

# Vendor Performance Analysis Report

## Business Problem:

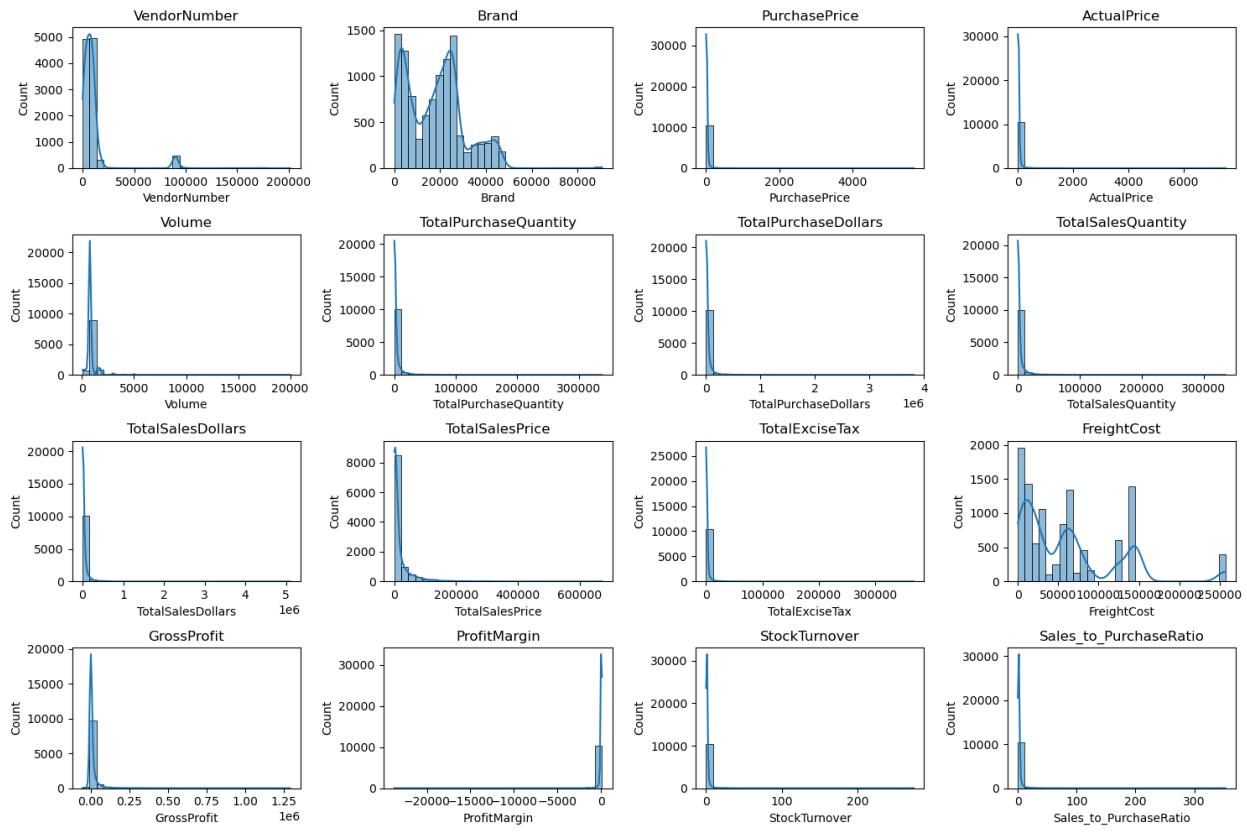
Effective inventory and sales management play a pivotal role in maximizing profitability within the retail and wholesale sector. Organizations must avoid margin erosion caused by suboptimal pricing strategies, slow-moving inventory, and overreliance on specific vendors. This analysis aims to:

- Identify underperforming brands that may require pricing revisions or targeted promotional strategies.
- Highlight top-performing vendors based on their contribution to sales and gross profit.
- Evaluate the effect of bulk purchasing on per-unit costs.
- Examine inventory turnover to minimize holding costs and enhance operational efficiency.
- Analyze profitability differences between high-performing and low-performing vendors.

