

Vendor Sales Analysis

Introduction – Vendor Sales Analysis Project

Project Objective:

The **Vendor Sales Analysis Project** was undertaken to evaluate the performance of vendors supplying goods to a retail and e-commerce network. The goal was to:

- Understand **vendor-level profitability**,
 - Detect **inventory inefficiencies**,
 - Monitor **sales effectiveness**, and
 - Support **data-driven procurement and business decisions**.
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Business Problem:

The client noticed a **sharp decline in monthly sales**, along with rising inventory and stagnant vendor performance. With over **30 million records** spread across purchases, sales, and inventory systems, the business needed an analytical system to:

- Detect underperforming vendors
 - Identify high-cost, low-margin products
 - Optimize stock turnover and vendor payouts
 - Improve return on procurement investments
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Tech Stack Used:

Tool	Purpose
Python (Pandas, NumPy)	Data preprocessing and metric generation
SQL (PostgreSQL)	Advanced query analysis and aggregations
Power BI	Dashboard and executive-level reporting

Data Volume:

- **6 relational tables**
- **30M+ records total**
- Includes: Purchase transactions, Sales logs, Invoices, Inventory positions, Vendor pricing

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Outcome Preview:

- Top 10 vendors control 65%+ of spending
 - ₹50+ Lakhs stuck in unsold inventory
 - High-margin products underperform in sales
 - Clear segmentation of vendors by ROI, efficiency, and profit contribution
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Vendor Sales Analysis – Raw Data Summary

Your project is built on **6 large-scale relational tables** containing real-world retail and supply chain data. Here's a structured overview of each table:

1. begin_inventory

- **Rows:** 206,530
 - **Purpose:** Tracks initial inventory stock before the analysis period.
 - **Key Columns:**
 - InventoryId, Store, City, Brand, Description, Size, onHand, Price, startDate
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2. end_inventory

- **Rows:** 2,019,126
 - **Purpose:** Captures the closing inventory stock levels.
 - **Key Columns:**
 - Same as begin_inventory + endDate instead of startDate
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3. purchase_prices

- **Rows:** 110,355
- **Purpose:** Maintains reference purchase prices and vendor mapping.
- **Key Columns:**

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- Brand, Description, PurchasePrice, VendorNumber, VendorName, Classification
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4. purchases

- **Rows:** 16,777,216
 - **Purpose:** Complete history of all product purchases from vendors.
 - **Key Columns:**
 - InventoryId, PONumber, PODate, ReceivingDate, InvoiceDate, PayDate, PurchasePrice, Quantity, Dollars
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5. sales

- **Rows:** 14,680,064
 - **Purpose:** Sales transaction log across stores, products, and vendors.
 - **Key Columns:**
 - SalesQuantity, SalesDollars, SalesPrice, SalesDate, ExciseTax, VendorName
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6. vendor_invoice

- **Rows:** 50,271
 - **Purpose:** Invoices and financial information for vendor orders.
 - **Key Columns:**
 - VendorNumber, PONumber, InvoiceDate, Freight, Approval
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Key Insights from Raw Tables:

- Huge datasets with **multi-million rows**, reflecting real industry scale.
- Vendor, product, and date columns allow strong **temporal and performance-based analysis**.
- Tables are **well-normalized** for joining and aggregation using InventoryId, VendorNumber, and PONumber.

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Vendor Sales Analysis – Python Summary

Purpose of Python Analysis:

The Python phase focused on data wrangling, performance measurement, and business insight generation from multi-million row datasets. Due to the large volume, pre-aggregation and metric computation were done in Python before moving to SQL and visualization.

Dataset Used:

The final cleaned and merged dataset, `vendor_summary_table.csv`, contains:

- 10,692 rows
 - 18 columns
 - Each row represents a unique vendor-brand-product combination
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Key Metrics Computed:

Here are the core metrics generated using Python and stored in the summary table:

Metric	Description
<code>total_purchase_quantity</code>	Total units purchased from the vendor
<code>total_purchase_dollars</code>	Total spend on purchases
<code>total_sales_quantity</code>	Units sold
<code>total_sales_dollars</code>	Gross sales revenue
<code>gross_profit</code>	Revenue - (Purchase + Excise + Freight)
<code>profit_margin</code>	Gross profit as % of revenue
<code>sales_to_purchase_ratio</code>	Ratio of sales to purchases (efficiency)
<code>stock_turnover</code>	Inventory efficiency (sales/purchases)

