

# Vendor Performance Analysis Report

## 📊 Exploratory Data Analysis (EDA)

### 🔢 Summary Statistics: Numerical Columns

A descriptive overview of the main numerical variables:

- **Negative Values & Zero Sales:** Some records show negative gross profit and margins, indicating losses or zero revenue. A few products have zero sales quantities or dollars, suggesting unsold or obsolete inventory.
- **High-Value Outliers:** Extremely high purchase and sales prices (up to \$5,681 and \$4,696) reveal the presence of premium items. Freight cost variability suggests shipment or logistics inconsistencies.
- **Inventory Movement Variance:** Stock turnover ranges from 0 to 344, showing both stagnant and fast-moving products. Sales-to-purchase ratio as high as ~480 highlights legacy stock sales or data recording anomalies.

	count	mean	std	min	25%	50%	75%	max
PurchasePrice	245396.0	15.288201	43.408284	0.36	6.53	9.69	16.270	5681.81
TotalPurchaseQuantity	245396.0	136.849672	324.251387	1.00	21.00	48.00	130.000	12705.00
TotalPurchaseDollars	245396.0	1311.760442	3844.374129	0.64	219.48	502.55	1180.370	248593.01
TotalFreightCost	245396.0	73773.995618	68439.329795	0.09	16978.67	61966.91	123780.220	257032.07
AvgSalesPrice	245396.0	20.265091	38.428978	0.00	9.92	13.99	21.990	4696.99
TotalSalesQuantity	245396.0	132.752192	320.166036	0.00	17.00	48.00	127.000	12552.00
TotalSalesDollars	245396.0	1815.695911	5228.395499	0.00	273.80	681.68	1664.975	312513.46
TotalExciseTax	245396.0	76.879979	329.543730	0.00	3.59	12.44	44.150	18389.61
GrossProfit	245396.0	556.689657	1491.098921	-4431.90	79.64	209.56	527.310	82550.22
GrossProfitMargin	245396.0	30.641452	10.217025	-174.58	26.09	31.86	36.180	84.15
StockTurnover	245396.0	1.085713	2.672578	0.00	0.83	0.99	1.040	344.00
SalesToPurchaseRatio	245396.0	1.601398	3.731363	0.00	1.17	1.41	1.620	479.74

## 6 Categorical Columns Summary (Key Insights)

- **Vendors:** 128 unique vendors; **MARTIGNETTI COMPANIES** is the most prominent, suggesting strong distribution presence.
- **Stores:** 80 unique store numbers; **Store No. 50** has the highest activity, likely due to high sales volume or size.
- **Cities:** 68 cities covered; **MOUNTMEND** leads in transaction volume, hinting at either multiple stores or a major retail hub.
- **Products:** 9,651 unique product descriptions; **Southern Comfort** is the most frequently sold, indicating wide popularity.

	count	unique		top	freq
<b>VendorNumber</b>	245396	126		4425	24503
<b>VendorName</b>	245396	128	MARTIGNETTI COMPANIES	24503	
<b>Brand</b>	245396	10663		5299	156
<b>Description</b>	245396	9651	Southern Comfort	715	
<b>Store</b>	245396	80		50	7664
<b>City</b>	245396	68	MOUNTMEND	19297	

## Detailed Analysis Topics and Insights

### 1. Top Vendors Performance Ranking

Vendors were ranked based on Total Purchase, Total Sales, Stock Turnover, and Gross Profit. Top 5 vendors include:

- **DIAGEO NORTH AMERICA INC**
- **MARTIGNETTI COMPANIES**
- **PERNOD RICARD USA**
- **JIM BEAM BRANDS COMPANY**
- **CONSTELLATION BRANDS INC**

All have purchases > \$15M, sales > \$24M, and gross profit > \$9M.