## Exploratory Data Analysis (EDA) 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	13.324515	30.405457	39.956135	9.971666e+01
StockTurnover	10692.0	1.706793e+00	6.020460	0.00	0.807229	0.981529	1.039342	2.745000e+02
Sales_to_PurchaseRatio	10692.0	2.504390e+00	8.459067	0.00	1.153729	1.436894	1.665449	3.529286e+02



### Negative & Zero Observations:

- **Gross Profit:** The minimum value of **-52,002.78** indicates instances of significant losses, likely driven by high procurement costs, aggressive discounting, or selling products below their purchase price.
- **Profit Margin:** The presence of a minimum value of  $-\infty$  suggests cases where revenue is zero or insufficient to cover costs, resulting in extreme negative margins and highlighting unprofitable or inactive products.
- **Total Sales Quantity and Sales Dollars:** Several products record zero sales despite being purchased, indicating slow-moving or obsolete inventory. Such items contribute to capital lock-in and overall inventory inefficiency.

### Outlier Identified Through High Standard Deviation:

- **Purchase and Actual Prices:** Maximum values of **5,681.81** and **7,499.99**, compared to much lower mean values (**24.39** and **35.64**), point to the presence of premium or high-value product categories.
- **Freight Cost:** A wide range from **0.09** to **257,032.07** reflects substantial variability in logistics expenses, potentially due to bulk shipments, long-distance transportation, or inconsistent freight arrangements.
- **Stock Turnover:** Values ranging from **0** to **274.5** indicate stark differences in product movement. While some products sell rapidly, others remain unsold for extended periods.

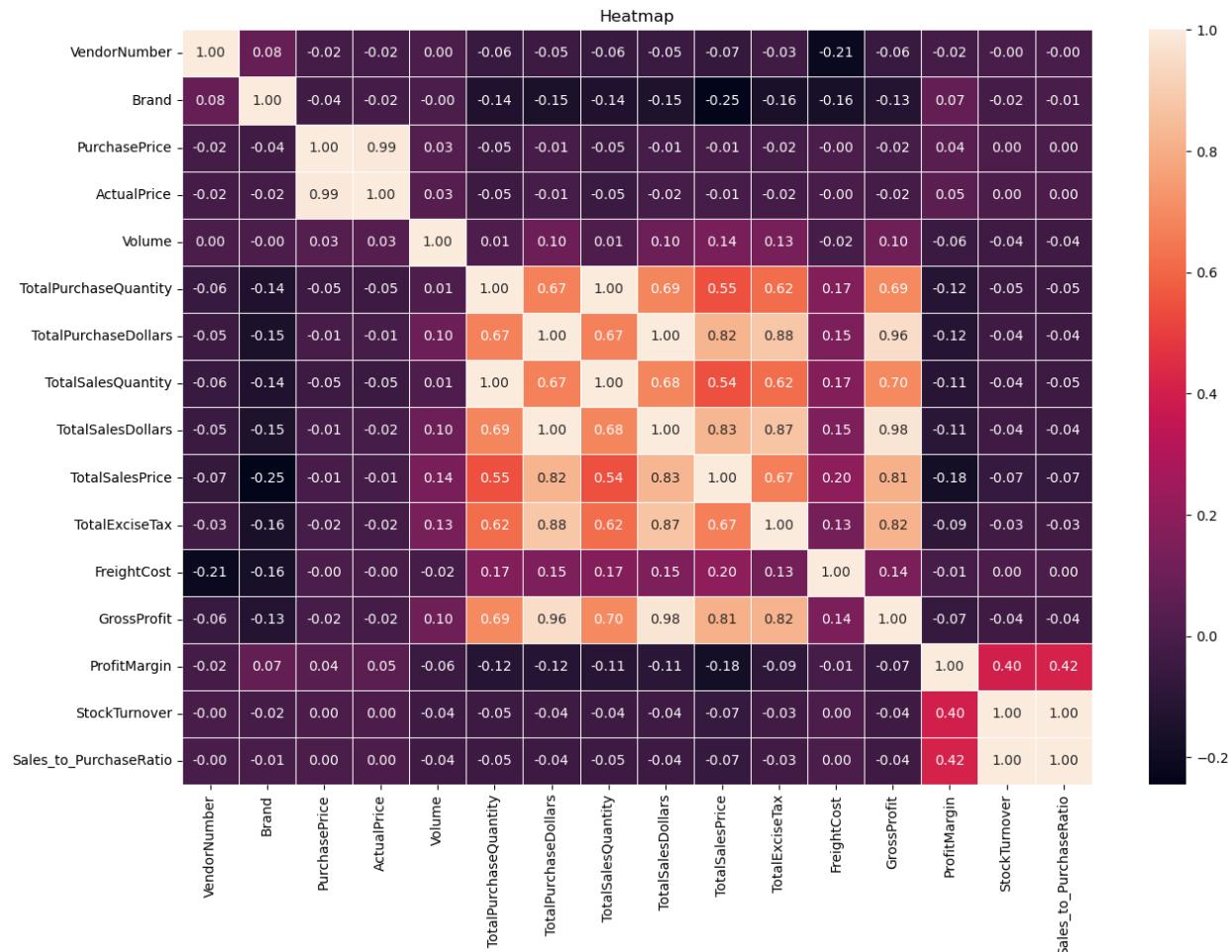
periods. Turnover values greater than **1** suggest sales being fulfilled from previously accumulated inventory rather than recent purchases.

