

Analysis Report

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

Determine top vendors contributing to sales and gross profit.

Analyze the impact of bulk purchasing on unit costs.

Assess the impact of bulk purchasing on unit costs.

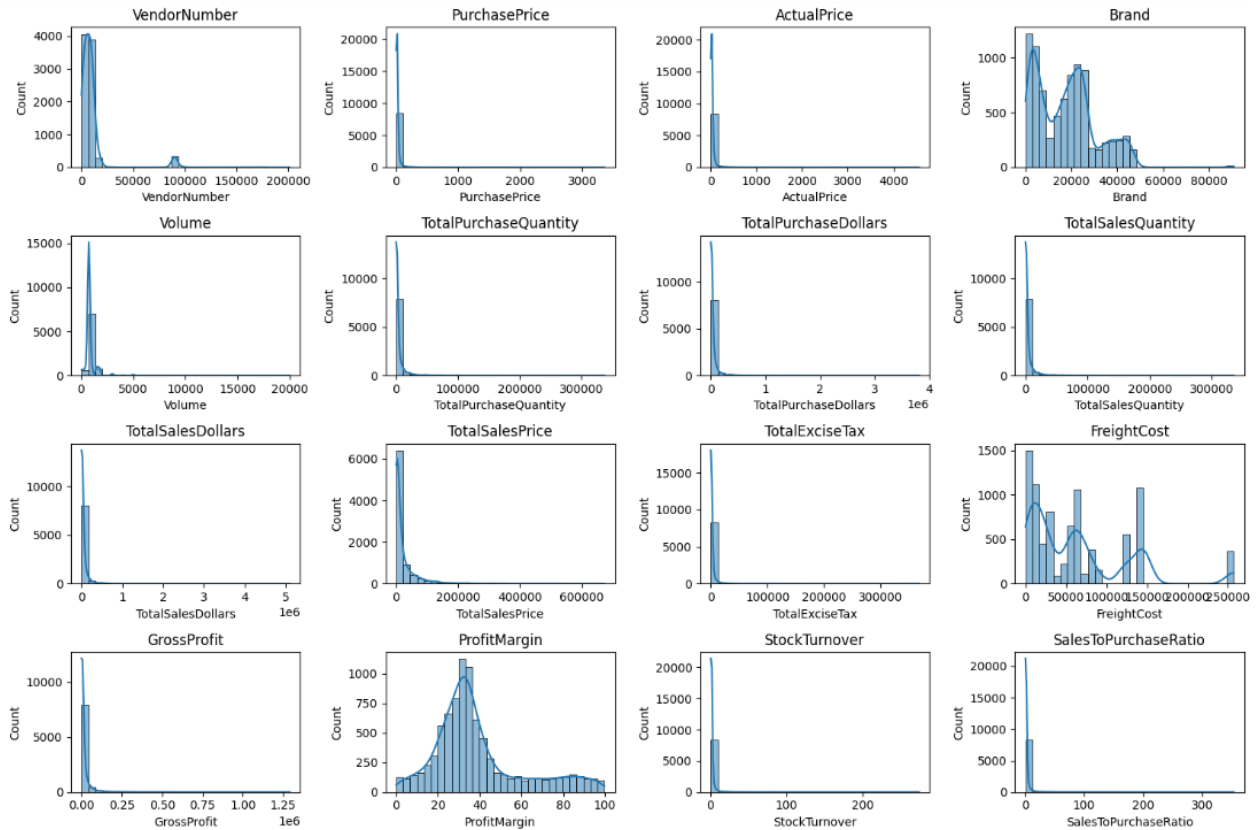
Assess inventory turnover to reduce holding costs and improve efficiency.

Investigate the profitability variance between high- performing and low performing vendors.

Exploratory Data Analysis

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
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
Brand	10692.0	1.803923e+04	12662.187074	58.00	5793.500000	18761.500000	25514.250000	9.063100e+04
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
SalesToPurchaseRatio	10692.0	2.504390e+00	8.459067	0.00	1.153729	1.436894	1.665449	3.529286e+02



Negative & Zero Values:

Gross Profit: The minimum gross profit of -52,002.78 suggests that the loss was occurred due to heavy discount or it could be due the selling products as lower prices than the purchasing price.

Profit Margin: The profit margin tends to negative infinity, which means that either the revenue is zero or even lower than the total cost.

Total Sales Quantity: Some product has zero sales that mean these products were purchased but never sold.

