

Vendor Performance Analysis Report

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Chapter 1

Introduction

This report presents the results of a data analysis project on a **Vendor Performance Dataset**. The main objective of this analysis is to explore the dataset, identify key patterns, and derive meaningful insights that can support decision-making in vendor and brand management.

The dataset provides detailed information about vendors and their associated performance metrics. It contains the following attributes:

- **Vendor Details:** VendorNumber, VendorName, Brand, Description
- **Pricing Information:** PurchasePrice, ActualPrice, TotalSalesPrice
- **Quantities and Transactions:** Volume, TotalPurchaseQuantity, TotalSalesQuantity
- **Financials:** TotalPurchaseDollars, TotalSalesDollars, TotalExciseTax, FreightCost
- **Profitability and Efficiency Metrics:** GrossProfit, ProfitMargin, StockTurnover, SalesPurchaseRatio

Analyzing this dataset allows us to understand vendor performance from multiple perspectives, such as purchase and sales trends, profitability, cost structure, and efficiency ratios. These insights can be useful for evaluating vendor reliability, optimizing procurement strategies, and improving overall business performance.

Structure of the Report:

The remainder of this report is organized as follows:

- Chapter 2 presents the Exploratory Data Analysis (EDA), highlighting the key characteristics and patterns in the dataset.
- Chapter 3 discusses the main results, supported by tables and visualizations.
- Chapter 4 concludes the report with a summary of findings and possible future improvements.

Chapter 2

Exploratory Data Analysis (EDA)

In this section, we explore the dataset to understand its structure, quality, and key patterns. The steps carried out are as follows:

EDA Key Points

- Loaded the dataset and checked its shape (rows and columns).
- Reviewed the column names and data types.
- Calculated basic statistics such as mean, median, minimum, and maximum values.
- Checked for missing values and duplicate entries.
- Visualized data distributions using histograms and boxplots.
- Examined relationships between variables with scatterplots and correlation heatmaps.
- Identified outliers and unusual patterns in the dataset.

Summary Statistics

	count	mean	std	min	25%	50%	75%	max
VendorNumber	10692.0	1.065065e+04	18753.519148	2.00	3951.0000	7153.000	9552.0000	201359.00
Brand	10692.0	1.803923e+04	12662.187074	58.00	5793.5000	18761.500	25514.2500	90631.00
PurchasePrice	10692.0	2.438530e+01	109.269375	0.36	6.8400	10.455	19.4825	5681.81
ActualPrice	10692.0	3.564367e+01	148.246016	0.49	10.9900	15.990	28.9900	7499.99
Volume	10692.0	8.473605e+02	664.309212	50.00	750.0000	750.000	750.0000	20000.00
TotalPurchaseQuantity	10692.0	3.140887e+03	11095.086769	1.00	36.0000	262.000	1975.7500	337660.00
TotalPurchaseDollars	10692.0	3.010669e+04	123067.799627	0.71	453.4575	3655.465	20738.2450	3811251.60
TotalSalesQuantity	10692.0	3.077482e+03	10952.851391	0.00	33.0000	261.000	1929.2500	334939.00
TotalSalesDollars	10692.0	4.223907e+04	167655.265984	0.00	729.2200	5298.045	28396.9150	5101919.51
TotalSalesPrice	10692.0	1.879378e+04	44952.773386	0.00	289.7100	2857.800	16059.5625	672819.31
TotalExciseTax	10692.0	1.774226e+03	10975.582240	0.00	4.8000	46.570	418.6500	368242.80
FreightCost	10692.0	6.143376e+04	60938.458032	0.09	14069.8700	50293.620	79528.9900	257032.07
GrossProfit	10692.0	1.213238e+04	46224.337964	-52002.78	52.9200	1399.640	8660.2000	1290667.91
ProfitMargin	10692.0	-inf	NaN	-inf	13.3275	30.405	39.9600	99.72
StockTurnover	10692.0	1.706770e+00	6.020480	0.00	0.8100	0.980	1.0400	274.50
SalesPurchaseRatio	10692.0	2.504370e+00	8.459091	0.00	1.1500	1.440	1.6700	352.93

Figure 2.1: Summary Statistics of the Dataset

The summary statistics table above provides a quick overview of the dataset. It highlights important information such as the mean, median, minimum, maximum, and standard deviation of the variables. These values help us understand the central tendency and spread of the data before moving on to deeper analysis.

