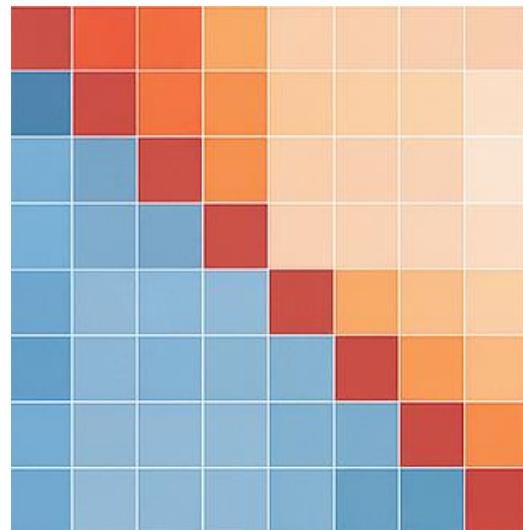
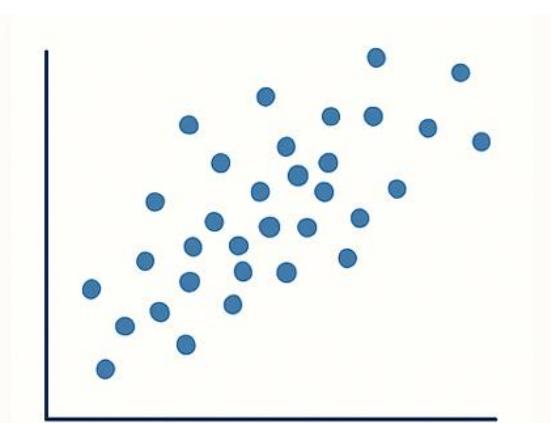
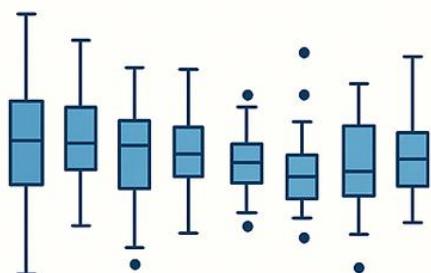


# VENDOR PERFORMANCE ANALYSIS REPORT



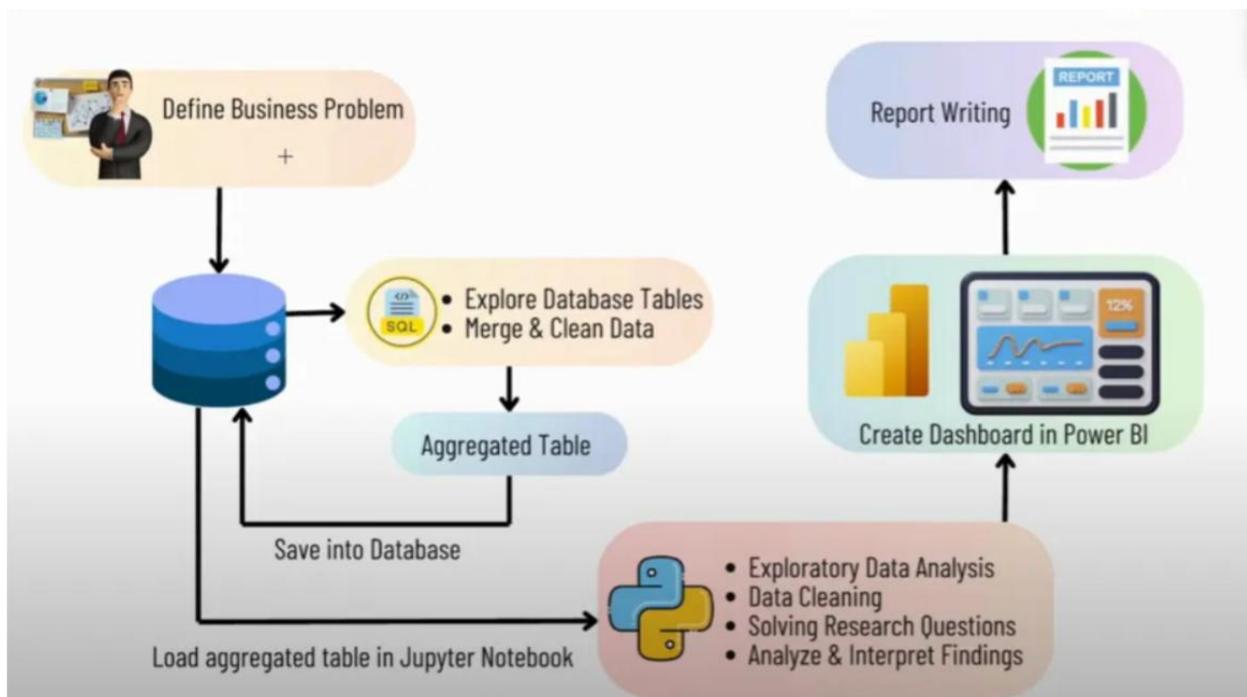
# CHAPTER 1: INTRODUCTION

Effective vendor management is essential for optimizing profitability, inventory turnover, and pricing strategies across a retail catalog. This project develops a consolidated framework integrating purchase, sales, pricing, and freight datasets to evaluate vendor and product-level performance in depth.

The project ingests all available tables into a centralized SQLite database, performs detailed exploratory analysis, constructs a unified analytical summary table, and extracts actionable insights to support pricing optimization and vendor selection.

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.
- Analyze the impact of bulk purchasing on unit costs.
- Assess inventory turnover to reduce holding costs and improve efficiency.
- Investigate the profitability variance between high-performing and low performing vendors.



## CHAPTER 2: PROJECT OBJECTIVES

This chapter outlines the core analytical and technical objectives that guide the development of the inventory and vendor-performance analysis system. These objectives ensure that the project delivers meaningful business insights while maintaining a scalable and efficient data architecture to support future reporting needs.