Data Transformation Steps:

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- Merged multiple tables: purchases, sales, purchase_prices, vendor_invoice
 - Calculated actual selling price from SalesDollars / SalesQuantity
 - Calculated gross profit by subtracting freight and tax from revenue
 - Grouped data by VendorNumber, Brand, Description to compute summaries
 - Exported final vendor summary table for SQL & Power BI
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Sample Insight:

Example from top vendor-product entries:

Vendor Name	Product	Gross Profit	Profit Margin
BROWN-FORMAN CORP	Jack Daniels No 7 Black	₹12.9 Lakhs	25.29%
DIAGEO NORTH AMERICA INC	Capt Morgan Spiced Rum	₹12.1 Lakhs	27.14%
PERNOD RICARD USA	Absolut 80 Proof	₹11.1 Lakhs	24.67%

Why Python First?

- Excel could not handle multi-million rows
- Python allowed large-scale preprocessing (merge, filter, groupby, math)
- Set up structured data for fast SQL query execution and dashboard reporting

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Vendor Sales Analysis – SQL Summary

Overview:

You used SQL to run advanced queries on the pre-aggregated `vendor_sales_summary` table, derived from multiple raw tables (purchases, sales, vendor_invoice, etc.). The SQL phase focused on extracting business-critical insights like vendor performance, stock efficiency, profit trends, and inventory risk.

SQL Questions & Strategic Insights:

1 High-Profit but Low-Performance Brands

Identify brands that show high profit margins but low total sales — a sign they may need promotion or pricing adjustments.

- **Query Summary:** Filtered vendors with gross profit > 0 and profit margin > 0 , then sorted to find underperforming but profitable vendors.
 - **Insight:** These are high-margin, low-sales brands that could become growth drivers if promoted properly.
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2 Top Vendors & Brands by Sales Profit

Analyzed net profit after removing excise tax, grouped by vendor and brand.

- **Result:** Revealed the most profitable vendor-brand combinations.
 - **Use Case:** Helps optimize vendor relationships and marketing focus on high-return products.
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3 Vendor Contribution to Purchase Spending

Calculated the percentage share of each vendor in the total purchase amount.

- **Insight:**
 - Top 10 vendors contribute 65.34% of total purchase spend.
 - Remaining 90% of vendors contribute only 34.66%.
 - **Implication:** Heavy dependency on a few key vendors – introduces supply chain risk.
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Recommendation:

- Diversify vendor base

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- Monitor top vendors closely
 - Negotiate better deals
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4 Bulk Purchases vs. Unit Price

Tested whether bulk purchases actually reduce unit cost using NTILE-based partitioning.

- Results:
 - Large orders → ₹57.14 per unit
 - Medium orders → ₹10.82 per unit
 - Small orders → ₹5.50 per unit
- Surprising Insight: Bulk orders didn't reduce cost – they were mostly for premium products.

✓ Recommendation:

- Analyze product-level pricing
 - Bulk buying doesn't always mean savings
 - Separate high-volume from high-cost items
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5 Low Inventory Turnover Vendors

Found vendors with stock turnover < 1, which means inventory is not moving efficiently.

- Vendors Identified:
 - LAUREATE IMPORTS CO
 - AAPER ALCOHOL & CHEMICAL CO
 - TRUETT HURST
- Risk: High storage costs, slow ROI, blocked capital

✓ Recommendation:

- Stop/reduce future orders for slow SKUs
 - Offer discounts or promotions
 - Audit product demand and reposition inventory
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6 Capital Locked in Unsold Inventory

Calculated value of unsold stock by vendor

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- Top Vendor: MARTINETTI COMPANIES → ₹19+ lakhs in unsold stock
- Top 3 Vendors: Over ₹50 lakhs combined in blocked capital

Action Plan:

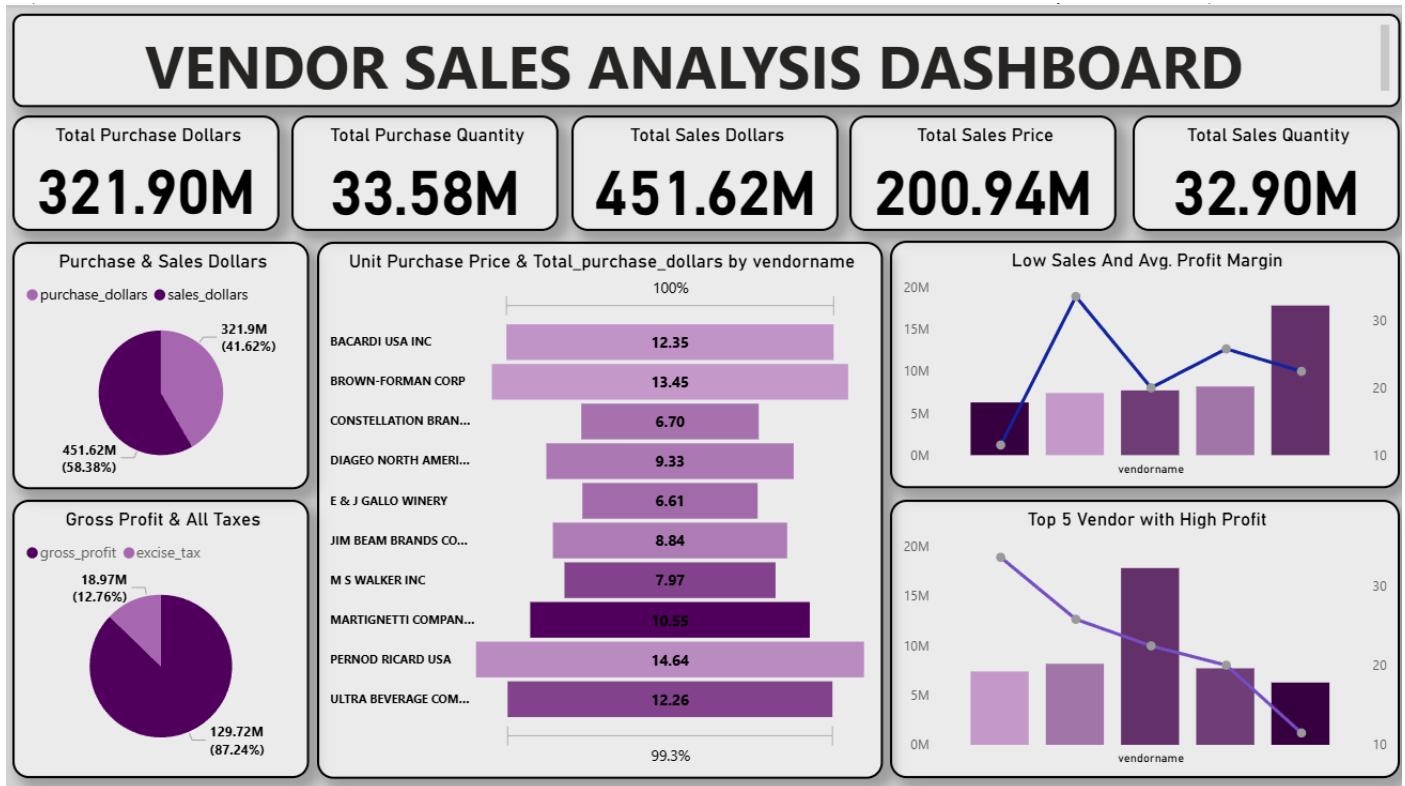
- Consider return policies
 - Push clearance campaigns
 - Adjust future PO quantities
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Final Conclusion from SQL Analysis:

- SQL was used to uncover high-level vendor strategy issues like:
 - Over-concentration in procurement
 - Inventory inefficiency
 - Unrealized profits due to poor stock rotation
- You built a data-driven recommendation system to support vendor negotiations, pricing strategies, and capital utilization.

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Power BI Dashboard Summary



Title: VENDOR SALES ANALYSIS DASHBOARD

This interactive dashboard presents a comprehensive overview of vendor performance in terms of purchases, sales, profit, and cost-effectiveness. The visuals are structured to assist with vendor evaluation, cost optimization, and strategic sourcing decisions.

