

# **Vendor Performance Report**

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### **Personal project**

## **Business Problem**

In today's competitive retail environment, effective inventory and sales management is central to maintaining profitability and operational agility. This report investigates key areas of vendor performance to surface actionable insights. The objectives include:

- Identifying underperforming brands for targeted promotional or pricing interventions.
  - Highlighting top-performing vendors in terms of gross profit and sales contribution.
  - Evaluating the impact of bulk purchasing on unit cost efficiency.
  - Assessing inventory turnover to reduce holding costs.
- Comparing profit margins across vendor groups to inform pricing strategy.

## **Exploratory Data Analysis Insights**

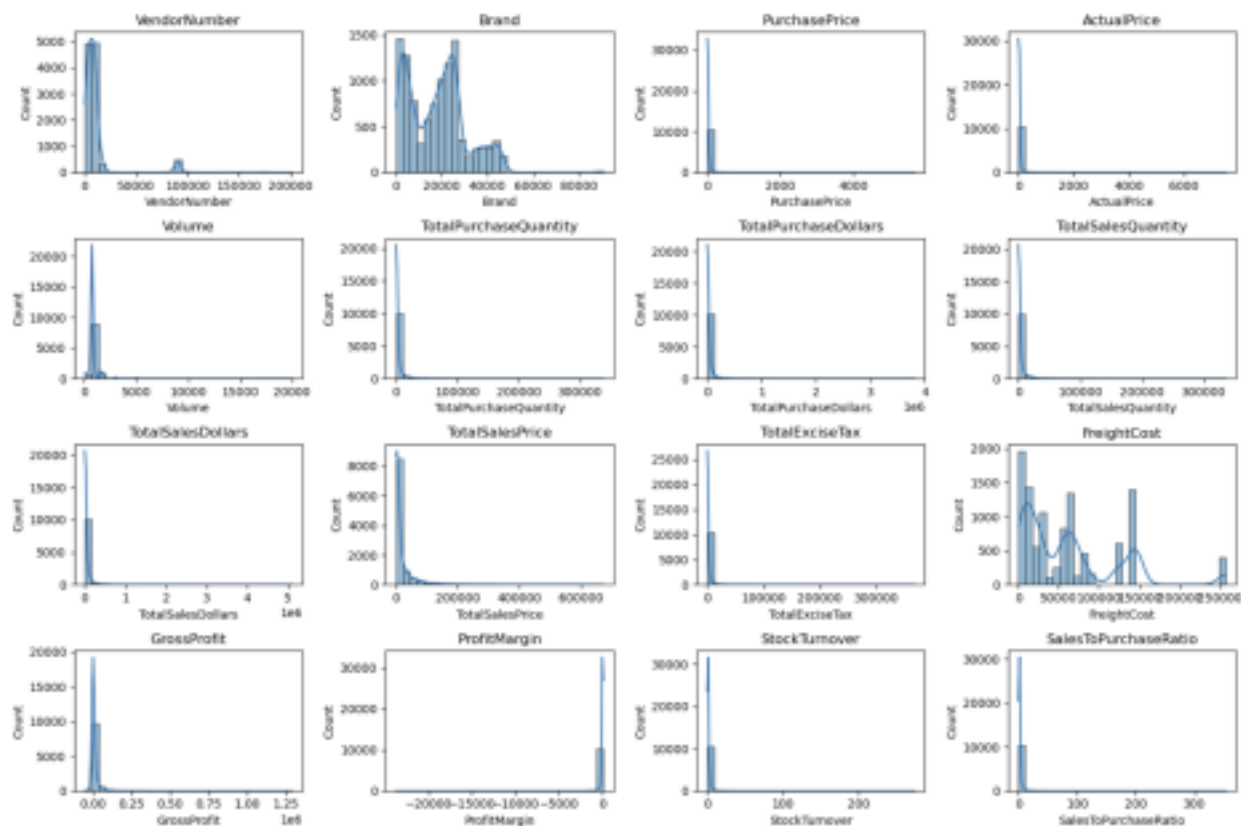
### **Summary Statistics and outliers**

A comprehensive scan of the dataset revealed several critical patterns:

- Negative Gross Profits reaching as low as -\$52,002 signal potential losses from unsustainable discounting or misaligned pricing strategies.
- Profit Margin anomalies, including a minimum of negative infinity, point to revenue shortfalls relative to cost, possibly due to overstocking or unsold inventory.
- Outlier Detection: Purchase and actual prices had extremely high maximums (\$5,681.81 and \$7,499.99), suggesting a skewed product range with premium offerings.
- Freight Costs ranged from \$0.09 to over \$257K, highlighting significant variation in shipping logistics and costs.
- Stock Turnover Variability (0 to 274.5) emphasizes disparities in product movement, with high turnover possibly driven by older inventory depletions.

These insights formed the basis for targeted data cleaning to focus the analysis on commercially relevant transactions.

	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
SalesToPurchaseRatio	10692.0	2.504390e+00	8.459067	0.00	1.153729	1.436894	1.665449	3.529286e+02

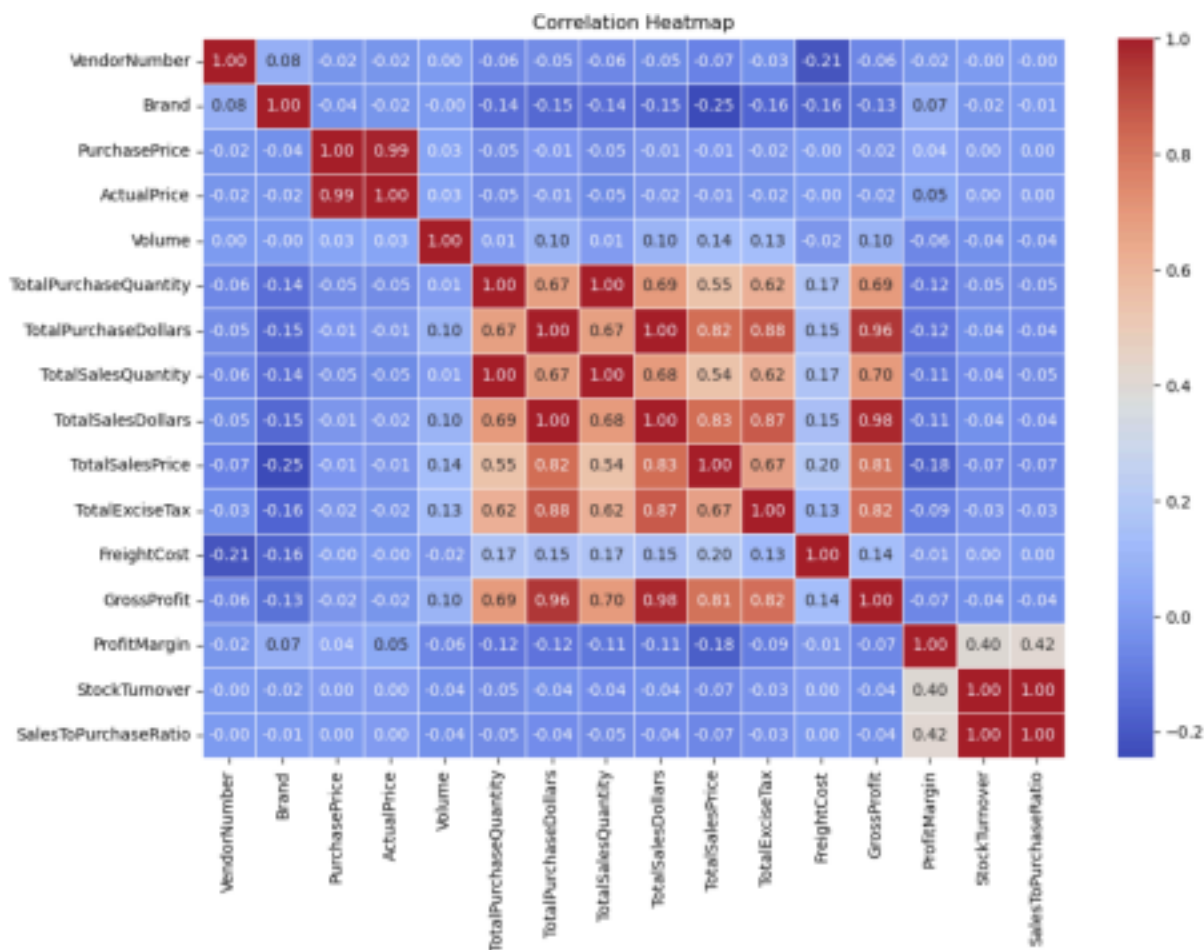


## Data Filtering

To ensure integrity and relevance in the insights:

- Transactions with **non-positive gross profit or profit margin** were excluded.