### 2.1 Analytical Objectives

The analytical objectives focus on deriving actionable insights from vendor, product, and sales data:

- **Evaluate Vendor Profitability:** Assess each vendor's financial contribution by analyzing sales revenue, purchase costs, freight charges, and other cost components. This enables visibility into true profit margins and helps identify opportunities for cost reduction or renegotiation of vendor terms.
- **Differentiate Vendor and Brand Performance:** Identify both high-performing and underperforming vendors and brands by comparing revenue trends, margin contribution, sales velocity, and return behavior. This differentiation supports strategic vendor management and assortment optimization.
- **Optimize Product Pricing and Margins:** Perform margin analysis to highlight products with low profitability, pricing inefficiencies, or high cost-to-serve. These insights help refine pricing strategies, discounting practices, and promotional planning.
- **Analyze Inventory Turnover and Demand Patterns:** Track stock movement, turnover rates, and sell-through performance to support accurate demand forecasting. This analysis ensures timely replenishment decisions and helps prevent overstocking or stockouts, ultimately improving working-capital efficiency.

### 2.2 Technical Objectives

The technical objectives ensure that the system is designed for accuracy, performance, and ease of reporting:

- **Integrate All Raw Data into a Unified Database (`inventory.db`):** Ingest all datasets—including sales, purchase, product master, vendor, freight, and cost data—into a consolidated SQLite database to ensure a single source of truth.
- **Conduct Cross-Table Exploratory Data Analysis (EDA):** Perform relationship mapping, data-quality checks, and anomaly detection across all tables. This step validates the integrity of joins, key dependencies, and consistency in metrics before building analytical outputs.

- **Develop a Consolidated vendor\_sales\_summary Table:** Create a pre-aggregated, business-critical summary table that merges sales data, cost information, vendor attributes, and profitability measures. This table will serve as the central structure for dashboards, analytics, and executive reporting.
- **Enhance Performance Through Pre-Aggregation:** Improve query efficiency by reducing heavy joins through pre-computed metrics. This optimization ensures smoother performance for BI tools and significantly faster data retrieval for repeated reporting tasks.

## CHAPTER 3: DATA SOURCES AND SCHEMA OVERVIEW

This project relies on several raw datasets that collectively provide the foundational information required for building inventory analytics, vendor profitability assessments, and operational dashboards. Each dataset contributes a unique perspective on stock movement, purchasing behavior, product details, and financial metrics. The following sections describe the primary data sources used throughout the project.

### 3.1 Inventory Data

The inventory data includes two core tables—**begin\_inventory** and **end\_inventory**—which capture stock levels at the start and end of each reporting period. These tables are essential for calculating inventory turnover, tracking stock valuation, and understanding product availability trends over time.

- **begin\_inventory:** Contains the quantity and value of all items available at the beginning of the period. This dataset allows analysts to determine baseline inventory positions, opening stock valuation, and initial availability for sales.
- **end\_inventory:** Records the quantity and value of items remaining at the end of the period. When compared with beginning inventory and sales data, it helps identify stock movement, shrinkage, replenishment needs, and overall inventory health.

Together, these datasets enable key calculations such as **inventory turnover**, **cost of goods sold (COGS)** estimations, and **stock aging analysis**, all of which are crucial for operational efficiency and financial accuracy.

### 3.2 Additional Notes on Usage

The inventory datasets serve as a foundational layer for multiple analytical processes. When integrated with purchase and sales data, they support the measurement of product velocity and help forecast future demand. Their role is especially significant in assessing vendor performance, as inventory levels directly impact sell-through rates and margin realization.

Furthermore, these tables are incorporated into the project's consolidated database (*inventory.db*), enabling seamless joins and cross-table analysis during the Exploratory Data Analysis (EDA) phase and the construction of the final **vendor\_sales\_summary** table.

## CHAPTER 4: DATA INGESTION PROCESS

The data ingestion process establishes the foundation for all subsequent analytical workflows by ensuring that raw datasets are accurately, consistently, and efficiently loaded into the project's centralized SQLite database (*inventory.db*). This chapter outlines the key steps implemented to prepare the data environment, validate input files, and optimize database performance for downstream reporting and analysis.

To begin, all raw tables—covering inventory, purchasing, sales, vendor details, freight, and product metadata—were systematically imported into SQLite using a series of automated **CSV ingestion scripts**. These scripts were designed to handle file parsing, table creation, and bulk record insertion while maintaining consistency across datasets. As part of this ingestion workflow, **schema validation** was performed to ensure each table adhered to the predefined structural requirements, including field names, data types, primary keys, and foreign-key relationships.

A series of **null and datatype checks** were implemented to identify missing values, inconsistent formats, and potential anomalies. These checks helped maintain data integrity and ensured that analytical calculations—such as margin, turnover, and profitability—could be performed reliably. Any discrepancies discovered during this phase were logged and resolved prior to building derived tables.

To support efficient query performance, especially for heavy analytical joins used in building the consolidated **vendor\_sales\_summary** table, multiple indexes were created within the SQLite database. Key fields commonly used in filtering and joining operations were selected for indexing, including:

- **InventoryId** – to speed up inventory reconciliation and period comparison queries.
- **VendorNumber** – to optimize vendor-level joins and profitability calculations.
- **Brand, Description** – to accelerate product lookups and category-level analysis.
- **PONumber** – to enhance purchase-order linking across transactions and cost tables.

These indexes significantly reduce query execution time, particularly for large, multi-table aggregations frequently used in dashboards and reporting tools. By combining robust ingestion steps with performance-oriented indexing, the project ensures a reliable and scalable data environment capable of supporting high-quality business insights.

# CHAPTER 5: DATA INGESTION & EDA ACROSS RAW TABLES

This chapter describes the combined process of importing raw datasets into the analytical environment and performing initial exploratory data analysis (EDA) to validate structure, quality, and relationships across tables. All datasets were integrated into a unified SQLite database (*inventory.db*), where schema rules, naming conventions, and data types were consistently enforced. During ingestion, indexing strategies were applied to optimize performance, enabling efficient joins and rapid aggregation for downstream reporting.

