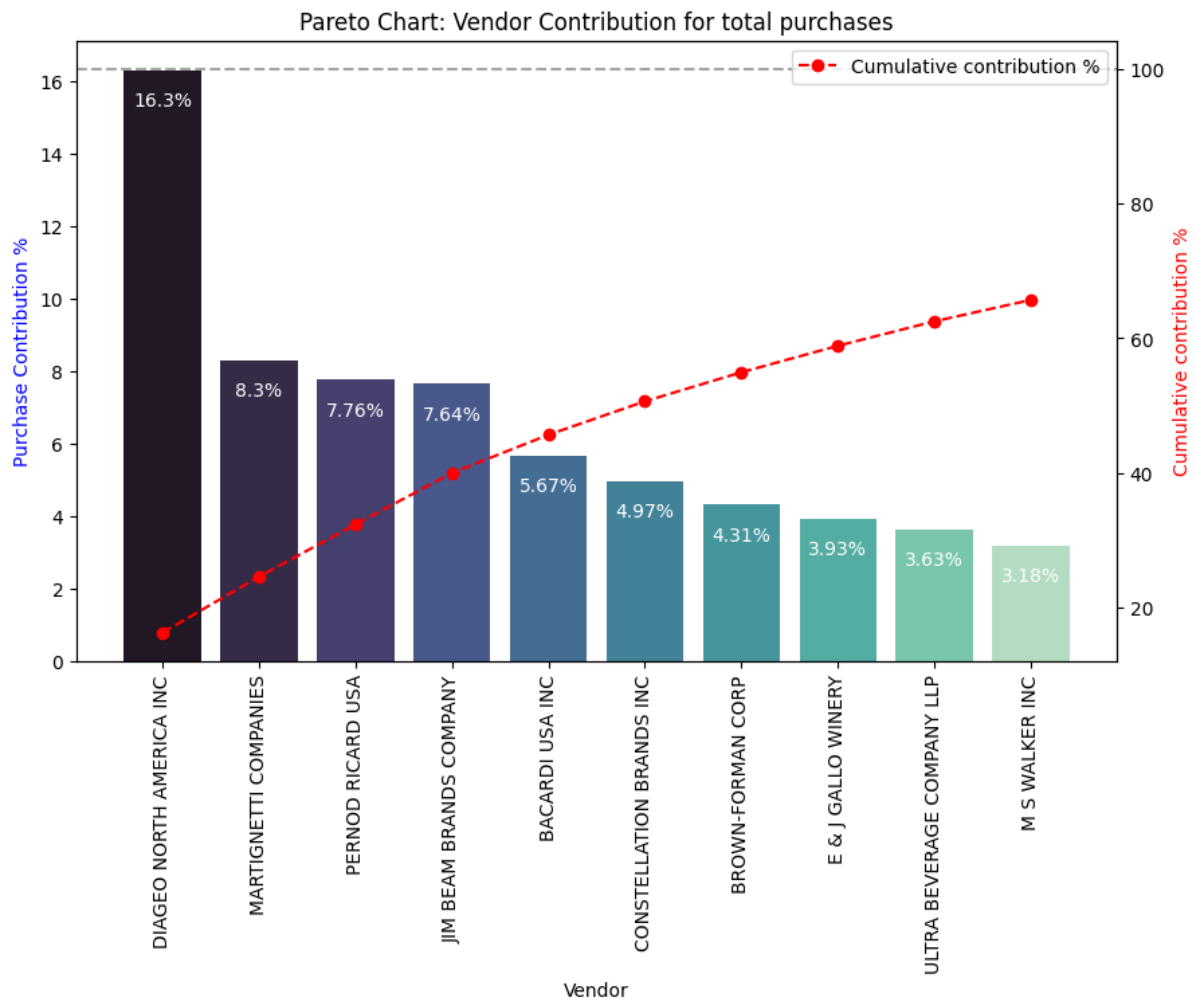
### Brands for promotional price adjustments:

Brands with total sales less than the threshold and profit margin more than the threshold value are potential targets for pricing adjustments.



## Other insights:





Top 10 vendors contribute 65.69% of the total purchase and remaining vendors contribute only 34.31%. This indicates over-reliance on some vendors, which is risky. The vendor contribution needs to be diversified.