- Products with **zero sales quantity** were filtered out to avoid skewed turnover ratios and focus on revenue-generating inventory.

## Correlation Insights



The report presents a clear correlation breakdown:

- **Purchase Price** has almost no correlation with **Sales Dollars** or **Gross Profit** (-0.012 and -0.016), indicating pricing alone doesn't dictate performance.
- A **strong correlation (0.999)** between total purchase and sales quantity confirms healthy inventory movement.
- **Profit Margin** shows a **negative correlation** with total sales price (-0.179), suggesting margin dilution at higher price points — likely due to market competitiveness.
- **Stock Turnover's** weak correlation with profitability metrics suggests that speed of sale doesn't always equate to higher profit.

These results highlight the complex interplay between pricing, volume, and profitability — supporting a nuanced strategy.

## 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 Mang	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'Estournal 10	558.87	69.434752

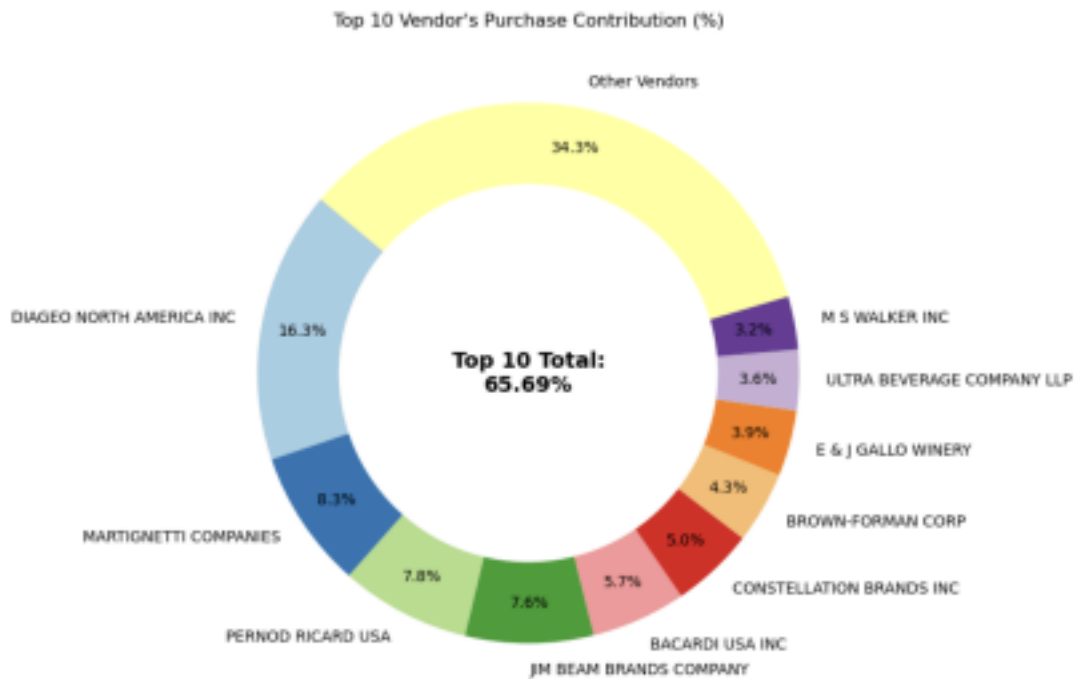
198 rows x 3 columns

A total of **198 brands** show high margins but low sales. These are prime candidates for volume-boosting strategies without compromising profitability.