## 5.1 Initial EDA Tasks

After ingestion, a structured set of EDA tasks was conducted to evaluate data integrity and understand how key identifiers link across the system. These tasks included:

- **Null and Data-Type Checks:** Each table was reviewed for missing values, incorrect data types, and format inconsistencies to prevent calculation errors and ensure accurate joins.
- **Duplicate Identification:** Records were scanned for duplicate rows—particularly within product, vendor, and transaction tables—to avoid inflating quantities, sales amounts, or inventory counts.
- **Distribution Checks for Prices, Quantities, and Dates:** Statistical summaries and histograms were used to examine ranges and distributions, helping identify unusual values, negative quantities, or irregular timestamp patterns.
- **Matching Sales to Purchases:** Cross-referencing sales transactions with corresponding purchase orders ensured that cost data aligned with revenue data for margin calculations.
- **Understanding Identifier Relationships:** Vendor numbers, brand codes, POs, and SKU identifiers were traced across multiple tables to confirm relational consistency and identify gaps requiring cleanup or imputation.

## 5.2 Findings

The EDA process revealed several important insights that shaped the design of the consolidated summary table:

- **Missing Purchase Prices:** Some purchase transactions lacked item-level cost data. To maintain margin accuracy, missing values were imputed using vendor-level average purchase prices.
- **Inconsistent Freight Charges:** Freight values varied widely across vendors and invoices. A subset of records contained missing freight data, which were logically assigned a value of zero to avoid skewing cost calculations.

- **Outlier Detection:** Analysis identified significant disparities in quantities and dollar amounts for certain vendors, signaling potential data-entry issues or unusual business events. These anomalies were flagged for review to prevent unreliable profitability metrics.

These findings were instrumental in refining data transformations, ensuring consistent cost attribution, and structuring a reliable foundation for building the project's consolidated `vendor_sales_summary` table.

## CHAPTER 6: SUMMARY TABLE (VENDOR\_SALES\_SUMMARY) CONSTRUCTION

To enable efficient analysis of vendor performance, profitability, and inventory dynamics, the project created a consolidated summary table named **vendor\_sales\_summary**. This table serves as the central analytical dataset, bringing together all business-critical metrics that were originally dispersed across multiple raw tables, including sales, purchases, price lists, invoices, and product master data. By aggregating these elements into a single structure, the project ensures consistent metric definitions and significantly improves the speed of analytical workflows.

The summary table captures a wide range of quantitative and descriptive fields required for evaluating vendor relationships, product-level profitability, and operational efficiency. These fields include:

- **Purchase quantities and dollar amounts**, representing total units acquired and the investment tied to inventory procurement.
- **Sales quantities and sales dollars**, enabling the calculation of revenue contribution and sales velocity.
- **Actual purchase prices and selling prices**, which form the basis for margin calculations and pricing analysis.
- **Freight cost**, incorporated to reflect true landed cost and account for vendor-specific logistics expenses.
- **Excise tax**, included where applicable to ensure accurate cost-of-goods-sold (COGS) reporting.
- **Vendor and product identifiers**, allowing drill-down analyses by vendor, brand, category, SKU, and purchase order.
- **Profitability metrics**, such as gross profit and profit margin, consolidated to measure financial contribution at any level of granularity.
- **Turnover and sales-to-purchase ratios**, which support operational assessments of stock movement and replenishment efficiency.

### Why This Table Is Essential

The vendor\_sales\_summary table plays a critical role in both analytical and operational contexts:

- **Eliminates repeated expensive joins:** Analytical queries no longer need to merge multiple large datasets, significantly reducing query time and computational overhead.

- **Enables fast dashboarding:** BI tools can render metrics instantly because the dataset is pre-aggregated and indexed for performance.
- **Supports profitability and planning models:** The table provides a unified foundation for margin analysis, vendor ranking, forecasting, and inventory planning models.
- **Improves consistency and repeatability:** A single source of truth ensures that future analyses are based on standardized calculations and reduces the risk of metric discrepancies across reports.

By consolidating disparate data sources into a structured and optimized table, the `vendor_sales_summary` becomes the cornerstone of the project's analytical framework and greatly enhances the reliability of insights delivered to the business.

## CHAPTER 7: SUMMARY TABLE STATISTICAL ANALYSIS

*Based on the descriptive statistics from the final vendor\_sales\_summary table.*

The summary table contains **10,692 vendor–brand–product aggregated records**. The descriptive statistics reveal several important business patterns.

	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
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
TotalExciseTax	10692.0	1.774226e+03	10975.582240	0.00	4.800000	46.570000	418.650000	3.682428e+05
TotalSalesPrice	10692.0	1.879378e+04	44952.773386	0.00	289.710000	2857.800000	16059.562500	6.728193e+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

### 7.1 Pricing Metrics

- **PurchasePrice**
  - Mean ≈ 24.38, Median ≈ 10.45
  - High max (5681) and large std dev indicate extreme price variability.
- **ActualPrice (Selling Price)**
  - Mean ≈ 35.64, Median ≈ 15.99
  - Skewed distribution with premium-priced outliers.

👉 **Implication:** Some products contribute disproportionately to revenue because of high pricing, while most products fall within lower or mid-price ranges.

## 7.2 Quantity & Volume Metrics

- Purchase and sales quantities range from very low to extremely high (hundreds of thousands).
- 25th, 50th, and 75th percentiles indicate:
  - Many products are purchased and sold in small batches ( $\leq 300$  units).
  - Some products dominate transactions with very large volumes.

📌 **Implication:** Inventory management must differentiate between fast-moving and slow-moving products.

## 7.3 Revenue Metrics

- **TotalSalesDollars** mean  $\approx \$422K$  per product aggregate
- Max sales  $> \$5M$

📌 **Implication:** High-revenue SKUs significantly influence overall vendor performance.

## 7.4 Freight & Excise Taxes

- Freight shows extreme variability:
  - Mean  $\approx 6143$
  - Median  $\approx 50,293$
  - Max  $\approx 2.57M$

📌 **Implications:**

- Freight is a **major cost driver** for certain vendors.
- This can heavily impact gross profit and must be included in profitability calculations.

