

Vendor Performance & Profitability Analysis

Business Problem:

The organization works with a **large vendor** supplying multiple brands and products. While overall revenue appears strong, management lacks clarity on:

- Which vendors truly **drive profitability**, not just revenue
- Whether the business is **over-dependent on a small set of vendors**
- Which vendors and brands are **eroding margins or locking capital in inventory**

Decisions related to procurement, vendor retention, and inventory allocation were being made **without a consolidated performance view**.

Project Objective:

1. Evaluate vendor performance using **sales, purchase cost, profit margin, and inventory efficiency**
2. Identify **top-performing vendors** and **low-performing vendors**
3. Identify **target** brands that needs promotional or pricing adjustments which exhibit **lower sales** performance but higher **profit margins**
4. Highlight **inventory and unsold capital risks**
5. Provide **actionable business recommendations** for procurement and management teams

Data Overview:

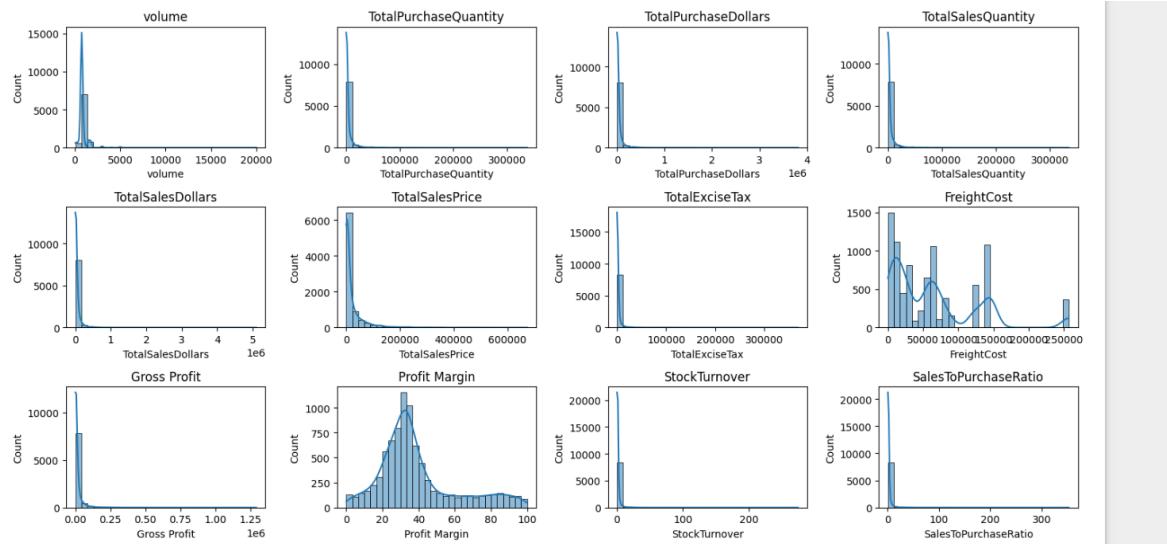
- **Dataset:** Vendor-level sales summary
- **Granularity:** Vendor × Brand × Product
- **Key Metrics:**
 - Total Sales & Purchase
 - Gross Profit & Profit Margin
 - Stock Turnover
 - Unsold Inventory Capital
- **Vendors:** 8,000+ vendors