Outlier Detected by High Standard Deviations:

Purchase and Actual price: The mean of Purchase and actual price are (24.39 & 35.64) but the maximum values are (5681.81 & 7499.99), indicates that the price of premium products is very high.

Stock turnover: It ranges from 0 to 274.5 with the average of 1.7, it means some products have high demands and sold out rapidly with ease but other gets unsold for a long period.

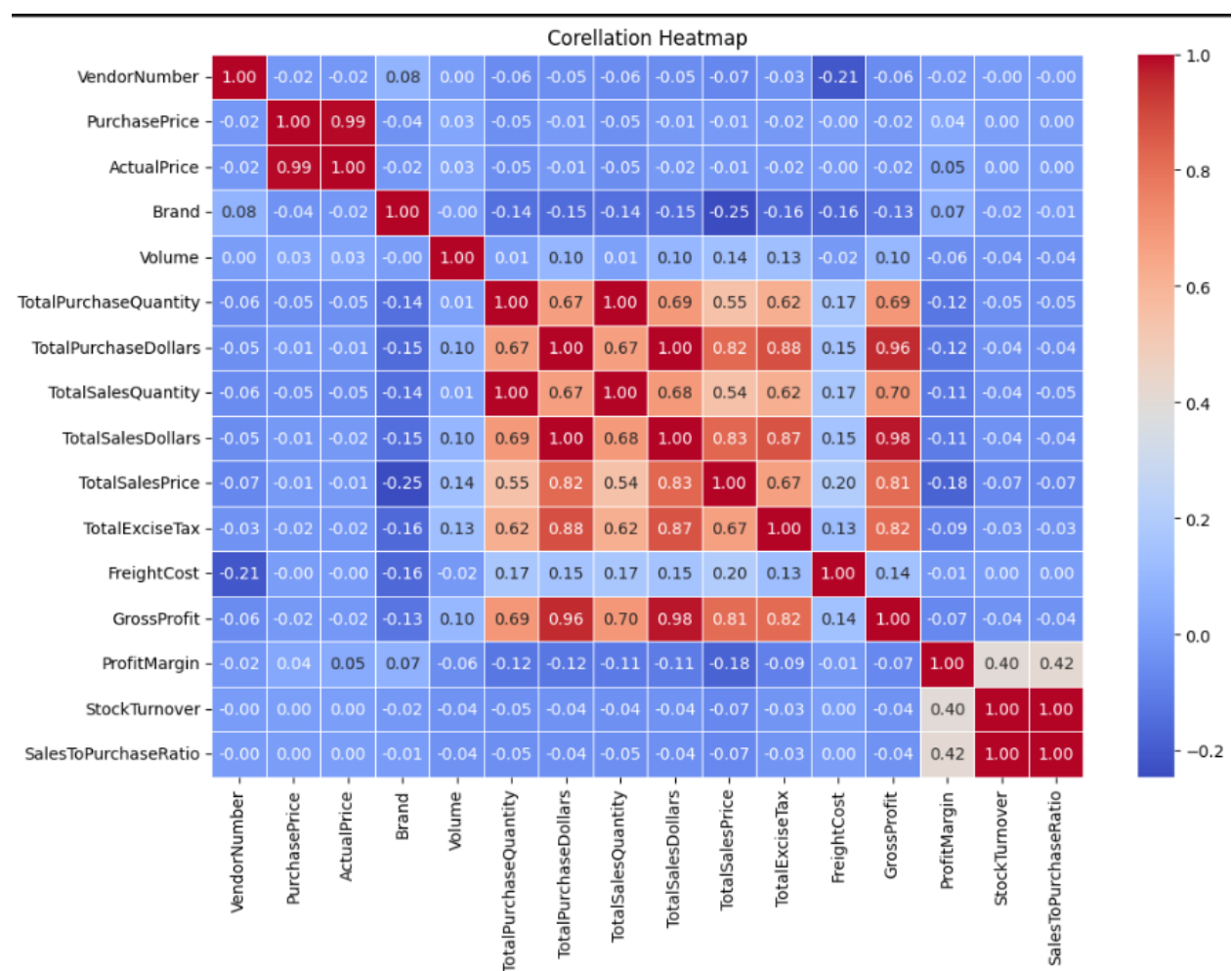
Data Filtering

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

Gross Profit >0

Profit Margin >0 (to ensure analysis focuses on profitable transactions).