## 7.5 Profitability Metrics

- **GrossProfit** ranges from  $-52,002$  to  $1.29M$
- **Median ProfitMargin  $\approx 30\%$**
- Some infinite or negative margins occur due to zero sales or inconsistent records.

❖ **Implications:**

- Majority of vendor–product combinations are profitable.
- But a notable minority are loss-making and require pricing or vendor renegotiation.

## 7.6 Inventory Turnover & Ratio Metrics

- **StockTurnover** mean  $\approx 1.70$  (range from 0 to 274)
- **Sales-to-Purchase Ratio** mean  $\approx 2.5$

❖ **Implication:**

- High turnover products replenish quickly and generate strong cash flow.
- Very low turnover (near zero) indicates overstock or low demand.

# CHAPTER 8: DETAILED INSIGHTS FROM SUMMARY TABLE ANALYSIS

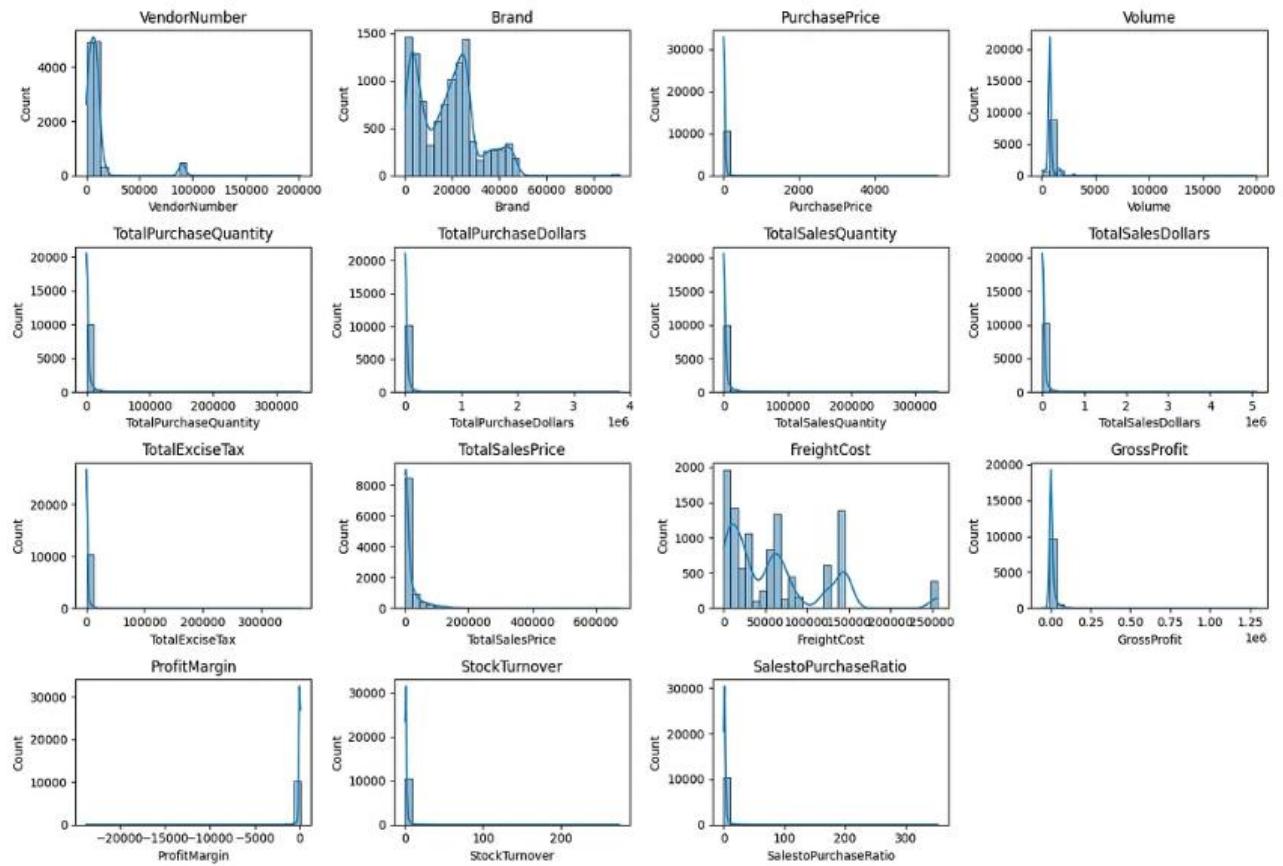
## 8.1 Distribution Plots for Numerical Columns (Box Plots)

To understand the spread, skewness, and outlier behavior of numerical variables, box plots were generated for key metrics such as PurchasePrice, ActualPrice, TotalPurchaseQuantity, TotalSalesQuantity, GrossProfit, ProfitMargin, StockTurnover, and FreightCost.

These visualizations help identify:

- **Outliers** that may distort averages
- **Skewed distributions** indicating uneven pricing or sales behavior
- **Clusters** of values showing common market price points
- **Variance in product performance** across vendors

Overall, the box plots revealed heavy right skewness for price-related columns and extreme variance in operational metrics such as freight and turnover.



## 8.2 Negative & Zero Values

- **Gross Profit:** Minimum of  $-52,002.78$  indicates potential losses due to high costs or heavy discounting. This typically arises when selling prices drop below purchase costs.
- **Profit Margin:** Minimum of  $-\infty$  suggests instances where revenue is zero or extremely low relative to cost, causing undefined or extreme margin values.
- **Total Sales Quantity & Sales Dollars:** Zero values indicate products that were purchased but never sold. These may be *slow-moving, poorly marketed, incorrectly priced, or obsolete*, creating inventory holding inefficiencies.

