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# VENDOR PERFORMANCE

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## 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:

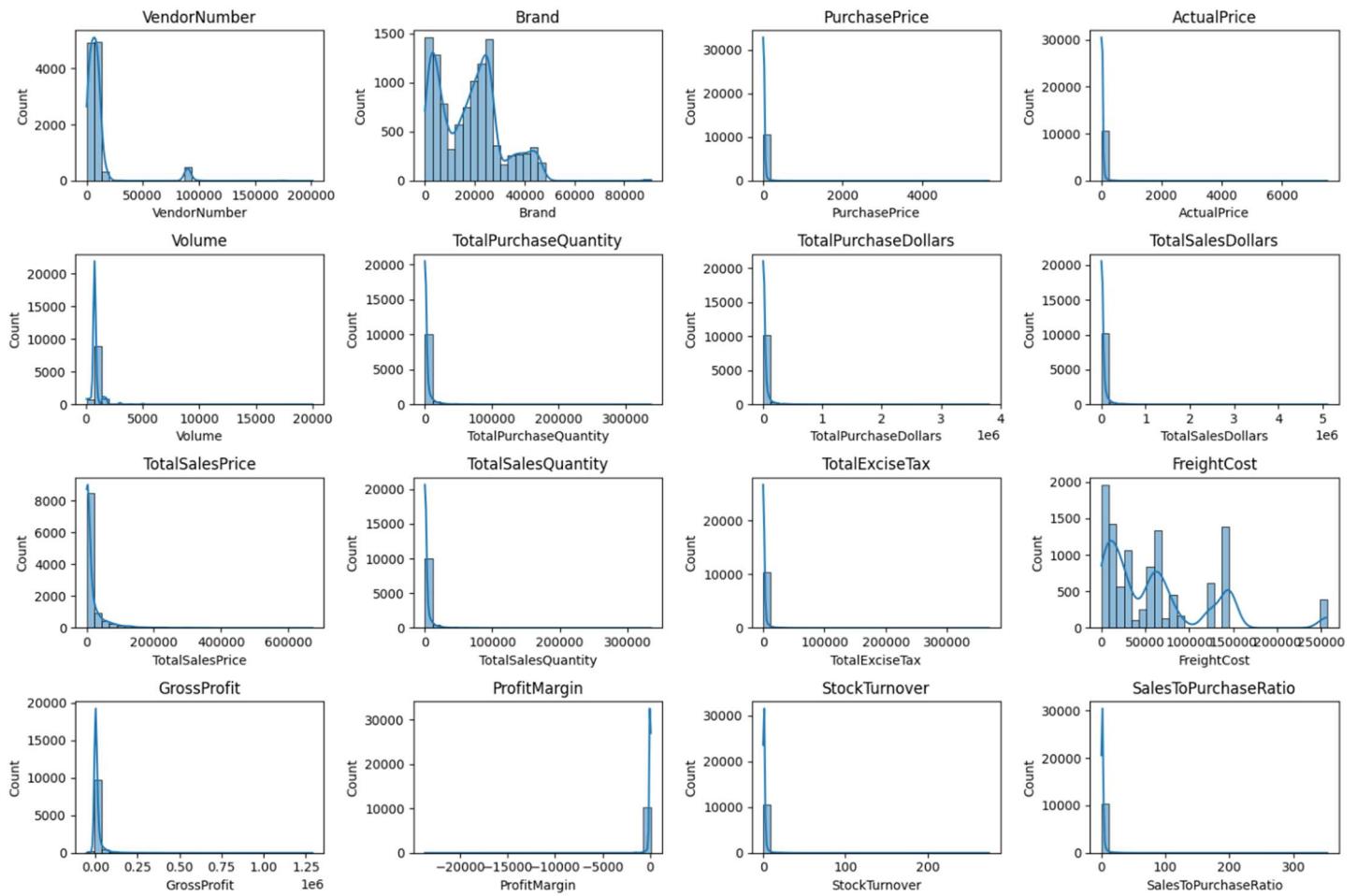
- Identify underperforming brands that require promotional or pricing adjustments.
- Determine top vendors contributing to sales and gross profit.
- Analyze the impact of bulk purchasing on unit costs.
- Assess inventory turnover to reduce holding costs and improve efficiency.
- Investigate the profitability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

