

Vendor Performance Analysis Report

Business Problem

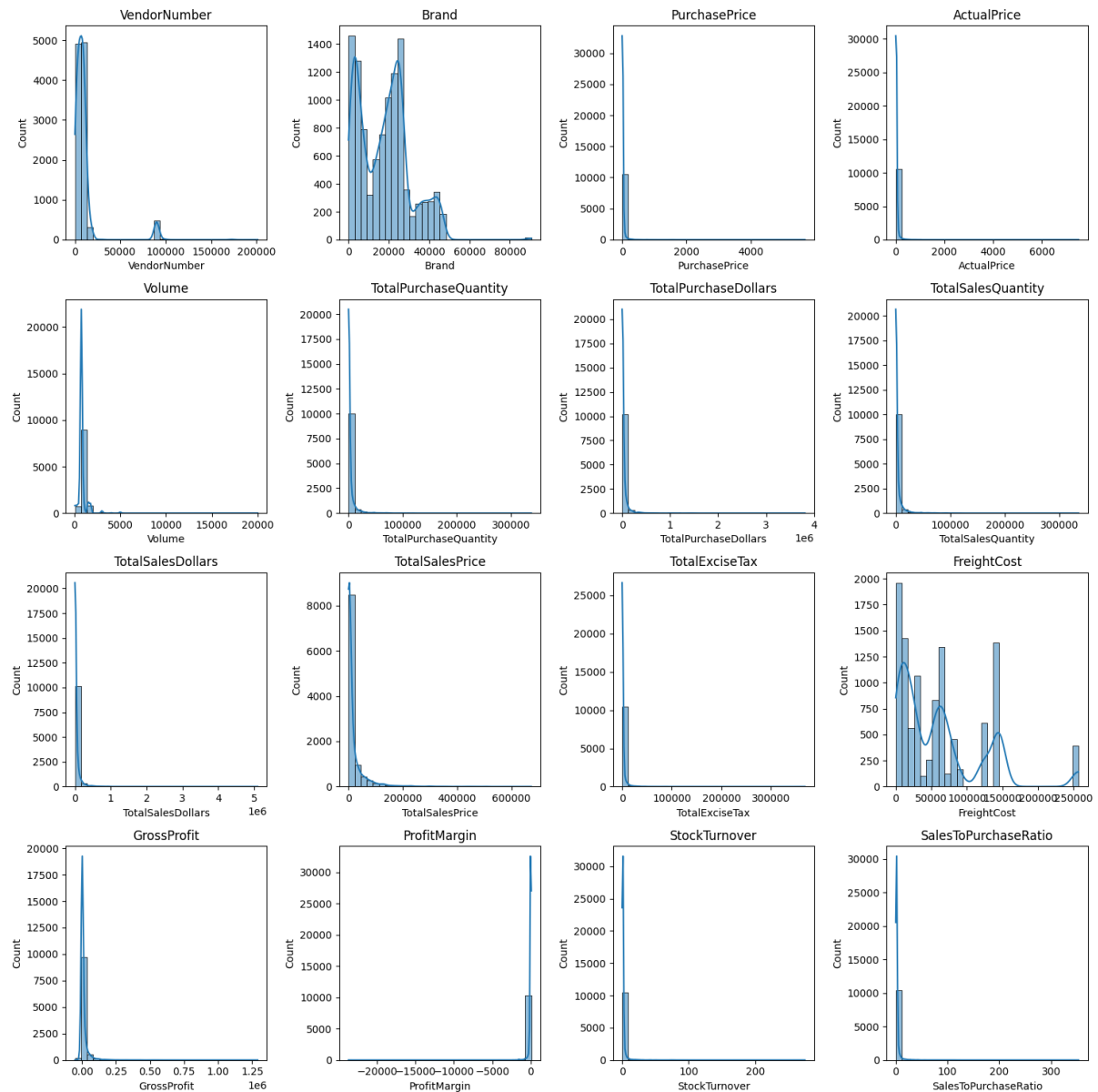
Effective inventory and sales management are critical for optimizing profitability in the retail and wholesale industry. Companies need to ensure that they are not incurring losses due to inefficient pricing, poor inventory turnover, or vendor dependency. The goal of this analysis is to:

- Identify underperforming brands that require promotional or pricing adjustments.
- Determine top vendors contributing to sales and gross profit.
- Analyse the impact of bulk purchasing on unit costs.
- Assess inventory turnover to reduce holding costs and improve efficiency.
- Investigate the profitability variance between high-performing and low-performing vendors.