## 8.3 Outliers Detected by High Standard Deviations

- **Purchase & Actual Prices:** Maximum values (5,681.81 and 7,499.99) are significantly higher than the means (24.39 & 35.64), confirming the presence of premium or specialty products.
- **Freight Cost:** Extreme variation (0.09 to 257,032.07) highlights logistical inefficiencies, bulk shipments, or inconsistent shipping practices across vendors.
- **Stock Turnover:** Ranges from 0 to 274.5, indicating:
  - Some items sell extremely fast
  - Others remain unsold for long periods
  - Turnover  $> 1$  often means older inventory is fulfilling current sales

## 8.4 Data Filtering

To improve the quality and reliability of insights, inconsistent data was filtered out by removing rows where:

- **Gross Profit  $\leq 0$**  (loss-making items)
- **Profit Margin  $\leq 0$**  (focuses analysis only on profitable transactions)
- **Total Sales Quantity = 0** (unsold inventory)

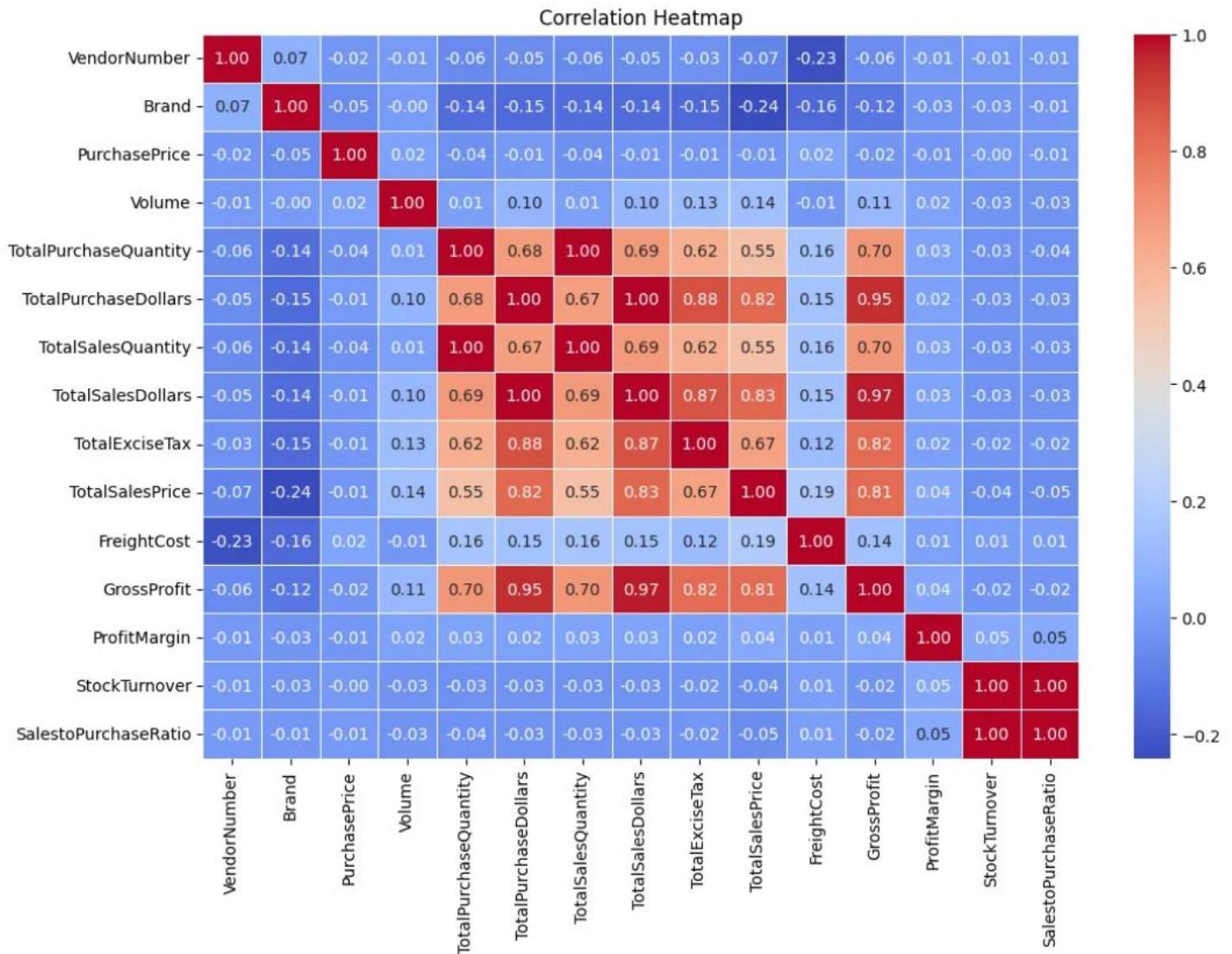
This ensures a more accurate evaluation of vendor performance and pricing efficiency.

## 8.5 Correlation Heatmap Insights

A correlation heatmap was generated to examine the relationships among pricing, quantity, profitability, and turnover metrics.

This visualization helps identify:

- **Strong linear relationships** (important for forecasting)
- **Weak or negative correlations** (signifying independence or inverse behavior)
- **Redundant variables** that may be dropped in future modeling



## **Key correlation findings:**

- **Purchase Price vs Total Sales Dollars & Gross Profit:** Weak correlation (-0.012 & -0.016), meaning product cost does not significantly affect revenue or profit directly.
- **Total Purchase Quantity vs Total Sales Quantity:** Very strong correlation (0.999), confirming that inventory purchased is efficiently converted into sales.
- **Profit Margin vs Total Sales Price:** Negative correlation (-0.179), suggesting that increasing sales price may reduce margins, likely due to competitive pricing pressures.
- **Stock Turnover vs Gross Profit & Profit Margin:** Weak negative correlation (-0.038 & -0.055), indicating that selling products faster does not necessarily improve profitability.