### Data Filtering:

To improve the reliability and interpretability of the analysis, inconsistent data points were excluded based on the following criteria:

- **Gross Profit  $\leq 0$ :** Transactions resulting in losses were removed to focus the analysis on value-generating sales.
- **Profit Margin  $\leq 0$ :** Records with non-positive margins were excluded to ensure the findings reflect profitable operations.
- **Total Sales Quantity = 0:** Items with no recorded sales were eliminated, as they represent unsold inventory and do not contribute to realized performance outcomes.

### Key Correlation Insights:



- **Purchase Price vs. Total Sales Dollars and Gross Profit:** The weak correlations (**-0.012** and **-0.016**) indicate that variations in purchase price have minimal influence

on overall sales revenue or gross profit. This suggests that pricing efficiency and demand dynamics play a larger role than cost differences alone.

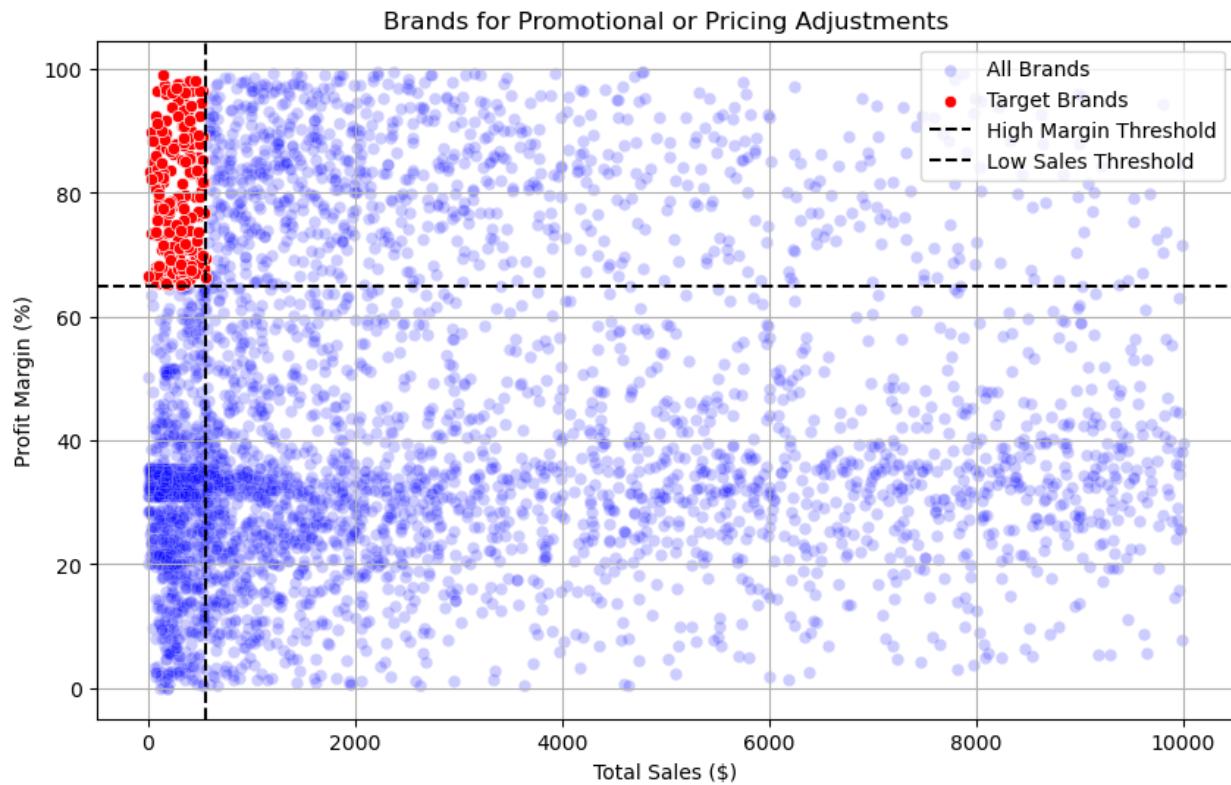
- **Total Purchase Quantity vs. Total Sales Quantity:** The near-perfect positive correlation (**0.999**) confirms strong alignment between purchasing and sales activity, reflecting effective inventory turnover and demand planning.