Chapter 3

Vendor Performance Analysis and Visualisation

3.1 Financial Metrics Analysis

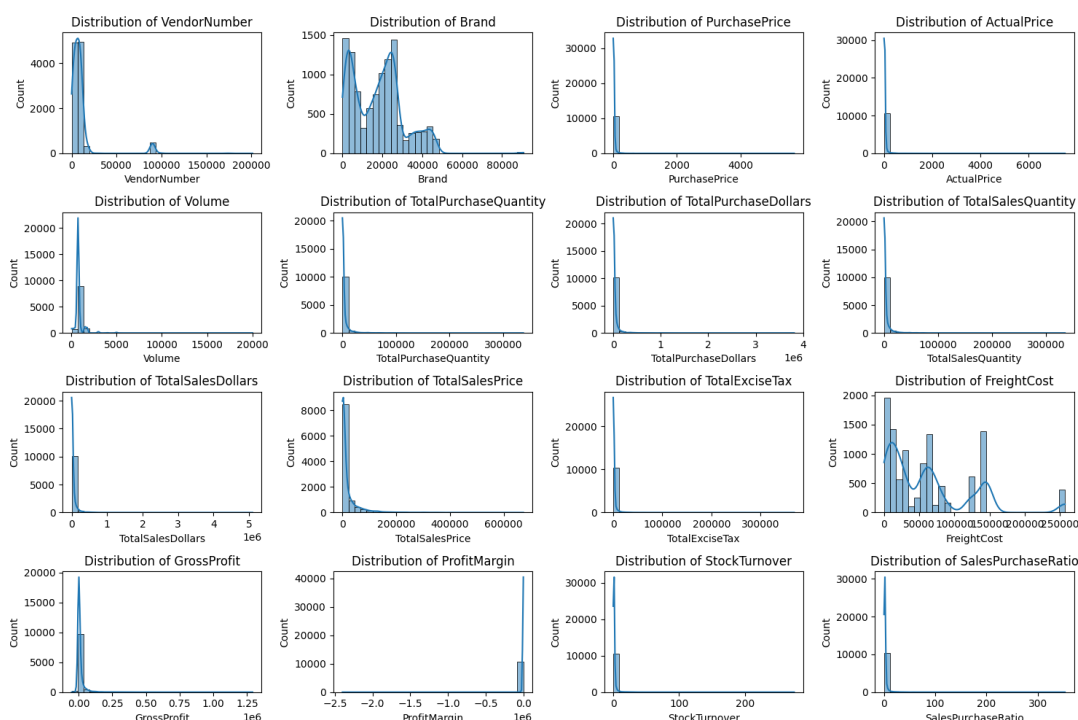


Figure 3.1: Visual Overview of Financial Metrics

The image above presents key financial metrics and anomalies observed during the data analysis. Below is a detailed explanation of the findings:

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 at lower prices than their purchase

costs.

- **Profit Margin:** Has a minimum of $-\infty$, which suggests 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 products.

Freight Cost

- Extreme variation from 0.09 to 257,032.07 suggests logistics inefficiencies, bulk shipments, or erratic shipping 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

- **Gross Profit ≤ 0 :** Transactions leading to losses were excluded to focus on profitable operations.
- **Profit Margin ≤ 0 :** Ensures the analysis centers around transactions that contribute positively to profitability.
- **Total Sales Quantity = 0:** Eliminates inventory that was never sold, reducing noise from unsold or obsolete stock.

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.