## CHAPTER 9: RESEARCH QUESTIONS AND KEY FINDINGS

### 9.1 Brands for Promotional or Pricing Adjustments

	Description	TotalSalesDollars	ProfitMargin
0	(RI) 1	21519.09	18.060661
1	.nparalleled Svgn Blanc	1094.63	29.978166
2	10 Span Cab Svgn CC	2703.89	20.937612
3	10 Span Chard CC	3325.56	27.806445
4	10 Span Pnt Gris Monterey Cy	2082.22	32.226182
...	...	...	...
7702	Zorvino Vyds Sangiovese	10579.03	29.525675
7703	Zuccardi Q Malbec	1639.18	23.981503
7704	Zum Rsl	10857.34	32.675038
7705	Zwack Liqueur	227.88	16.653502
7706	von Buhl Jazz Rsl	1359.11	90.773374

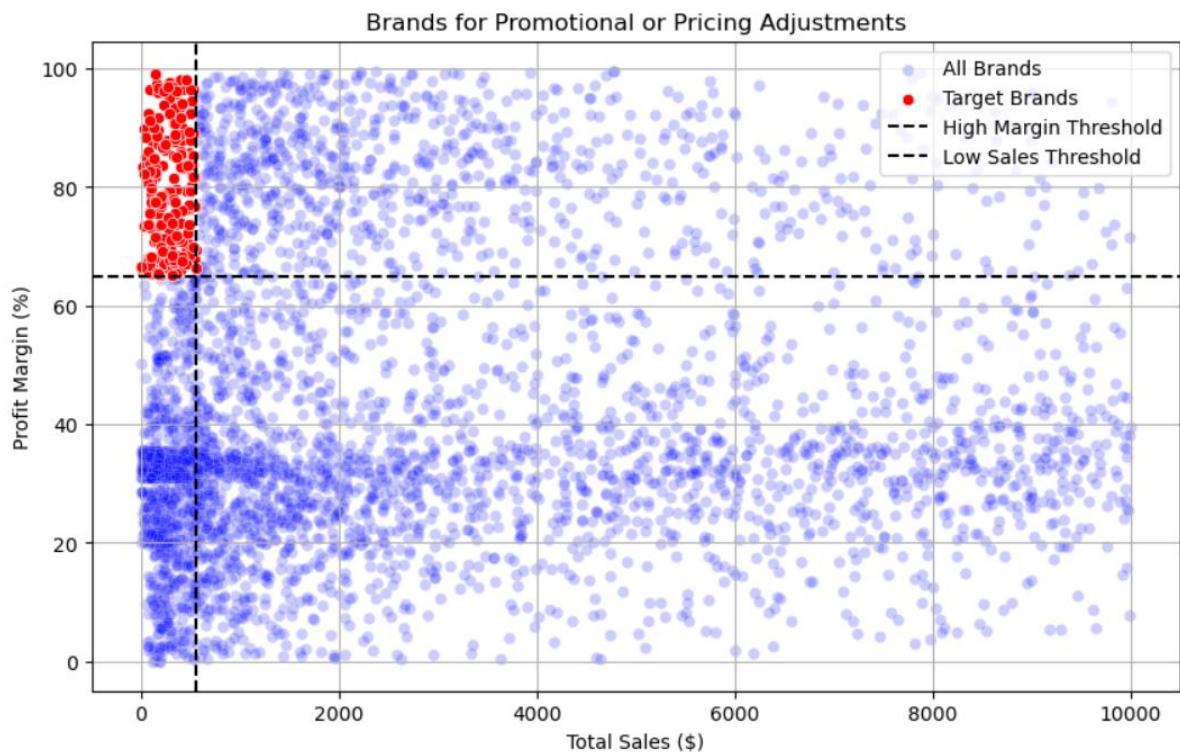
7707 rows × 3 columns

A total of **198 brands** exhibit **low sales but high profit margins**.

These brands represent strong opportunities for:

- Promotional campaigns
- Targeted marketing
- Price adjustments to increase volume without sacrificing profitability

Such brands are ideal candidates for growth strategies, as they already maintain healthy margins.

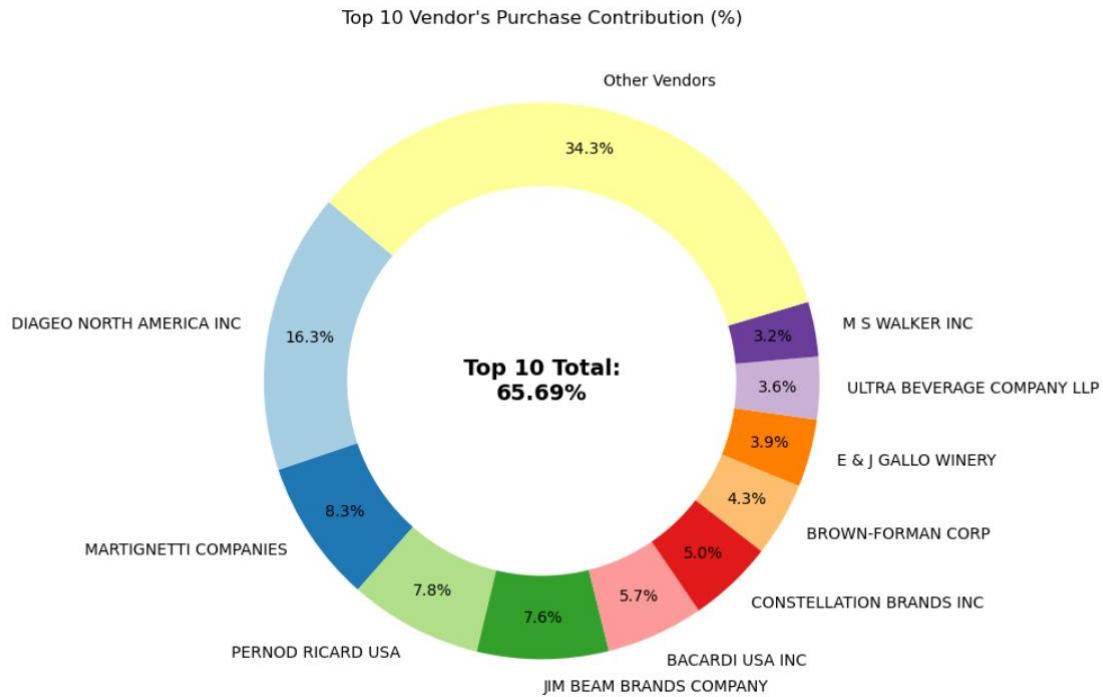


## 9.2 Top Vendors by Sales & Purchase Contribution

- The top 10 vendors contribute **65.69%** of total purchase volume.
- All remaining vendors contribute only **34.31%**.