Impact of Bulk Purchasing on Cost Savings:

unit_purchase_price	
Order_size	
small	39.068186
medium	15.486414
large	10.777625

This indicates that ordering in bulk results in lower unit cost (almost 72%).

Bulk pricing strategies encourage larger orders, increasing total sales while maintaining profitability.

vendors with low inventory turnover, indicating excess stock and slow-moving products. Identifying these vendors helps in planning for better stock management and minimizing financial strain:

Vendor Name	Stock Turnover
ALISA CARR BEVERAGES	0.615385
HIGHLAND WINE MERCHANTS LLC	0.708333
PARK STREET IMPORTS LLC	0.751306
Circa Wines	0.755676
Dunn Wine Brokers	0.766022
CENTEUR IMPORTS LLC	0.773953
SMOKY QUARTZ DISTILLERY LLC	0.783835
TAMWORTH DISTILLING	0.797078
THE IMPORTED GRAPE LLC	0.807569
WALPOLE MTN VIEW WINERY	0.820548

how much capital is locked in unsold inventory per vendor, and who contributes most (top 10)

VendorName	Unsold_inventory_value
DIAGEO NORTH AMERICA INC	722209.05

VendorName	Unsold_inventory_value
JIM BEAM BRANDS COMPANY	554665.63
PERNOD RICARD USA	470625.61
WILLIAM GRANT & SONS INC	401960.83
E & J GALLO WINERY	228282.61
SAZERAC CO INC	198436.41
BROWN-FORMAN CORP	177733.74
CONSTELLATION BRANDS INC	133617.62
MOET HENNESSY USA INC	126477.70
REMY COINTREAU USA INC	118598.15

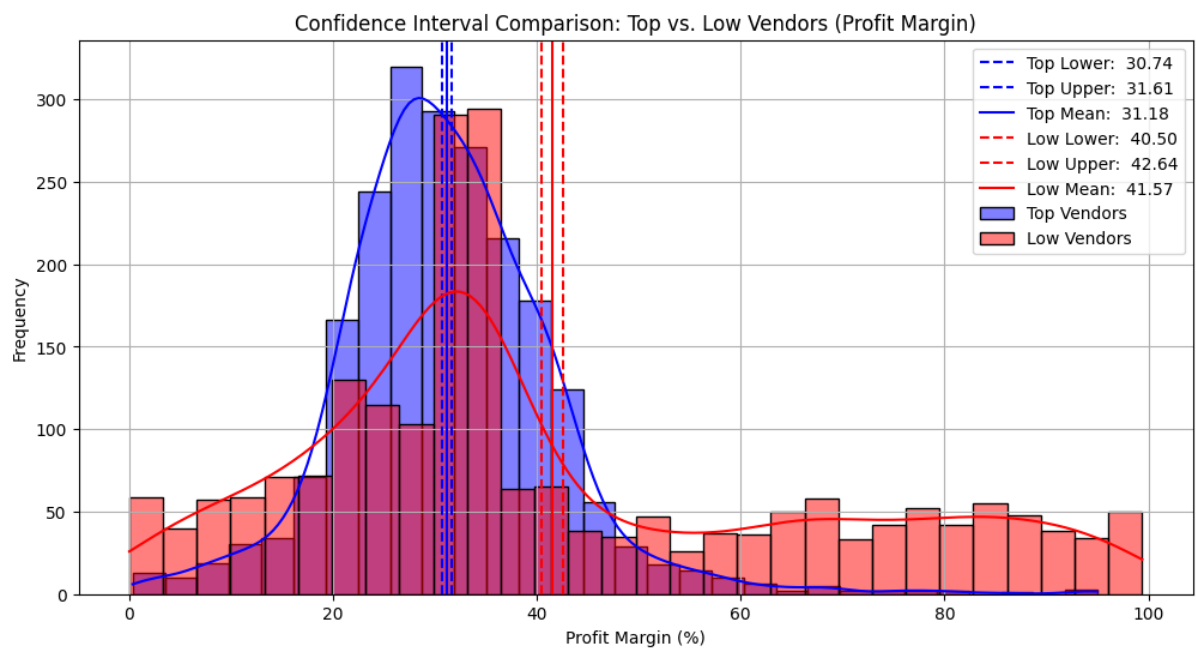
total\_unsold capital: 2708177.2199999997

Profit margin comparison: High vs Low-Performing vendors:

Top Vendors 95% CI: (30.74, 31.61), Mean: 31.18

Low Vendors 95% CI: (40.50, 42.64), Mean: 41.57

Low-performing vendors maintain higher margins but struggle with sales volumes, indicating potential inefficiencies or market reach issues.