◆ Top-Level KPIs (Cards):

Metric	Value	Insight
Total Purchase Dollars	₹321.90M	Represents the full procurement spend from all vendors
Total Purchase Quantity	33.58M units	Total volume purchased
Total Sales Dollars	₹451.62M	Total revenue generated from sales

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Metric	Value	Insight
Total Sales Price	₹200.94M	Aggregated selling price (potentially excluding taxes)
Total Sales Quantity	32.90M units	Slightly lower than purchase quantity → indicates unsold inventory

 **Observation:** Sales quantity is slightly less than purchase quantity, which implies some unsold or slow-moving inventory.

1. Purchase vs Sales Distribution (Pie Chart)

- Shows that:
 - Purchase value = ₹321.9M (41.62%)
 - Sales value = ₹451.62M (58.38%)
 -  Indicates positive margin between procurement and revenue.
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2. Gross Profit vs Excise Tax Breakdown

- Gross Profit: ₹129.72M (87.24% of total)
- Excise Tax: ₹18.97M (12.76% of total)

 **Interpretation:** The majority of the gain comes from gross margin; tax is a smaller component but still relevant for net revenue.

3. Unit Purchase Price vs Total Purchase Dollars (Bar Chart by Vendor)

- Highlights vendors like:
 - PERNOD RICARD USA (Highest unit price: ₹14.64)
 - CONSTELLATION BRANDS (Low unit price: ₹6.70)
 -  Useful to evaluate vendor cost efficiency and understand which vendors supply premium-priced products.
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4. Low Sales but High Profit Margin (Bar + Line Combo)

- Identifies vendors who:

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- Generate low sales but high profit margins
 - May be under-promoted premium brands
 - **Suggests a promotion opportunity to increase volume without hurting margins.**
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5. Top 5 Vendors by Gross Profit

- Vendors with highest contribution to profit
- Line chart overlays average profit margin
- Shows balance between volume and margin

Business Insight: Focus marketing efforts on vendors that deliver both volume and high margin.



Key Business Insights from This Page:

1. Revenue Surpasses Cost → Overall profitable product flow.
2. Some vendors have low sales but high margin → High potential for targeted promotions.
3. Purchase and Sales quantities are slightly mismatched → Indicates stockholding or slower turnover.
4. Excise tax is under control, not drastically reducing margins.
5. Vendor segmentation by cost and profit is clearly visible for strategic decision-making.

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Vendor Sales Analysis Project – Final Summary & Business Outcome

Project Overview

This project focuses on analyzing the vendor performance of a large-scale retail and e-commerce network using Python, SQL, and Power BI. Over 30 million records across 6 structured tables were processed to generate actionable insights for purchasing, sales, profitability, and inventory turnover.

Tools & Technologies Used

-  Python (Pandas, NumPy) – Data Cleaning & Aggregation
-  SQL (PostgreSQL) – Business Logic & Query Optimization
-  Power BI – Dashboard & Visual Storytelling

Data Sources & Tables

Table Name	Purpose	Rows
begin_inventory	Starting inventory stock	206K
end_inventory	Ending stock levels	2M+
purchase_prices	Vendor-product reference pricing	110K
purchases	Purchase transactions	16.7M
sales	Sales transactions	14.6M
vendor_invoice	Invoice and freight info	50K

Python Analysis

- Merged and cleaned multi-million-row datasets
- Computed key metrics:
 - Total Purchase & Sales
 - Gross Profit & Profit Margin

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- Unit Cost, Excise, Freight, Inventory Turnover
- Exported a summary dataset (`vendor_summary_table.csv`) for SQL and Power BI usage

 **Outcome:** Created a scalable base for fast queries and visual analysis across multiple business KPIs.

SQL Insights

- Top Vendors Analysis: 10 vendors accounted for 65%+ of total purchases
- Inventory Turnover: Identified slow-moving vendors with turnover < 1
- Capital Locking: ₹50+ lakh stuck in unsold inventory across top 3 vendors
- Profit vs Sales Efficiency: Some vendors had high margin but low sales
- Bulk Orders Analysis: Higher volumes didn't reduce per-unit cost (premium product bias)