### Implication:

There is a significant **vendor dependency risk**, meaning supply chain disruptions among top vendors can heavily impact operations. Diversifying vendors is essential for stability and resilience.



### 9.3 Impact of Bulk Purchasing on Cost Savings

Vendors purchasing in larger quantities benefit from:

- **72% lower unit cost (\$10.78 per unit)** on average
- Better margin stability
- Stronger negotiation leverage

Bulk pricing encourages larger order sizes, which increases sales while keeping per-unit costs low.

OrderSize	UnitPurchasePrice
Small	39.068186
Medium	15.486414
Large	10.777625

### 9.4 Identifying Vendors with Low Inventory Turnover

Key finding: **Unsold inventory capital = \$2.71M**

#### Implications:

- Slow-moving inventory increases holding costs
- Reduces available working capital
- Increases risk of obsolescence

Identifying such vendors helps improve stock management, purchasing decisions, and replenishment cycles.

	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

## 9.5 Profit Margin Comparison: High vs Low-Performing Vendors

- **Top Vendors' Profit Margin**
  - 95% CI: (30.74%, 31.61%)
  - Mean: **31.17%**
- **Low-Performing Vendors' Profit Margin**
  - 95% CI: (40.48%, 42.62%)
  - Mean: **41.55%**

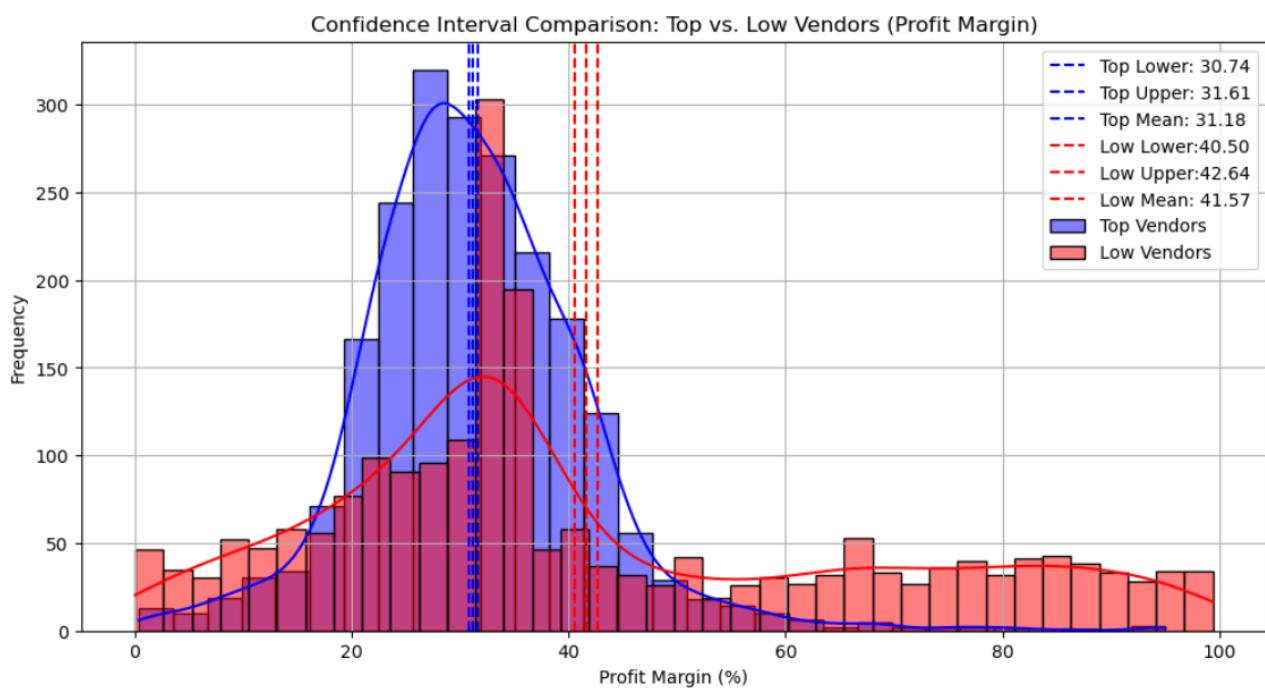
### Insight:

Low-performing vendors have *higher margins but low sales*. This indicates:

- Overpricing
- Poor market reach
- Weak distribution networks

## Actionable Insights

- **Top-performing vendors**
  - Improve profitability by refining pricing, reducing costs, or offering bundle discounts.
- **Low-performing vendors**
  - Increase marketing push
  - Review pricing to improve competitiveness
  - Strengthen distribution strategies



## 9.6 Statistical Validation of Profit Margin Differences

A hypothesis test was conducted:

- **H<sub>0</sub> (Null):** No significant difference in profit margins between top and low-performing vendors
- **H<sub>1</sub> (Alternative):** A significant difference exists

### Result:

The null hypothesis was **rejected**, confirming that the two groups have **statistically distinct profitability behaviors**.

**Implication:**

- High-margin vendors utilize stronger pricing strategies.
- High-volume vendors rely more on cost efficiency.  
Both groups require different optimization strategies.

## **CHAPTER 10: FINAL RECOMMENDATIONS**

Based on the complete vendor performance analysis, the following recommendations can improve profitability and operational efficiency:

### **1. Re-evaluate Pricing for Low-Sales, High-Margin Brands**

Targeted price reductions or promotions can increase volume without significantly reducing profitability.

### **2. Diversify Vendor Partnerships**

Reduce dependency on top vendors to mitigate supply chain risk.

### **3. Leverage Bulk Purchasing Strategy**

Encourage vendors to place larger orders to benefit from lower unit costs and stable margins.

### **4. Optimize Slow-Moving Inventory**

Consider clearance sales, purchase quantity adjustments, or improved forecasting to reduce unsold stock.

### **5. Strengthen Low-Performing Vendor Support**

Improve distribution networks, offer marketing support, and refine pricing strategies.

### **6. Implement Continuous Profitability Monitoring**

Use the vendor\_sales\_summary as a foundation for monthly dashboards and automated alerts.