VendorName	Total_Purchase	Total_Sales	Stock_Turnover	Gross_Profit	Final_Rank
DIAGEO NORTH AMERICA INC	50.96M	68.43M	1.18	18.68M	25.00
MARTIGNETTI COMPANIES	27.86M	40.00M	1.05	13.70M	51.00
CONSTELLATION BRANDS INC	15.57M	24.31M	1.07	9.07M	55.00
PERNOD RICARD USA	24.12M	32.13M	1.11	8.67M	40.00
BACARDI USA INC	17.62M	24.81M	1.59	7.07M	23.00

### 2. Brand-Level Insights

Top brands based on performance ranking include:

- **Jack Daniels Tennessee Fire, Liberty School Cab Svn, Dom Perignon, J Lohr Seven Oaks Cab Svn, Banfi Chianti Clsc RSV**

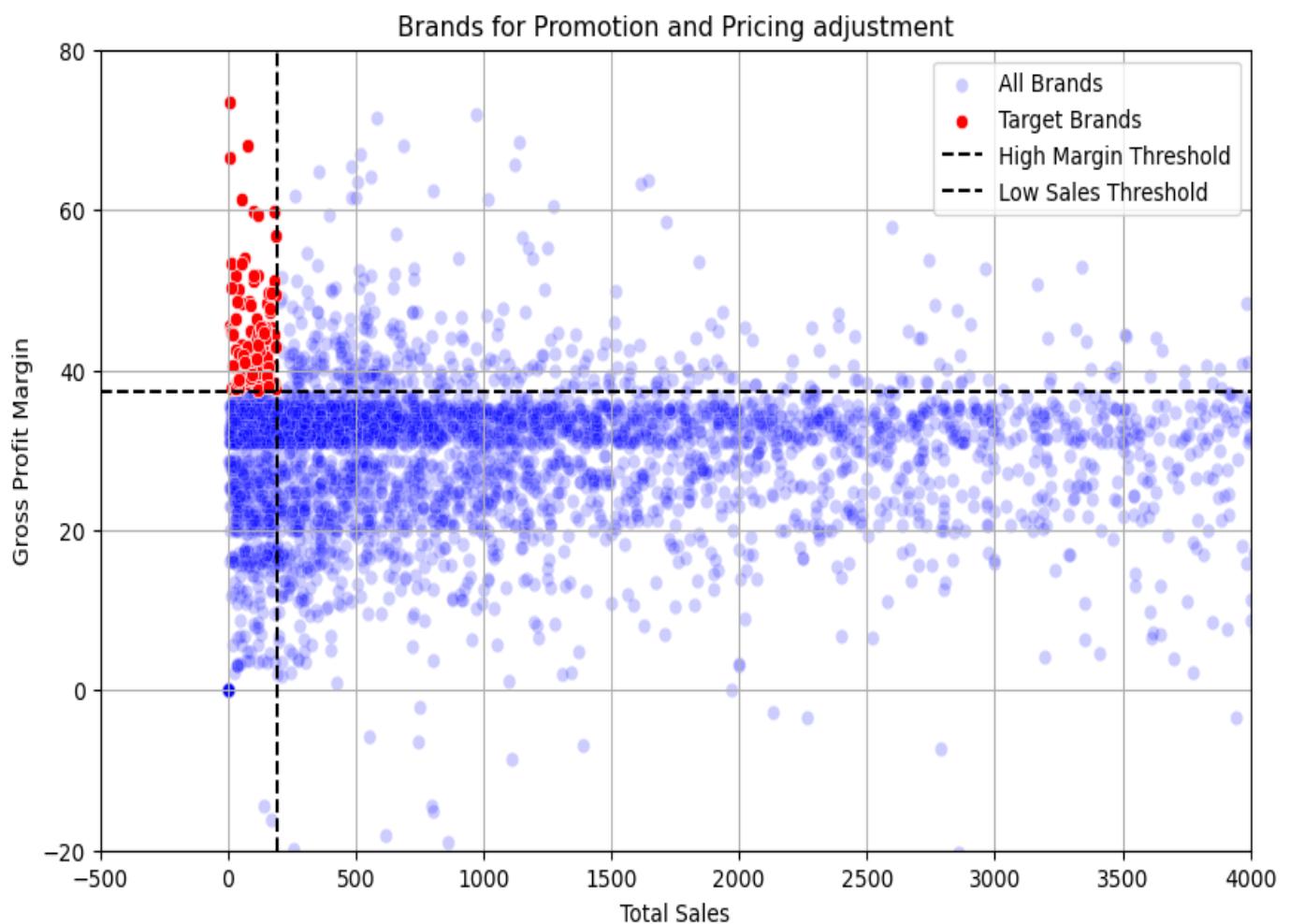
All of them show stock turnover > 1.5 and profit margins > 39%.