EDA

Summary Statistics

	count	mean	std	min	25%	50%	75%	max
VendorNumber	10692.0	1.065065e+04	18753.519148	2.000000e+00	3951.000000	7153.000000	9552.000000	2.013590e+05
Brand	10692.0	1.803923e+04	12662.187074	5.800000e+01	5793.500000	18761.500000	25514.250000	9.063100e+04
PurchasePrice	10692.0	2.438530e+01	109.269376	3.600000e-01	6.840000	10.455000	19.482500	5.681810e+03
ActualPrice	10692.0	3.564367e+01	148.246018	4.900000e-01	10.990000	15.990000	28.990000	7.499990e+03
Volume	10692.0	8.473605e+02	664.309212	5.000000e+01	750.000000	750.000000	750.000000	2.000000e+04
TotalPurchaseQuantity	10692.0	3.140887e+03	11095.086769	1.000000e+00	36.000000	262.000000	1975.750000	3.376600e+05
TotalPurchaseDollars	10692.0	3.010669e+04	123067.799579	7.100000e-01	453.457505	3655.464984	20738.244843	3.811252e+06
TotalSalesQuantity	10692.0	3.077482e+03	10952.851391	0.000000e+00	33.000000	261.000000	1929.250000	3.349390e+05
TotalSalesDollars	10692.0	4.223907e+04	167655.266045	0.000000e+00	729.219982	5298.044970	28396.914898	5.101920e+06
TotalSalesPrice	10692.0	1.879378e+04	44952.773491	0.000000e+00	289.709993	2857.799950	16059.562242	6.728193e+05
TotalExciseTax	10692.0	1.774226e+03	10975.582217	0.000000e+00	4.800000	46.570001	418.650006	3.682428e+05
FreightCost	10692.0	6.143376e+04	60938.458015	9.000000e-02	14069.870026	50293.619843	79528.990326	2.570321e+05
GrossProfit	10692.0	1.213238e+04	46224.338038	-5.200278e+04	52.920004	1399.640052	8660.199908	1.290668e+06
ProfitMargin	10692.0	-inf	NaN	-inf	13.324516	30.405457	39.956132	9.971666e+01
StockTurnover	10692.0	1.706793e+00	6.020460	0.000000e+00	0.807229	0.981529	1.039342	2.745000e+02
SalesToPurchaseRatio	10692.0	2.504390e+00	8.459068	0.000000e+00	1.153729	1.436894	1.665449	3.529286e+02



Summary Statistics Insights:

Negative & Zero Values:

- **Gross Profit:** Minimum value is -52,002.78, indicating losses. Some products or transactions may be selling at a loss due to high costs or selling at discounts lower than the purchase price..
- **Profit Margin:** Has a minimum of -inf, which suggests cases where revenue is zero or even lower than costs.
- **Total Sales Quantity & Sales Dollars:** Minimum values are 0, meaning some products were purchased but never sold. These could be slow-moving or obsolete stock.

