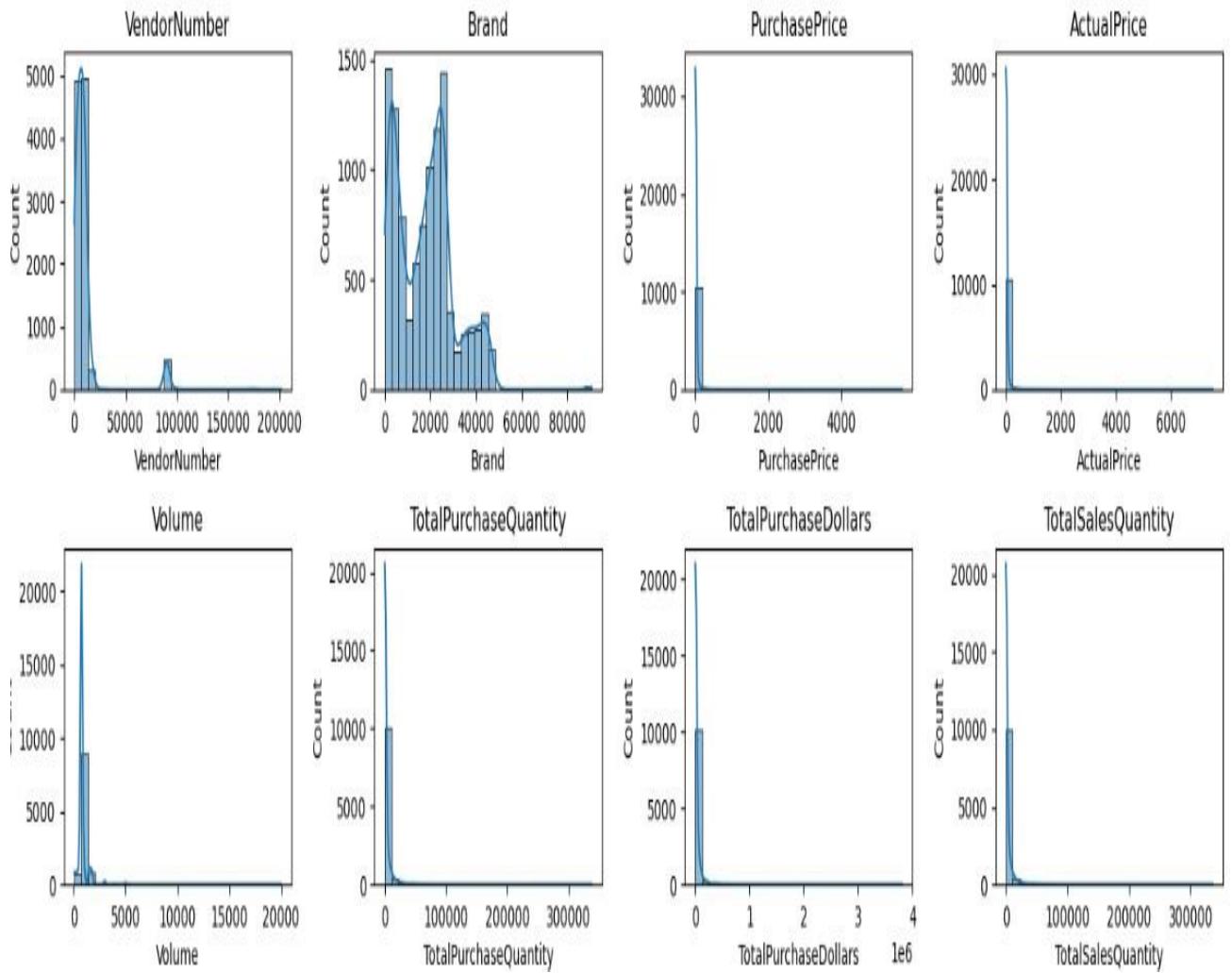


EXPLORATORY DATA ANALYSIS INSIGHTS

Summary Statistics

	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
ActualPrice	10692.0	3.564367e+01	148.246016	0.49	10.990000	15.990000	28.990000	7.499990e+03
Volume	10692.0	8.473605e+02	664.309212	50.00	750.000000	750.000000	750.000000	2.000000e+04
TotalPurchaseQuantity	10692.0	3.140887e+03	11095.086769	1.00	36.000000	262.000000	1975.750000	3.376600e+05
TotalPurchaseDollars	10692.0	3.010669e+04	123067.799627	0.71	453.457500	3655.465000	20738.245000	3.811252e+06
TotalSalesQuantity	10692.0	3.083905e+03	10977.098899	0.00	33.000000	261.000000	1929.250000	3.357760e+05
TotalSalesDollars	10692.0	4.231997e+04	167977.918806	0.00	729.220000	5298.045000	28417.515000	5.107868e+06
TotalSalesPrice	10692.0	1.882944e+04	45042.569582	0.00	289.717500	2857.965000	16083.062500	6.735891e+05
TotalExciseTax	10692.0	1.777785e+03	10996.120145	0.00	4.800000	46.570000	419.257500	3.691927e+05
FreightCost	10692.0	6.143376e+04	60938.458032	0.09	14069.870000	50293.620000	79528.990000	2.570321e+05
GrossProfit	10692.0	1.221327e+04	46540.467875	-52002.78	53.550000	1407.615000	8726.575000	1.296616e+06
ProfitMargin	10692.0	-inf	NaN	-inf	13.396482	30.539492	40.042072	9.971666e+01
StockTurnover	10692.0	1.707866e+00	6.020577	0.00	0.807897	0.983131	1.040838	2.745000e+02

Above table represent the statistics of columns of our dataset. The above table gives the information about the count ,mean, standard deviation of our dataset columns. Which helps us understand the data.



Above we have created a histogram for our dataset columns.

Negative & Zero Values:

Gross Profit: Negative gross profit indicating potential losses due to high costs or heavy discounts. This could be due to selling products at lower prices than their purchase costs.

Profit Margin: Has a minimum of infinity, which suggests instances where revenue is zero or even lower than the total cost, leading to extreme negative profit margins.

Total Sales Quantity and Sales Dollars: Some products show, zero sales, indicating they were purchased but never sold . These may be slow-moving or obsolete stock, leading to inventory inefficiencies.

Outliers Detected by High Standard Deviations:

Purchase and Actual Prices: The maximum values are significantly higher than the mean, indicating premium products offerings.

Freight Costs: Extreme variation from 0.09 to 257,032.07 suggests logistics inefficiencies, bulk shipments, or erratic shipping costs across different products.