Description	Total_Purchases	Total_Sales	Stock_Turnover	Profit_Margin	Total_Score
Jack Daniels Tennessee Fire	307995.09	462598.86	1.802792	51.224351	1178.0
Liberty School Cab Svn	133564.14	232587.36	1.966702	42.920106	1877.0
Dom Perignon	395736.96	588733.77	1.506316	39.095789	2259.0
J Lohr Seven Oaks Cab Svn	225660.47	454423.47	1.135140	44.587477	2388.0
Banfi Chianti Clsc RSV	133201.44	219699.09	1.665750	39.927625	2490.0

### 3. Low Volume, High Margin Brands

Brands like **Concannon Glen Ellen Wh Zin**, **Santa Rita Organic Svn Bl**, and **Cherry On Top Sweet White** have low sales (< \$15) but very high profit margins (> 40%), indicating pricing/promotion opportunities.

	Description	TotalSalesDollars	GrossProfitMargin
<b>2537</b>	Concannon Glen Ellen Wh Zin	9.98	73.55
<b>7777</b>	Santa Rita Organic Svn Bl	9.99	66.47
<b>1448</b>	Camelot Chard	9.99	45.55
<b>2284</b>	Cherry On Top Sweet White	12.99	45.03
<b>8191</b>	Snoqualmie Cabernet/Merlot	12.99	50.35

