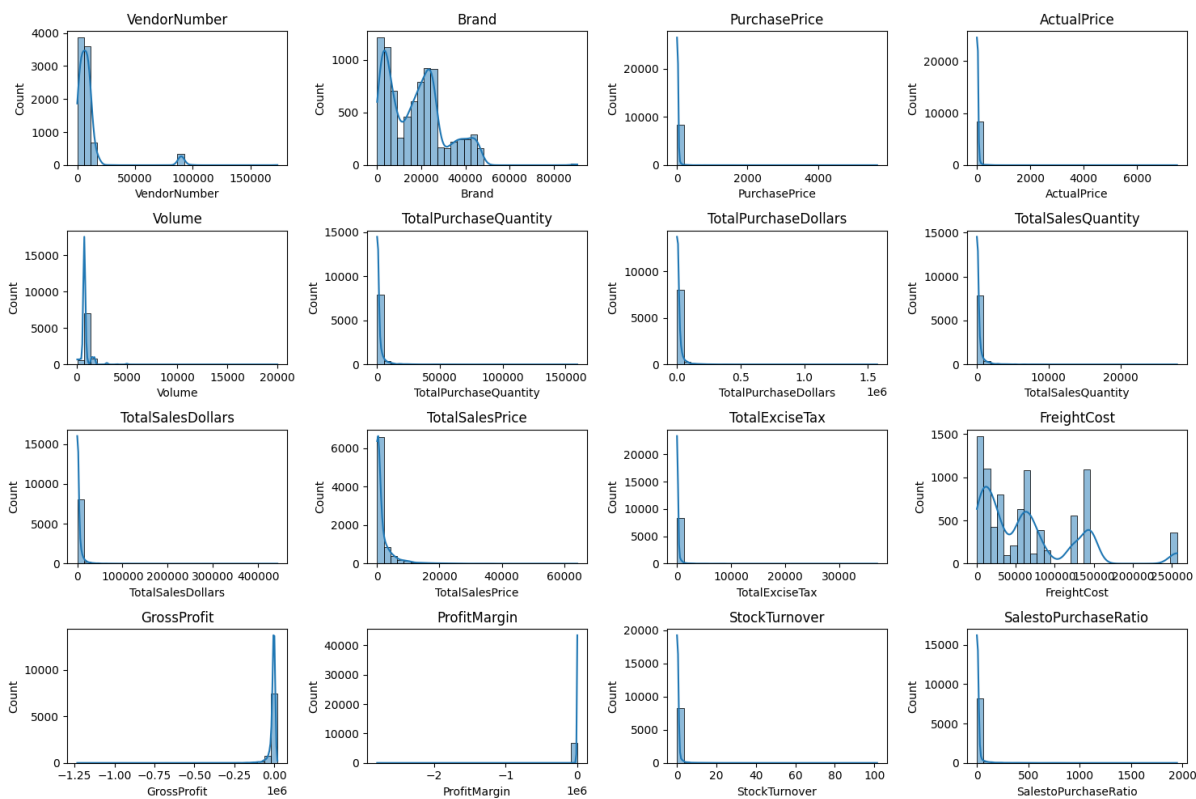


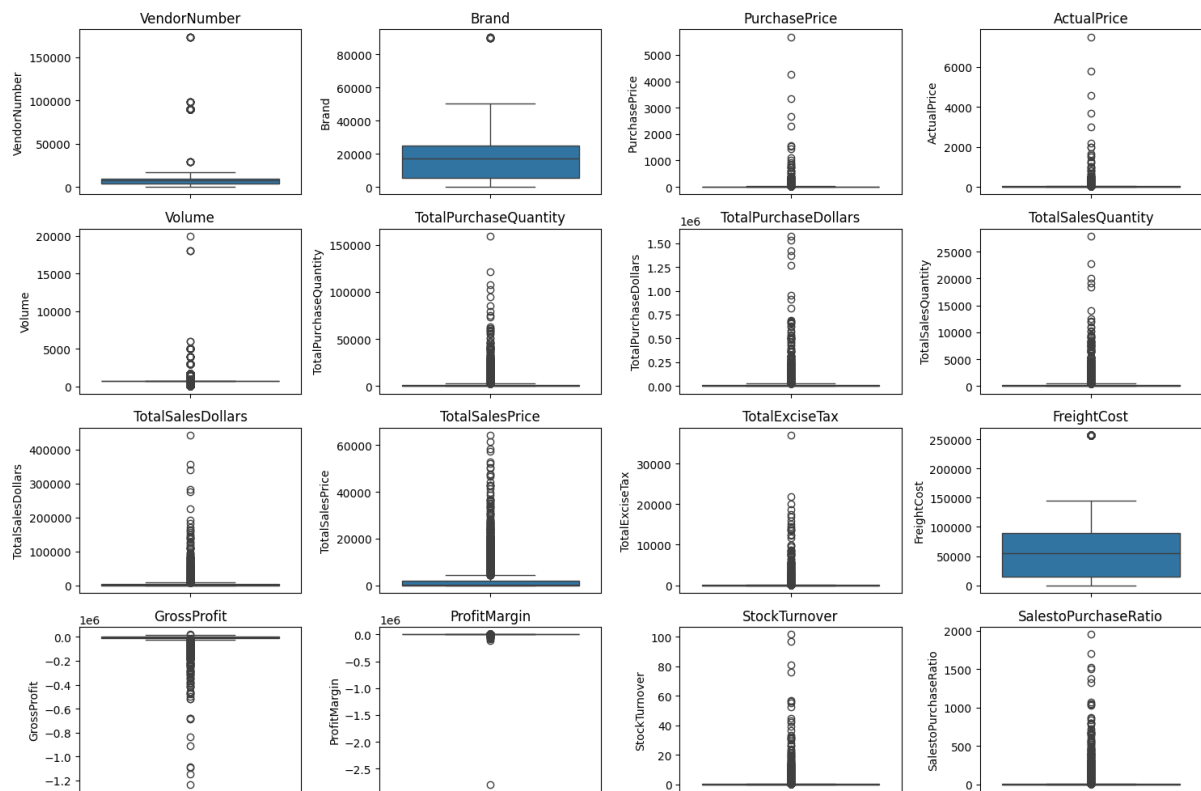
Exploratory Data Analysis Insights

Summary Statistics:

	count	mean	std	min	25%	50%	75%	max
VendorNumber	8503.0	1.012780e+04	17663.278743	2.00	3664.000000	7153.000000	9552.000000	1.733570e+05
Brand	8503.0	1.759251e+04	13002.506160	58.00	5295.500000	17432.000000	24982.500000	9.063100e+04
PurchasePrice	8503.0	2.189845e+01	105.884530	0.36	6.800000	10.270000	18.245000	5.681810e+03
ActualPrice	8503.0	3.220028e+01	144.284353	0.49	10.990000	15.990000	26.990000	7.499990e+03
Volume	8503.0	8.549867e+02	618.300037	50.00	750.000000	750.000000	750.000000	2.000000e+04
TotalPurchaseQuantity	8503.0	1.672260e+03	5444.265284	1.00	24.000000	229.000000	1177.500000	1.593960e+05
TotalPurchaseDollars	8503.0	1.559235e+04	56216.842154	0.71	344.640000	2806.200000	12386.850000	1.574072e+06