Outliers Indicated by High Standard Deviations:

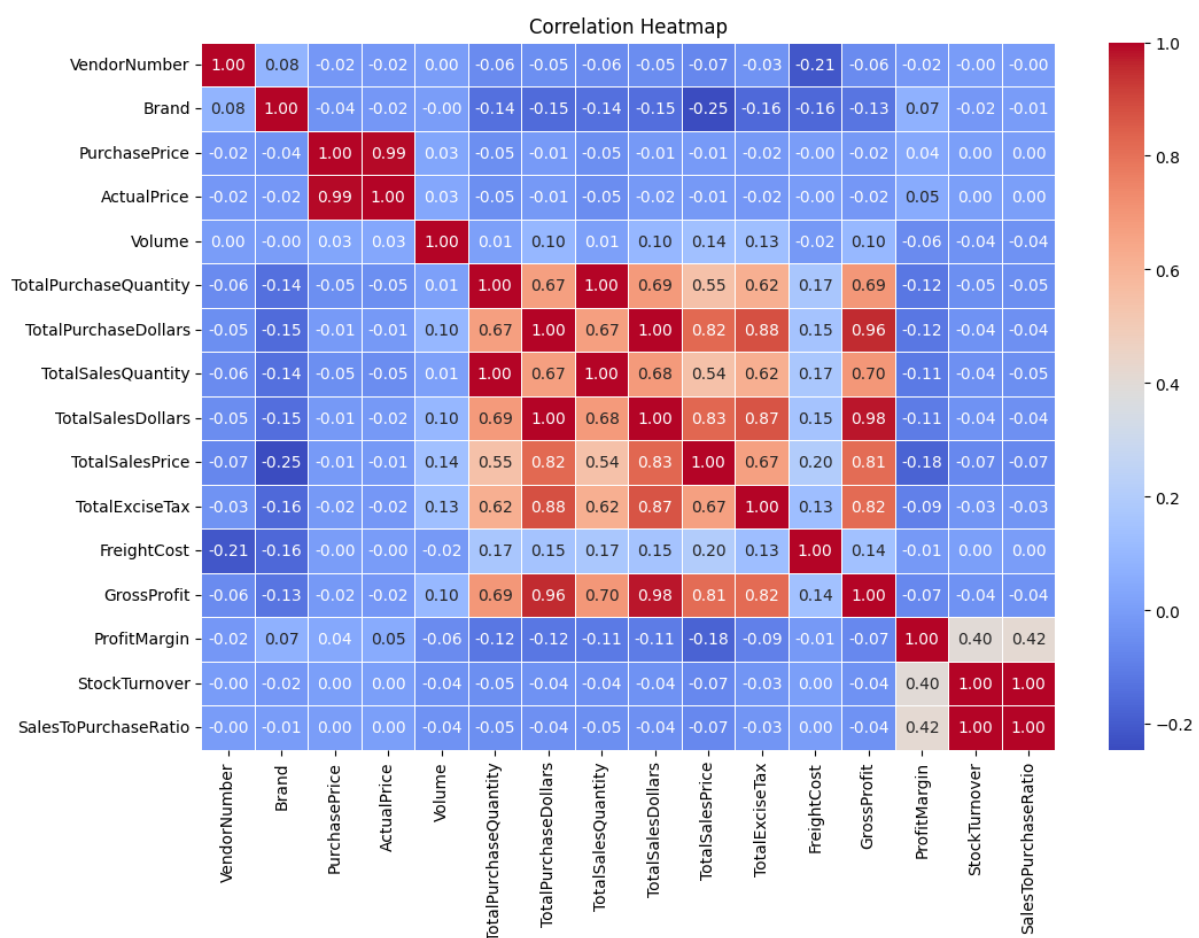
- **Purchase & Actual Prices:** The max values (5,681.81 & 7,499.99) are significantly higher than the mean (24.39 & 35.64), indicating potential premium products.
- **Freight Cost:** Huge variation, from 0.09 to 257,032.07, suggests logistics inefficiencies or bulk shipments.
- **Stock Turnover:** Ranges from 0 to 274.5, implying some products sell extremely fast while others remain in stock indefinitely. Value more than 1 indicates that Sold quantity for that product is higher than purchased quantity due to either sales are being fulfilled from older stock.