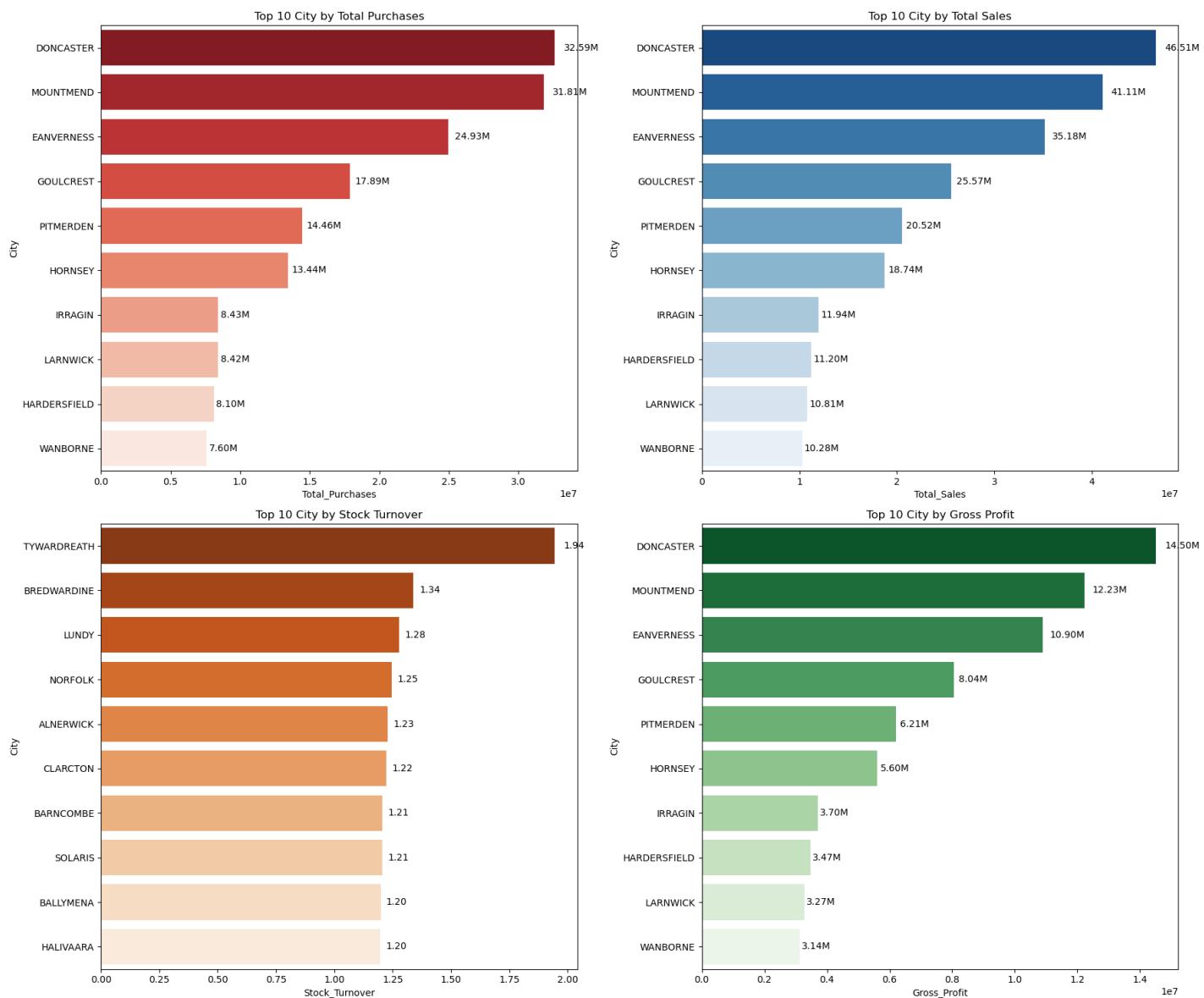


## 4. City-wise Analysis

Cities like **Doncaster**, **Eanverness**, and **Goulcrest** dominate in all KPIs:

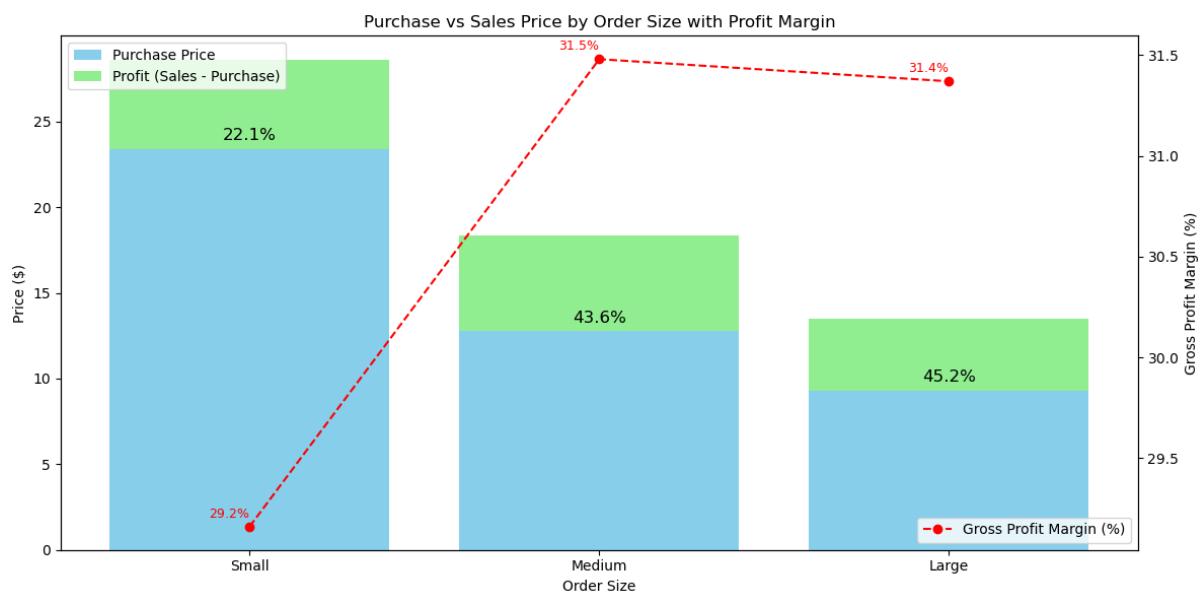
- Purchases > \$17M, Sales > \$25M, Profit > \$8M, Stock Turnover > 1.15