 **Outcome:** Strategic recommendations on vendor negotiations, stock clearance, and purchase optimization.

Power BI Dashboard

- Live KPIs: Total Purchase, Sales, Profit, Quantity
- Pie Charts: Spend vs Revenue & Profit vs Excise Tax
- Bar Charts: Vendor-level cost vs sales insight
- Line Charts: Profit margin trends, low-performing brands
- Comparative Visuals: Top vendors, high cost vs high return mapping

 **Outcome:** Executive-level dashboard to track vendor health, inventory efficiency, and guide procurement decisions.

Business Outcomes

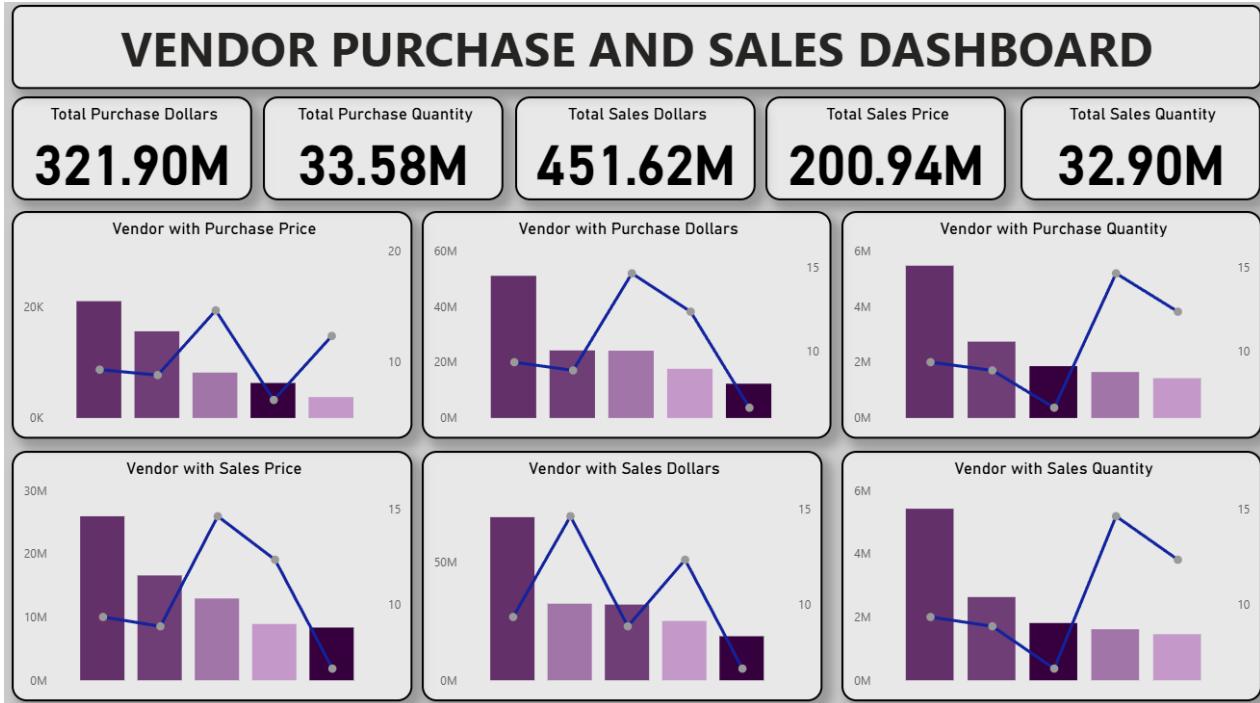
Key Area	Insight / Decision Impact
Vendor Strategy	Reduce dependency on top 10 vendors; negotiate better pricing
Inventory Turnover	Identify and fix slow-moving SKUs
Capital Efficiency	Reinvest blocked inventory capital into high-velocity products

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Key Area **Insight / Decision Impact**

