Executive Summary

Vendor Sales Performance & Inventory Optimization Analysis (2024–2025)

Business Context

Retail profitability is influenced by vendor concentration, purchasing strategy, pricing discipline, and inventory efficiency. Leadership requires clarity on which vendors drive value, where capital is being inefficiently deployed, and how purchasing behavior impacts margins and cash flow. This analysis evaluates sales, purchases, vendor performance, and inventory dynamics to support data-driven decisions that improve profitability and operational efficiency.

Key Business Questions

- Which vendors and brands are underperforming and require intervention?
- How concentrated is revenue and profit across vendors?
- Does bulk purchasing meaningfully reduce unit costs?
- How efficiently is inventory being converted into sales?
- Are profit margin differences between vendors statistically and practically meaningful?

Key Findings

- Vendor Concentration Risk
  - The top 10 vendors contribute 65.69% of total purchase value, indicating a high dependency on a small vendor subset.
  - This concentration increases exposure to supplier pricing changes, disruptions, and negotiation leverage imbalance.
- Purchasing Strategy Drives Material Cost Savings
  - Bulk purchasing results in approximately 72% lower unit costs compared to small-order purchases.
  - Cost reductions remain meaningful after accounting for purchase prices and freight, suggesting economies of scale materially improve margins when demand is predictable.
- Inventory Inefficiency Ties Up Significant Capital
  - Approximately $2.71M is locked in unsold inventory, reflecting slow-moving or overstocked products.
  - Several vendors show low stock turnover despite consistent purchasing volume, increasing holding costs and cash flow pressure.
- Revenue Does Not Equal Profitability
  - High-revenue vendors tend to operate at lower profit margins, while lower-revenue vendors maintain higher margins.

    - This indicates potential premium pricing, better cost control, or lower operational complexity among smaller vendors.
- Meaningful Profit Margin Differences Across Vendor Tiers
    - Hypothesis testing confirms a statistically and practically meaningful difference in mean profit margins between top-performing and low-performing vendors.
    - The effect size suggests margin variance is large enough to justify differentiated vendor strategies rather than uniform pricing or purchasing policies.

Recommendations

- Diversify Vendor Exposure Strategically
    - Reduce over-reliance on top vendors by identifying mid-tier vendors with strong margins and acceptable volume scalability.
    - This balances supply-chain risk without materially sacrificing profitability.
- Expand Bulk Purchasing Where Demand Is Stable
    - Increase bulk buying for high-turnover products with predictable demand to capture unit-cost savings.
    - Pair this with tighter demand forecasting to avoid excess inventory accumulation.
- Actively Optimize Inventory for Low-Turnover Vendors
    - Reassess reorder quantities, pricing, or promotional strategies for vendors contributing disproportionately to unsold inventory.
    - Prioritize liquidation or pricing adjustments for products with persistently low stock turnover.