## Exploratory Data Analysis Insights

### Summary Statistics

	mean	std	min	25%	50%	75%	max
<b>VendorNumber</b>	1069	1.06506	18753.51	2.00	3951.00	7153.00	9552.00
	2.0	5e+04	9148		0000	0000	0000
<b>Brand</b>	1069	1.80392	12662.18	58.00	5793.50	18761.5	25514.2
	2.0	3e+04	7074		0000	00000	50000
<b>PurchasePrice</b>	1069	2.43853	109.2693	0.36	6.84000	10.4550	19.4825
	2.0	0e+01	75		0	00	00
<b>ActualPrice</b>	1069	3.56436	148.2460	0.49	10.9900	15.9900	28.9900
	2.0	7e+01	16		00	00	00
<b>Volume</b>	1069	8.47360	664.3092	50.00	750.000	750.000	750.000
	2.0	5e+02	12		000	000	000
<b>TotalPurchaseQuantity</b>	1069	3.14088	11095.08	1.00	36.0000	262.000	1975.75
	2.0	7e+03	6769		00	000	0000
<b>TotalPurchaseDollars</b>	1069	3.01066	123067.7	0.71	453.457	3655.46	20738.2
	2.0	9e+04	99627		500	5000	45000

<b>TotalSalesDollars</b>	1069 2.0	4.22390 7e+04	167655.2 65984	0.00	729.220 000	5298.04 5000	28396.9 15000	5.10192 0e+06
<b>TotalSalesPrice</b>	1069 2.0	1.87937 8e+04	44952.77 3386	0.00	289.710 000	2857.80 0000	16059.5 62500	6.72819 3e+05
<b>TotalSalesQuantity</b>	1069 2.0	3.07748 2e+03	10952.85 1391	0.00	33.0000 00	261.000 000	1929.25 0000	3.34939 0e+05
<b>TotalExciseTax</b>	1069 2.0	1.77422 6e+03	10975.58 2240	0.00	4.80000 0	46.5700 00	418.650 000	3.68242 8e+05
<b>FreightCost</b>	1069 2.0	6.14337 6e+04	60938.45 8032	0.09	14069.8 70000	50293.6 20000	79528.9 90000	2.57032 1e+05
<b>GrossProfit</b>	1069 2.0	1.21323 8e+04	46224.33 7964	-5200 2.78	52.9200 00	1399.64 0000	8660.20 0000	1.29066 8e+06
<b>ProfitMargin</b>	1069 2.0	-inf	NaN	-inf	13.3245 15	30.4054 57	39.9561 35	9.97166 6e+01
<b>StockTurnover</b>	1069 2.0	1.70679 3e+00	6.020460	0.00	0.80722 9	0.98152 9	1.03934 2	2.74500 0e+02
<b>SalesToPurchaseRatio</b>	1069 2.0	2.50439 0e+00	8.459067	0.00	1.15372 9	1.43689 4	1.66544 9	3.52928 6e+02