City	Total_Purchases	Total_Sales	Stock_Turnover	Gross_Profit	Final_Rank
DONCASTER	32.59M	46.51M	1.17	14.50M	21.00
EANVERNESS	24.93M	35.18M	1.18	10.90M	22.00
GOULCREST	17.89M	25.57M	1.17	8.04M	28.00



## 5. 📦 Order Size Insights (Key Takeaways)

- **Small Orders:** Least efficient — highest purchase costs and lowest margins (~29%), limiting profitability despite higher sales prices.
- **Medium Orders:** Most profitable — best balance of cost and price, yielding the **highest average profit margin (~31.5%).**
- **Large Orders:** Highly profitable — lowest unit costs with solid margins (~31.4%), ideal for scaling revenue through bulk sales.



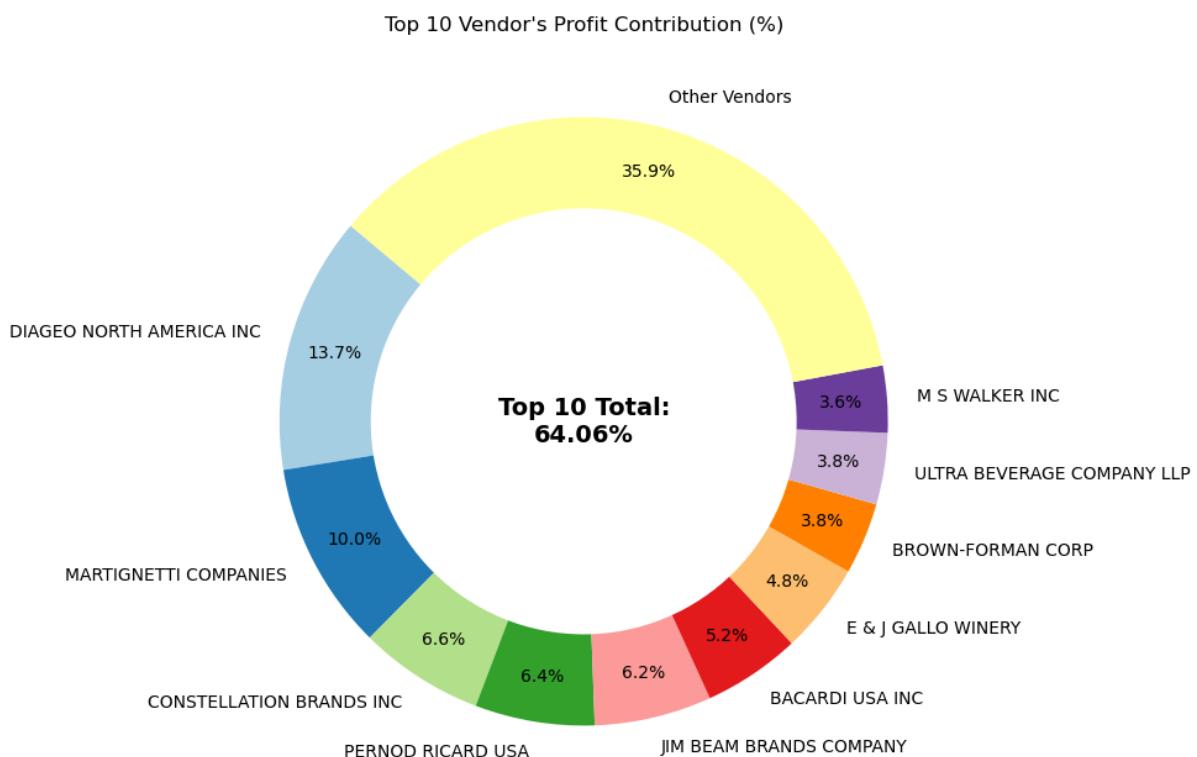
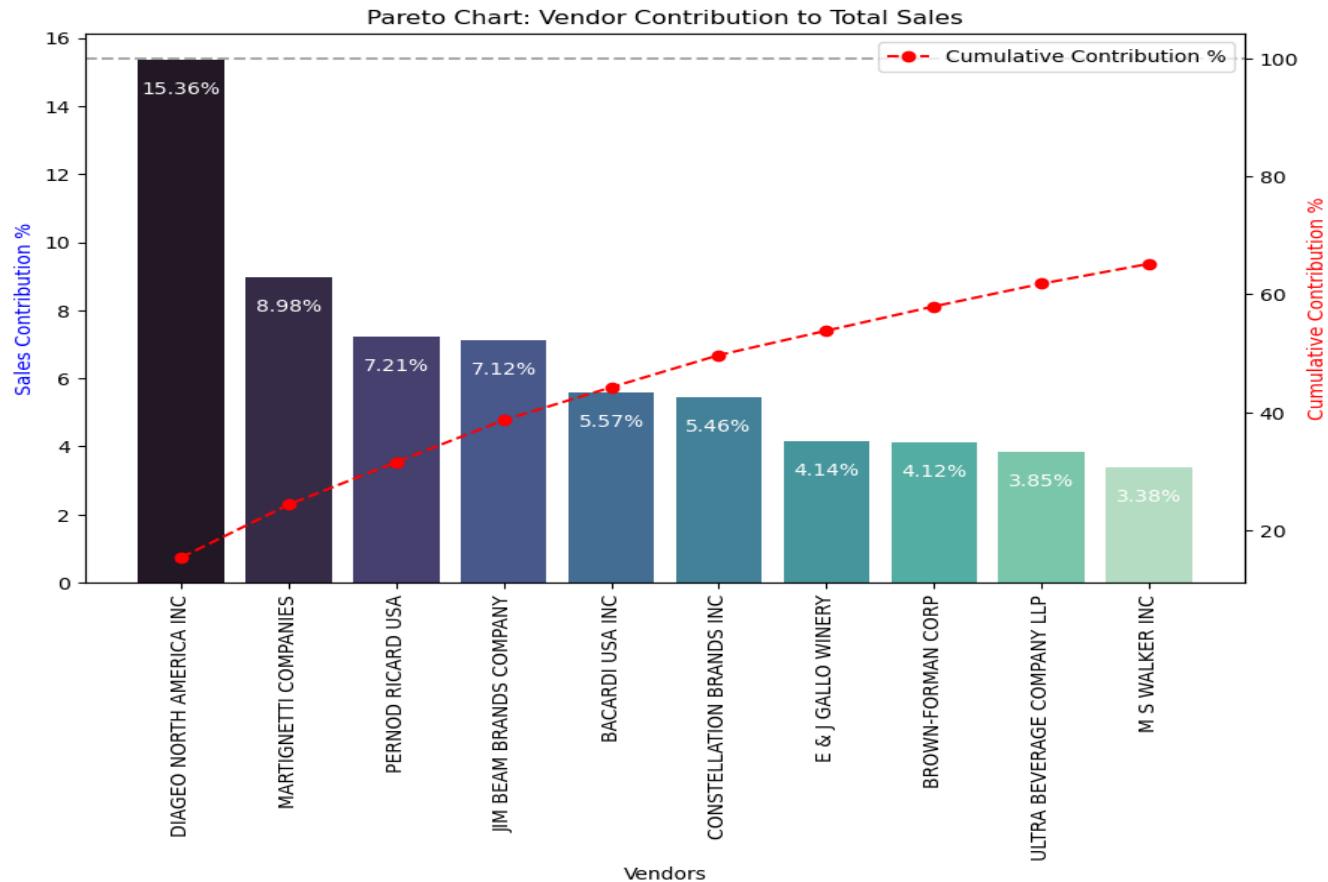
## 6. Unsold Capital by Vendor

- **MARTIGNETTI COMPANIES** has the highest unsold capital at \$2.86M.
- Followed by **DIAGEO NORTH AMERICA INC** and **ULTRA BEVERAGE COMPANY LLP**.