Exploratory Data Analysis (EDA) Insights

SUMMARY STATISTICS

	count	mean	std	min	25%	50%	75%	max
VendorNumber	8566.0	1.010616e+04	17633.844417	2.000000e+00	3664.000000	7153.000000	9552.000000	2.013590e+05
Brand	8566.0	1.761224e+04	12945.824030	5.800000e+01	5375.250000	17598.500000	24934.750000	9.063100e+04
PurchasePrice	8566.0	2.177682e+01	81.180609	0.000000e+00	6.660000	10.060000	17.842500	3.352930e+03
Actual_Price	8566.0	3.229144e+01	112.408353	0.000000e+00	9.990000	14.990000	25.990000	4.559990e+03
volume	8566.0	8.643931e+02	724.189140	5.000000e+01	750.000000	750.000000	750.000000	2.000000e+04
TotalPurchaseQuantity	8566.0	3.771366e+03	12275.608628	1.000000e+00	42.000000	431.000000	2665.250000	3.376600e+05
TotalPurchaseDollars	8566.0	3.587890e+04	136708.128544	0.000000e+00	545.422500	5011.660000	26597.997500	3.811252e+06
TotalSalesQuantity	8566.0	3.748312e+03	12124.366939	1.000000e+00	62.000000	490.500000	2674.750000	3.349390e+05
TotalSalesDollars	8566.0	5.154174e+04	186051.275079	1.980000e+00	1351.760000	8483.780000	40640.237500	5.101920e+06
TotalSalesPrice	8566.0	2.276104e+04	49301.813941	9.900000e-01	584.670000	4549.755000	22595.517500	6.728193e+05
TotalExciseTax	8566.0	2.182458e+03	12224.516135	1.000000e-01	9.450000	84.810000	595.405000	3.682428e+05
FreightCost	8566.0	6.343769e+04	62266.536737	9.000000e-02	14836.570000	55551.820000	89286.270000	2.570321e+05
Gross Profit	8566.0	1.566284e+04	51006.319043	2.842171e-14	491.580000	3087.050000	12467.760000	1.290668e+06
Profit Margin	8566.0	3.872562e+01	21.385859	1.367480e-14	25.929296	33.358949	44.133270	1.000000e+02
StockTurnover	8566.0	2.031757e+00	6.685495	4.285714e-01	0.945233	1.000000	1.120484	2.745000e+02
SalesToPurchaseRatio	8566.0	inf	NaN	1.000000e+00	1.350061	1.500577	1.789974	inf
UnitPurchasePrice	8566.0	2.177682e+01	81.180609	0.000000e+00	6.660000	10.060000	17.842500	3.352930e+03
UnsoldInventoryValue	8566.0	3.161623e+02	6032.736739	-1.855908e+05	-357.520000	0.000000	516.945000	1.697857e+05



Negative & Zero Values

Gross Profit:

Minimum value of **-52,002.78**, indicating potential losses due to high costs or heavy discounts. This may occur when products are sold at prices lower than their purchase costs.

Profit Margin:

Has a minimum value of $-\infty$ (**negative infinity**), which suggests cases where revenue is zero or lower than the total cost, resulting in extremely negative profit margins.

Total Sales Quantity & Total Sales Dollars:

Some products show **zero sales**, indicating they were purchased but never sold. These may represent slow-moving or obsolete inventory, leading to inventory inefficiencies.

Outliers Detected by High Standard Deviations

Purchase Price & Actual Price:

The maximum values (**5,681.81** and **7,499.99**) are significantly higher than their respective means (**24.39** and **35.64**), indicating the presence of premium or high-value product offerings.

Freight Cost:

Shows extreme variation, ranging from **0.09** to **257,032.07**, indicating potential logistics inefficiencies, bulk shipment effects, or highly inconsistent shipping costs across different products.

Stock Turnover:

Ranges from **0** to **274.5**, suggesting that while some products sell very quickly, others remain unsold for extended periods. A value greater than **1** indicates that sales exceeded the purchased quantity, likely due to fulfillment from older inventory stock.

Data Filtering

To improve the reliability of the analysis, inconsistent data points were removed based on the following criteria:

- **Gross Profit ≤ 0** — Excluded transactions that resulted in losses.
- **Profit Margin ≤ 0** — Ensured the analysis focused only on profitable transactions.
- **Total Sales Quantity = 0** — Removed inventory items that were purchased but never sold.