Expected Business Impact

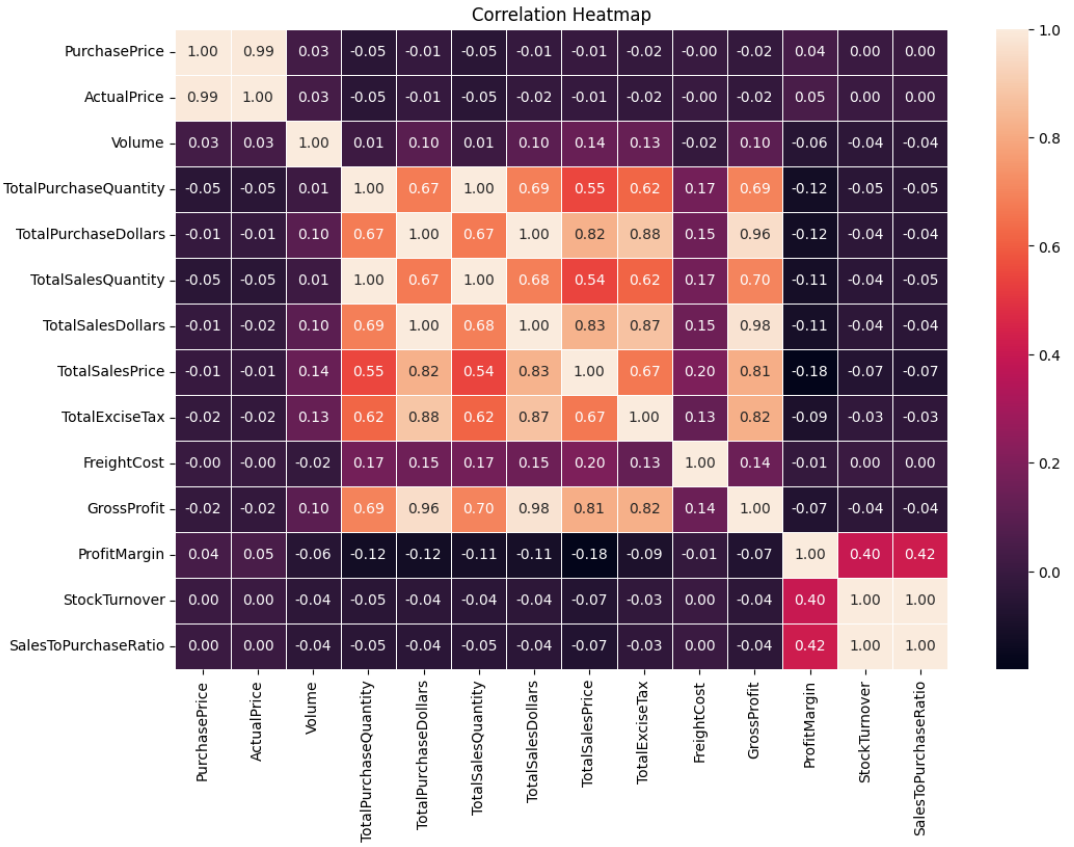
- Margin Improvement: Lower unit costs and improved vendor mix can lift gross margins without increasing sales volume.
- Cash Flow Optimization: Reducing excess inventory unlocks up to $2.71M in working capital.
- Risk Reduction: Decreased vendor concentration improves supply-chain resilience.
- Operational Efficiency: Data-driven purchasing and inventory policies reduce holding costs and improve turnover.

Analytical Foundation

- Large-scale transactional data (12.8M+ sales records) integrated using BigQuery and dbt.
- Medallion architecture ensuring data reliability and analytics-ready models.

- Business KPIs engineered and validated via dbt data quality tests.
- Statistical testing applied to ensure insights are meaningful, not just significant.