TotalSalesQuantity	8503.0	2.847676e+02	959.709116	0.00	3.000000	34.000000	198.000000	2.790500e+04
TotalSalesDollars	8503.0	3.843601e+03	13465.240926	0.00	59.865000	649.350000	3086.910000	4.423479e+05
TotalSalesPrice	8503.0	1.874260e+03	4258.199371	0.00	22.625000	362.250000	1820.785000	6.424215e+04
TotalExciseTax	8503.0	1.623145e+02	942.951344	0.00	0.340000	5.750000	47.875000	3.695799e+04
FreightCost	8503.0	6.395457e+04	62253.166958	0.27	14836.570000	55551.820000	89286.270000	2.570321e+05
GrossProfit	8503.0	-1.174875e+04	43726.979852	-1232958.91	-9204.925000	-1878.310000	-166.680000	1.987808e+04
ProfitMargin	8503.0	-inf	NaN	-inf	-834.374400	-301.348300	-144.152314	9.956005e+01
StockTurnover	8503.0	5.764923e-01	3.012078	0.00	0.066667	0.166023	0.268884	1.015000e+02
SalestoPurchaseRatio	8503.0	1.440018e+01	69.977781	0.00	0.736228	2.402244	5.553340	1.949870e+03



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Summary Statistics Insights:

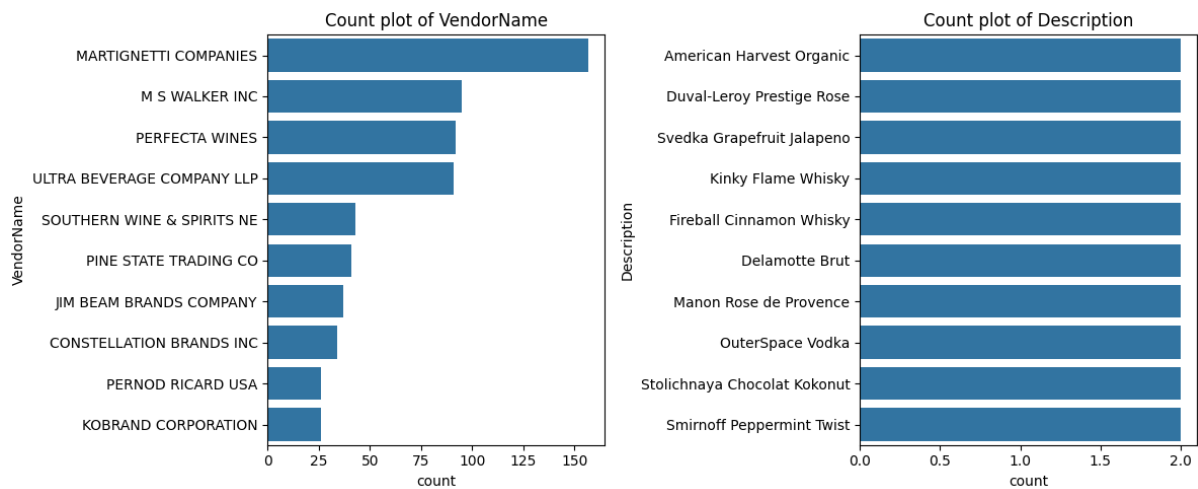
- Negative & Zero Values:**
 - Gross Profit* drops to **-1.25M**, indicating losses from high costs or heavy discounting.
 - Profit Margin* reaches **$-\infty$** , suggesting revenue is zero or below cost.
 - Sales Quantity* & *Sales Dollars* show **0 values**, highlighting unsold or obsolete stock.
- High Outliers:**
 - Purchase & Actual Prices:*** Max values (**5,681 & 7,499**) far exceed means (~24 & ~35), pointing to premium-priced items.
 - Freight Cost:*** Wide range (**0.09 to 257K**) suggests bulk shipments or logistics inefficiencies.
 - Stock Turnover:*** From **0 to ~100**, showing fast-selling vs stagnant items; values >1 indicate rapid sales.
 - Sales-to-Purchase Ratio:*** Peaks near **1,900**, showing excess sales over purchases due to backlog or clearance.
- Distribution Patterns:**
 - Most metrics are **right-skewed**, driven by a few high-value outliers.
 - Quantities and volumes cluster near zero, indicating low sales frequency or slow-moving inventory.

Data Filtering

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

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

Count Plot by Vendor Name & Description (Brand)