VendorName	TotalPurchaseQuantity	TotalSalesQuantity	Unsold_Capital
<b>MARTIGNETTI COMPANIES</b>	2.64M	2.54M	2.86M
<b>DIAGEO NORTH AMERICA INC</b>	5.46M	5.40M	2.76M
<b>ULTRA BEVERAGE COMPANY LLP</b>	1.08M	1.01M	1.96M
<b>JIM BEAM BRANDS COMPANY</b>	2.74M	2.62M	1.64M
<b>PERNOD RICARD USA</b>	1.65M	1.61M	1.28M

## 7. Gross Profit Contribution & Pareto Analysis

- Top 10 vendors contribute over **60%** of total sales and gross profit.
- Pareto distribution shows concentration of profits among a few vendors.



## 8. Confidence Interval Analysis Summary: Top vs. Low Vendors

### 1. Confidence Interval Comparison

The 95% confidence interval for **Top Vendors** (31.44% – 31.56%) is **higher** than that of **Low Vendors** (28.15% – 28.36%), indicating a clear difference in average profit margins.

### 2. Sales & Margin Relationship

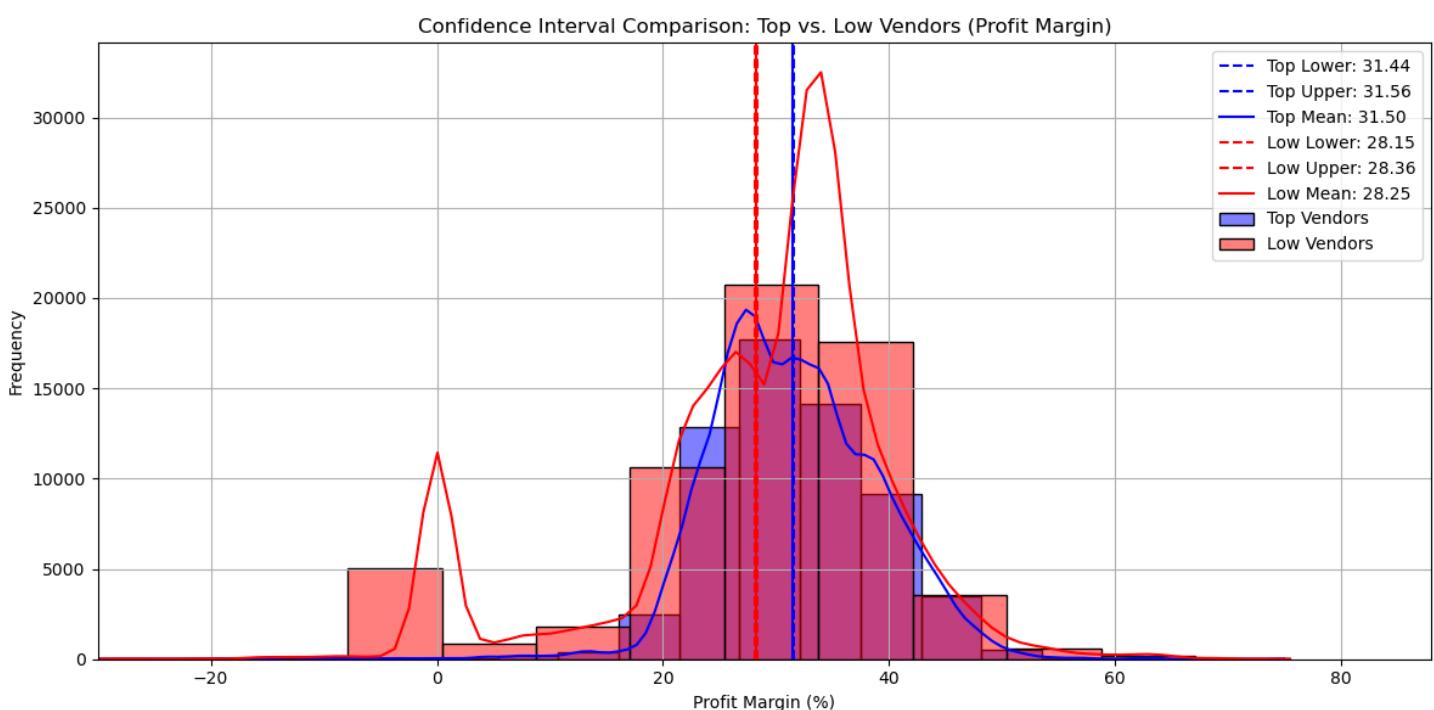
Vendors with **higher sales volumes (Top Vendors)** consistently show **higher profit margins**, while **Low Vendors** with lesser sales tend to have **lower margins**, suggesting a positive correlation between sales performance and margin efficiency.