- **Profit Margin vs. Total Sales Price:** A negative correlation (**-0.179**) suggests that higher selling prices are associated with lower margins, potentially due to competitive pricing pressures, discounting strategies, or increased costs linked to higher-priced items.
- **Stock Turnover vs. Gross Profit and Profit Margin:** The weak negative correlations (**-0.038** and **-0.055**) indicate that faster inventory turnover does not automatically translate into higher profitability, highlighting the need to balance sales velocity with margin optimization.

## Research Questions and Key Findings:

### 1. Brands Requiring Promotional Support or Pricing Optimization:

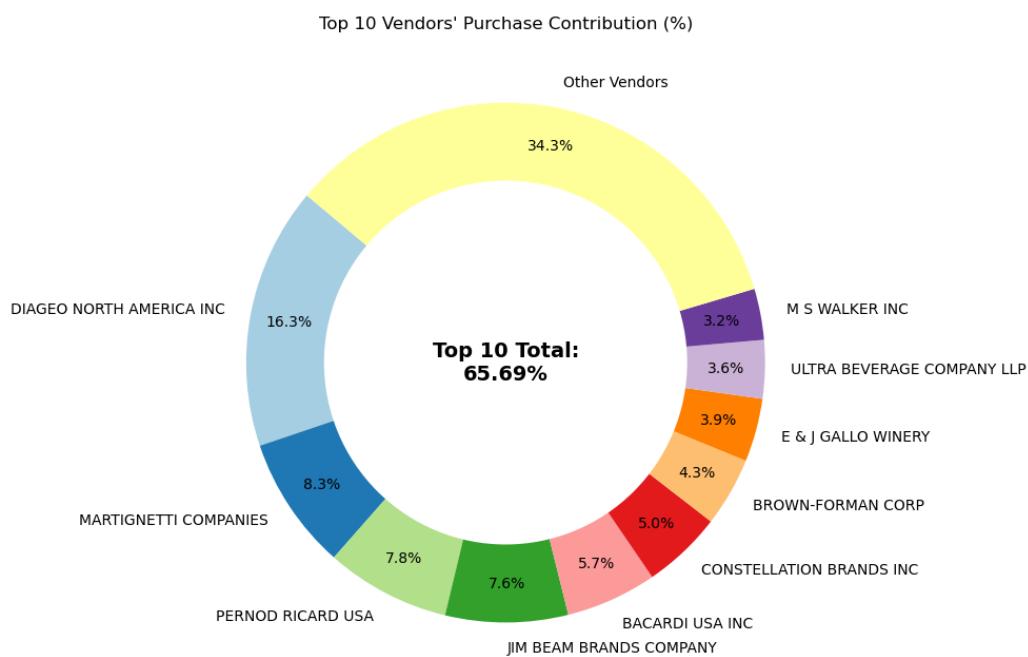
Brand with Low Sales but High Profit Margin:				
	Description	TotalSalesDollars	ProfitMargin	
6199	Santa Rita Organic Svgn Bl	9.99	66.466466	
2369	Debauchery Pnt Nr	11.58	65.975820	
2070	Concannon Glen Ellen Wh Zin	15.95	83.448276	
2188	Crown Royal Apple	27.86	89.806174	
6237	Sauza Sprklg Wild Berry 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				

