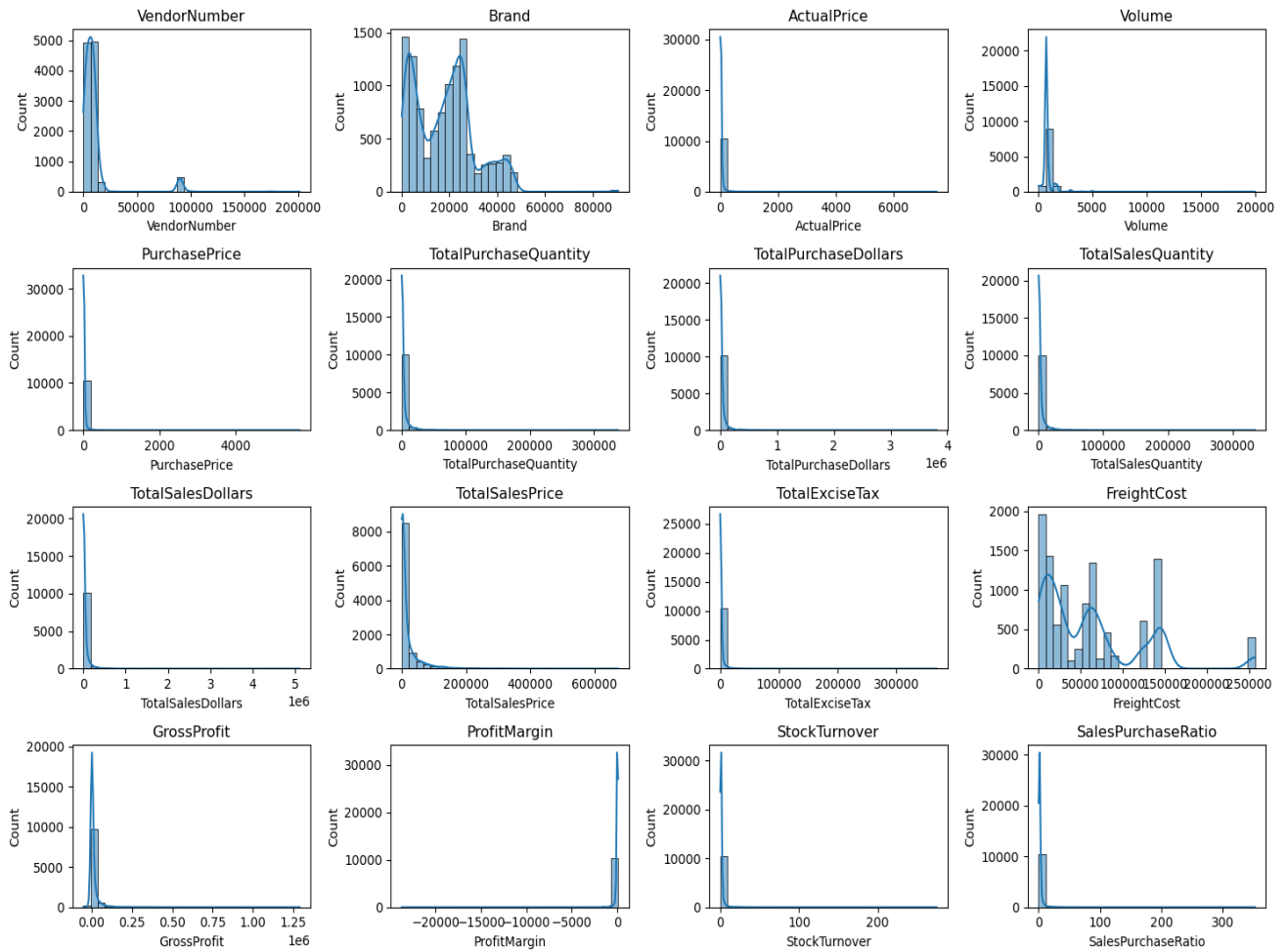


# Exploratory Data Analysis Insights

## Summary Statistics

	count	unique	top	freq	mean	std	min	25%	50%	75%	max
VendorNumber	10692.0	NaN	NaN	NaN	10650.649458	18753.519148	2.0	3951.0	7153.0	9552.0	201359.0
VendorName	10692	128	MARTIGNETTI COMPANIES	1388	NaN	NaN	NaN	NaN	NaN	NaN	NaN
Brand	10692.0	NaN	NaN	NaN	18039.228769	12662.187074	58.0	5793.5	18761.5	25514.25	90631.0
Description	10692	9651	Southern Comfort	10	NaN	NaN	NaN	NaN	NaN	NaN	NaN
ActualPrice	10692.0	NaN	NaN	NaN	35.643671	148.246016	0.49	10.99	15.99	28.99	7499.99
Volume	10692.0	NaN	NaN	NaN	847.36055	664.309212	50.0	750.0	750.0	750.0	20000.0
PurchasePrice	10692.0	NaN	NaN	NaN	24.385303	109.269375	0.36	6.84	10.455	19.4825	5681.81
TotalPurchaseQuantity	10692.0	NaN	NaN	NaN	3140.886831	11095.086769	1.0	36.0	262.0	1975.75	337660.0
TotalPurchaseDollars	10692.0	NaN	NaN	NaN	30106.693372	123067.799627	0.71	453.4575	3655.465	20738.245	3811251.6
TotalSalesQuantity	10692.0	NaN	NaN	NaN	3077.482136	10952.851391	0.0	33.0	261.0	1929.25	334939.0
TotalSalesDollars	10692.0	NaN	NaN	NaN	42239.074419	167655.265984	0.0	729.22	5298.045	28396.915	5101919.51
TotalSalesPrice	10692.0	NaN	NaN	NaN	18793.783627	44952.773386	0.0	289.71	2857.8	16059.5625	672819.31
TotalExciseTax	10692.0	NaN	NaN	NaN	1774.226259	10975.58224	0.0	4.8	46.57	418.65	368242.8
FreightCost	10692.0	NaN	NaN	NaN	61433.763214	60938.458032	0.09	14069.87	50293.62	79528.99	257032.07
GrossProfit	10692.0	NaN	NaN	NaN	12132.381048	46224.337964	-52002.78	52.92	1399.64	8660.2	1290667.91
ProfitMargin	10692.0	NaN	NaN	NaN	-inf	NaN	-inf	13.324515	30.405457	39.956135	99.716657
StockTurnover	10692.0	NaN	NaN	NaN	1.706793	6.02046	0.0	0.807229	0.981529	1.039342	274.5
SalesPurchaseRatio	10692.0	NaN	NaN	NaN	2.50439	8.459067	0.0	1.153729	1.436894	1.665449	352.928571



### 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 negative infinity, which suggests the 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 costs across different products.