Data Filtering:

To enhance the reliability of data, we removed the inconsistent data point where:

- Gross Profit ≤ 0 (To exclude transactions leading to losses)
- Profit Margin ≤ 0 (To ensure analysis focuses to profitable transactions)
- Total Sales Quantity = 0 (To eliminate inventory that was never sold)

Correlation Insights



- **Purchase Price vs. Total Sales Dollars & Gross Profit:** Weak correlation (-0.012 and -0.016), indicating that price variations do not significantly impact sales revenue or profit.
- **Total Purchase Quantity vs. Total Sales Quantity:** Strong correlation (0.999), confirming efficient inventory turnover.
- **Profit Margin vs. Total Sales Price:** Negative correlation (-0.179), suggesting increasing sales prices may lead to reduced margins, possibly due to competitive pricing pressures.
- **Stock Turnover vs. Gross Profit & Profit Margin:** Weak negative correlation (-0.038 & -0.055), indicating that faster stock turnover does not necessarily equate to higher profitability.

Research Questions and Key Findings

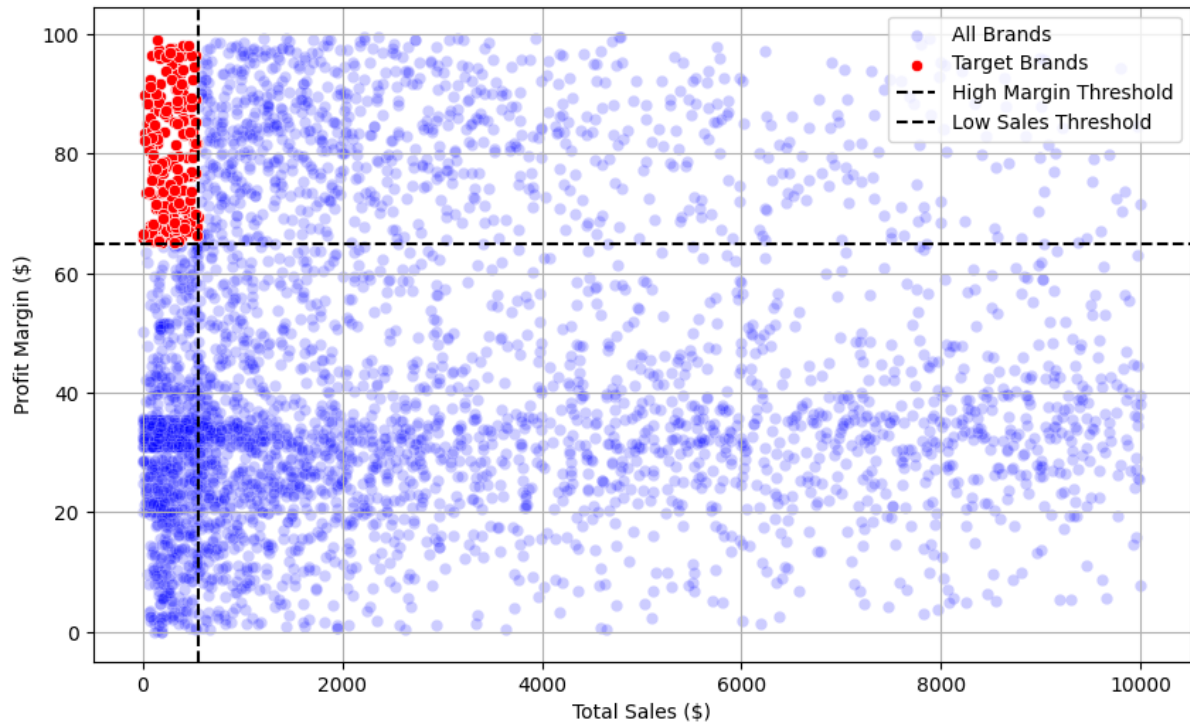
Q1] Identify brands that needs promotion or pricing adjustments which exhibits lower sales performance but higher profit margin?