A total of **198 brands** demonstrate low sales volumes but relatively high profit margins, indicating an opportunity to increase sales through targeted marketing initiatives, promotional campaigns, or pricing optimization—without materially impacting profitability.



## 2. Top Vendors by Sales and Purchase Contribution:

The top 10 vendors account for **65.69% of total purchases**, while all remaining vendors collectively contribute only **34.31%**. This high concentration indicates a strong dependency on a limited number of suppliers, which increases exposure to supply chain disruptions and operational risk, underscoring the need for greater vendor diversification.



### 3. Effect of Bulk Purchasing on Cost Reduction:

Vendors purchasing in large quantities benefit from approximately **72% lower unit costs (\$10.78 per unit)** compared to higher per-unit costs associated with smaller orders. These bulk pricing advantages incentivize larger purchase volumes, supporting higher total sales while preserving overall profitability.

OrderSize	
Small	39.068186
Medium	15.486414
Large	10.777625

### 4. Vendors with Inefficient Inventory Turnover:

The total capital tied up in unsold inventory amounts to **\$2.71 million**, indicating a significant drag on cash flow and operational efficiency. Slow-moving stock increases holding and storage costs while constraining working capital and profitability. Identifying vendors with low inventory turnover supports more effective inventory planning and corrective actions to reduce financial strain.

StockTurnover	VendorName	
0.615385	ALISA CARR BEVERAGES	
0.708333	HIGHLAND WINE MERCHANTS LLC	
0.751306	PARK STREET IMPORTS LLC	
0.755676	Circa Wines	
0.766022	Dunn Wine Brokers	
0.773953	CENTEUR IMPORTS LLC	
0.783835	SMOKY QUARTZ DISTILLERY LLC	
0.797078	TAMWORTH DISTILLING	
0.807569	THE IMPORTED GRAPE LLC	
0.820548	WALPOLE MTN VIEW WINERY	

VendorName	UnsoldInventoryValue
DIAGEO NORTH AMERICA INC	722.21K
JIM BEAM BRANDS COMPANY	554.67K
PERNOD RICARD USA	470.63K
WILLIAM GRANT & SONS INC	401.96K
E & J GALLO WINERY	228.28K
SAZERAC CO INC	198.44K
BROWN-FORMAN CORP	177.73K
CONSTELLATION BRANDS INC	133.62K
MOET HENNESSY USA INC	126.48K
REMY COINTREAU USA INC	118.60K