Total Sales Quantity > 0



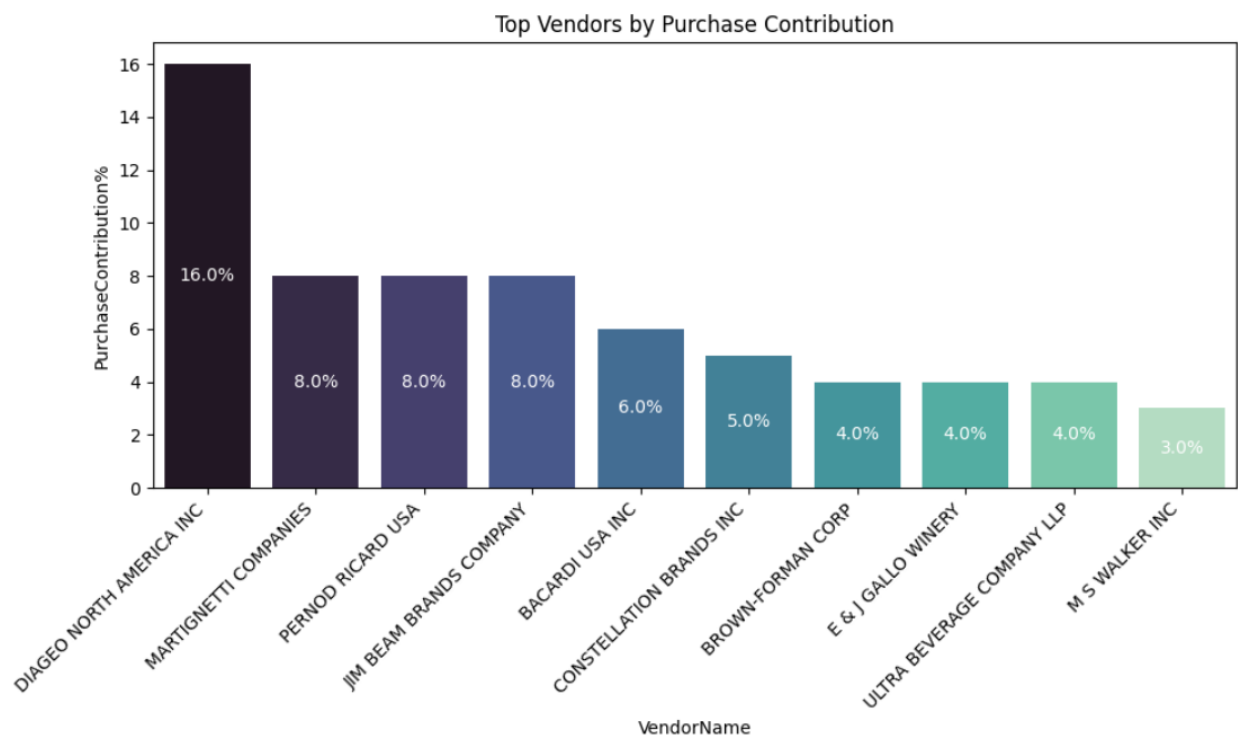
1. From the heatmap, it can be clearly seen that if the grossprofit and PurchasePrice are

correlated with each other with the coefficient of correlation of 0.96. It means it means higher purchase prices are generally associated with higher gross profits.