Procurement Smart bulk ordering with product-level cost checks

Sales Optimization Promote low-volume, high-margin products



VENDOR PERFORMANCE DASHBOARD

Total Purchase Dollars 321.90M	Total Purchase Quantity 33.58M	Total Sales Dollars 451.62M	Total Sales Price 200.94M	Total Sales Quantity 32.90M						
vendorname	Gross_profit	Unit Purchase Price	Purchase_dollars	Sales_dollars	Purchase_quantity	Sales_quantity	Volume	Actual_price	Sales_price	Export_charges
BACARDI USA INC	73,80,987.07	12.35	1,76,24,378.72	2,50,05,365.79	1427075	1457011	137074	3,748.85	88,97,463.00	1,47,32,234.55
BROWN-FORMAN CORP	49,47,178.52	13.45	1,35,29,433.08	1,84,76,611.60	1006122	983740	103262	4,436.23	71,74,369.64	87,12,413.36
CONSTELLATION BRANDS INC	88,93,216.33	6.70	1,55,73,917.90	2,44,67,134.23	2325892	2301458	460045	8,763.53	96,48,316.26	3,63,44,748.43
DIAGEO NORTH AMERICA INC	1,77,80,038.12	9.33	5,09,59,796.85	6,87,39,834.97	5459788	5422335	321675	20,933.14	2,59,18,044.19	10,17,84,699.72
E & J GALLO WINERY	62,64,166.57	6.61	1,22,89,608.09	1,85,53,774.66	1858260	1808718	598740	6,272.97	83,33,203.20	3,11,69,355.73
JIM BEAM BRANDS COMPANY	76,95,470.11	8.84	2,42,03,151.05	3,18,98,621.16	2737165	2629964	319325	15,535.43	1,65,67,359.03	4,54,64,315.99
M S WALKER INC	45,00,248.96	7.97	1,09,35,817.30	1,54,36,066.26	1372841	1342230	660111	22,584.36	71,48,294.21	4,63,30,217.88
MAJESTIC FINE WINES	18,68,760.46	7.86	35,06,668.63	53,75,429.09	446119	433515	29250	779.62	13,19,458.90	6,68,328.42
MARTIGNETTI COMPANIES	1,30,98,427.80	10.55	2,78,61,690.02	4,09,60,117.82	2640411	2578596	1090364	50,489.83	1,60,29,789.77	20,11,61,785.12
MOET HENNESSY USA INC	40,72,184.02	22.14	94,72,995.20	1,35,45,179.22	427867	424235	87436	22,574.94	57,48,026.00	56,08,282.16
PERFECTA WINES	21,14,245.50	10.24	56,65,501.53	77,79,747.03	553116	511663	603190	40,310.53	39,96,047.45	2,24,88,167.16
PERNOD RICARD USA	81,55,452.61	14.64	2,41,24,091.56	3,22,79,544.17	1647558	1613338	207574	8,134.56	1,29,28,734.45	3,03,26,153.90
PROXIMO SPIRITS INC.	29,27,272.67	11.13	75,88,929.90	1,05,15,302.57	682042	667583	90775	2,371.34	53,75,526.86	41,33,446.68
SAZERAC CO INC	33,33,809.70	6.99	99,16,770.26	1,32,50,579.96	1417727	1385019	122700	3,225.31	60,61,731.83	69,90,813.18
SOUTHERN WINE & SPIRITS NE	20,04,754.06	9.19	36,99,813.46	57,04,567.52	402677	397315	256746	22,892.64	26,05,722.64	61,99,408.34
STE MICHELLE WINE ESTATES	18,12,753.80	7.35	30,86,650.70	48,99,404.50	419822	418564	105187	2,863.05	20,50,379.04	22,12,838.30
TREASURY WINE ESTATES	17,61,344.12	5.98	29,78,686.40	47,40,030.52	497770	495294	87937	1,678.48	19,94,444.43	15,13,330.14
ULTRA BEVERAGE COMPANY LLP	45,92,032.17	12.26	1,32,10,613.93	1,78,02,646.10	1077527	1042270	636205	39,128.21	97,81,946.34	5,69,61,783.90
WILLIAM GRANT & SONS INC	16,74,483.96	19.69	59,60,744.35	76,35,228.31	302685	283309	66300	11,336.99	48,87,614.03	24,48,988.02
WINE GROUP INC	30,81,856.59	5.92	52,58,636.79	83,40,493.38	888385	868988	314937	1,938.49	38,36,459.69	54,47,182.41

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End Note

The Vendor Sales Analysis Project successfully transforms raw, unstructured multi-source data into valuable business insights using the full Data Analytics lifecycle:

Data Collection → Cleaning → Processing → Querying → Visualization → Decision Support

This project not only reflects technical depth in data handling but also delivers a clear business narrative that supports strategic decision-making.