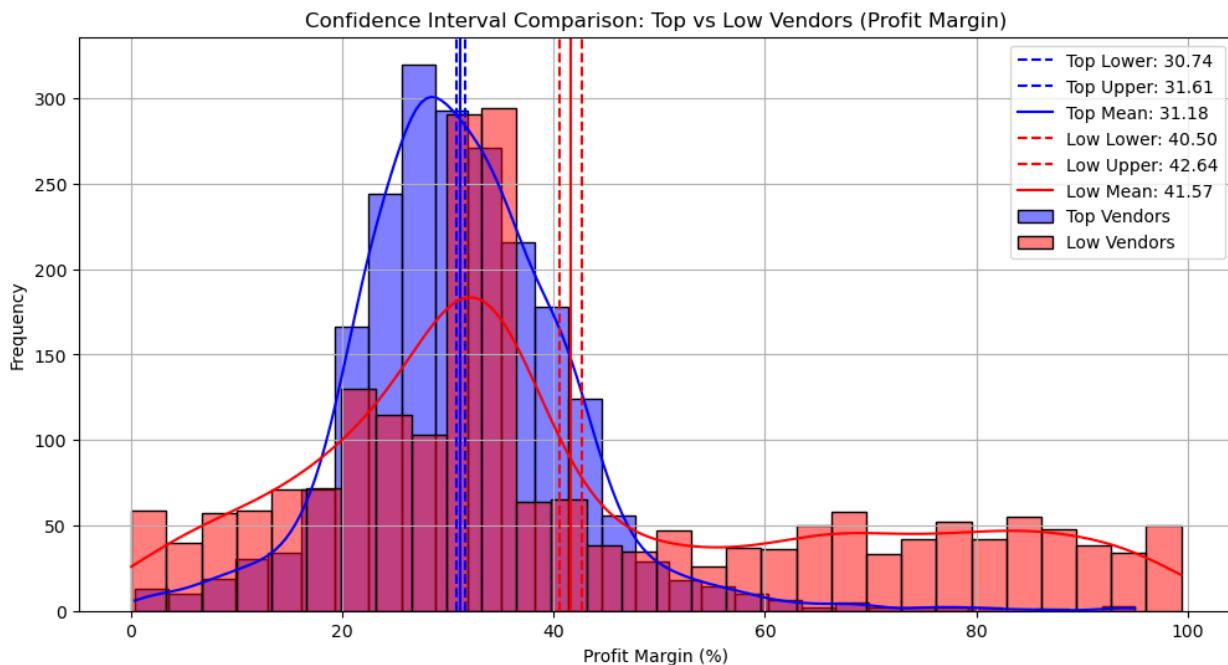
### 5. Profit Margin Analysis: High-Performing vs. Low-Performing Vendors:

- Top Vendors' Profit Margin (95% CI): 30.74%–31.61%, **with a mean of 31.17%**
- Low-Performing Vendors' Profit Margin (95% CI): 40.48%–42.62%, **with a mean of 41.55%**

Despite lower sales volumes, low-performing vendors exhibit significantly higher profit margins. This disparity suggests potential pricing inefficiencies, limited market reach, or insufficient demand stimulation rather than cost-related disadvantages, indicating opportunities for volume growth through pricing refinement or targeted market expansion.

#### Actionable Insights:

- **Top-performing vendors:** Enhance profitability through refined pricing strategies, tighter cost control, and the introduction of value-driven or bundled promotional offerings.
- **Low-performing vendors:** Strengthen sales performance by increasing marketing visibility, optimizing pricing structures, and expanding or improving distribution reach.



## 6. Statistical Confirmation of Profit Margin Differences:

### Hypothesis Testing:

- **$H_0$  (Null Hypothesis):** There is no statistically significant difference in profit margins between top-performing and low-performing vendors.
- **$H_1$  (Alternative Hypothesis):** A statistically significant difference exists in profit margins between the two vendor groups.

### Result:

The null hypothesis is rejected, indicating a meaningful difference in profit margins between top-performing and low-performing vendors.

### Implication:

Low-performing vendors achieve higher margins, likely due to stronger pricing strategies, while top-performing vendors can further improve overall profitability by focusing on cost optimization and operational efficiency.

### **Final Recommendations:**

- Reassess pricing strategies for low-volume, high-margin brands to stimulate sales growth while preserving profitability.
- Broaden the vendor base to reduce overdependence on a limited number of suppliers and minimize supply chain risk.
- Capitalize on bulk purchasing benefits to sustain competitive pricing while maintaining effective inventory control.
- Improve the management of slow-moving inventory through optimized order quantities, targeted clearance initiatives, or revised storage approaches.
- Strengthen marketing, sales, and distribution efforts for low-performing vendors to increase volumes without eroding margins.
- Collectively, these actions will support sustainable profitability, reduce operational risk, and improve overall business efficiency.