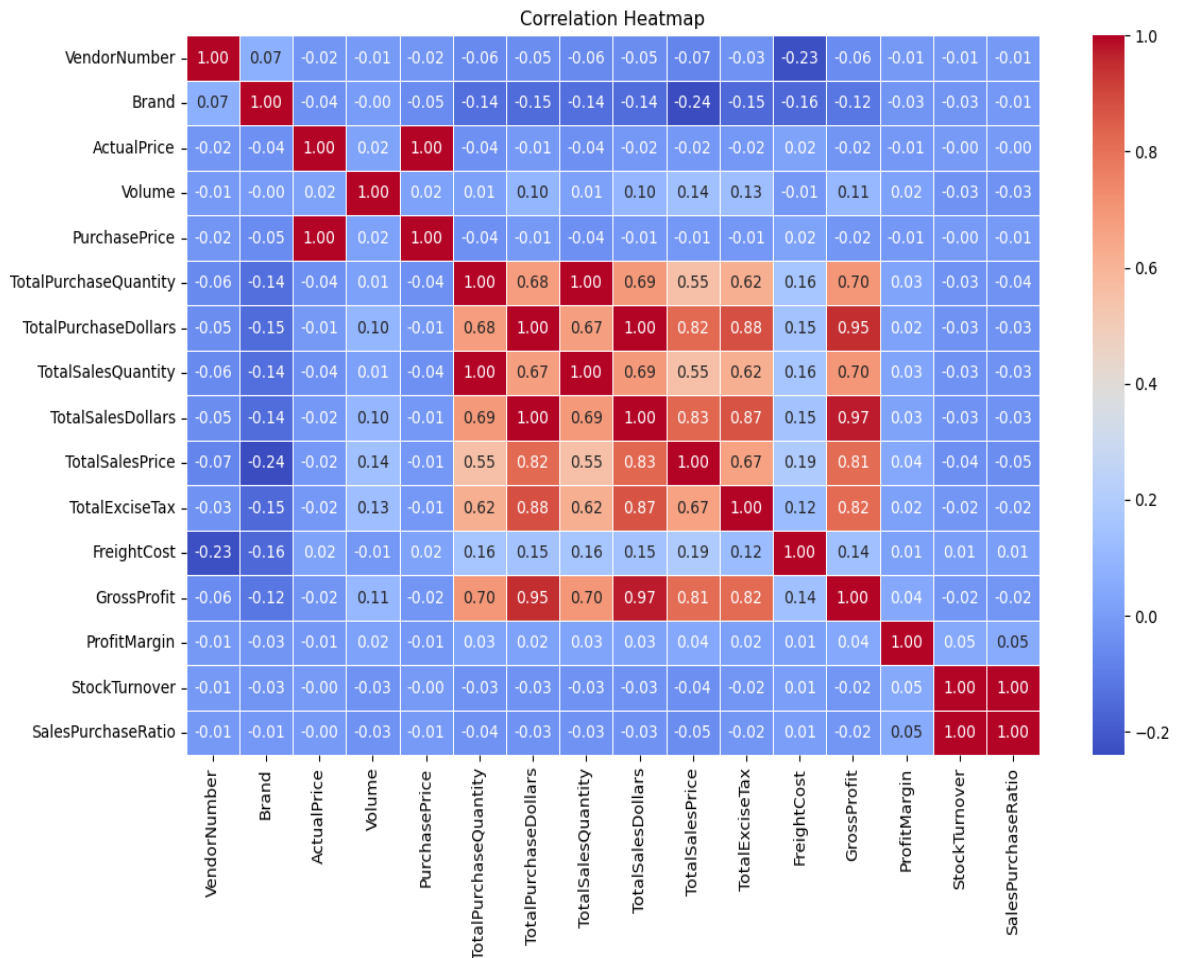
**Stock Turnover:** Ranges from 0 to 274.5, suggesting some products sell rapidly while others remain unsold for long periods. A value greater than 1 indicates that sales for a product exceed the purchased quantity due to older stock fulfilling orders.

### **Data Filtering**

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

- Gross Profit is less than or equal to 0 (to exclude transactions leading to losses)
- Profit Margin less than or equal to 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 (-0.0038 & -0.055), indicating that faster stock turnover does not necessarily equate to higher profitability.