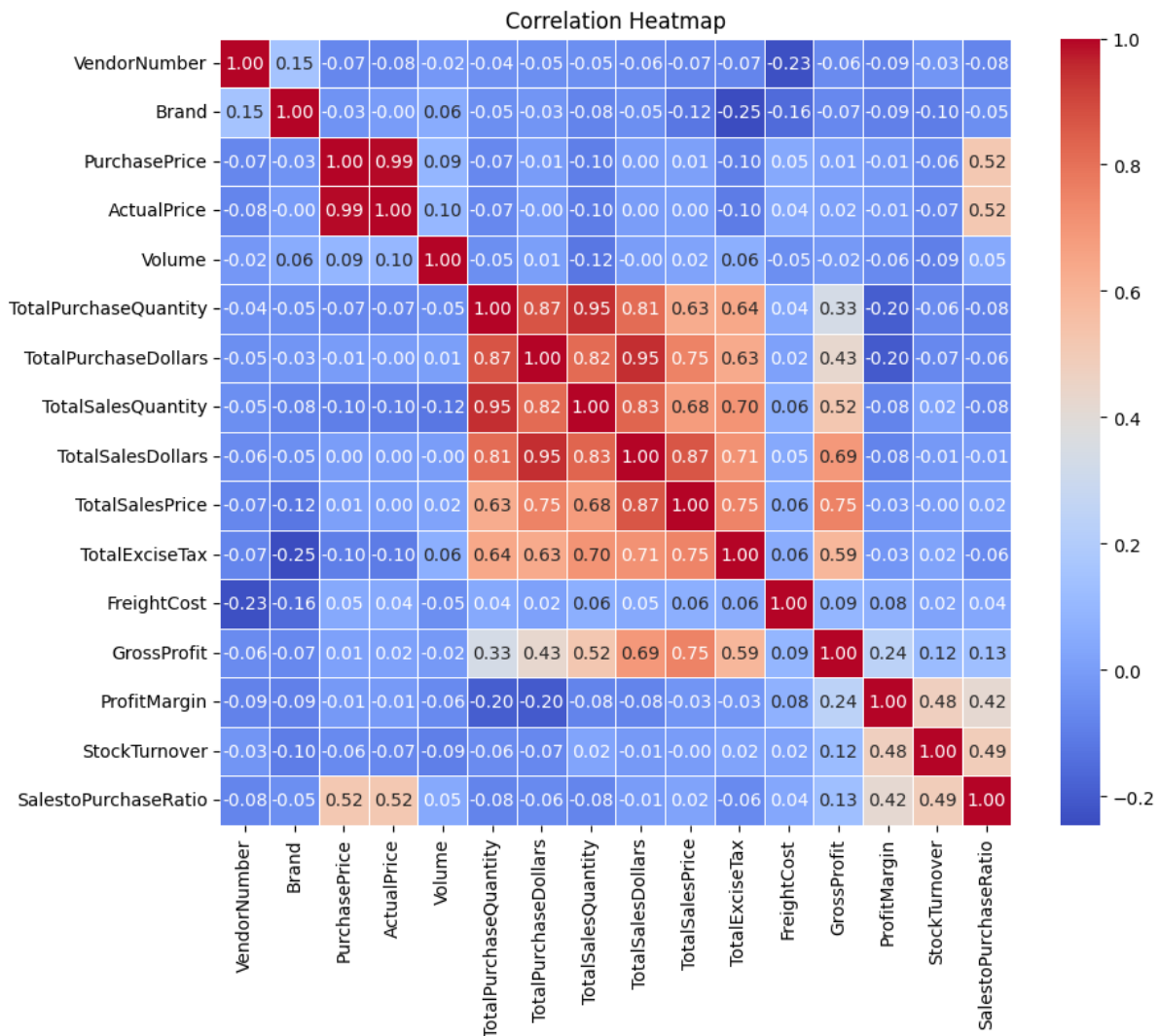


The graph shows two main findings:

- **Vendor dominance:** A few vendors, especially "MARTIGNETTI COMPANIES," handle most transactions, while others trail far behind.
- **Product variety:** Each top-selling product appears only twice, indicating sales are spread thinly across many items rather than concentrated in a few.

This means the business relies heavily on select vendors but offers a wide, low-volume product selection.

Correlation Insights



Insight:

- 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.