Brand with low sales but high profit margin :

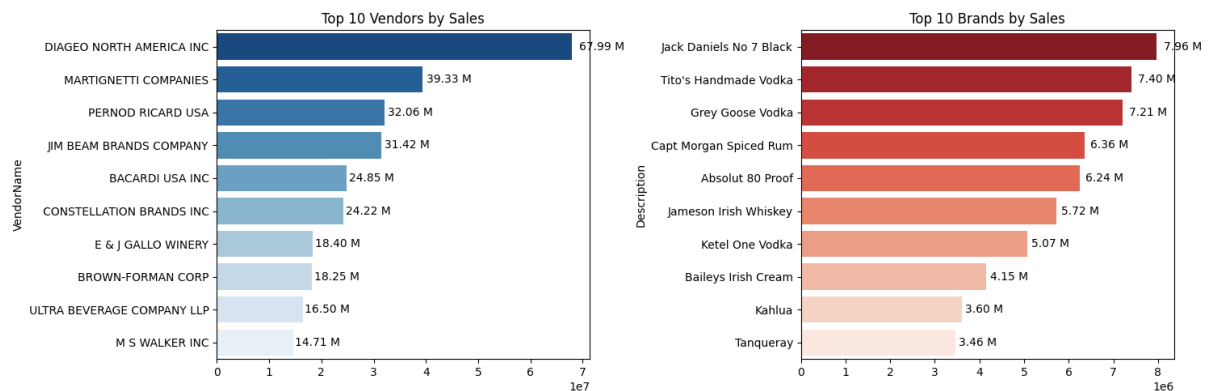
	Description	TotalSalesDollars	ProfitMargin
6199	Santa Rita Organic Svgn Bl	9.990000	66.466467
2369	Debauchery Pnt Nr	11.580000	65.975820
2070	Concannon Glen Ellen Wh Zin	15.950000	83.448275
2188	Crown Royal Apple	27.859999	89.806173
6237	Sauza Sprklg Wild Berry Marg	27.959999	82.153076
...
5074	Nanbu Bijin Southern Beauty	535.679998	76.747312
2271	Dad's Hat Rye Whiskey	538.890007	81.851584
57	A Bichot Clos Marechaudes	539.939995	67.740860
6245	Sbragia Home Ranch Merlot	549.750000	66.444748
3326	Goulee Cos d'Estournel 10	558.870010	69.434753

198 rows × 3 columns

198 Brands exhibits low sales but high profit margin, which could benefit from targeted marketing, promotion or price optimization to increase volume without compromising profitability.