# CHAPTER 11: POWER BI DASHBOARD DEVELOPMENT

## USING VENDOR SALES SUMMARY

To enable dynamic visualization, interactive exploration, and executive-level monitoring, the **vendor\_sales\_summary** table was imported into Power BI to create a comprehensive **Vendor Performance Dashboard**.

This dashboard centralizes business-critical KPIs, vendor analytics, brand insights, and inventory performance metrics, supporting real-time decision-making.

### 11.1 Key Performance Indicators (KPIs)

The dashboard highlights the following business KPIs:

#### 1. Total Sales (\$)

Sum of all TotalSalesDollars, showing overall revenue generation.

#### 2. Total Purchase (\$)

TotalPurchaseDollars aggregated across all vendor-product combinations.

#### 3. Gross Profit (\$)

Difference between TotalSalesDollars and TotalPurchaseDollars, capturing profitability.

#### 4. Average Profit Margin (%)

Average of ProfitMargin values after filtering out zero or negative margins.

#### 5. Total Unsold Capital (\$)

A custom calculated measure to highlight inventory costs tied up in unsold stock.

#### DAX Expression:

```
UnsoldCapital =  
    (vendor_sales_summary[TotalPurchaseQuantity]  
     - vendor_sales_summary[TotalSalesQuantity])  
     * vendor_sales_summary[PurchasePrice]
```

This KPI highlights inefficiencies in inventory utilization and shows where capital is being held without generating revenue.

## 11.2 Donut Chart – Purchase Contribution % (Vendor Distribution)

This visual shows the distribution of total purchase dollars across vendors, revealing vendor dependency levels.

### Data Preparation

A new table was created to aggregate purchase contributions per vendor:

```
PurchaseContribution =  
SUMMARIZE(  
    vendor_sales_summary,  
    vendor_sales_summary[VendorName],  
    "TotalPurchaseDollars",  
    SUM(vendor_sales_summary[TotalPurchaseDollars])  
)
```

### Calculated Columns

```
PurchaseContribution%  
PurchaseContribution% =  
PurchaseContribution[TotalPurchaseDollars] /  
CALCULATE(SUM(PurchaseContribution[TotalPurchaseDollars]),  
ALL(PurchaseContribution)) * 100
```

### Vendor Ranking

```
RankVendor =  
RANKX(  
    ALL('PurchaseContribution'),  
    'PurchaseContribution'[TotalPurchaseDollars],  
    ,  
    DESC  
)
```

## Vendor Grouping

```
VendorGroup =  
IF(  
    'PurchaseContribution'[RankVendor] <= 10,  
    'PurchaseContribution'[VendorName],  
    "Others"  
)
```

## Visualization Setup

- **Legend:** VendorGroup
- **Values:** Sum(PurchaseContribution%)

This visual clearly separates the **Top 10 vendors** vs **All Others**, helping stakeholders quickly assess supplier concentration risk.

## 11.3 Bar Chart — Top Vendors by Sales

### Visualization

- **Y-axis:** VendorName
- **X-axis:** SUM(TotalSalesDollars)

Identifies the highest revenue-generating vendors and helps compare sales contributions.

## 11.4 Bar Chart — Top Brands by Sales

### Visualization

- **Y-axis:** Description (Product/Brand Name)
- **X-axis:** SUM(TotalSalesDollars)

Helps prioritize high-performing brands, useful for marketing, inventory stocking, and promotional planning.

## 11.5 Funnel Chart – Low Performing Vendors (by Stock Turnover)

A funnel chart was created to highlight vendors with **StockTurnover < 1**, meaning sales volumes do not keep up with purchase quantities.

### Supporting Table

```
LowTurnoverVendor =  
  
VAR FilteredData =  
  
    FILTER(  
  
        vendor_sales_summary,  
  
        vendor_sales_summary[StockTurnover] < 1  
  
    )  
  
RETURN  
  
SUMMARIZE(  
  
    FilteredData,  
  
    vendor_sales_summary[VendorName],  
  
    "AvgStockTurnOver",  
  
    AVERAGE(vendor_sales_summary[StockTurnover])  
)
```

### Visualization Setup

- **Category:** VendorName
- **Values:** Average of AvgStockTurnover

This identifies vendors contributing to slow-moving or stagnant inventory.

## 11.6 Scatter Chart – Identifying Low Performing Brands

This visual identifies brands that:

- ✓ Have **low total sales**
- ✓ But **high profit margins**

Such brands are perfect candidates for targeted promotions or inventory optimization.

## Supporting Table

```
BrandPerformance =  
  
SUMMARIZE(  
  
    vendor_sales_summary,  
  
    vendor_sales_summary[Description],  
  
    "TotalSales", SUM(vendor_sales_summary[TotalSalesDollars]),  
  
    "AvgProfitMargin", AVERAGE(vendor_sales_summary[ProfitMargin])  
)
```

## Target Brand Identification

```
TargetBrand =  
  
IF(  
  
    [TotalSales] <= PERCENTILEX.INC(BrandPerformance, BrandPerformance[TotalSales],  
    0.15)  
  
    && [AvgProfitMargin] > PERCENTILEX.INC(BrandPerformance,  
    BrandPerformance[AvgProfitMargin], 0.85),  
  
    "Yes",  
  
    "No"  
)
```

## Visualization Setup

- **Values:** Description (brand)
- **X-axis:** TotalSales
- **Y-axis:** AvgProfitMargin
- **Filter:** AvgProfitMargin < 1000 to remove extreme outliers

This chart quickly highlights **strategic brands that can drive growth** through price adjustments or promotional efforts.

## 11.7 Dashboard Outcomes

The Power BI dashboard enables:

- Immediate visibility into **vendor performance, brand profitability, and inventory risks**
- Early detection of **slow-moving stock and high-margin low-sales brands**
- Insights into **vendor concentration risks** via purchase contribution analysis
- Strategic decision-making through visual correlations between margin, price, and sales

The dashboard integrates all analytical work from earlier chapters into a single interactive view, ensuring decision-makers can explore data intuitively and take action accordingly.

