**Business** **Problem**

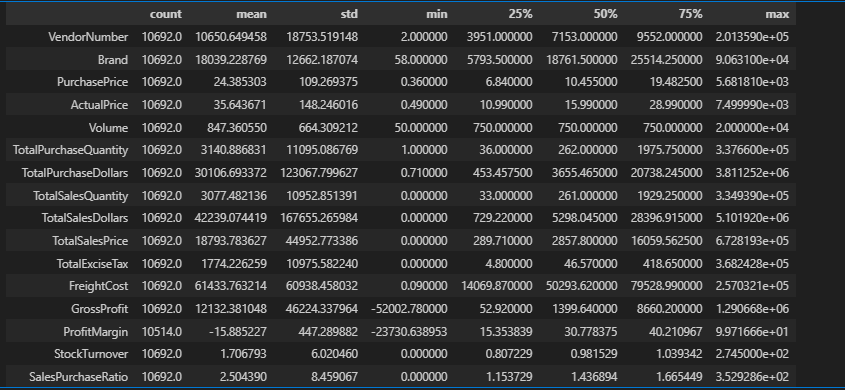
**VENDOR PERFORMANCE ANALYSIS**

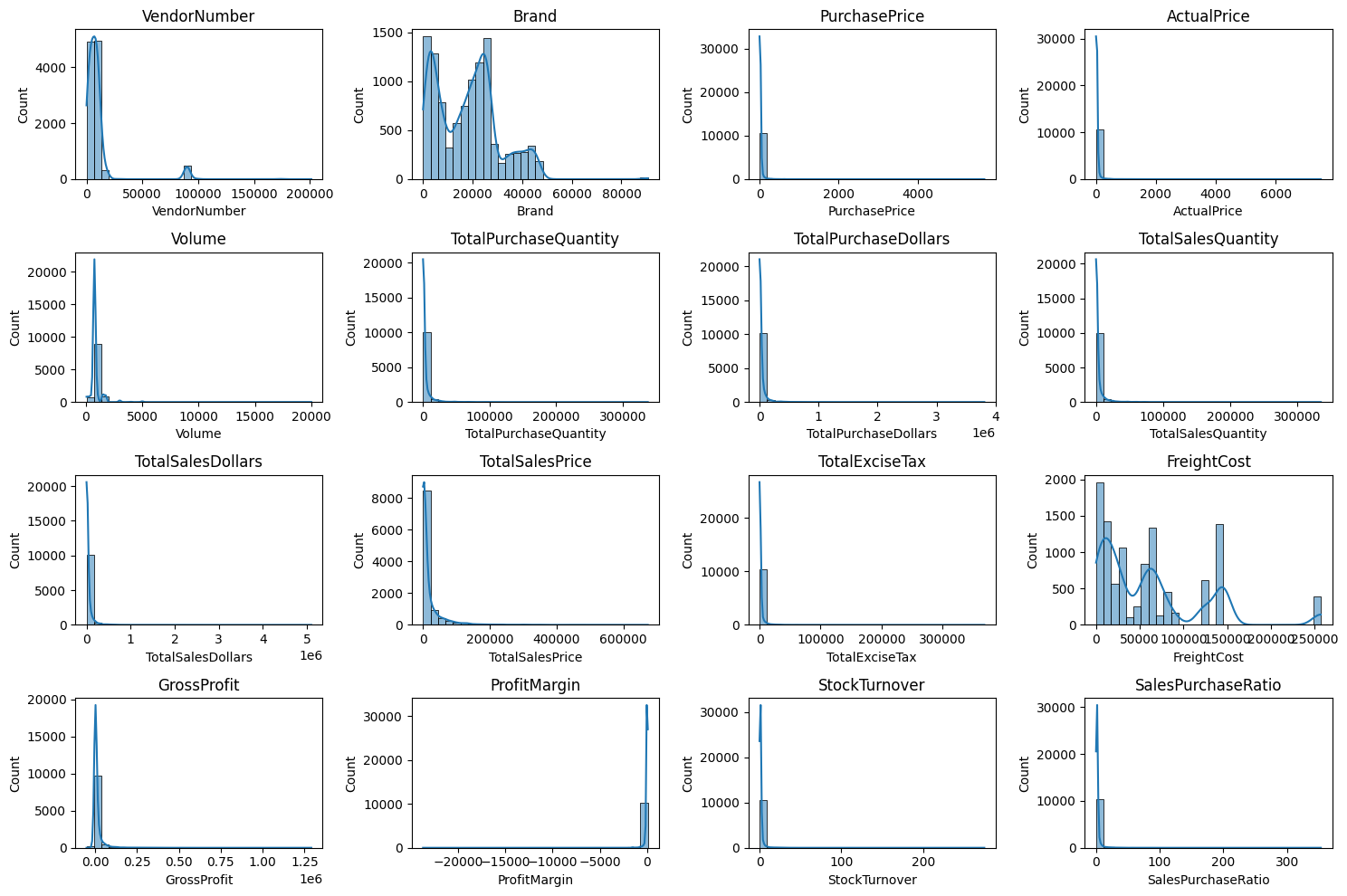
Effective inventory and sales management are critical for optimizing profitability in the retail and wholesale industry. Companies need to ensure that they are not incurring losses due to inefficient pricing, poor inventory turnover, or vendor dependency. The goal of this analysis is to:

