

Business Problem

Effective inventory and sales management are critical for optimising profitability in the retail and wholesale industry. Organisation need to ensure they are not incurring losses due to inefficient pricing, poor inventory 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.

-Analyse impact of bulk purchasing on unit cost.

-Asses inventory turnover to reduce holding cost and improve efficiency.

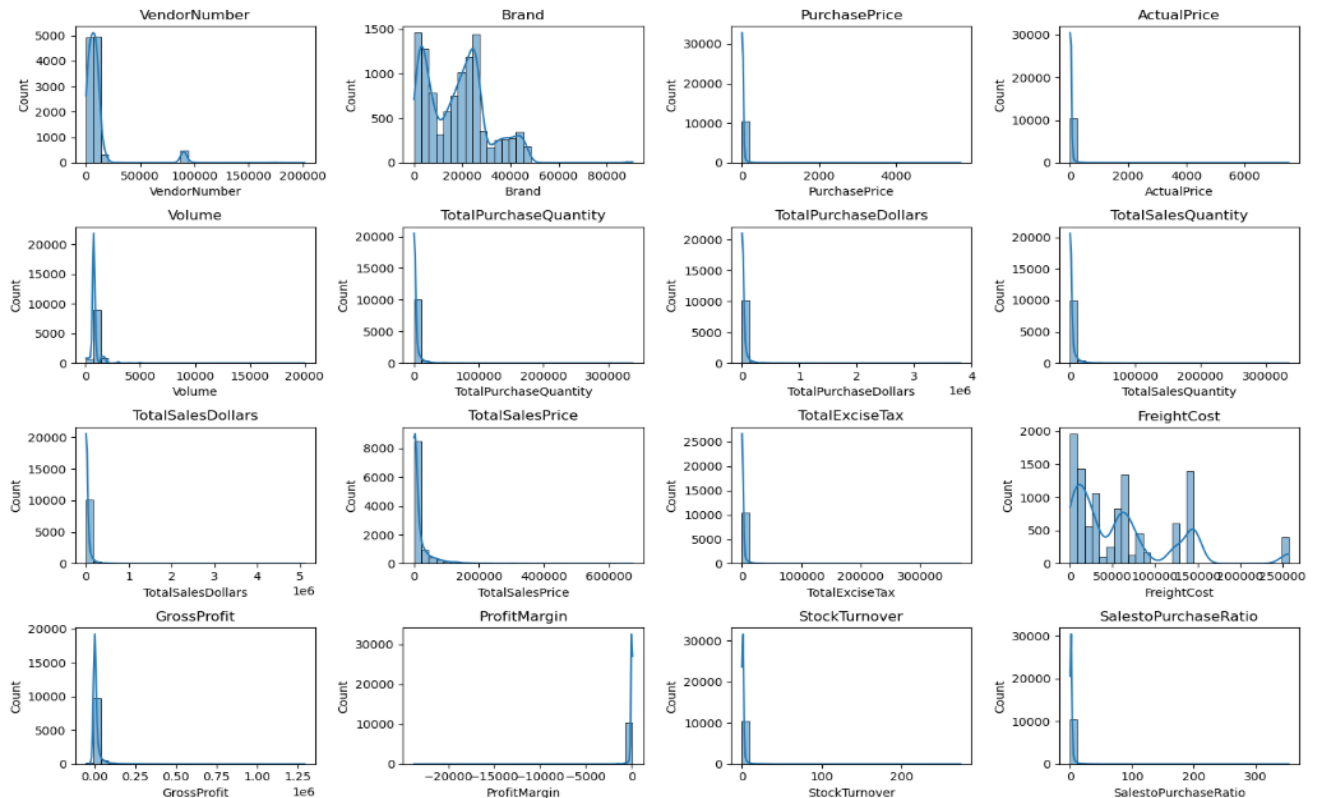
Investigate profitability variance between high-performing and low-performing vendors.

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

-On average, vendors generate over 2.5× in sales value compared to their total purchases, showing strong profitability and efficient sales conversion.

However, the high standard deviation indicates that a few top-performing vendors drive most of the revenue, while others contribute relatively less — suggesting an opportunity to identify and replicate the practices of high performers



Negative and Zero Value:

- 1.Gross profit:** Minimum value is -52,002.78 indicating losses. Some products or transaction may be selling at a loss due to high cost or selling at discounts lower than the purchase price.
- 2.Profit Margin:** Has a minimum of -infinity, which suggest cases where revenue is zero or even lower than cost leading to negative profit margins.
- 3.Total Sales Quantity and 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 indication by high standard deviation:

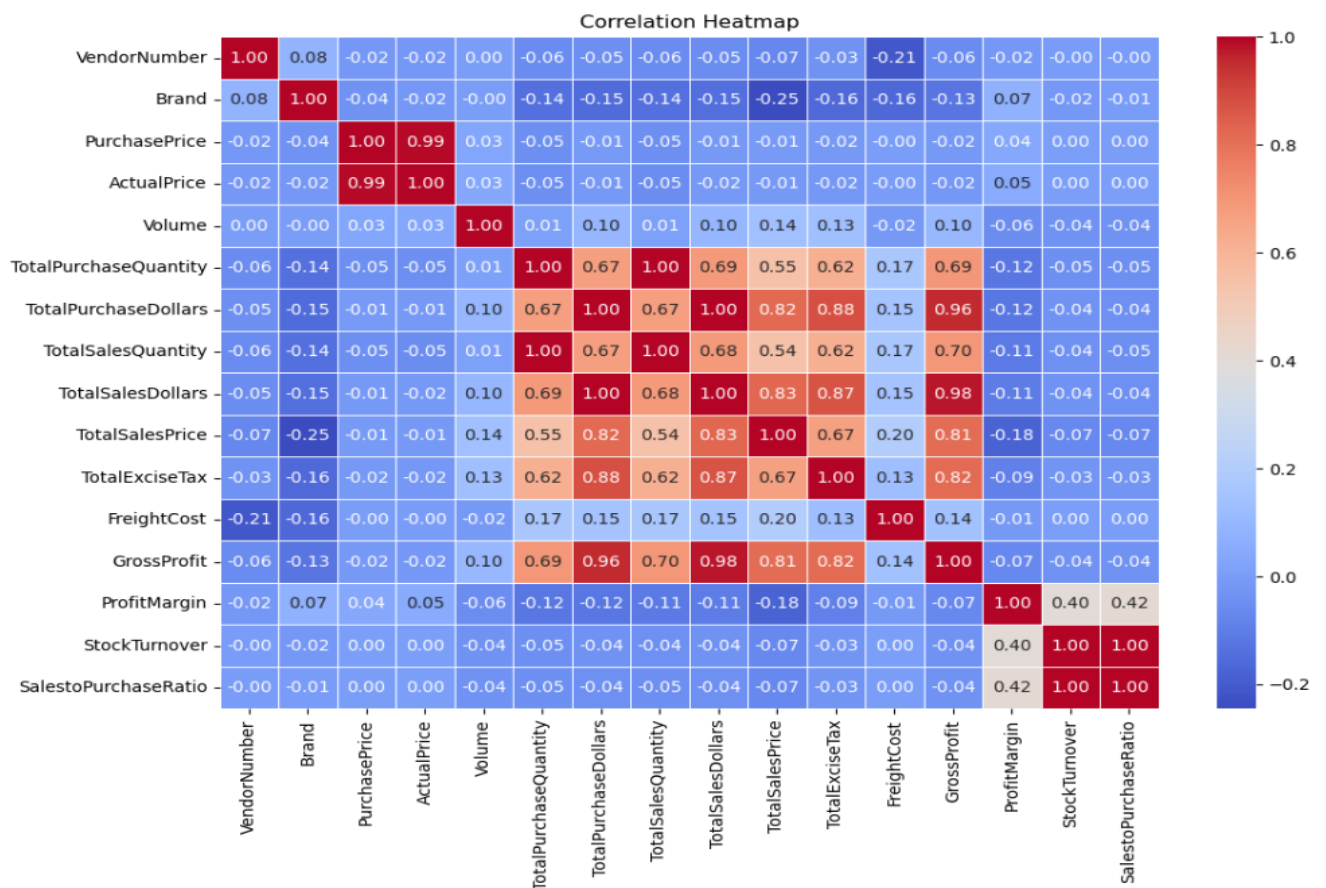
- 1.Purchase and actual price:** The maximum values (5.681.81 & 7.499.99) are significantly higher than the mean (24.39 & 35.64), indicating premium product offerings.
- 2.Freight Cost:** Extreme variation from 0.09 to 2.57,032.07 suggest logistics inefficiencies or bulk shipments or erratic shipping costs across different products.
- 3.Stock Turnover:** Ranges from 0 to 274.5 implying some product sell extremely fast while other 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 :

1. Gross Profit ≤ 0 (to exclude transaction leading to losses).
2. Profit Margin ≤ 0 (to ensure analysis focuses on profitable transaction).
3. Total Sales Quantity = 0 (to eliminate inventory that was never sold).

Correlation Insights



- Interpretation of Correlation insights:

1. Purchase Price vs Total Sales Dollars & Gross Profit: Weak correlation (-0.01 and -0.02), Indicating that price variation do not significantly impact sales revenue or profit.

2. Total Purchase Quantity vs Total Sales Quantity: Strong correlation (0.999), confirming efficient inventory turnover.

3. Profit Margin vs Total Sales Price: Negative correlation (-0.18), suggesting increasing sales price may lead to reduced margins, possibly due to competitive pricing pressures.

