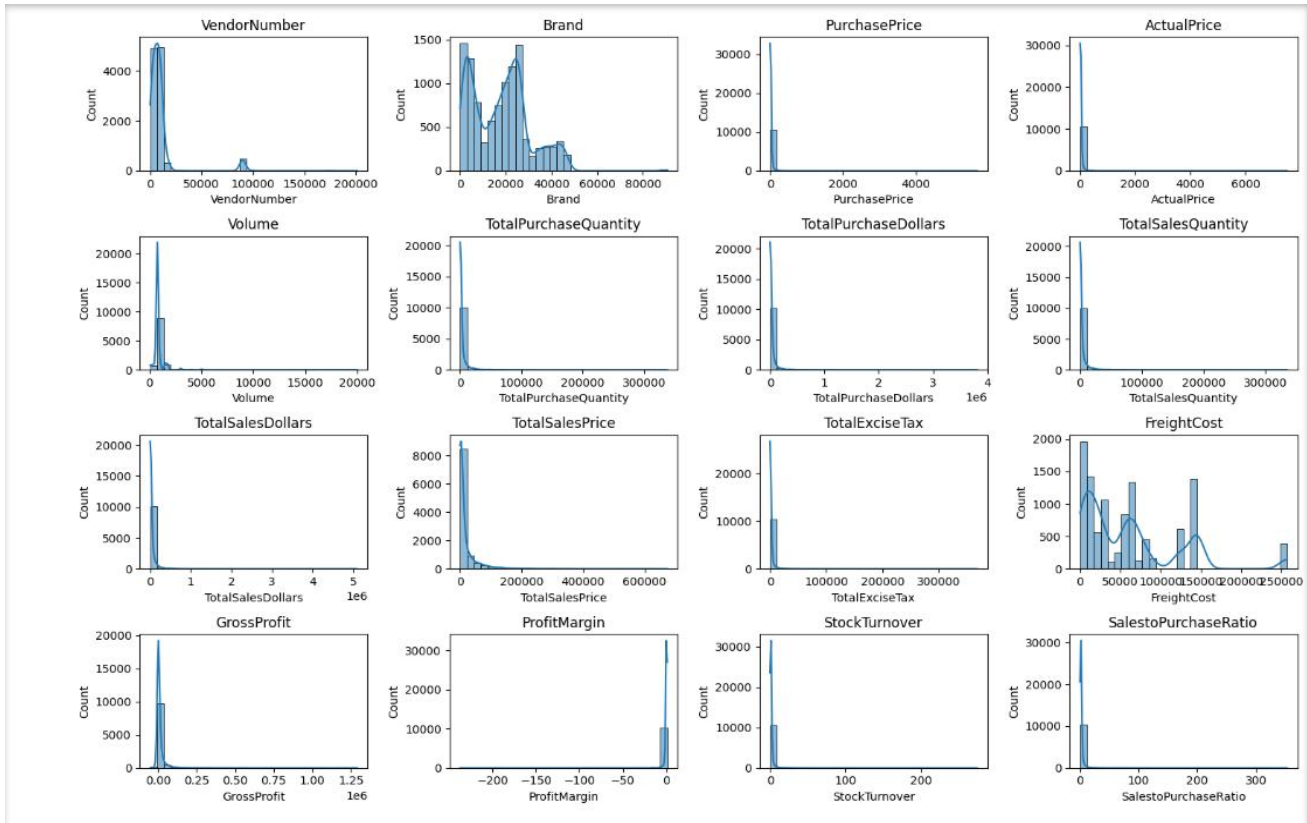


# Exploratory Data Analysis Insights

## 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	3.077482e+03	10952.851391	0.00	33.000000	261.000000	1929.250000	3.349390e+05
TotalSalesDollars	10692.0	4.223907e+04	167655.265984	0.00	729.220000	5298.045000	28396.915000	5.101920e+06
TotalSalesPrice	10692.0	1.879378e+04	44952.773386	0.00	289.710000	2857.800000	16059.562500	6.728193e+05
TotalExciseTax	10692.0	1.774226e+03	10975.582240	0.00	4.800000	46.570000	418.650000	3.682428e+05
FreightCost	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
ProfitMargin	10692.0	-inf	NaN	-inf	0.133245	0.304055	0.399561	9.971666e-01
StockTurnover	10692.0	1.706793e+00	6.020460	0.00	0.807229	0.981529	1.039342	2.745000e+02
SalestoPurchaseRatio	10692.0	2.504390e+00	8.459067	0.00	1.153729	1.436894	1.665449	3.529286e+02



### Negative & Zero Values:

**Gross Profit:** Minimum of -52,002.78, 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  $\infty$ , which suggests instances where revenue is zero or even lower than the total cost, leading to extreme negative profit margins.