Correlation Analysis Insights

Purchase Price vs. Total Sales Dollars & Gross Profit:

Shows a weak negative correlation (**-0.012** and **-0.016**), indicating that variations in purchase price do not significantly influence sales revenue or gross profit.

Total Purchase Quantity vs. Total Sales Quantity:

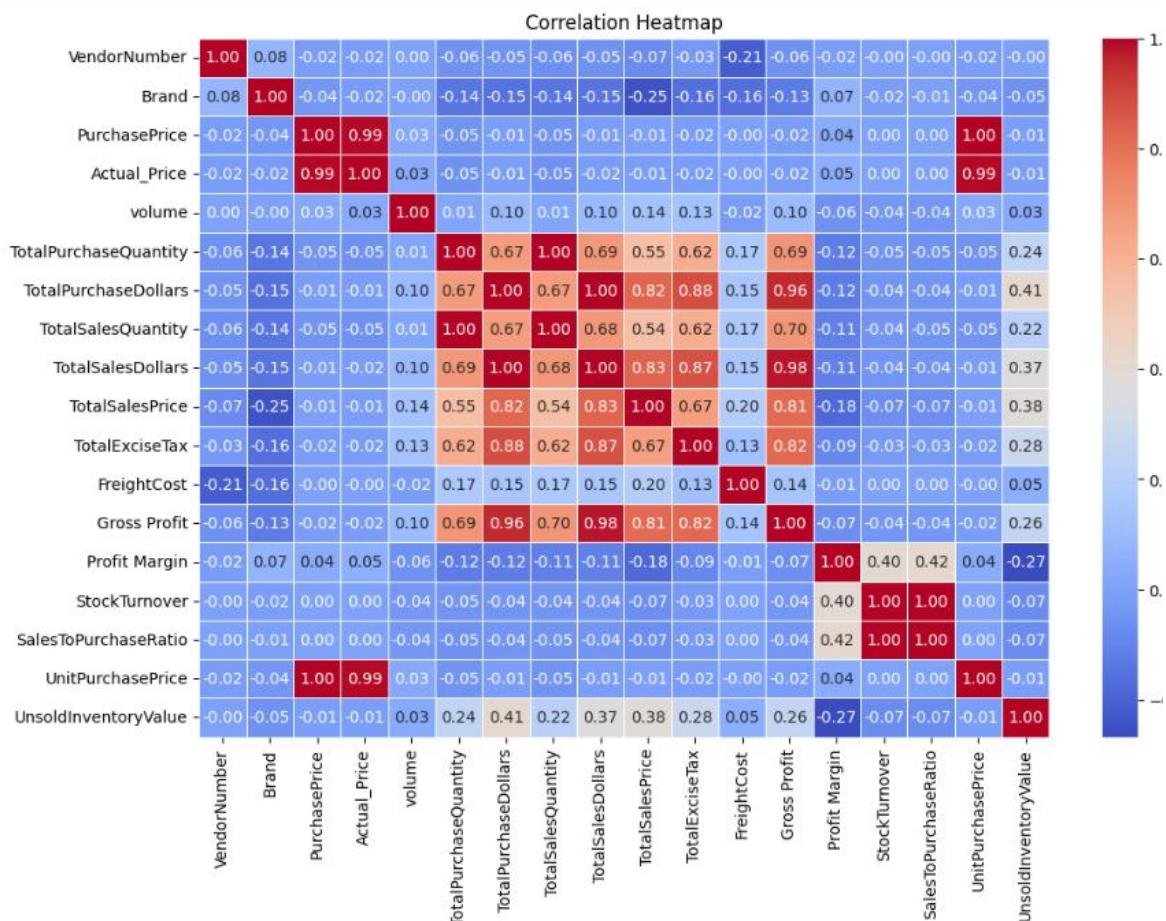
Exhibits a strong positive correlation (**0.999**), confirming efficient inventory movement and alignment between purchasing and sales volumes.