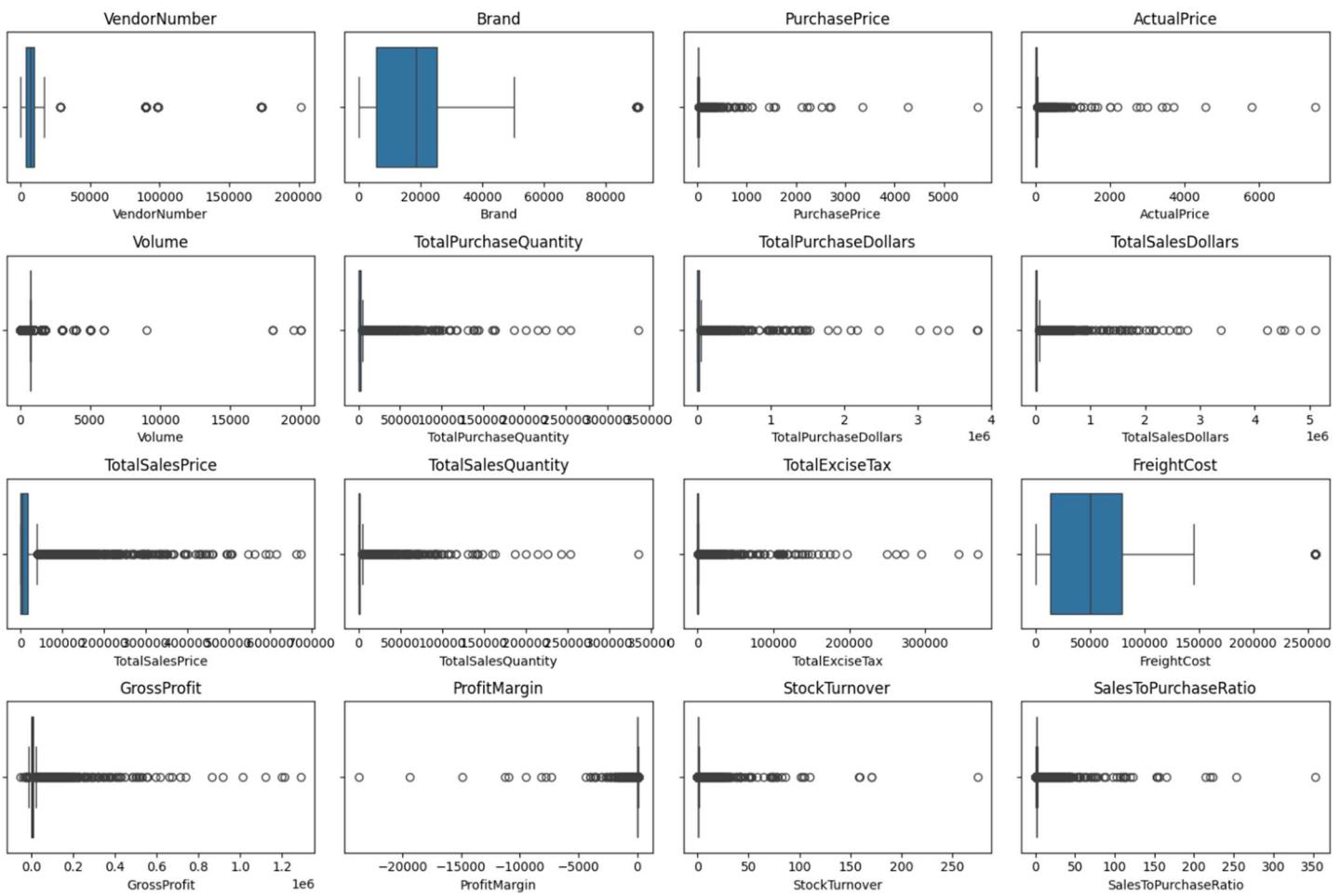


## Negative & Zero Values:

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 -infinity, which suggests instances where revenue is zero or even lower than 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 variations 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.