* 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:**

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**Negative & Zero Values**:

* Gross Profit: Minimum value is -52,002.78, indicating losses. Some products or transactions may be selling at a loss due to high costs or selling at discounts lower than the purchase price..
* Profit Margin: Has a minimum of-00, which suggests cases where revenue is zero or even lower than costs.
* Total Sales Quantity & Sales Dollars: Minimum values are 0, meaning some products were purchased but never sold. These could be slow-moving or obsolete stock.

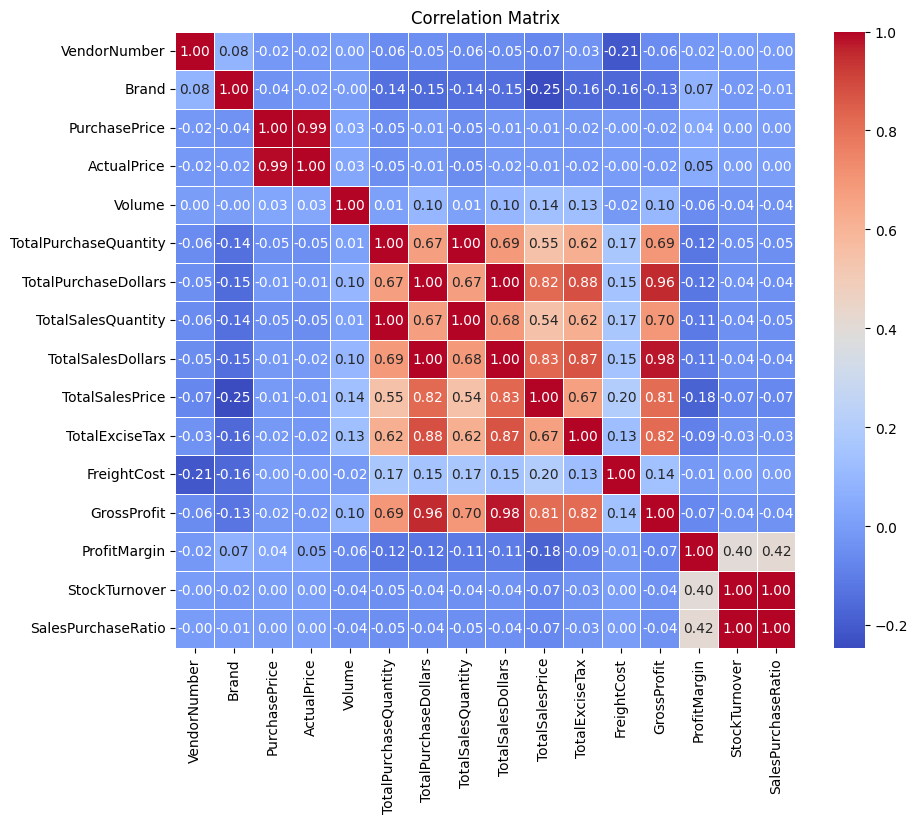
**Outliers Indicated by High Standard Deviations:**

* **Purchase & Actual Prices**: The max values (5,681.81 & 7,499.99) are significantly higher than the mean (24.39 & 35.64), indicating potential premium products.
* **Freight Cost**: Huge variation, from 0.09 to 257,032.07, suggests logistics inefficiencies or bulk shipments.
* **Stock Turnover**: Ranges from 0 to 274.5, implying some products sell extremely fast while others remain in stock indefinitely. Value more than 1 indicates that Sold quantity for that product is higher than purchased quantity due to either sales are being fulfilled from older stock.