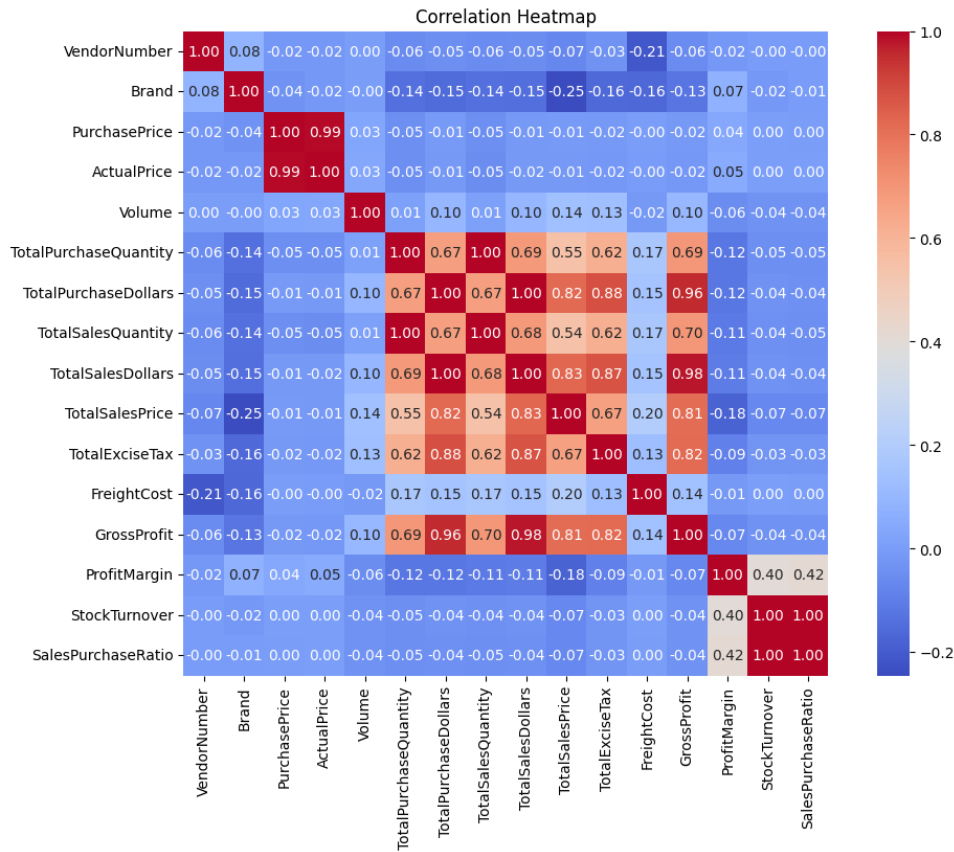


Figure 3.2: Correlation Analysis Between Key Financial Metrics

- **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 (-0.038 and -0.055), indicating that faster stock turnover does not necessarily equate to higher profitability.

Research Questions & Key Findings

1.Brands Identified for Promotional or Pricing Adjustments

	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

Figure 3.3: Brands with Low Sales but High Profit Margin

Insight:

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.