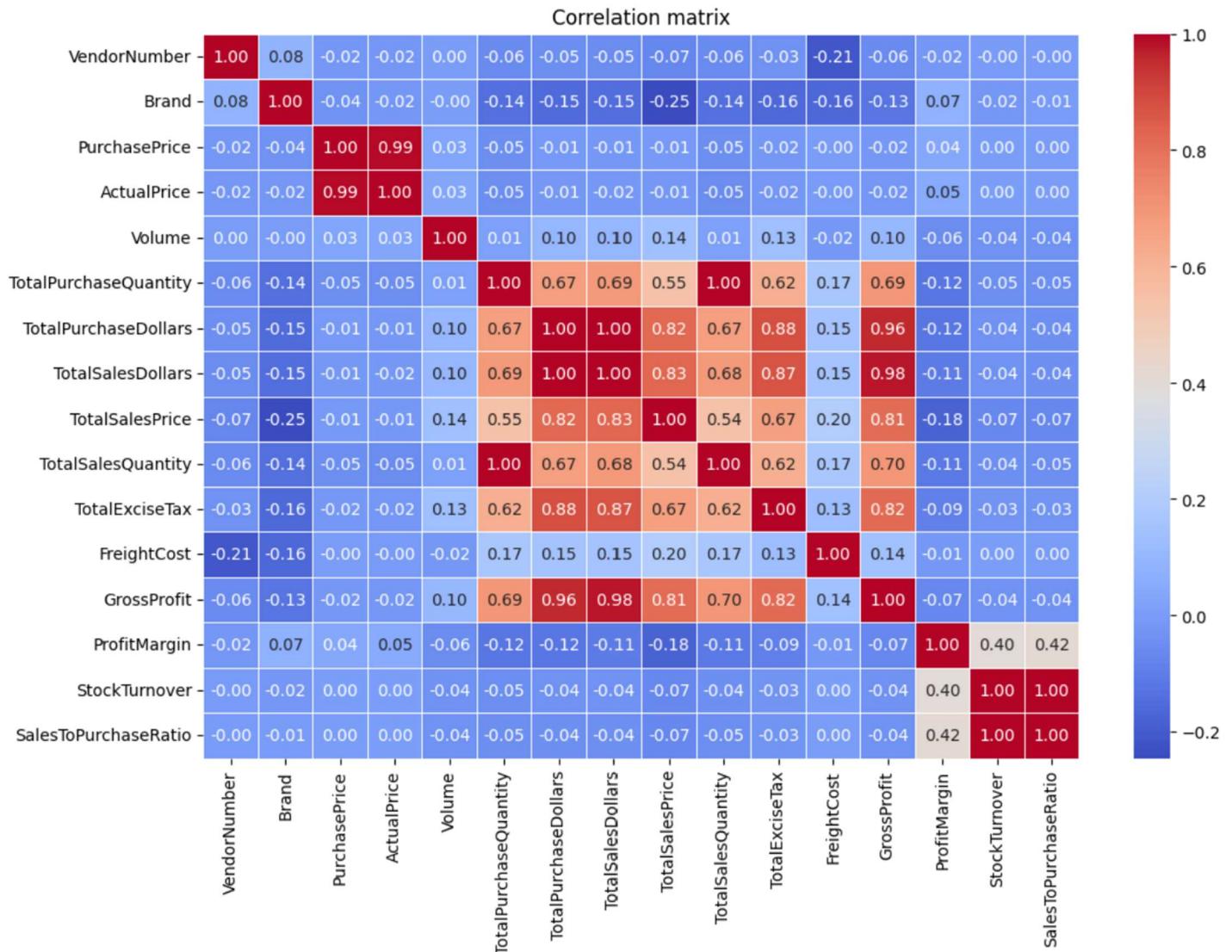
## Data Filtering

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

- Gross Profit  $\leq 0$  (to exclude transaction leading to losses).

- Profit Margin  $\leq 0$  (to ensure analysis focuses on profitable transactions).
- Total sales quantity  $> 0$  (to eliminate inventory that never sold).

## Correlation Insights



Purchase Price & Total Sales Dollars & Gross Profit: Weak correlation (-0.012 and -0.016), indicating that price variations do not significantly impact sales revenues 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.