**Total Sales Quantity & 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 & Actual Prices:** The maximum values (5,681.81 & 7,499.99) are significantly higher than the mean (24.39 & 35.64), indicating premium product offerings.

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

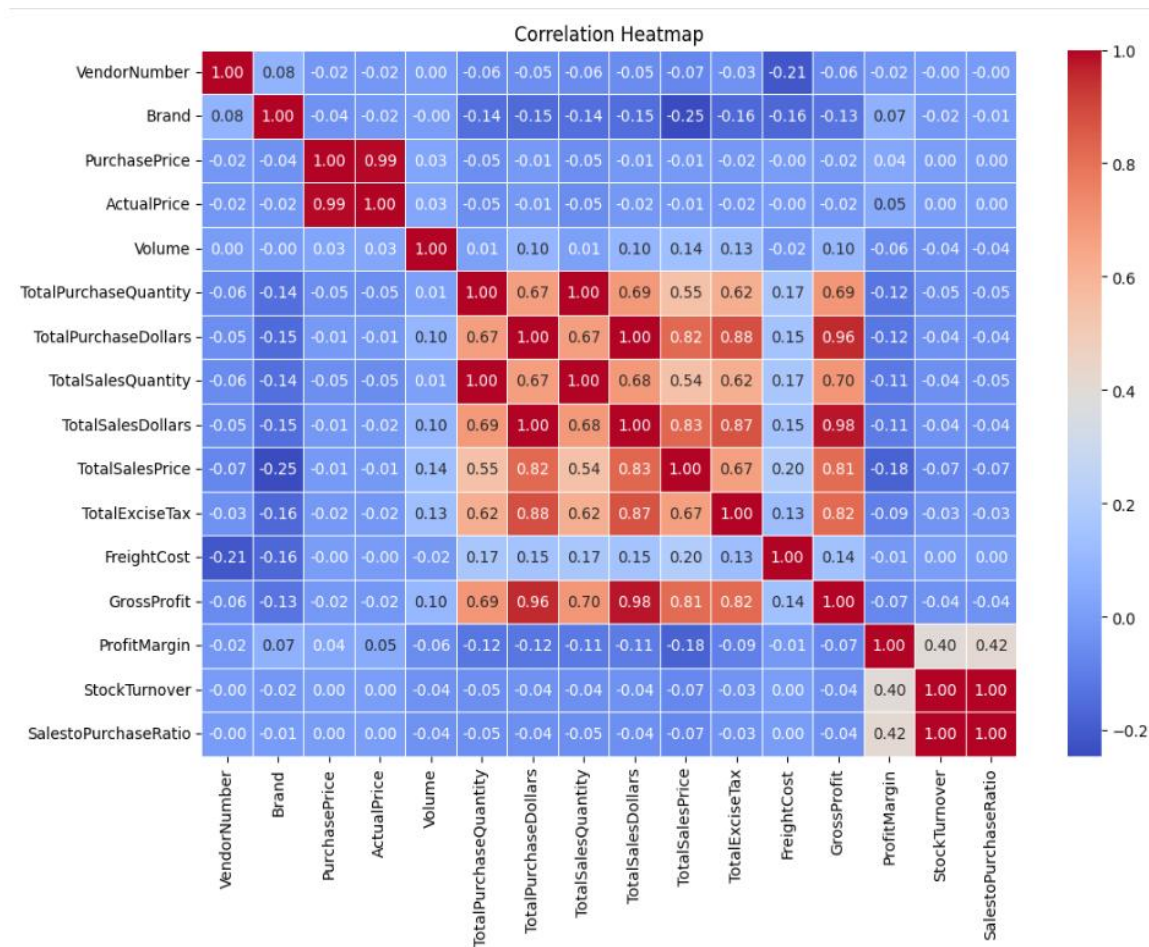
**Stock Turnover:** Ranges from 0 to 274.5, suggesting some products sell rapidly while others remain unsold for long periods. A value greater than 1 indicates that sales for a product exceed the purchased quantity due to older stock fulfilling orders.

## Data Filtering

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

- Gross Profit  $\leq 0$  (to exclude transactions leading to losses).
- Profit Margin  $\leq 0$  (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 to higher profitability.