**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).

**Correlation Insights**

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**Purchase Price vs Total Sales Dollars vs Gross Profit:**

Purchase Price has weak correlations with Total Sales Dollars (-0.012) and Gross Profit (-0.016), suggesting that price variations do not significantly impact sales revenue or profit.

**Total Purchase Quantity vs Total Sales Quantity:**

Strong correlation between total purchase quantity and total sales quantity (0.999), confirming efficient inventory turnover.

**Profit Margin vs Total Sales Price:**

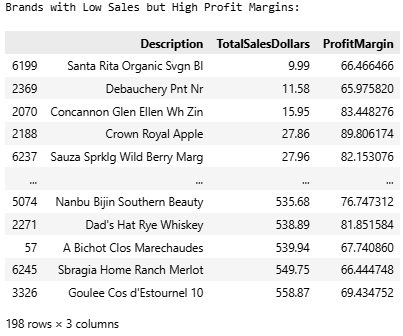
Negative correlation between profit margin & total sales price (-0.179) suggests that as sales price increases, margins decrease, possibly due to competitive pricing pressures.

**Stock Turnover vs Gross Profit vs Profit Margin:**

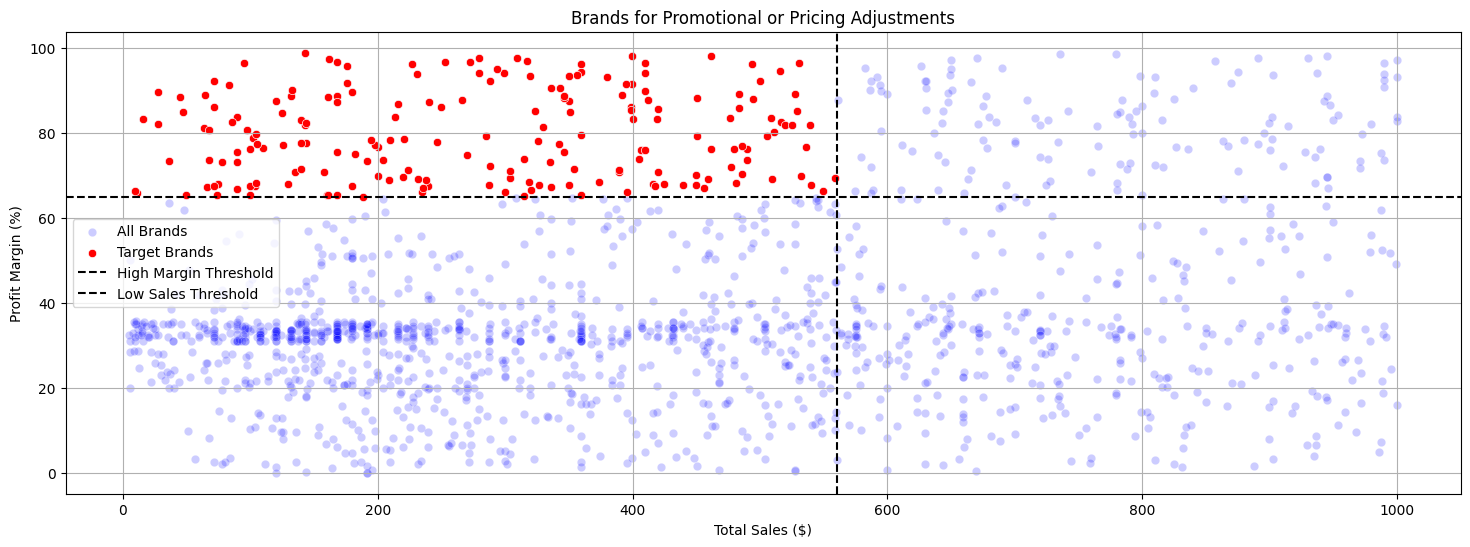
Stock Turnover has weak negative correlations with both Gross Profit (-0.038) and Profit Margin (-0.055), indicating that faster turnover does not necessarily result in higher profitability.