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

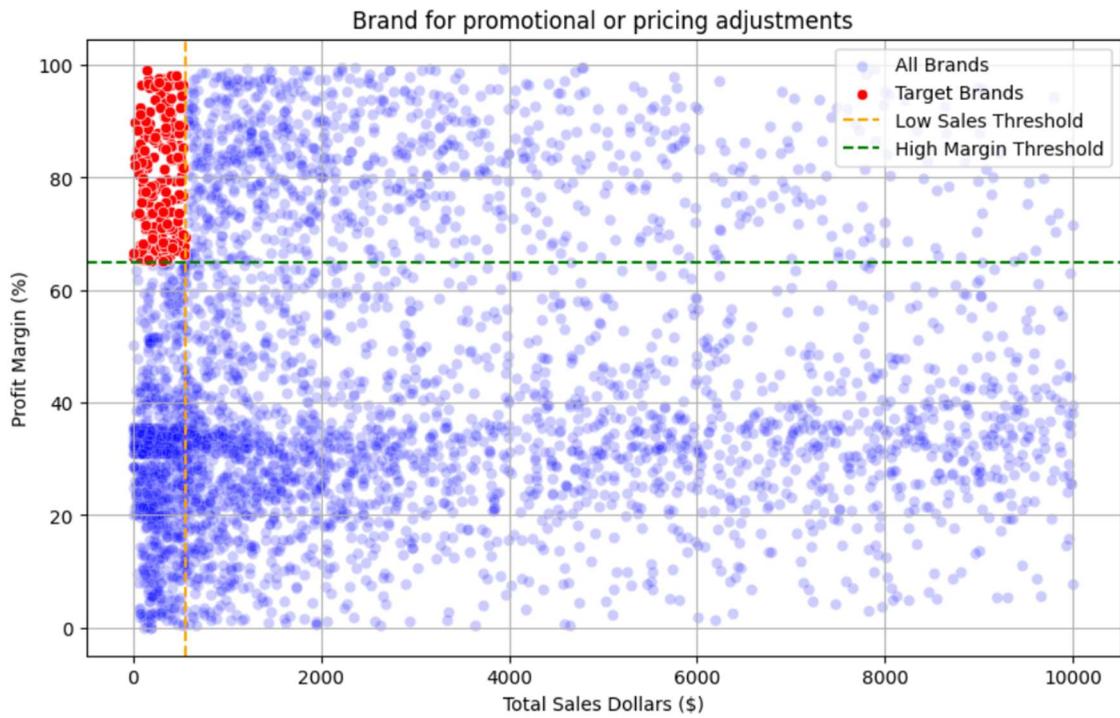
### 1. Brands for Promotional or Pricing Adjustments

Brands with low sales but high profit margin:

	Description	TotalSalesDollars	ProfitMargin
6199	Santa Rita Organic Svgn Bl	9.99	66.466466
2369	Debauchery Pnt Nr	11.58	65.975820
2070	Concannon Glen Ellen Wh Zin	15.95	83.448276
2188	Crown Royal Apple	27.86	89.806174
6237	Sauza Sprklg Wild Berry Marg	27.96	82.153076
...	...	...	...
5074	Nanbu Bijin Southern Beauty	535.68	76.747312
2271	Dad's Hat Rye Whiskey	538.89	81.851584
57	A Bichot Clos Marechaudes	539.94	67.740860
6245	Sbragia Home Ranch Merlot	549.75	66.444748
3326	Goulee Cos d'Estournel 10	558.87	69.434752