Data Analysis

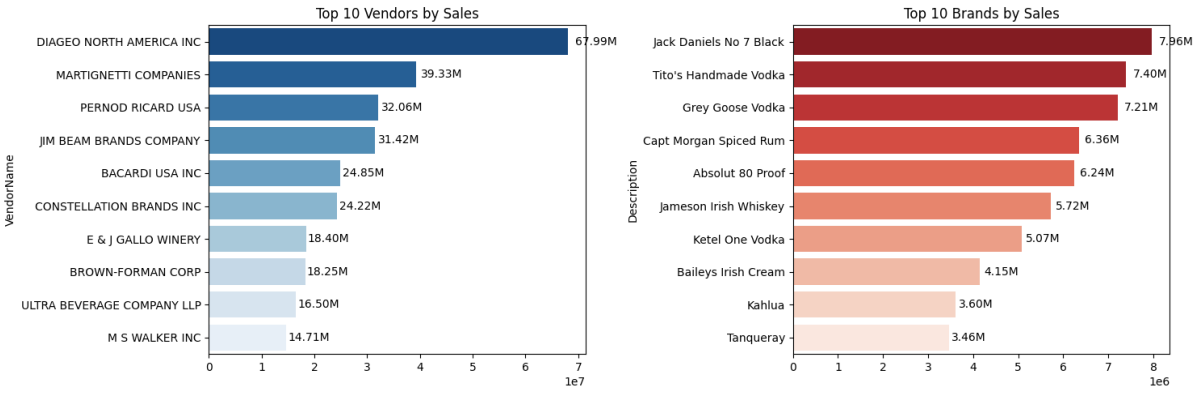


- PurchasePrice has weak correlations with TotalSalesDollars (-0.012) and GrossProfit(-0.016), suggesting that price variations do not significantly impact sales revenue or profit.
- Strong correlation between total purchase quantity and total sales quantity (0.999), confirming efficient inventory turnover.
- Negative correlation between profit margin & total sales price (-0.179), suggests that as sales price increases, margins decreases, possibly due to competitive pricing pressures.
- StockTurnover has weak negative correlations with both GrossProfit(-0.038) and ProfitMargin(-0.055), indicating that faster turnover does not necessarily result in higher profitability.

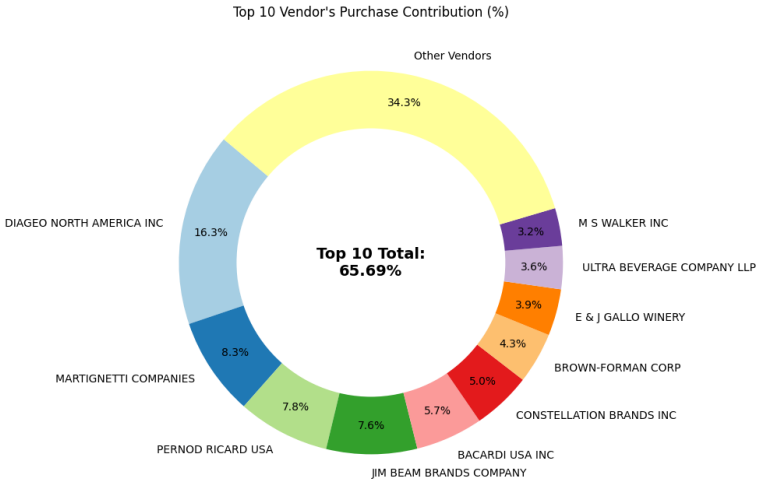
Identify Brands that need Promotional or Pricing Adjustments which exhibit lower sales performance but higher profit margins.

	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 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

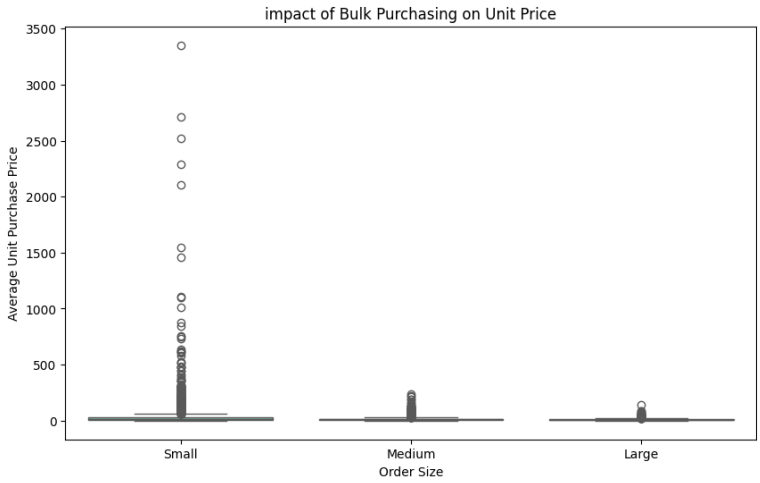
Which Vendors and brands demonstrate the highest sales performance?



Which Vendors contribute the most to total purchase dollars?



Does purchasing in bulk reduce the unit price, and what is the optimal purchase volume for cost savings?



- Vendors buying in bulk get the lowest unit price ($10.78 per unit), meaning higher margins if they can manage inventory efficiently.
- The price difference between small and large orders is substantial (~72% reduction in unit cost).
- This suggests that bulk pricing strategies successfully encourages vendors to purchase in larger volumes, leading to higher overall sales despite lower per-unit revenue.

Which vendors have low inventory turnover, indicating excess stock and slow-moving products?