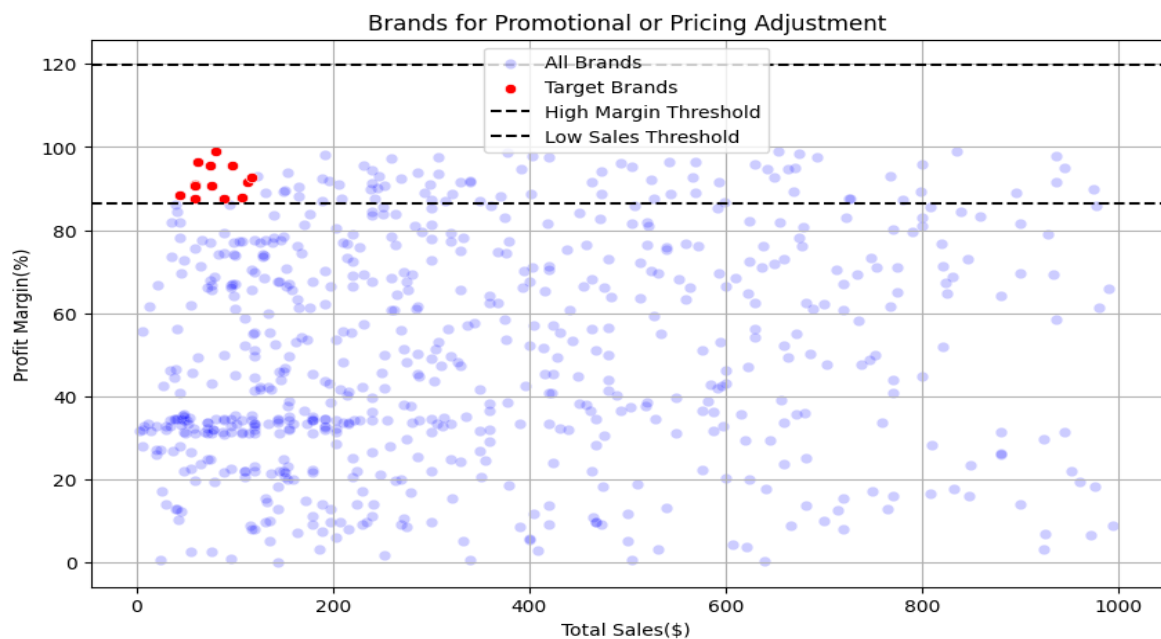
Research Questions & Key Findings

1. Brands for promotional or Pricing Adjustments

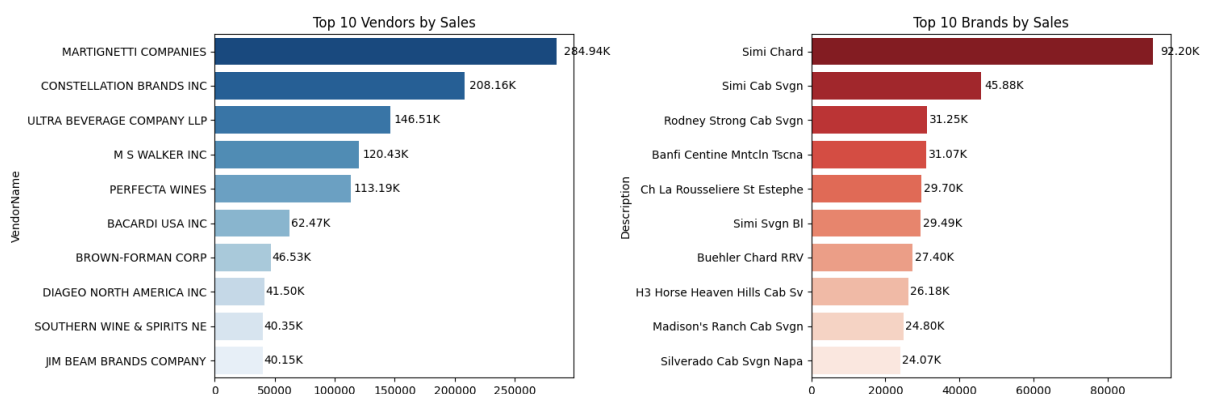
Brands with LOW Sales but High Profit Margins:

	Description	TotalSalesDollars	ProfitMargin
924	Tracia Syrah	44.94	88.495772
66	Bacardi Oakheart Spiced Trav	59.94	87.554221
275	Chicken & Turkey Cotes du Rh	59.94	90.990991
845	St Elder Elderflower Liqueur	60.39	90.594469
351	Dr McGillicuddy's Apple Pie	62.72	96.269133
47	Aresti Pnt Nr Curico Vly	74.85	95.617902
326	DeKuyper Buttershots Trav	76.93	90.718835
908	Three Olives Grape Vodka	80.19	99.114603
846	St Germain Liqueur	89.94	87.658439
706	Piehole Apple Pie	98.01	95.592287
156	Capri Natura Limoncello	107.94	87.919214
619	Mojoshot Blue Lagoon RTD	112.86	91.591352
952	Vigne A Porrona Rosso	116.91	92.592593

A total of **13 Brands** exhibits lower sales but High Profit Margins, which could benefit from Target Marketing, promotions, or price optimizing to increase volume without compromising profitability.