## 2. Top Vendors by Sales & Purchase Contribution

Just **10 vendors account for 65.69%** of total purchases. While efficient, this over-reliance heightens risk and calls for **vendor diversification** to protect supply chain continuity.



### 3. Impact of Bulk Purchasing on Cost Savings

Yes. Vendors placing larger orders benefit from **72% lower unit costs**. This affirms bulk purchasing as a powerful lever for profitability when balanced with inventory risk.

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.

OrderSize	UnitPurchasePrice
Small	39.057543
Medium	15.486414
Large	10.777625

### 4. Identifying Vendors with Low Inventory Turnover

Low turnover ties up **\$2.71M in unsold stock**, negatively impacting cash flow and warehouse efficiency. These vendors need sharper demand forecasting and optimized ordering.

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.

VendorName	StockTurnover
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

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

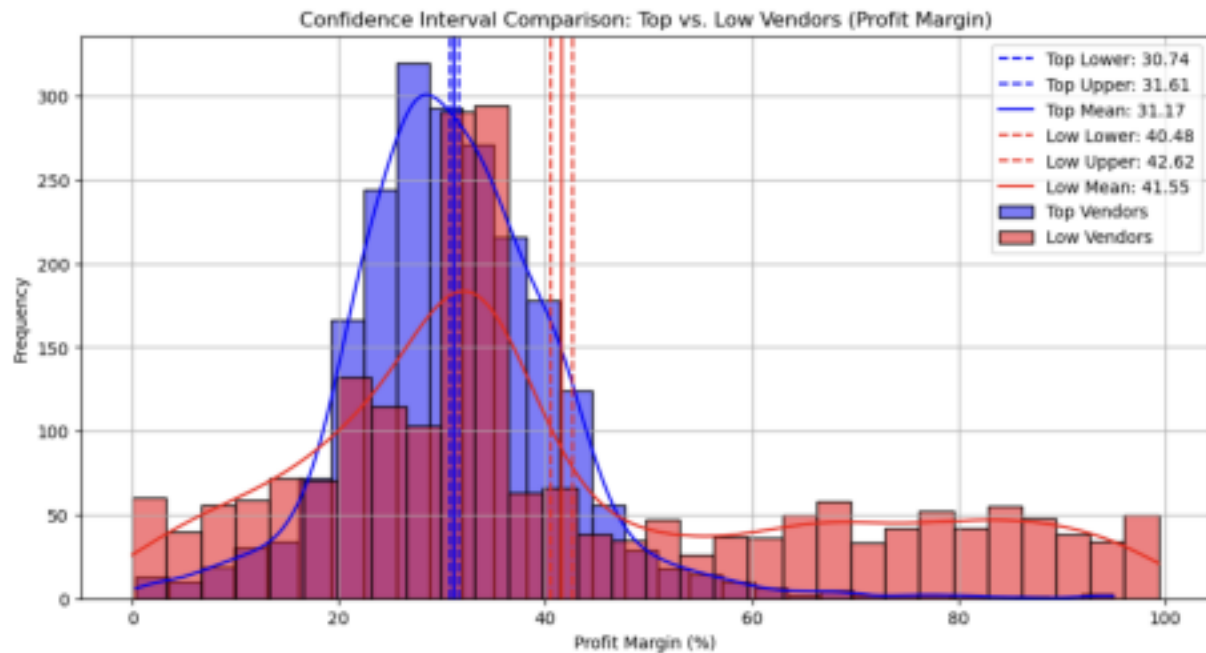
## 5. Profit Margin Comparison: High vs. Low-Performing Vendors

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%

- **Top Vendors:** Mean margin ~31.17%
- **Low-performing Vendors:** Mean margin ~41.55%

Higher margins among low performers may reflect pricing issues or poor market reach — key areas for improvement.



## 6. Statistical Validation of Profit Margin Differences

A hypothesis test confirms a statistically significant difference in profit margins between vendor groups. This validates the need for distinct strategies for high-volume vs. high-margin vendors.

### Hypothesis 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.