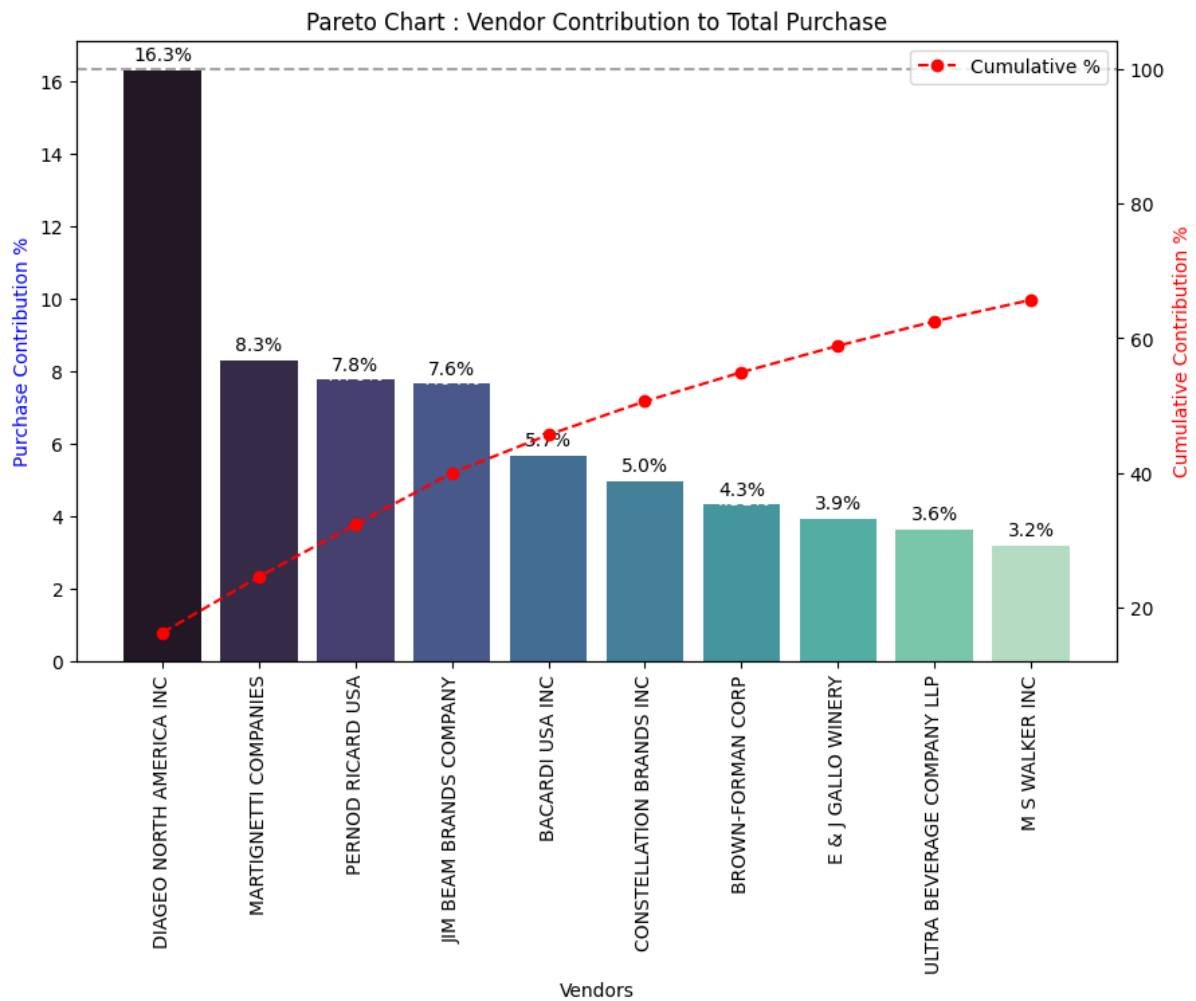


Q2] Which vendors and brands demonstrate the highest sales performance?



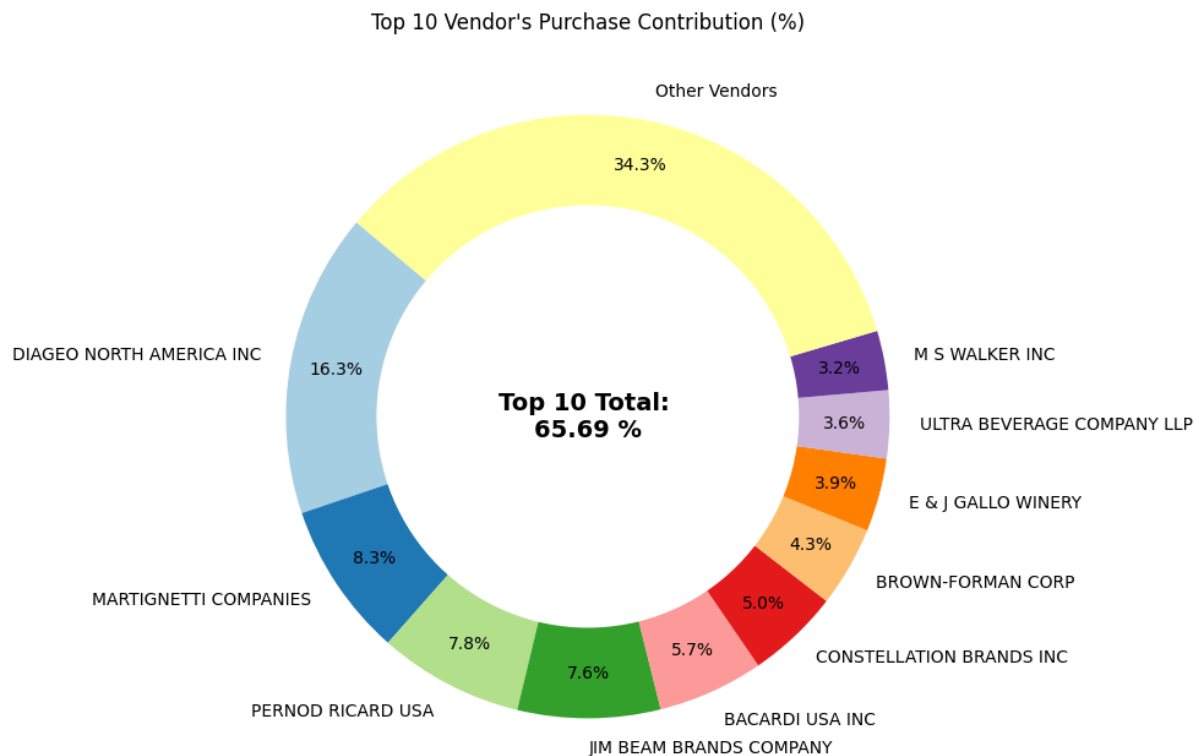
Q3] Which vendors contributes the most to the total purchase dollars?