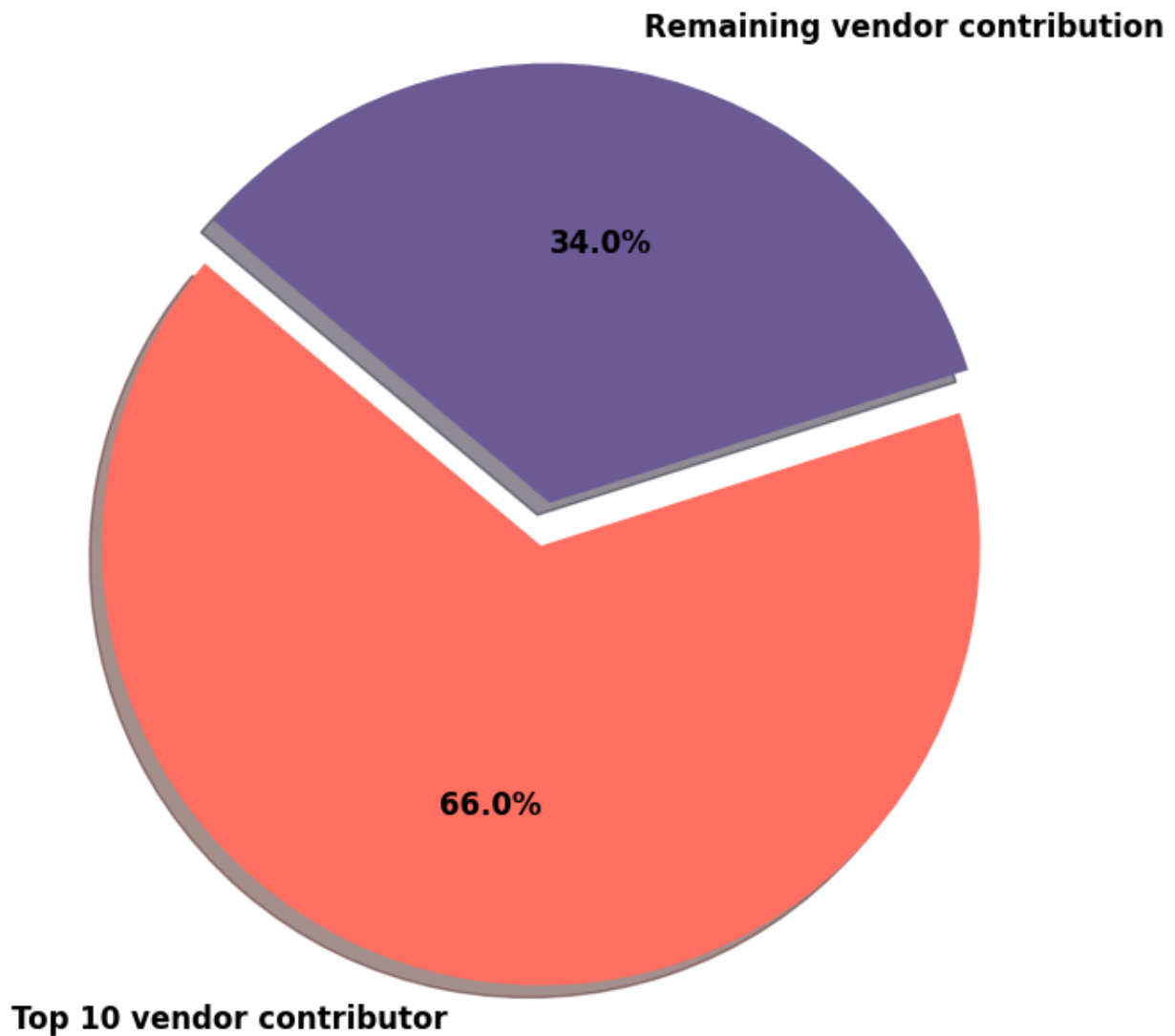
2. The coefficient of correlation between Gross profit and TotalPurchaseQuantity is 0.69. This means purchasing high quantity of goods gives high gross margin.

3. The coefficient of correlation between Gross profit and Purchase Price is -0.02, which means gross profit doesnot depend on Purchase Price.

Top 10 vendors with high Purchasing Contribution



Vendor Contribution Analysis



Research Question and Key Findings

1. Brands for Promotional or Pricing Adjustments

Top 10 Low StockTurnover Vendors.

Brands with Low Sales but High Profit Margin

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

The profit margin of the above mentioned Brands is high but the sales is low. So, these brands needs promotion or they need to lower the price of the products.

Vendor with low Stock Turnover

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

The stock turnover of the above mentions vendor is very low. So, they need to invest on advertisement or promotion so that they can clear the stock. Moreover, they need to purchase product in lower quantity until their stock turnover increases.