Profit Margin vs. Total Sales Price:

Demonstrates a negative correlation (**-0.179**), suggesting that increases in sales price may be associated with reduced margins, potentially due to competitive pricing pressures or discounting strategies.

Stock Turnover vs. Gross Profit & Profit Margin:

Shows weak negative correlations (**-0.038** and **-0.055**), indicating that faster inventory turnover does not necessarily translate into higher profitability.



Research Questions & Key Findings

1. Brands for promotion or Pricing Adjustments

brands with low sales but high profit Margins:

	Description	Total Sales Dollars	Profit Margin
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

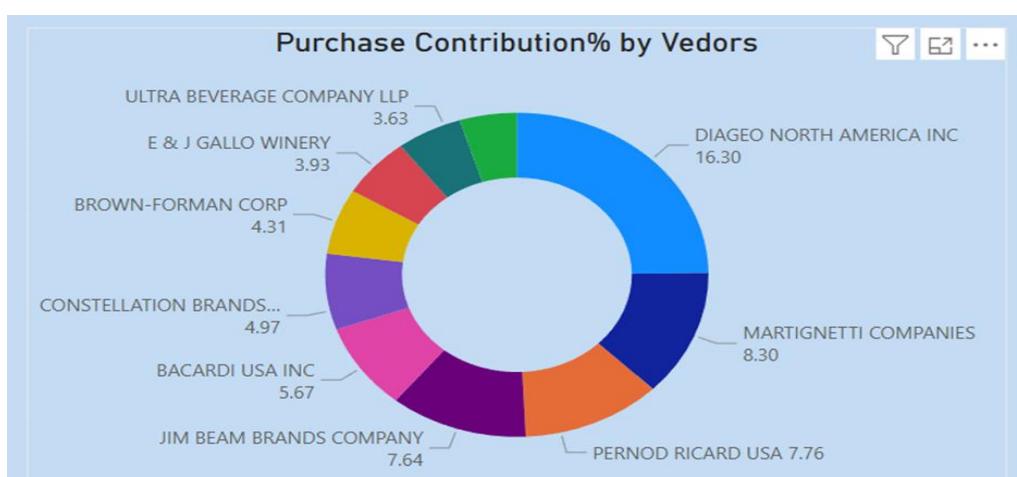
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Insight:

198 brands exhibit lower sales volumes but higher profit margins. These brands present an opportunity for **targeted marketing, selective promotions, or pricing optimization** to increase sales volume while preserving profitability.

2. Top Vendors by Sales & Purchase Contribution

The **top 10 vendors** account for **65.69%** of total purchases, while the remaining vendors contribute only **34.31%**. This heavy dependence on a small vendor group increases exposure to **supply chain disruptions and vendor concentration risk**, highlighting the need for **supplier diversification**.



3. Impact of Bulk Purchasing on Cost Savings

Vendors purchasing in large quantities achieve an average **72% lower unit cost (\$10.78 per unit)** compared to higher unit costs associated with smaller orders.

Bulk pricing strategies incentivize larger purchase volumes, increasing overall sales while maintaining profitability.

OrderSize	TotalPurchaseQuantity
0	large
1	large
2	large
3	large
4	large
...	...
8561	Small
8562	Small
8563	Small
8564	Small
8565	large