Top 10 vendors that contribute the most to total purchases dollars.



Q4] How much of total procurement is dependent on the top vendor?

Top 10 vendors contributes 65.69% of total purchase, while the remaining vendors contributes only 34.31%. The over-reliance on a few vendors may introduce risk such as supply chain disruption, indicating need for diversification.



Q5] Does purchasing in bulk reduces the unit price, and what is the optimal purchase volume for saving cost ?

Average unit purchase price:

UnitPurchasePrice	
OrderSize	
Small	39.057543
Medium	15.486414
Large	10.777625

- **Vendors buying in bulk** (Large Order Size) get the **lowest unit price** (\$10.78 per unit), meaning higher margins if they can manage inventory efficiently.
- The **price difference between Small and Large orders is substantial** (~72% reduction in unit cost)
- This suggests that bulk pricing strategies successfully **encourage vendors to purchase in larger volumes**, leading to higher overall sales despite lower per-unit revenue.

Q6] Which vendors have low inventory turnover, indicating excess stock and slow-moving products ?

VendorName	StockTurnover
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

- Stock Turnover < 1 means these vendors can sell the previous stock, before buying a new stock, therefore indicating good vendors.
- Lower the Stock Turnover indicates excess stock and slow-moving products
- Ideal Stock Turnover is 1