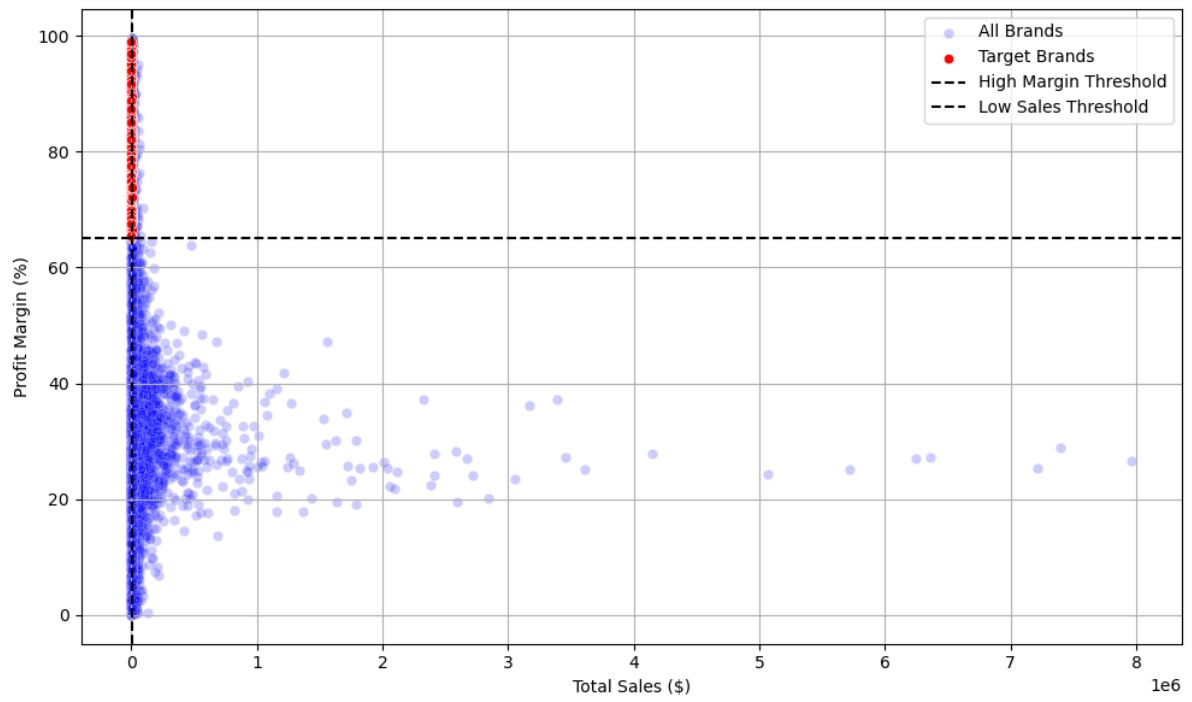
## Research Questions & Key Findings

### 1. Brands for Promotional or Pricing Adjustments

Brands with low Sales but High Profit Margins:			
	Description	TotalSalesDollars	ProfitMargin
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

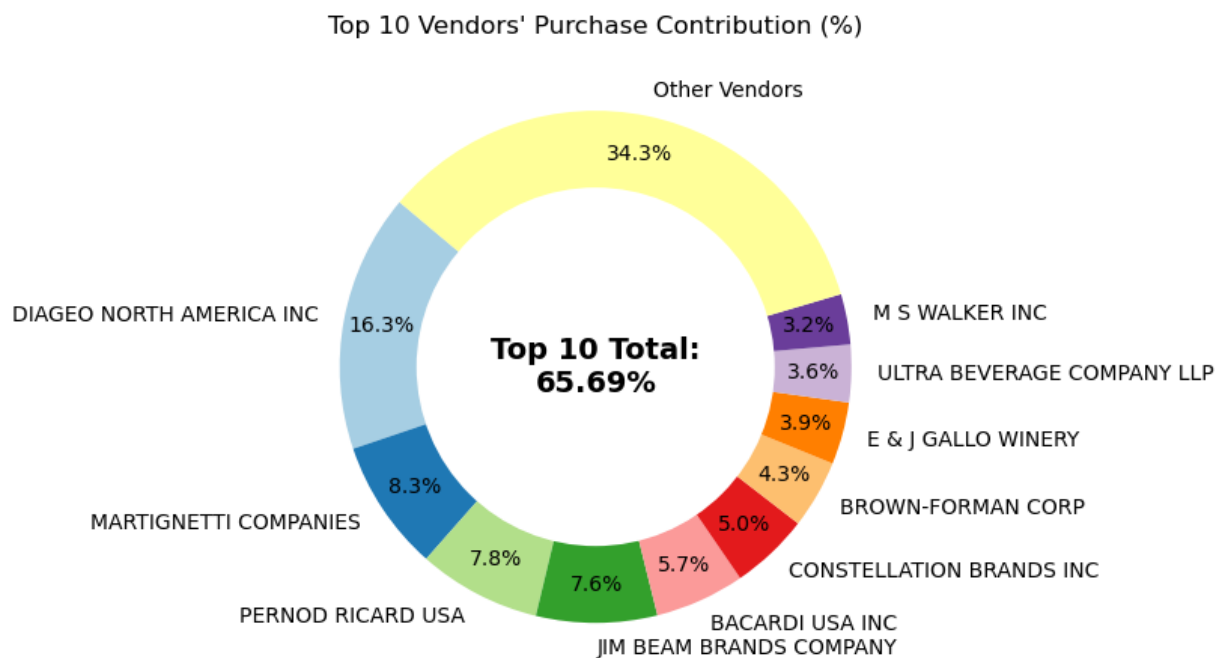
198 rows × 3 columns

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

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 risk 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 purchasing strategies encourage larger orders, increasing total sales while maintaining profitability.

UnitPurchasePrice	
OrderSize	
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 affects overall profitability.