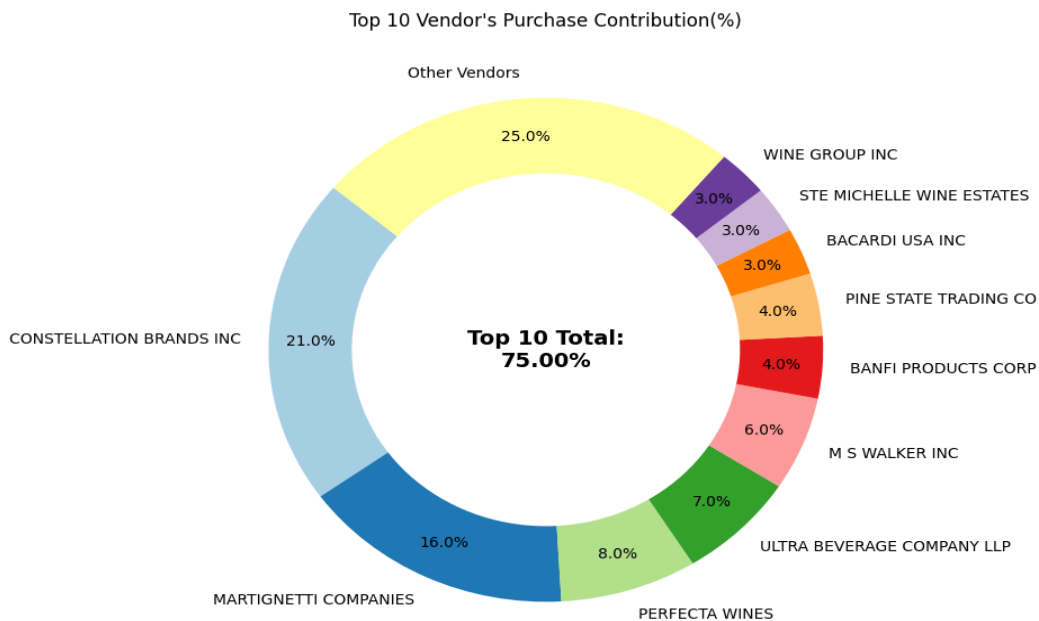


2. Top Vendors & Brands by Sales:



- **Vendor sales are highly concentrated:** Top vendors dominate—MARTIGNETTI COMPANIES accounts for nearly 285K sales, far ahead of others, revealing dependency on a few suppliers.
- **Brand sales are less concentrated:** Even the top brand (Simi Chard) only reaches 92.20K in sales, with a steep drop after, suggesting customers are spread across many brands rather than few highly popular names.
- **Potential action:** Reliance on a small set of vendors could be a risk or opportunity for negotiation; meanwhile, expanding or focusing the brand mix may offer growth, as brand preferences are more fragmented.

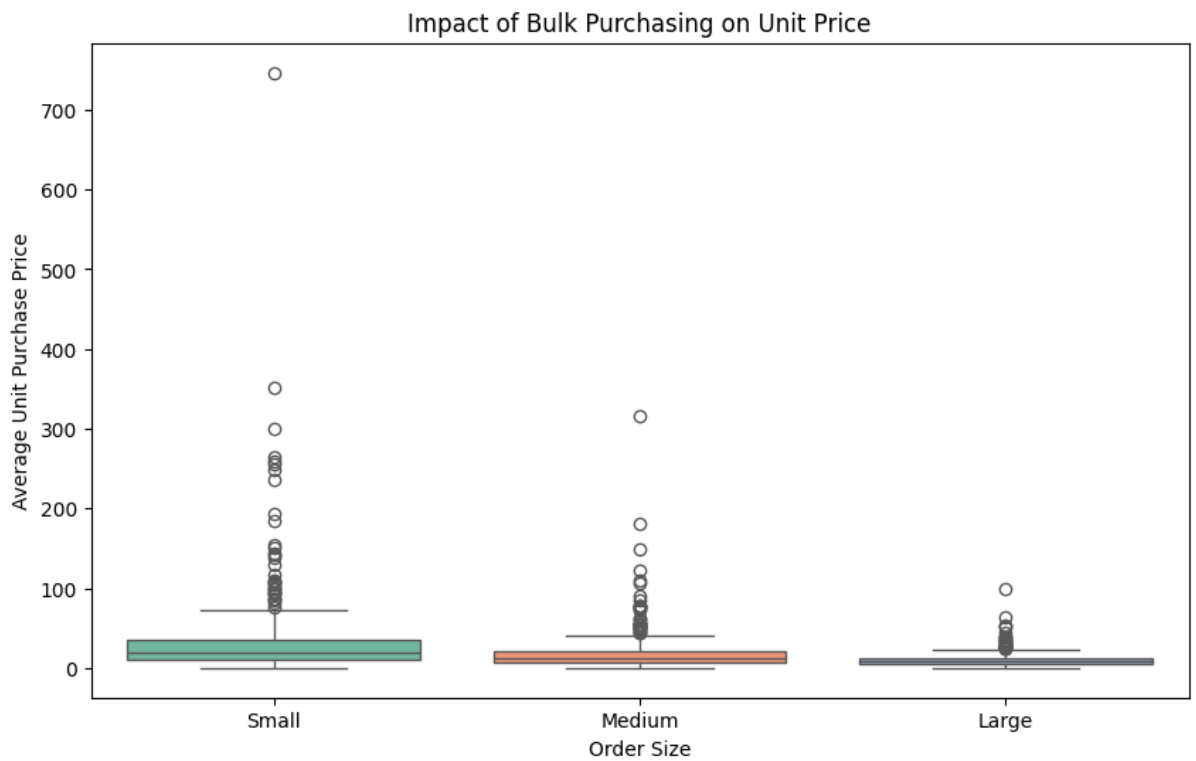
3. Top Vendors by Sales & Purchase Contribution



The **Top 10 Vendors** contributes **75.00% of total purchases**, while the **remaining vendors** contribute only **25.00%**. The over-reliance on a few vendors may introduce risks such as supply chain disruptions, indicating a need for diversification.