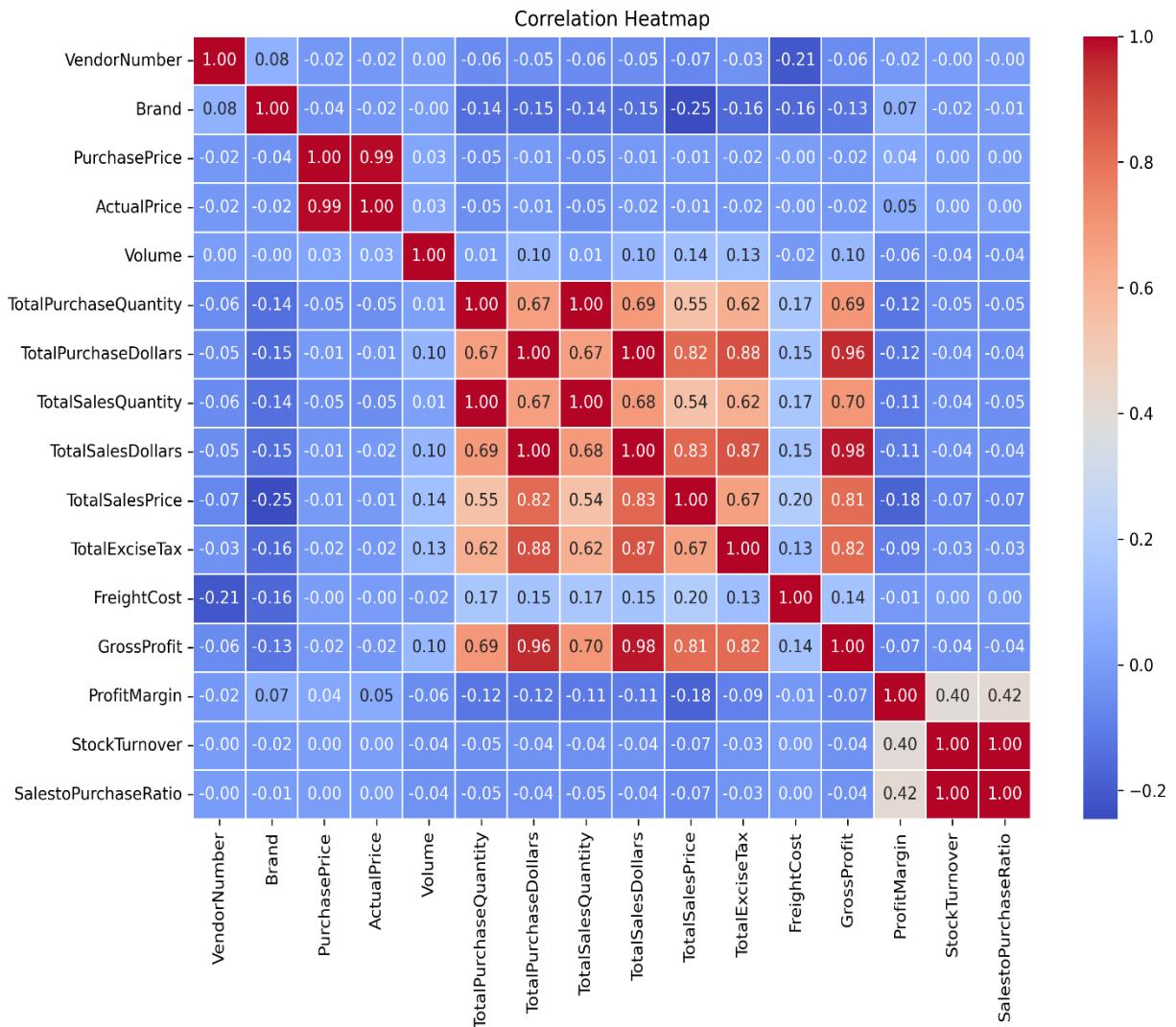
Stock Turnover: Ranges from 0 to 274.5, suggesting some products sell rapidly while others remain unsold for long periods. A value greater than 1 indicates that sales for a product exceed the purchased quantity due to older stock fulfilling orders.

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)

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 higher profitability.