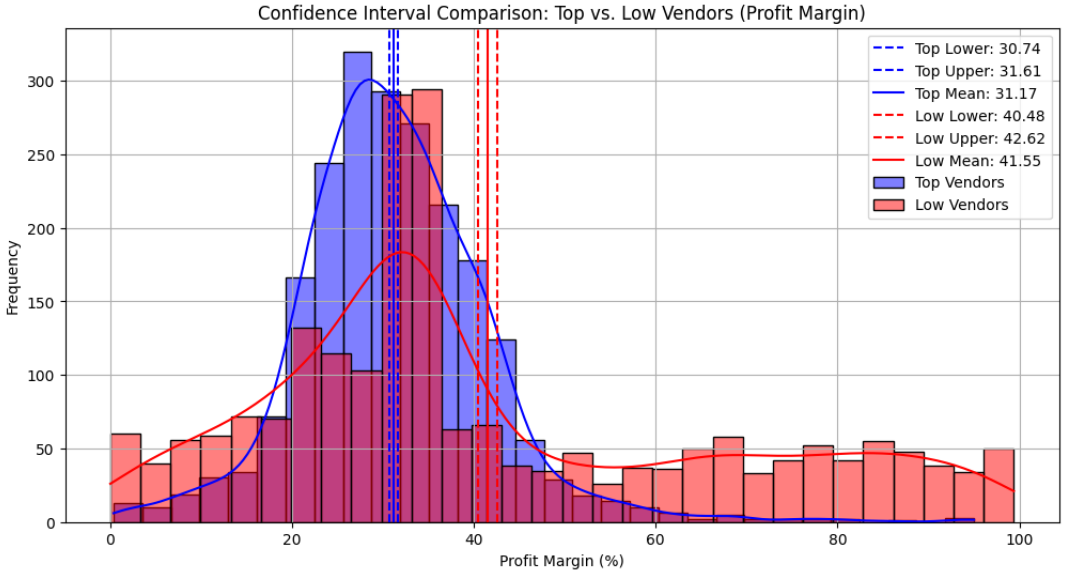
VendorName	StockTurnover
ALISA CARR BEVERAGES	0.615385
HIGHLAND WINE MERCHANTS LLC	0.708333
PARK STREET IMPORTS LLC	0.751306
Circa Wines	0.755676
Dunn Wine Brokers	0.766022
CENTEUR IMPORTS LLC	0.773953
SMOKY QUARTZ DISTILLERY LLC	0.783835
TAMWORTH DISTILLING	0.797078
THE IMPORTED GRAPE LLC	0.807569
WALPOLE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

How much capital is locked in unsold inventory per vendor, and which vendors contribute the most to it?

Total Unsold Capital: 2.71M

	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

What is the 95% confidence intervals for profit margins of top-performing and low-performing vendors?



- The confidence interval for low-performing vendors (40.48% to 42.62%) is significantly higher than that of top-performing vendors (30.74% to 31.61%).
- This suggests that vendors with lower sales tend to maintain higher profit margins, potentially due to premium pricing or lower operational costs.
- For High-Performing Vendors: If they aim to improve profitability, they could explore selective price adjustments, cost optimization, or bundling strategies.
- For Low-Performing Vendors: Despite higher margins, their low sales volume might indicate a need for better marketing, competitive pricing, or improved distribution strategies.

Is there a significant difference in profit margins between top-performing and low-performing vendors?

Vendors were segmented into performance tiers based on total sales volume, with top- and low-performing vendors defined as those in the upper and lower quartiles of total sales, respectively. Differences in profit margins between these groups were evaluated using an independent two-sample Welch t-test, which is robust to unequal variances.

The analysis indicates a statistically significant difference in mean profit margins between top- and low-performing vendors ($t = -17.64$, $p < 0.001$). The negative test statistic indicates that top-performing vendors exhibit lower average profit margins than low-performing vendors, suggesting a trade-off between sales volume and margin efficiency.

This result highlights that higher sales performance does not necessarily correspond to higher profitability on a per-unit basis and may reflect pricing strategy, cost structure, or competitive dynamics among high-volume vendors.