4. Impact of Bulk Purchasing on Cost Savings

UnitPurchasePrice	
OrderSize	
Small	36.175954
Medium	20.555619
Large	11.235182



- Vendors placing **Large Orders** achieve the **lowest unit price**, enabling higher margins if inventory is managed well.
- There is a **significant price gap** (~70% reduction) between Small and Large orders, showing strong cost benefits of bulk purchases.
- This confirms that **bulk pricing strategies** effectively incentivize larger purchases, boosting overall sales despite reduced per-unit prices.

5. Identifying Vendors with Low Inventory Turnover

Total Unsold Inventory Capital: \$15.84M

Slow-moving inventory increases storage costs, reduces cash flow efficiency, and affects overall profitability.

Identifying vendors with low inventory turnover enables better stock management, minimizing financial strain

StockTurnover	
VendorName	
PALM BAY INTERNATIONAL INC	0.666667
WILLIAM GRANT & SONS INC	0.695652
STE MICHELLE WINE ESTATES	0.704484
TREASURY WINE ESTATES	0.705882
PINE STATE TRADING CO	0.708564
WINE GROUP INC	0.721168
CONSTELLATION BRANDS INC	0.727265
Russian Standard Vodka	0.730769
R.P.IMPORTS INC	0.733333
VINEXTRA INC	0.733491

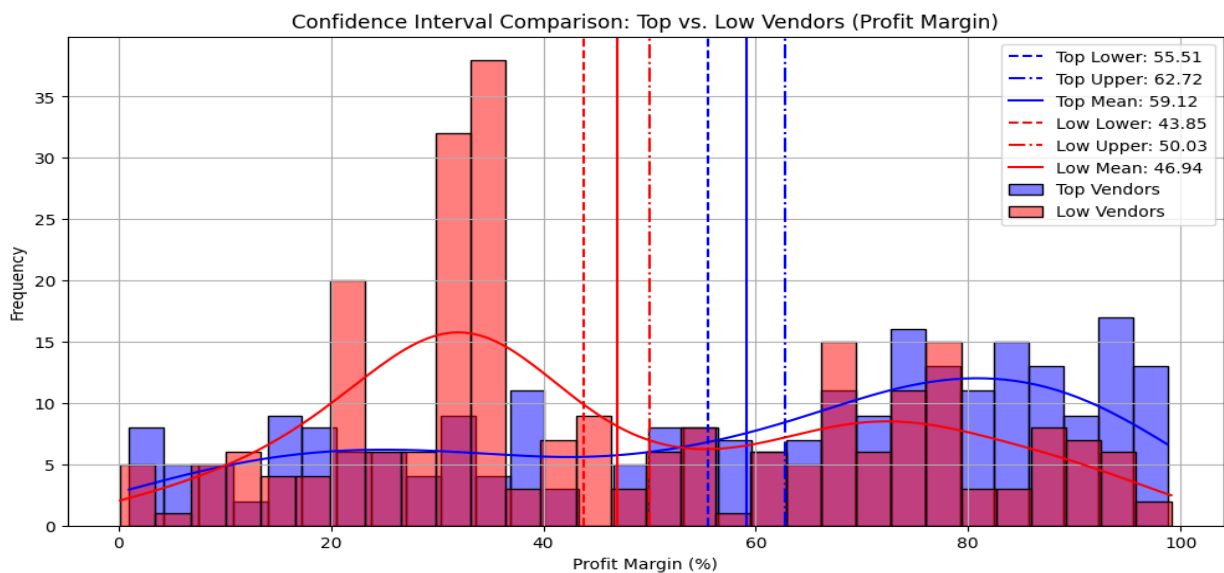
VendorName	UnsoldInventoryValue
CONSTELLATION BRANDS INC	35.53K
BANFI PRODUCTS CORP	8.40K
PINE STATE TRADING CO	7.29K
TRINCHERO FAMILY ESTATES	6.06K
WINE GROUP INC	5.79K
STE MICHELLE WINE ESTATES	4.03K
WESTERN SPIRITS BEVERAGE CO	1.16K
FREDERICK WILDMAN & SONS	994.2299999999999
SIDNEY FRANK IMPORTING CO	561.55
MOET HENNESSY USA INC	360.80000000000007

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6. Profit Margin Comparison: High vs Low- Performing Vendors

Top Vendors 95% CI: (55.51, 62.72), Mean: 59.12
Low Vendors 95% CI: (43.85, 50.03), Mean: 46.94

- Low-Performing Vendors maintain higher margins but struggles with sales volume, indicating potential pricing inefficacies or market reach issue.
- Actionable Insights:
 - Top- Performing Vendors: Optimize profitability by adjusting pricing, reducing operational costs, or offering bundled promotion.
 - Low-Performing Vendors: Improve marketing efforts, optimize prizing strategies, and enhance distribution networks.