Research Questions and Key Findings

1. Brands for Promotional or Pricing Adjustments

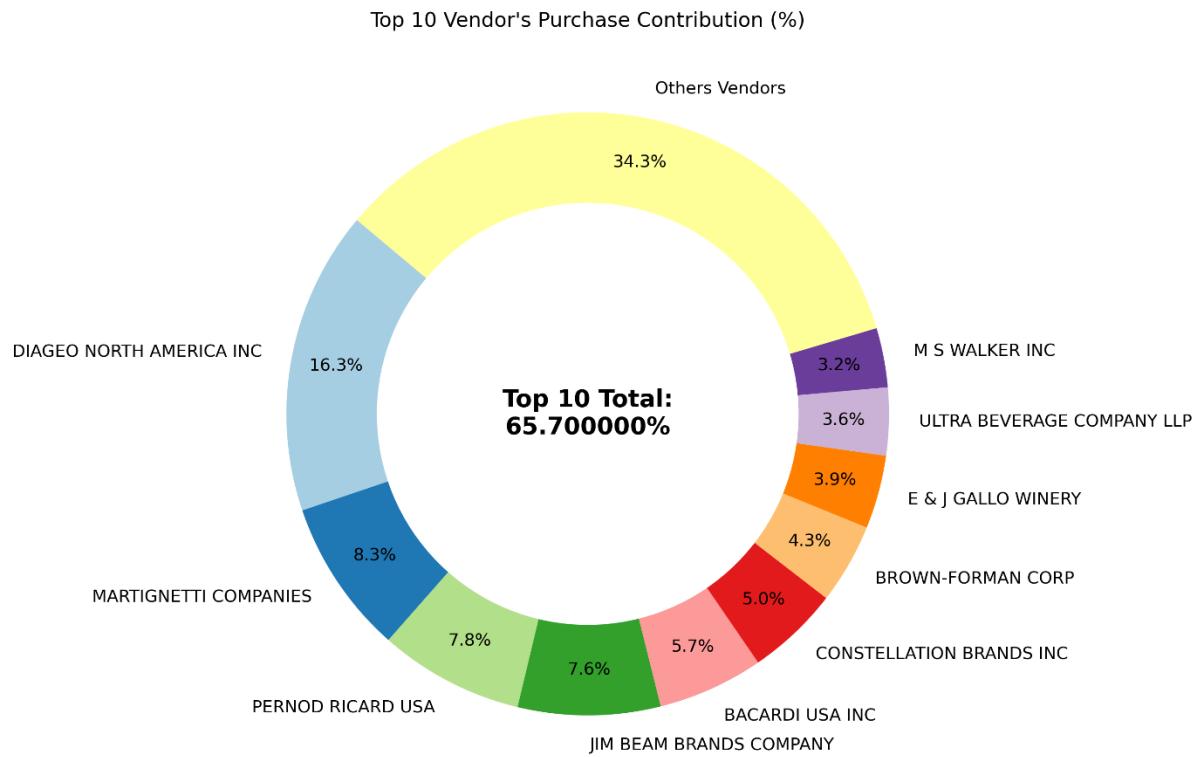
Brands with low sales but high profit margin				
		Description	TotalSalesDollars	ProfitMargin
6202	Santa Rita Organic Svgn Bl		9.99	66.466466
2372	Debauchery Pnt Nr		11.58	65.975820
2072	Concannon Glen Ellen Wh Zin		15.95	83.448276
2190	Crown Royal Apple		27.86	89.806174
6240	Sauza Sprklg Wild Berry Marg		27.96	82.153076
...
5077	Nanbu Bijin Southern Beauty		535.68	76.747312
2273	Dad's Hat Rye Whiskey		538.89	81.851584
57	A Bichot Clos Marechaudes		539.94	67.740860
6248	Sbragia Home Ranch Merlot		549.75	66.444748
3329	Goulee Cos d'Estournel 10		558.87	69.434752

198 brands exhibit lower sales but higher profit margins , which could benefit from targeted marketing , promotions, or price optimizations to increase volume without compromising profitability.



2. Top Vendors by sales and Purchase Contribution

The top 10 vendors contribute 65.69 % of total purchases, while the remaining vendors contribute only 34.31 %. This over-reliance on a few vendors may introduce risks such as supply chain disruptions, indicating a need for visualization.



3. Impact of Bulk Purchasing on Cost Savings

Vendors buying in large quantities receive a 72 % lower unit cost (\$ 10.78 per unit vs. higher unit costs in smaller orders.)

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

UnitPurchasePrice	
OrderSize	
Small	39.057028
Medium	15.478473
Large	10.782249

4. Identifying Vendors with low Inventory Turnover

Total Unsold Inventory Capital: \$2.71M

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.

	Stock Turnover
	Vendor Name
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	0.791594
TAMWORTH DISTILLING	0.797078
THE IMPORTED GRAPE LLC	0.807569
WALPOLE MTN VIEW WINERY	0.820548

	VendorName	UnsoldInventoryValue
25	DIAGEO NORTH AMERICA INC	621.47K
46	JIM BEAM BRANDS COMPANY	507.70K
68	PERNOD RICARD USA	414.41K
116	WILLIAM GRANT & SONS INC	388.39K
30	E & J GALLO WINERY	203.42K
79	SAZERAC CO INC	168.19K
11	BROWN-FORMAN CORP	153.12K
77	REMY COINTREAU USA INC	113.68K
61	MOET HENNESSY USA INC	106.74K
54	MAJESTIC FINE WINES	106.63K