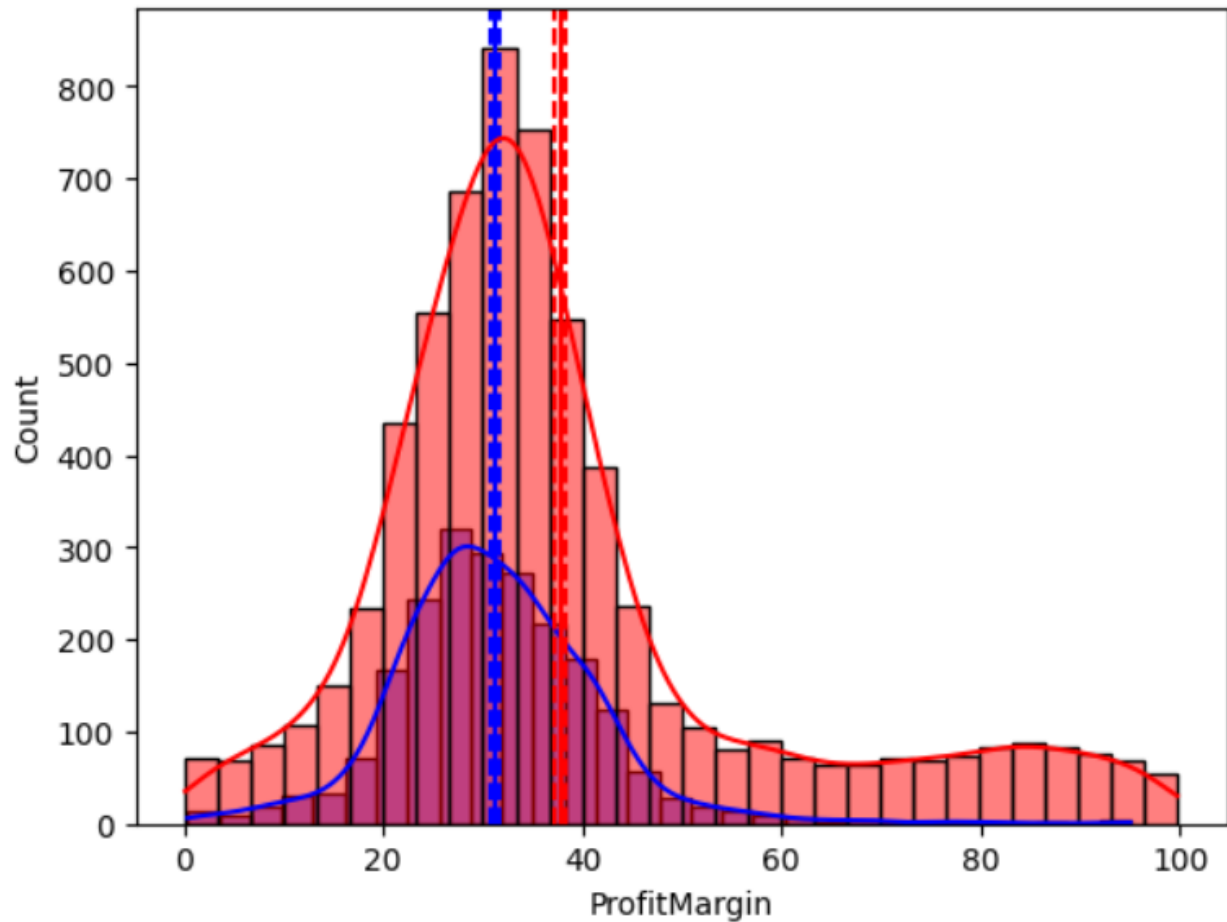
Impact of Bulk Purchasing on Cost Saving.

Vendors buying on bulk get the product on almost 72% cheaper price than the vendors who purchase products in small quantity. So, purchasing on bulk will be beneficial for the vendors.

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OrderSize
Small      28.613428
Medium     15.513992
Large      11.059342
Name: UnitPurchasePrice, dtype: float64
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Profit Margin Comparison: High vs. Low Performing Vendors.

1. The confidence interval for low performing vendors (37.29% to 38.26%) is significantly higher than that of top- performing vendors (30.74% to 31.61%)
2. This suggests that vendors with lower sales tend to main higher profit margins, potentially due to premium pricing or lower operational costs.
3. For High Performing Vendors: If they aim to improve profitability, they could explore selective price adjustments, cost optimization or bundling strategies.
4. For Low- Performing Vendors: Despite higher margin, their low sales volume might indicate a need for better marketing, competitive pricing or improved distribution strategies.



Statistical Validation of Profit Margin Differences

Ho(Null Hypothesis): There is no significant difference in the mean profit margins of top-performing and low-performing vendors

H1(Null Hypothesis): There is significant difference in the mean profit margins of top-performing and low-performing vendors

Results: P-value is less than 0.05, which rejects the null hypothesis and conclude that there is significant difference in the mean profit margins of top-performing and lower-performing vendors.

Implication: Higher-margin vendors may benefit from better pricing strategies while top-selling vendors could focus on cost efficiency.