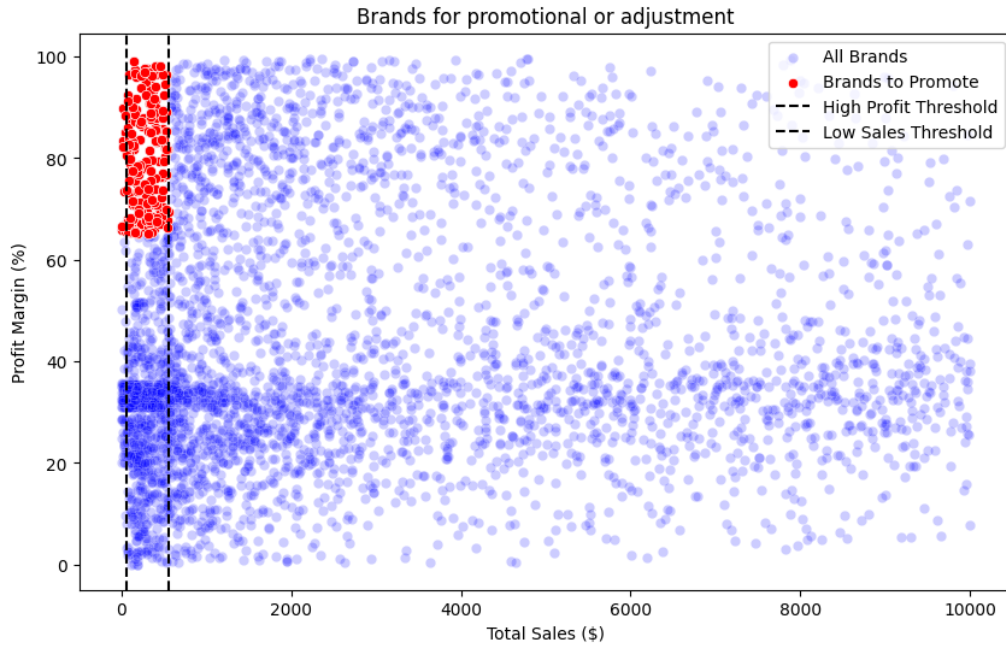


Figure 3.4: Brands for Promotional and Pricing Adjustment

2. Vendor Contribution Analysis

Top Vendors by Sales & Purchase Contribution

Insight:

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

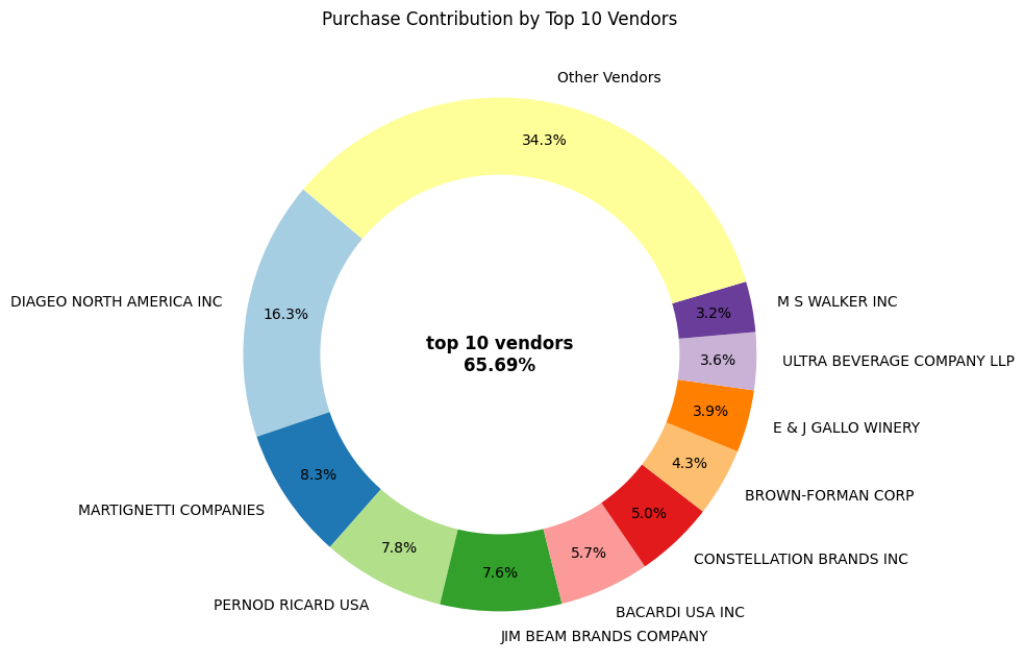


Figure 3.5: Top 10 Vendors' Purchase Contribution (%)

3. Cost Efficiency Analysis

Impact of Bulk Purchasing on Cost Savings

Insight:

Vendors buying in large quantities receive a 72% lower unit cost (10.78 per unit) compared to smaller orders. Bulk pricing strategies encourage larger orders, increasing total sales while maintaining profitability.

UnitPurchasePrice	
OrderSize	
Small	39.068186
Medium	15.486414
Large	10.777625

Figure 3.6: Bulk Purchasing Reduces Unit Cost by 72%

4.Inventory Performance Analysis

Identifying Vendors with Low Inventory Turnover

Insight:

Slow-moving inventory increases storage costs, reduces cash flow efficiency, and affects overall profitability. Identifying vendors with low inventory turnover enables better stock management and minimizes financial strain.