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

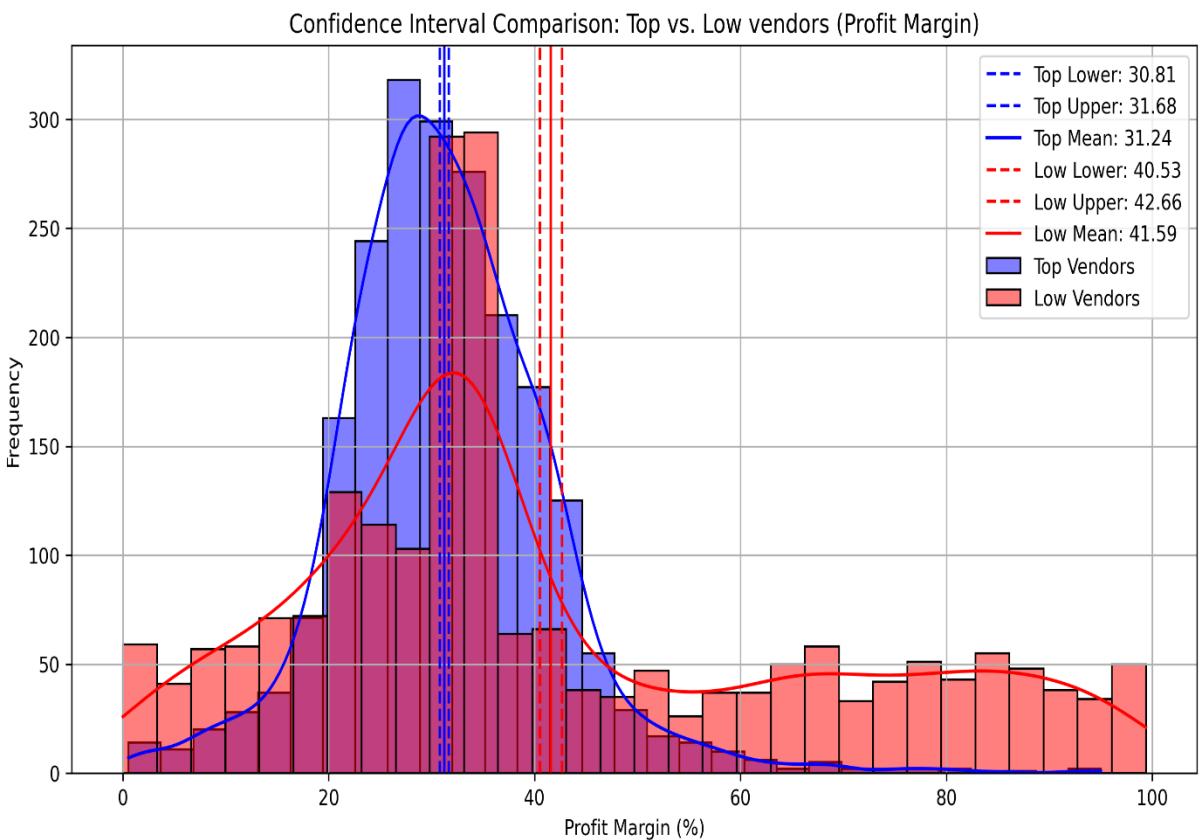
Top vendors 'Profit Margin (95% Confidence Interval):

(30.74%,31.61%), Mean: 31.17% Low Vendors'Profit Margin (95% Confidence Level): (40.48%, 42.62%),Mean: 41.55%

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

Actionable Insights:

- Top-performing vendors: optimize profitability by adjusting pricing, reducing operational costs, or offering bundled promotions.
- Low-performing vendors: Improve marketing efforts, optimize pricing strategies, and enhance distribution networks.



6. Statistical Validation of Profit Margin Differences

Hypothesis Testing:

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

H1(Alternate 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.

Final Recommendation

- Re-evaluate pricing for sales, high-margin brands to boost sales volume 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 while optimizing inventory management.
- Optimize slow-moving inventory by adjusting purchase qualities, 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.