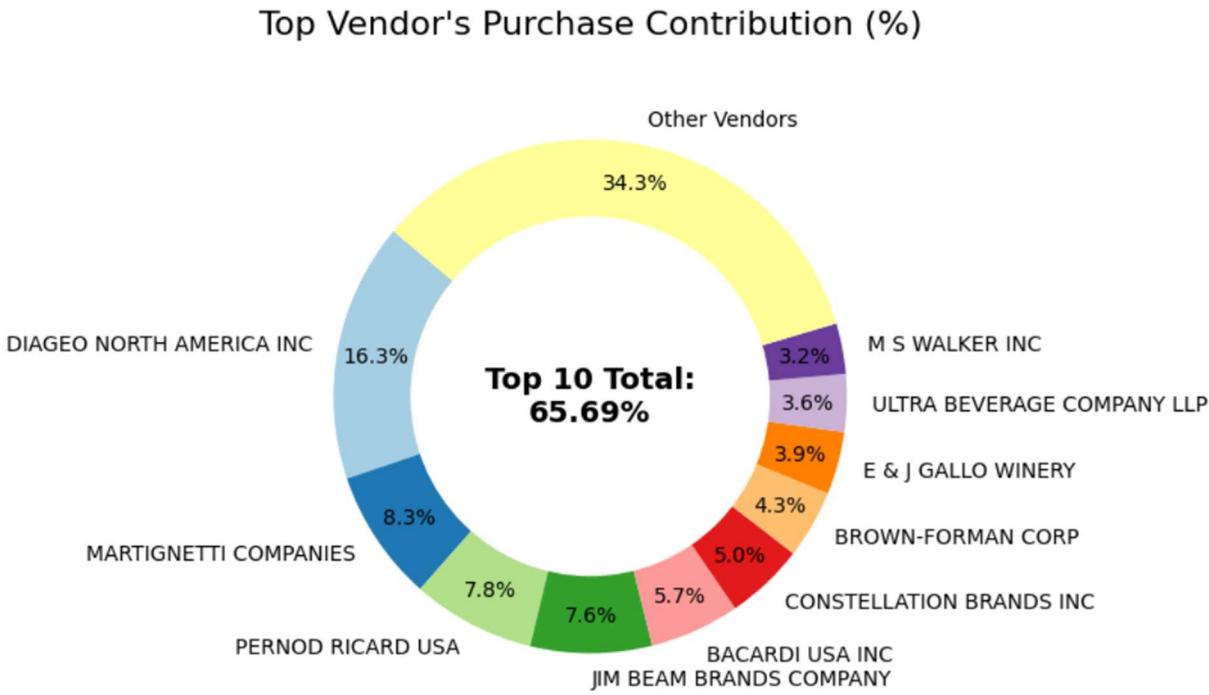
198 rows × 3 columns

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

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.

Unit Purchase Price	
Order Size	Unit Purchase Price
Small	39.068186
Medium	15.486414
Large	10.777625

### 4. Identifying Vendors with Low Inventory Turnover

Total Unsold Inventory Capital: \$2.71M

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

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

StockTurnover	VendorName	VendorName	UnsoldInventoryValue
	<b>ALISA CARR BEVERAGES</b>	0.615385	
	<b>HIGHLAND WINE MERCHANTS LLC</b>	0.708333	
	<b>PARK STREET IMPORTS LLC</b>	0.751306	
	<b>Circa Wines</b>	0.755676	
	<b>Dunn Wine Brokers</b>	0.766022	
	<b>CENTEUR IMPORTS LLC</b>	0.773953	
	<b>SMOKY QUARTZ DISTILLERY LLC</b>	0.783835	
	<b>TAMWORTH DISTILLING</b>	0.797078	
	<b>THE IMPORTED GRAPE LLC</b>	0.807569	
	<b>WALPOLE MTN VIEW WINERY</b>	0.820548	
	<b>25 DIAGEO NORTH AMERICA INC</b>		722.20905K
	<b>46 JIM BEAM BRANDS COMPANY</b>		554.66563K
	<b>68 PERNOD RICARD USA</b>		470.62561K
	<b>116 WILLIAM GRANT &amp; SONS INC</b>		401.96083000000004K
	<b>30 E &amp; J GALLO WINERY</b>		228.28261K
	<b>79 SAZERAC CO INC</b>		198.43641K
	<b>11 BROWN-FORMAN CORP</b>		177.73373999999998K
	<b>20 CONSTELLATION BRANDS INC</b>		133.61762K
	<b>61 MOET HENNESSY USA INC</b>		126.47769999999998K
	<b>77 REMY COINTREAU USA INC</b>		118.59814999999999K