4. Stock Turnover vs. Gross Profit & Profit Margin: Weak negative correlation (-0.04 & 0.40), indicating that faster stock turnover does not necessarily equate to higher profitability.

Research Questions & Key Findings

1.Brands for Promotional or Pricing Adjustments

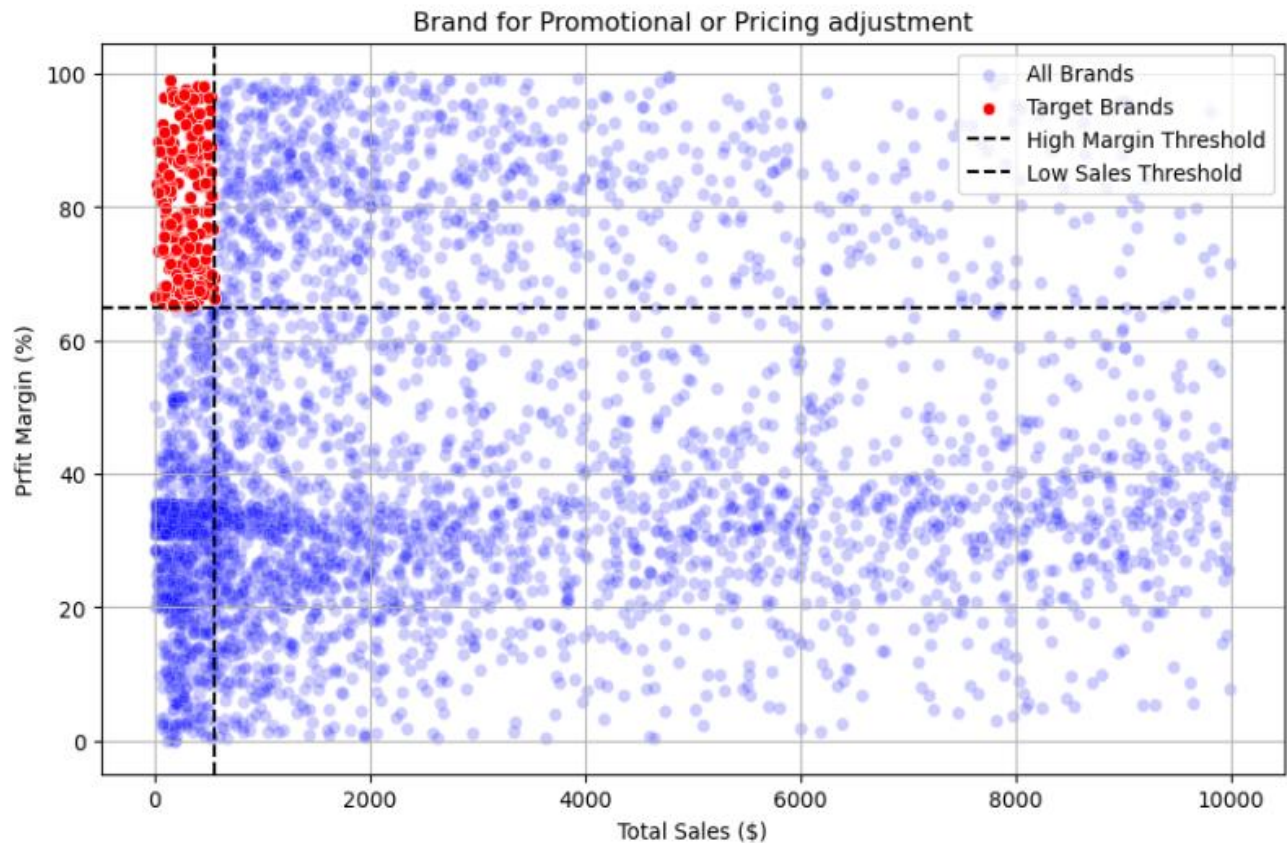
Brands with low sales and high profit margin:

	Description	TotalSalesDollars	ProfitMargin
6199	Santa Rita Organic Svcn 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

198 Brands exhibits sales but higher profit margin, which can be increased by promotions, targeted marketing or price optimisations to increase volume without compromising on profitability.