**Questions and key findings**

1. **Brands for promotional or pricing adjustments:**

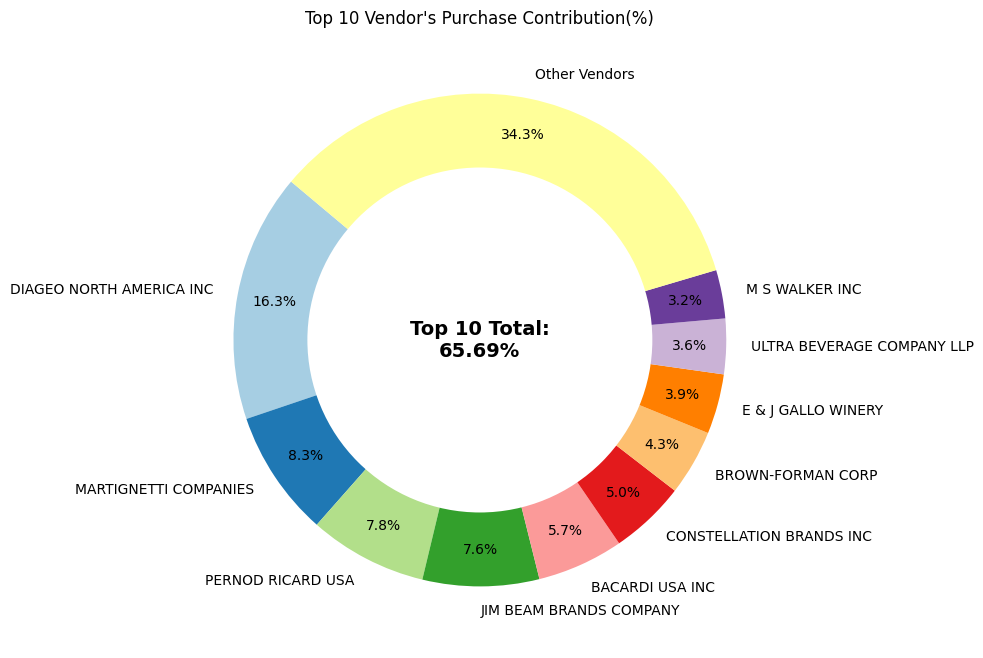
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198 brands exhibit lower sales but higher profit margins,which could benefit from targeted marketing,promotions or price optimizations to increase volume without compromising probability



1. **Top Vendors by Sales & Purchase Contribution:**

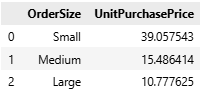
The top 10 vendors contribute 65.69% of total purchases, while the remaining vendors contribute only 34.31%. This over-reliance on a few vendors may introduce risks such as supply chain disruptions, indicating a need for diversification.



**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.



**4.Identifying Vendors with Low Inventory Turnover:**

Total Unsold Invenotry Capital:$2.71M

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

Identifying vendors enables better stock management,minimizing financial strain.



**5.Profit Margin Comparision: High vs Low-performing Vendors:**

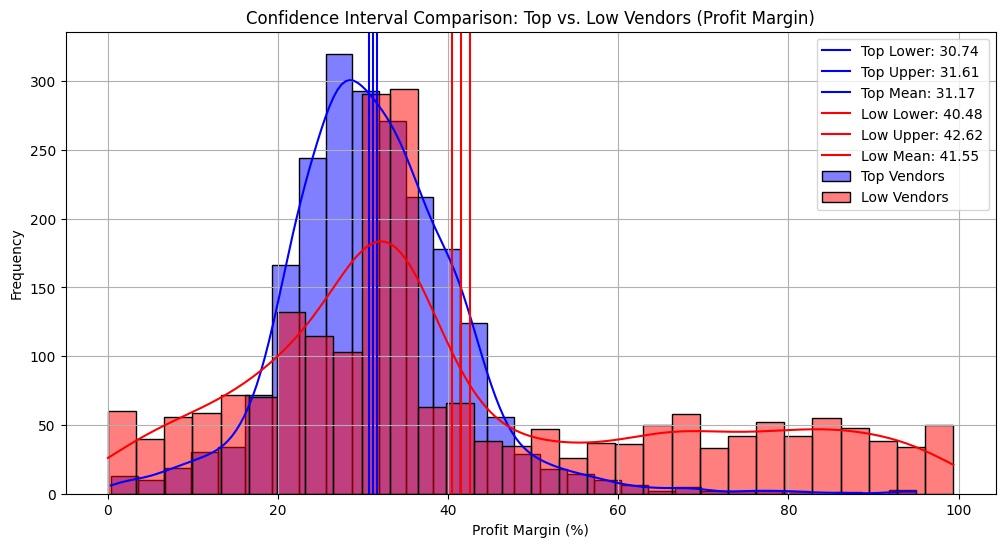
Top Vendors' Profit Margin (95% CI): (30.74%, 31.61%), Mean: 31.17%

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:**

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

**H1 (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.