The confidence interval for low-performing vendors is higher than that of the top-performing vendors.

Vendors with lower sales tend to maintain higher profit margins, potentially due to premium pricing or lower operational costs.

For High-Performing Vendors: If they aim to improve profitability, they could explore selective price adjustments, cost optimization, or handling strategies.

For low-performing Vendors: Despite higher margins, their low sales volume might indicate a need for better marketing, competitive pricing, or improved distribution strategies.

## Statistical Validation of Profit Margin Differences:

Hypothesis Testing:

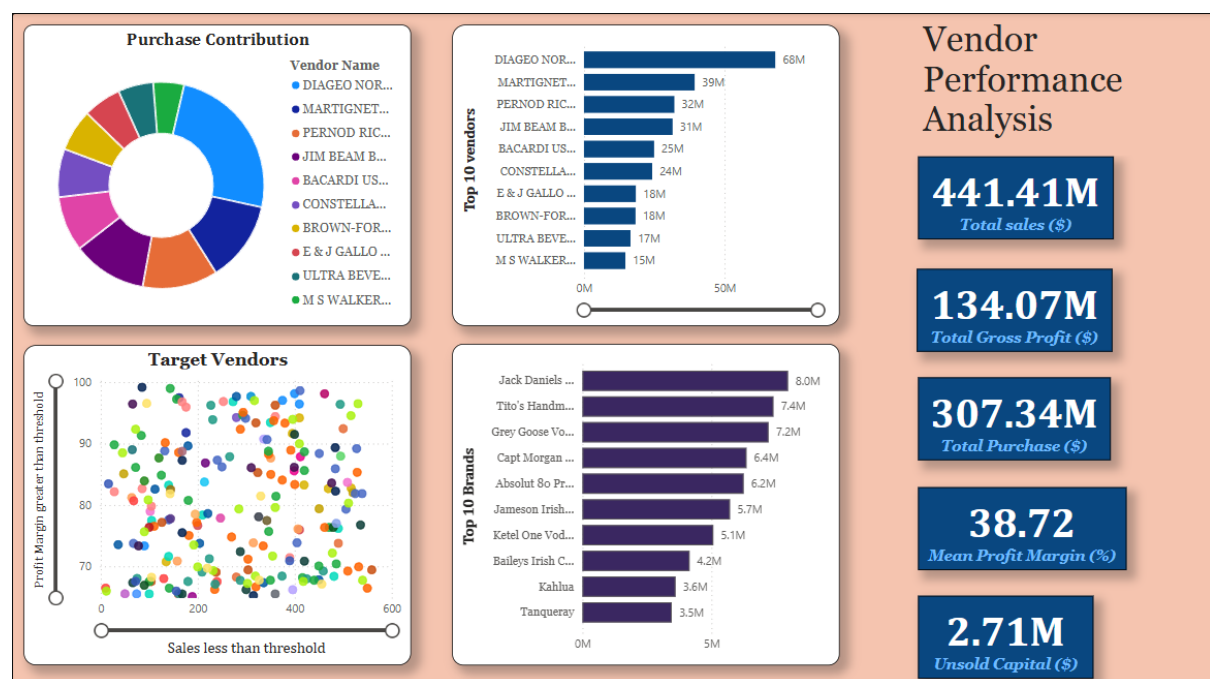
H0 (null hypothesis): There is no significant difference in mean profit margins

H1 (alternative hypothesis): There is a significant difference

Result: The null hypothesis is rejected, confirming that there is significant difference in the mean profit margins of the two distinctly performing groups.

## Dashboard:

The following dashboard gives deeper insights into various indicators and features of inventory management.



## Final Recommendations:

1. Reevaluate pricing for low-sales, high-margin brands to boost sales volume without sacrificing profitability.
2. Diversify vendor partnerships to reduce dependency on a few suppliers and mitigate supply chain risks.



3. Leverage bulk purchasing advantages to maintain competitive pricing while optimizing inventory management.
4. Optimize slow-moving inventory by adjusting purchase quantities, launching clearance sales, or revising storage strategies.
5. Enhance marketing and distribution strategies for low-performing vendors to drive higher sales volume without compromising profit margins.