7. Statistical Validation of Profit Margin Differences:

Hypothesis Testing:

H₀ (Null Hypothesis): No significant difference in profit margins between top and low-performing vendors.

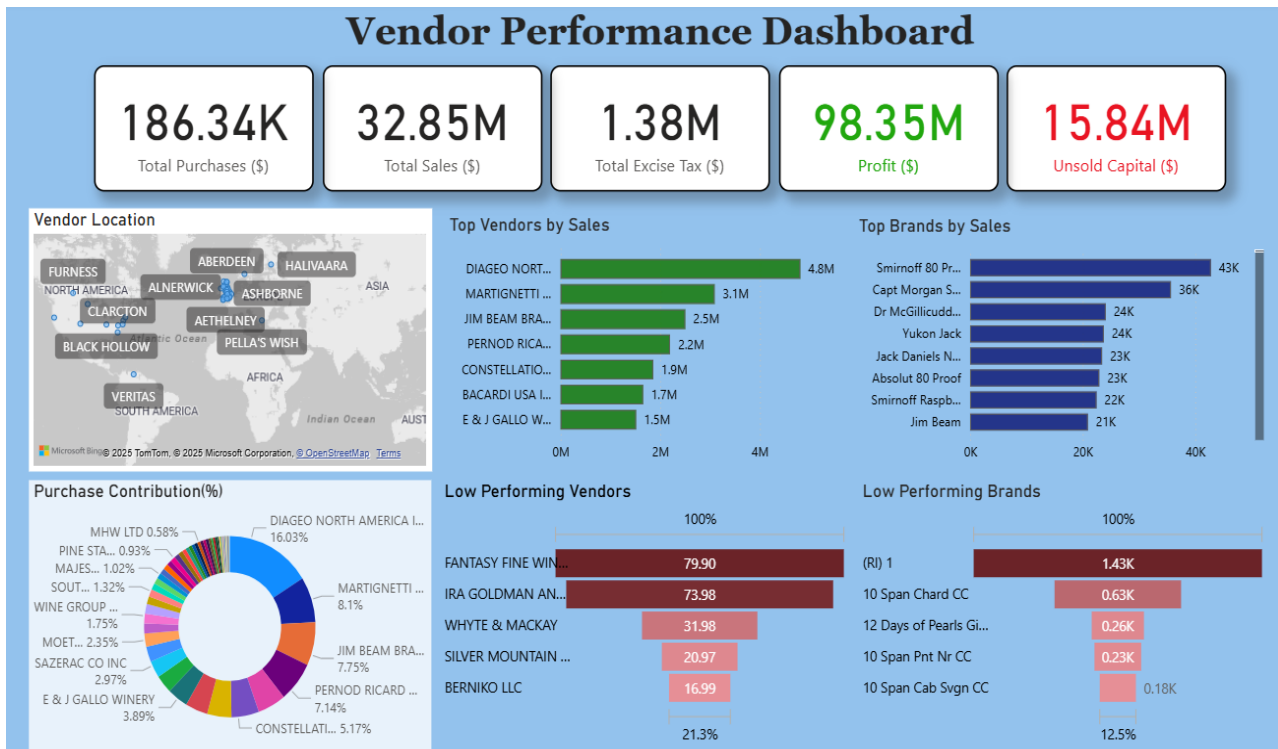
H₁ (Alternative Hypothesis): A significant difference exists in profit margins between the two vendor groups.

Result: The null hypothesis is rejected, confirming that the two groups operate under distinctly different profitability models.

Implication: High-margin vendors may benefit from better pricing strategies, while top-selling vendors could focus on cost efficiency.

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POWER-BI Dashboard



Final Recommendations:

- Re-evaluate pricing for low-sales, high-margin brands to boost sales without sacrificing profitability.
- Diversify vendor- partnership to reduce dependency on a few suppliers and mitigate supply chain risks.
- Leverage bulk purchasing advantages to maintain competitive pricing optimizing inventory management.
- Optimize slow- moving inventory by adjusting purchase quantities, launching clearance sales, revising storage strategies.
- Enhance marketing and distributing strategies for low- performing vendors to drive higher sales volume without compromising profit margins.
- By implementing these steps, the company can:
 - **Achieve Higher sustainable profitability.**
 - **Mitigate the potential risks.**
 - **Enhance overall operational inefficiencies.**

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Method: Exploratory Data Analysis (EDA)

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