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

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

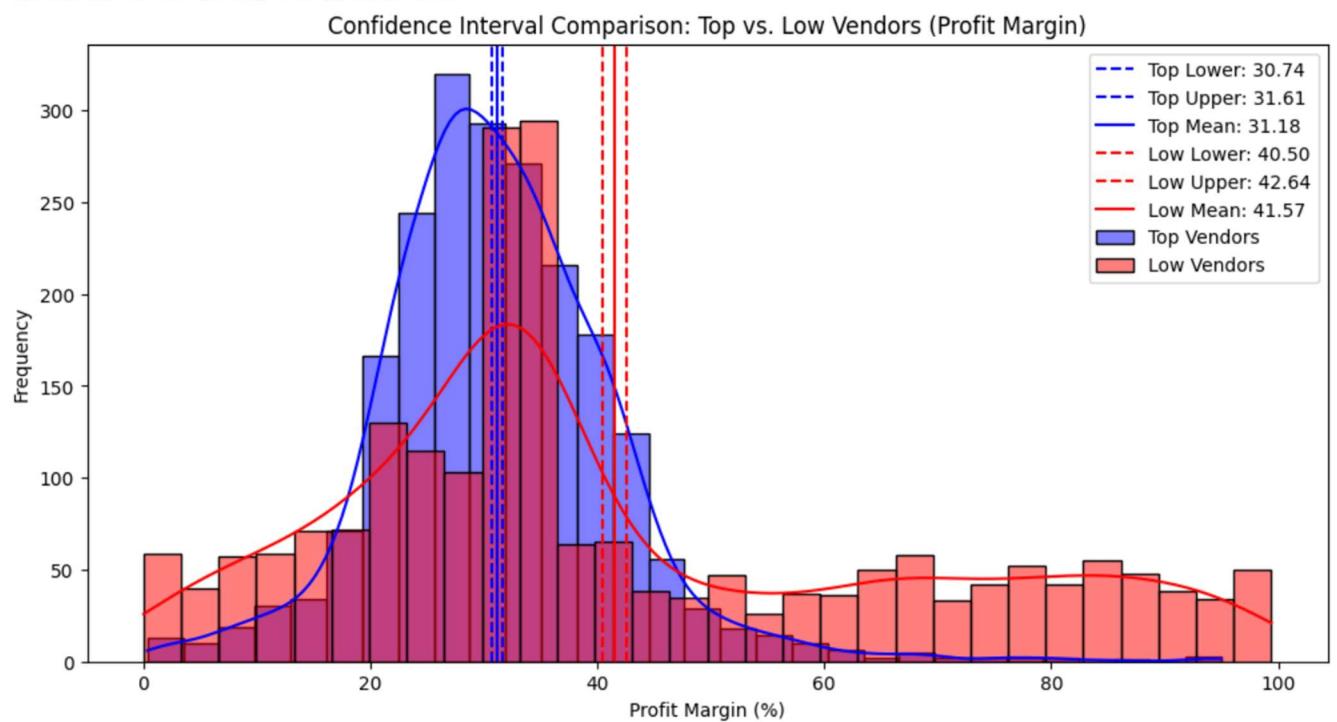
Low Vendors Profit Margin (95% CI): (40.48%, 42.62%), Mean:41.55%

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.

Top Vendors 95% CI: (30.74, 31.61), Mean: 31.18  
 Low Vendors 95% CI: (40.50, 42.64), Mean: 41.57



## 6. Statistical Validation of Profit Margin Differences

### Hypothesis Testing:

**Ho (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 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 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.