### 3. Top Vendors Suggestion

Maintain current sales strategies and consider expanding product reach to leverage strong margins further. Focus on scaling high-margin items and strengthening vendor partnerships.

### 4. Low Vendors Suggestion

Reevaluate pricing, marketing, and inventory strategies to improve margin performance. Target cost reduction and analyze low-margin products for potential improvement or replacement.



## 9. Hypothesis Test: Two-Sample T-Test for Profit Margins

**Null Hypothesis ( $H_0$ ):** There is no significant difference between the profit margins of top vendors and low vendors.

**Alternative Hypothesis ( $H_1$ ):** There is a significant difference between the profit margins of top vendors and low vendors.

### Two-Sample T-Test Results:

- **t-statistic:** 52.50
- **p-value:** 0.00000e+00

### Conclusion:

Since the p-value is extremely small (much less than 0.05), we reject the null hypothesis. This confirms that the difference in profit margins between top and low-performing vendors is statistically significant.

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## ✓ Recommendations

- **Focus promotional efforts on high-margin but low-sales brands** such as *Concannon Glen Ellen Wh Zin* or *Santa Rita Organic Svgn Bl*. These products show strong profitability per unit and can drive overall profit if visibility and sales volume are increased.
- **Prioritize partnerships with top-performing vendors** like *DIAGEO NORTH AMERICA INC* and *MARTIGNETTI COMPANIES*. Their high purchase and sales volumes, along with consistent profit margins, make them valuable contributors to overall performance.
- **Optimize purchasing strategies by encouraging medium-sized orders**, which offer the highest profit margins. Avoid very small purchase quantities unless absolutely necessary, as they lead to increased per-unit costs and reduced profitability.
- **Monitor and address unsold inventory and legacy stock**, especially for vendors with high unsold capital. This could involve promotions, stock redistribution, or negotiation of better terms.
- **Leverage top-performing cities and stores** such as *Doncaster* and *Store No. 50* as models for operations and strategy. These locations can serve as benchmarks for expanding high-margin products and improving stock turnover elsewhere.
- **Use Pareto insights to focus on the top 20% of vendors and brands** driving the majority of profit. This will help prioritize efforts and resources where they have the most financial impact.



# Power BI Dashboard Overview

- Imported** the final dataset into Power BI.
- Created** summarized tables using `SUMMARIZE` for vendors, brands, and cities.
- Built measures** for profit contribution and cumulative distribution.
- Visualized** on 5 dashboard pages:
  - Main KPIs:** Total Sales, Purchases, Gross Profit, etc.
  - Vendor/Brand/City Pages:** With slicers and top 10 visuals
  - Top 5 Summary:** Showing final ranked performance by KPIs