8566 rows × 2 columns

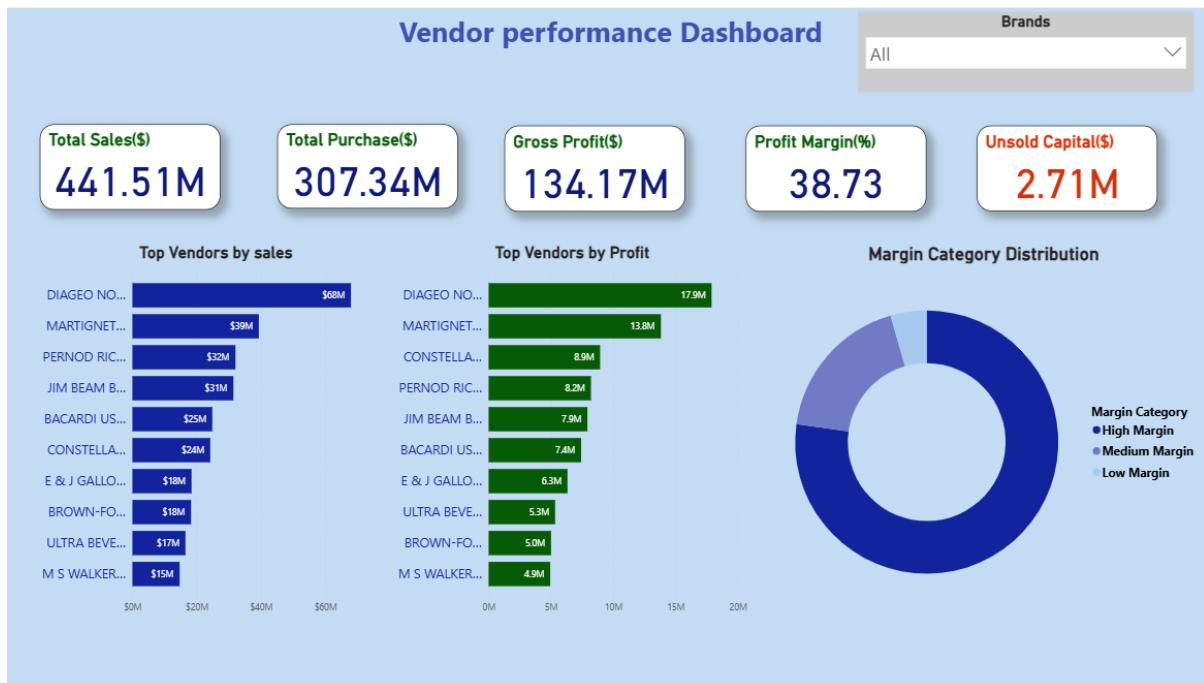
4. Identifying Vendors with Low Inventory Turnover

Total Unsold Inventory Capital: \$2.71M

Slow-moving inventory increases storage and holding costs, reduces cash-flow efficiency, and negatively impacts overall profitability.

Identifying vendors with low inventory turnover supports improved stock planning and replenishment decisions, helping minimize financial strain and working-capital lock-in.

StockTurnover	VendorName	UnsoldInventoryValue
ALISA CARR BEVERAGES	0.615385	\$722,209.05
HIGHLAND WINE MERCHANTS LLC	0.708333	\$554,665.63
PARK STREET IMPORTS LLC	0.751306	\$470,625.61
Circa Wines	0.755676	\$401,960.83
Dunn Wine Brokers	0.766022	\$228,282.61
CENTEUR IMPORTS LLC	0.773953	\$198,436.41
SMOKY QUARTZ DISTILLERY LLC	0.783835	\$177,733.74
TAMWORTH DISTILLING	0.797078	\$133,617.62
THE IMPORTED GRAPE LLC	0.807569	\$126,477.70
WALPOLE MTN VIEW WINERY	0.820548	\$118,598.15



Final Recommendations

- Re-evaluate pricing strategies for low-sales, high-margin brands to drive higher sales volumes while preserving overall profitability.

- Diversify vendor partnerships to reduce dependency on a small set of suppliers and mitigate supply-chain risk.
- Leverage bulk-purchasing advantages to maintain competitive pricing while improving inventory efficiency.
- Optimize slow-moving inventory by adjusting purchase quantities, initiating clearance strategies, or revising storage and holding approaches.
- Enhance marketing and distribution efforts for low-performing vendors to increase sales volumes without eroding profit margins.
- By implementing these recommendations, the company can improve long-term profitability, reduce operational and supply-chain risks and enhance overall operational efficiency.