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

StockTurnover		VendorName	UnsoldInventoryValue
VendorName			
ALISA CARR BEVERAGES	0.615385	DIAGEO NORTH AMERICA INC	722.21K
HIGHLAND WINE MERCHANTS LLC	0.708333	JIM BEAM BRANDS COMPANY	554.67K
PARK STREET IMPORTS LLC	0.751306	PERNOD RICARD USA	470.63K
Circa Wines	0.755676	WILLIAM GRANT & SONS INC	401.96K
Dunn Wine Brokers	0.766022	E & J GALLO WINERY	228.28K
CENTEUR IMPORTS LLC	0.773953	SAZERAC CO INC	198.44K
SMOKY QUARTZ DISTILLERY LLC	0.783835	BROWN-FORMAN CORP	177.73K
TAMWORTH DISTILLING	0.797078	CONSTELLATION BRANDS INC	133.62K
THE IMPORTED GRAPE LLC	0.807569	MOET HENNESSY USA INC	126.48K
WALPOLE MTN VIEW WINERY	0.820548	REMY COINTREAU USA INC	118.60K



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

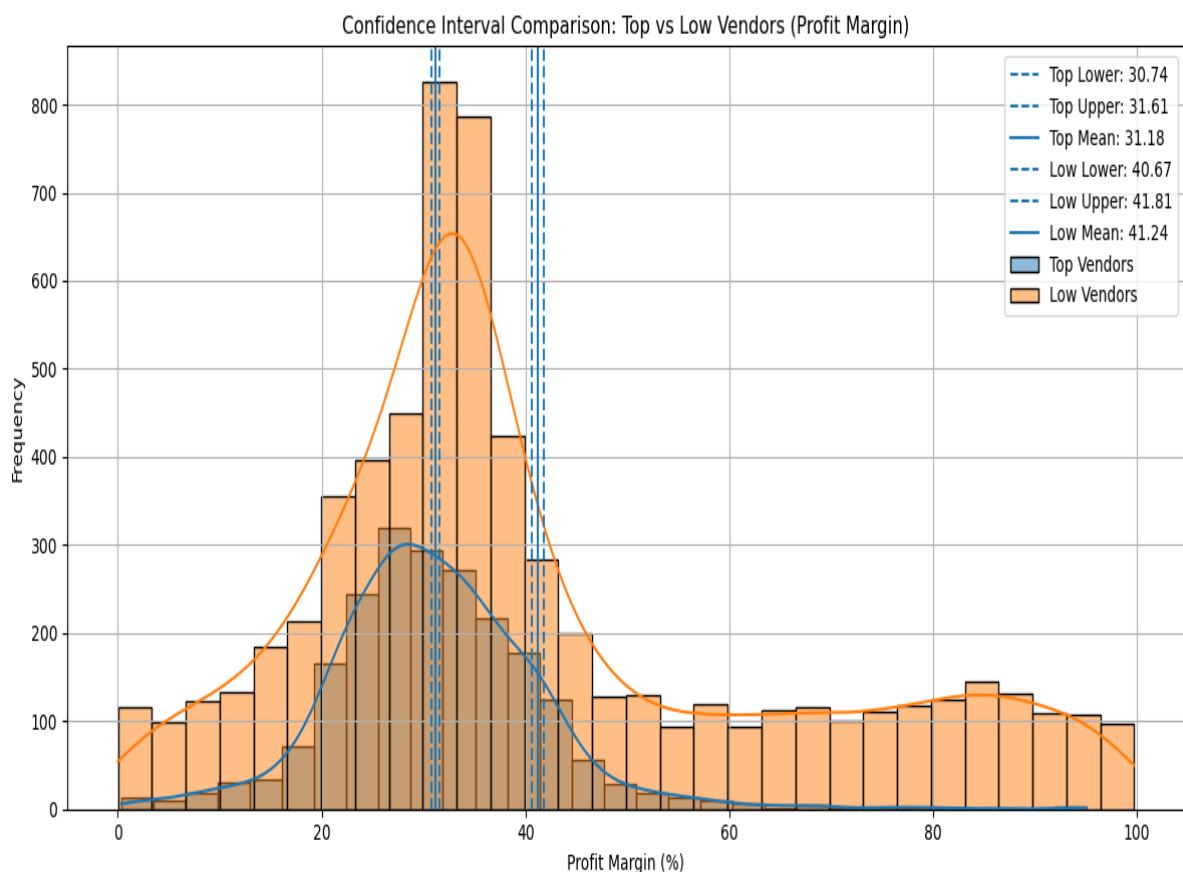
Top Vendor's Profit Margin (95% CI): (30.74%, 31.61%), Mean: 31.17%

Low Vendor's 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

**Hypotheses Testing:**

$H_0$  (Null Hypothesis):

No significant difference in profit margins between top and low-performing vendors.

$H_1$  (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.