	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

Figure 3.7: Vendors with low Inventory Turnover

	VendorName	UnsoldInventoryValue
25	DIAGEO NORTH AMERICA INC	\$722.21K
46	JIM BEAM BRANDS COMPANY	\$554.67K
68	PERNOD RICARD USA	\$470.63K
116	WILLIAM GRANT & SONS INC	\$401.96K
30	E & J GALLO WINERY	\$228.28K
79	SAZERAC CO INC	\$198.44K
11	BROWN-FORMAN CORP	\$177.73K
20	CONSTELLATION BRANDS INC	\$133.62K
61	MOET HENNESSY USA INC	\$126.48K
77	REMY COINTREAU USA INC	\$118.60K

Figure 3.8: Vendors Contributing to 2.71M in Unsold Inventory Capital

5.Profitability Analysis

Profit Margin Comparison: High vs. Low-Performing Vendors

Insight:

Low-performing vendors maintain higher average profit margins (41.55%) compared to top-performing vendors (31.17%), as indicated by their respective 95% confidence intervals:

- **Top Vendors:** (30.74%, 31.61%)
- **Low Vendors:** (40.48%, 42.62%)

This suggests potential pricing inefficiencies or limited market reach among low-performing vendors.

Actionable Recommendations:

- For top-performing vendors: Enhance profitability by refining pricing strategies, reducing operational costs, or offering bundled solutions.
- For low-performing vendors: Investigate sales volume constraints and evaluate market positioning to improve turnover without compromising margin.

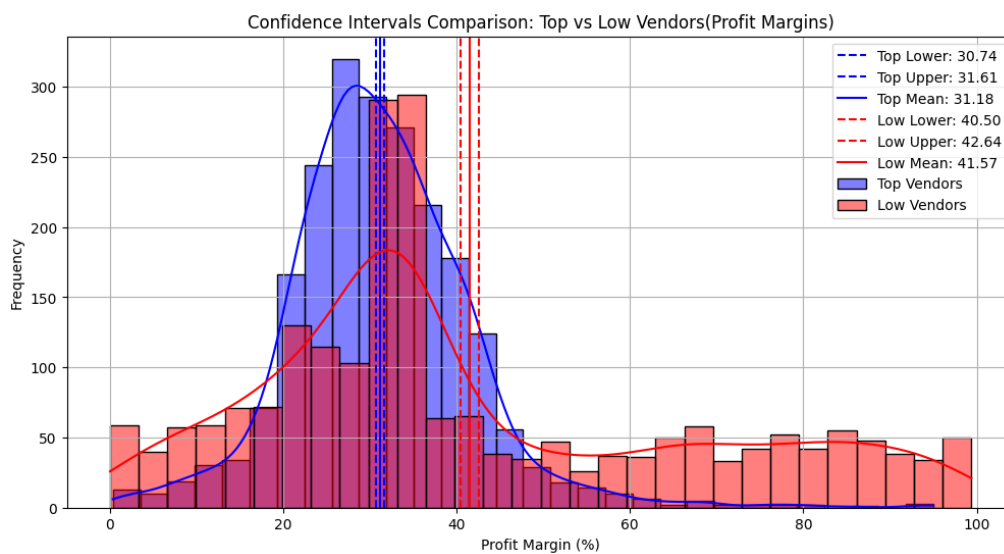


Figure 3.9: Profit Margin Distribution Across Vendor Performance Tiers

6. Statistical Validation

Profit Margin Differences Between Vendor Tiers

Hypothesis Testing:

- H_0 : No significant difference in profit margins between top and low-performing vendors.
- H_1 : A significant difference exists in profit margins between the two vendor groups.

Result:

The null hypothesis (H_0) is rejected, confirming that the two groups operate under distinctly different profitability models.

Implication:

High-margin vendors may benefit from refined pricing strategies, while top-selling vendors could focus on cost efficiency to enhance overall profitability.

Chapter 4

Conclusion

Final Recommendations

Pricing Strategy for Low-Sales, High-Margin Brands

Recommendation:

Re-evaluate pricing for low-sales, high-margin brands to stimulate demand and increase sales volume, while preserving overall profitability.

Recommendations:

- Diversify vendor partnerships to reduce dependency and mitigate supply chain risks.
- Leverage bulk purchasing to maintain competitive pricing and optimize inventory.
- Address slow-moving inventory via adjusted purchase quantities, clearance sales, or revised storage strategies.
- Strengthen marketing and distribution for low-performing vendors to drive higher sales volumes.

Outcome:

Implementing these strategies supports sustainable profitability, risk mitigation, and improved operational efficiency.