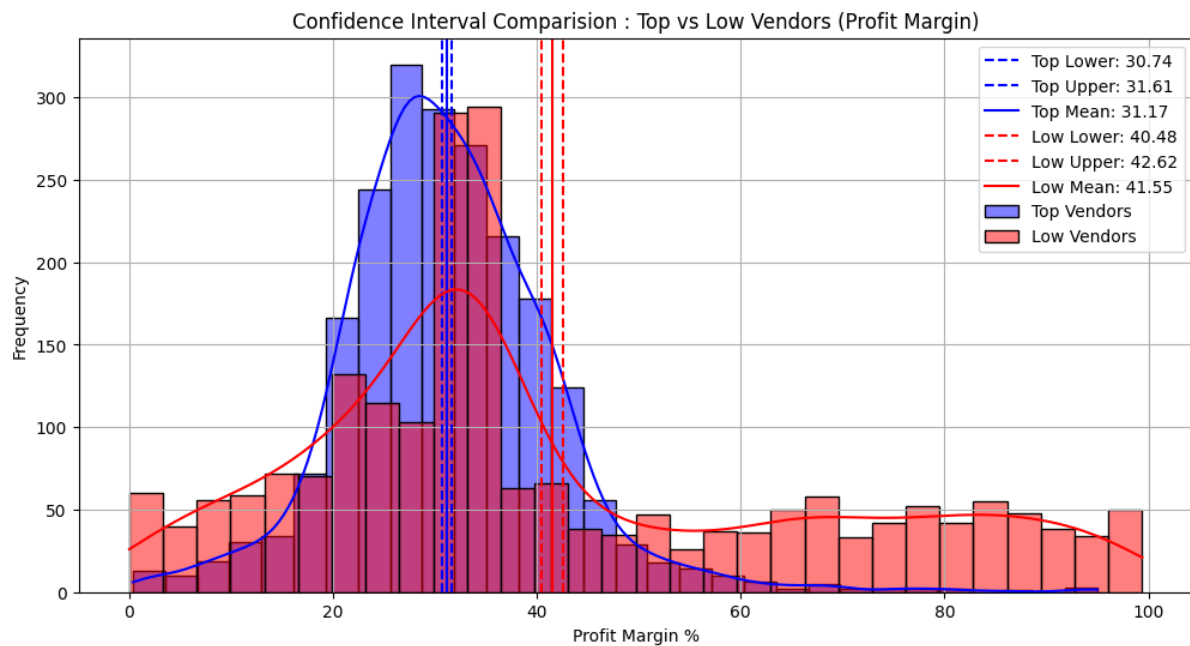
Q7] How much capital is locked in unsold inventory per vendor, and which vendor contributes the most to it ?

- Total Unsold Capital : \$2.71 M
- Top 10 vendors with high unsold inventory are:

	VendorName	UnsoldInventoryValue
25	DIAGEO NORTH AMERICA INC	722.21 K
46	JIM BEAM BRANDS COMPANY	554.67 K
68	PERNOD RICARD USA	470.63 K
116	WILLIAM GRANT & SONS INC	401.96 K
30	E & J GALLO WINERY	228.28 K
79	SAZERAC CO INC	198.44 K
11	BROWN-FORMAN CORP	177.73 K
20	CONSTELLATION BRANDS INC	133.62 K
61	MOET HENNESSY USA INC	126.48 K
77	REMY COINTREAU USA INC	118.60 K

Q8] What is 95% confidence interval for profit margin of top-performing and low-performing vendors ?

- Top Vendors 95% CI: (30.74, 31.61), Mean : 31.17
- Low Vendors 95% CI: (40.48, 42.62), Mean : 41.55



Findings :

- The confidence interval for low-performing vendors (40.48% to 42.62%) is significantly higher than that of top-performing vendors (30.74% to 31.61%).
- This suggests that vendors with lower sales **tend to maintain higher profit margins, potentially due to premium pricing or lower operational costs.**

Recommendations :

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

Q9] Is there significant difference in profit margin between top-performing and low-performing vendors ?

Hypothesis Testing :

- **H0 (Null Hypothesis)** : there is no significant difference in profit margin between top-performing and low-performing vendors.
- **H1 (Alternative Hypothesis)**: there is significant difference in profit margin between top-performing and low-performing vendors.

Result:

- T-Statistics : -17.6440, P-value : 0.0000

- Since p-value is very small we **Reject H0** , therefore **there is significant difference** in profit margin between top-performing and low-performing vendors.

Implications:

- High margin vendors can benefit from better pricing strategies, while top-selling vendors can focus on cost efficiency.

Final Recommendations:

- **Re-evaluate pricing** for low-sales, high-margin brands to boost sales volume without sacrificing profitability.
- **Diversify vendor partnerships** to reduce dependency on a few suppliers and mitigate supply chain risks.
- **Leverage bulk purchasing advantages** to maintain competitive pricing while optimizing inventory management.
- **Optimize slow-moving inventory** by adjusting purchase quantities, launching clearance sales, or revising storage strategies.
- **Enhance marketing and distribution strategies** for low-performing vendors to drive higher sales volumes without compromising profit margins.
- **By implementing these recommendations**, the company can achieve sustainable profitability, mitigate risks, and enhance overall operational efficiency.