## Research Questions & Key Findings

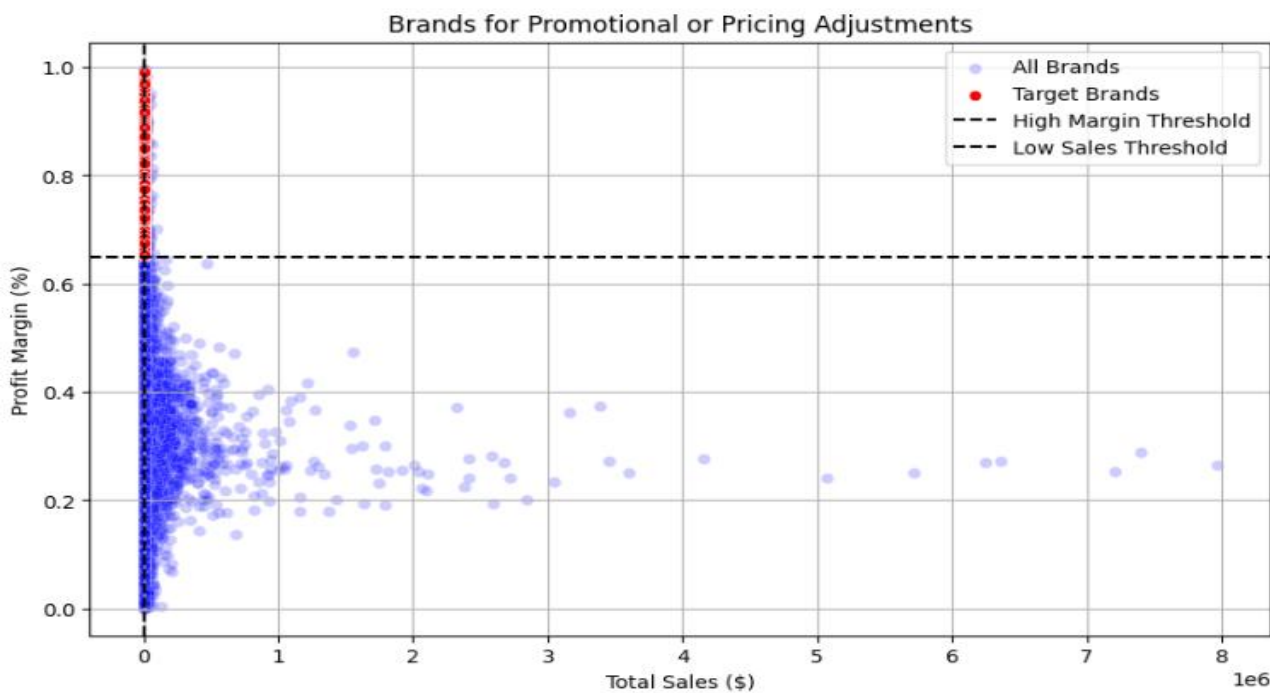
### 1.Brands for Promotional or Pricing Adjustments

Brands with Low Sales but High Profit Margin:

	Description	TotalSalesDollars	ProfitMargin
6199	Santa Rita Organic Svgn Bl	9.99	0.664665
2369	Debauchery Pnt Nr	11.58	0.659758
2070	Concannon Glen Ellen Wh Zin	15.95	0.834483
2188	Crown Royal Apple	27.86	0.898062
6237	Sauza Sprklg Wild Berry Marg	27.96	0.821531
...	...	...	...
5074	Nanbu Bijin Southern Beauty	535.68	0.767473
2271	Dad's Hat Rye Whiskey	538.89	0.818516
57	A Bichot Clos Marechaudes	539.94	0.677409
6245	Sbragia Home Ranch Merlot	549.75	0.664447
3326	Goulee Cos d'Estournal 10	558.87	0.694348

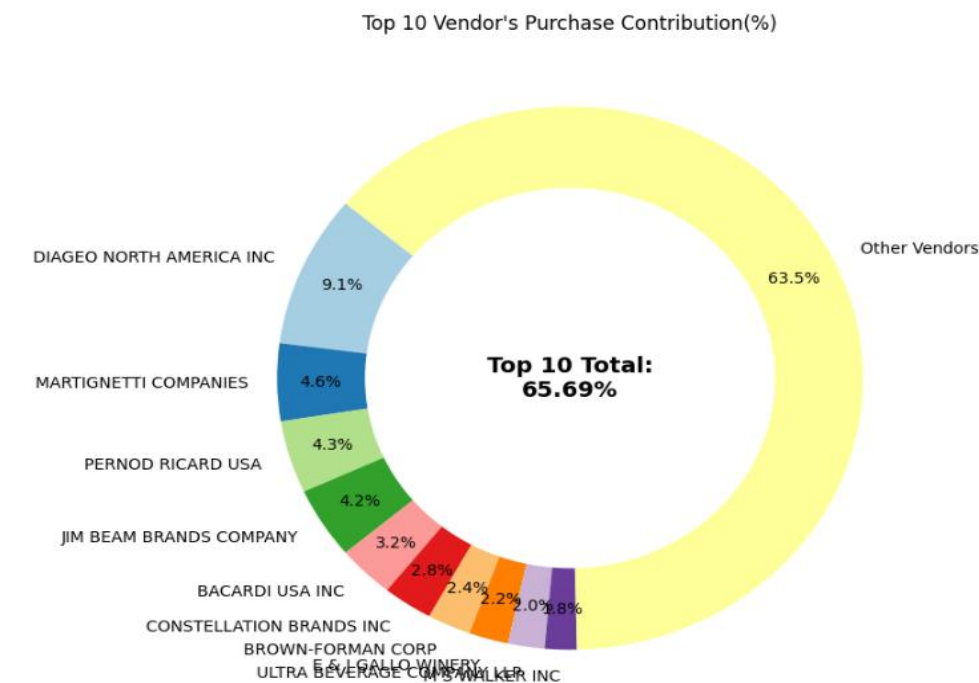
198 rows × 3 columns

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 & 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 diversification.