1.Brands for Promotional or Pricing Adjustment



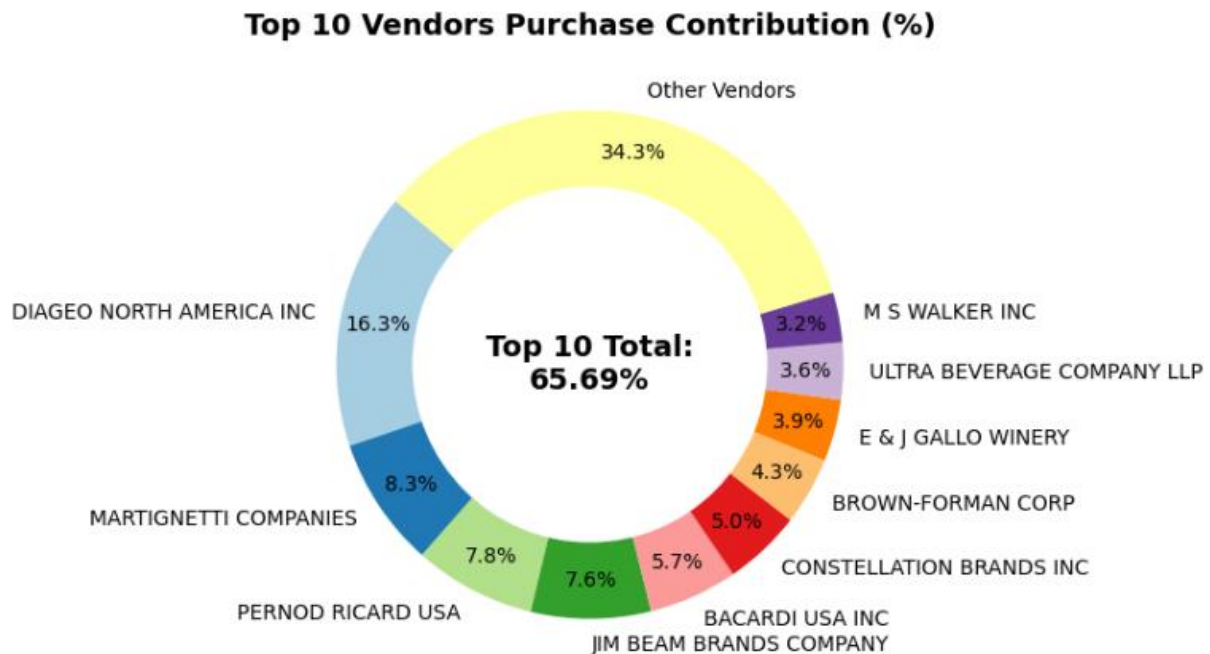
The scatter plot indicates that several brands (highlighted in red) have high profit margins but low total sales.

These brands represent potential targets for promotional or pricing adjustments — by reducing prices or increasing marketing efforts, their sales volume can be improved without severely impacting profitability.

Overall, the majority of brands cluster around moderate margins (20–60%) and medium-to-high sales, showing a stable market performance.

2. 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.



The purchasing trend suggests strong partnerships with globally recognized beverage brands, reflecting the company's alignment with premium suppliers; however, diversification into emerging or regional vendors could offer cost optimization and reduce supply risk.

3. Effects of bulk purchasing in reducing unit price and optimal purchase volume for cost saving.

Vendors buying in large quantities receive a 72% lower unit cost (\$10.78) per unit vs. higher unit cost in 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

4. Identifying Vendors with Low Inventory Turnover

Total Unsold Inventory Capital: \$2.71M

Slow-moving inventory increases storage costs, reduce cash flow efficiency, and affects overall profitability.

Identifying vendors with low inventory turnover enables better stock management, minimizing 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

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%

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.**
- **Revisit Pricing Strategies: Low-performing vendors with high profit margins should consider revising their pricing to improve competitiveness and boost sales volumes without compromising profitability.**

- **Strengthen Top Vendor Partnerships:** Collaborate with top-performing vendors to negotiate better contract terms, such as volume-based discounts or credit benefits, to slightly improve overall profit margins.
- **Adopt Data-Driven Vendor Segmentation:** Categorize vendors into clusters (e.g., “High Volume–Low Margin” and “Low Volume–High Margin”) to apply targeted strategies for improving both sales and profitability.
- **Benchmark and Share Best Practices:** Use operational benchmarks from top-performing vendors to help low-performing ones improve efficiency, pricing discipline, and market competitiveness.

Final Recommendations

1. Adopt a Data-Driven Decision Framework: Regularly evaluate vendor and brand performance metrics to ensure pricing, inventory, and sales strategies are aligned with business goals.

2. Strengthen Supplier Ecosystem: Build long-term relationships with high-performing vendors while onboarding new suppliers to increase competitiveness and reduce operational dependency.

3. Enhance Profitability through Product Mix Optimization: Focus on improving the contribution margin by promoting high-performing, fast-moving products and strategically managing low-margin inventory.

4. Implement Predictive Inventory Planning: Use historical sales and correlation insights to forecast demand and minimize excess stock or stockouts, improving overall supply chain responsiveness.

5. Invest in Brand and Channel Diversification: Expand marketing efforts and sales channels (online and offline) to capture untapped customer segments and stabilize revenue streams.

6. Monitor and Review Performance Continuously:

Establish a performance review system (monthly or quarterly) to track progress, identify inefficiencies, and adjust strategies proactively.