## 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 encourage larger orders, increasing total sales while maintaining profitability.

UnitPurchasePrice	
OrderSize	
Small	43.776954
Medium	17.894005
Large	11.308807

## 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.

StockTurnover	
VendorName	
AAPER ALCOHOL & CHEMICAL CO	0.000000
LAUREATE IMPORTS CO	0.000000
TRUETT HURST	0.041667
IRA GOLDMAN AND WILLIAMS, LLP	0.075000
HIGHLAND WINE MERCHANTS LLC	0.148920
UNCORKED	0.217238
MILTONS DISTRIBUTING CO	0.236111
VINEYARD BRANDS LLC	0.256241
LOYAL DOG WINERY	0.308333
BLACK COVE BEVERAGES	0.340588

	VendorName	UnsoldInventoryValue
28	DIAGEO NORTH AMERICA INC	980.09K
63	MARTIGNETTI COMPANIES	928.99K
50	JIM BEAM BRANDS COMPANY	857.80K
114	ULTRA BEVERAGE COMPANY LLP	780.27K
73	PERFECTA WINES	571.81K
74	PERNOD RICARD USA	554.74K
59	M S WALKER INC	469.96K
125	WILLIAM GRANT & SONS INC	436.49K
33	E & J GALLO WINERY	315.20K
14	BROWN-FORMAN CORP	284.91K

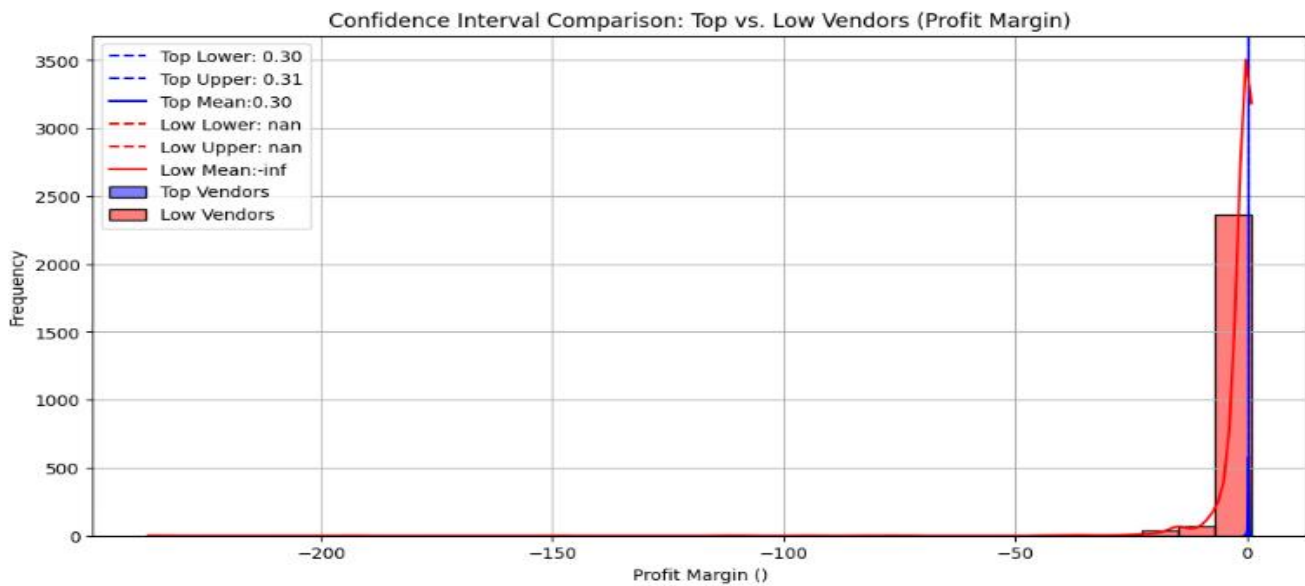
### 5. Profit Margin Comparison: High vs. Low-Performing Vendors

Top Vendors' Profit Margin (95% CI): (30.74%, 31.61%), Mean: 31.17%  
 Low Vendors' Profit Margin (95% CI): (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:

**H<sub>0</sub> (Null Hypothesis):** No significant difference in profit margins between top and low-performing vendors.

**H<sub>1</sub> (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.

## 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.