Regional Sales Analysis

An **Exploratory Data Analysis**
Case Study

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1. Problem Statement

Sales teams often lack a clear, data-driven understanding of regional performance, making it difficult to identify growth opportunities and optimize resources. This project aims to analyse and visualize regional sales data to uncover trends, evaluate profitability, and support strategic decision-making.

Business Questions:
- Inconsistent revenue and profit performance across U.S. regions
- Lack of visibility into seasonal swings, top SKUs, and channel profitability

1. Problem Statement

Project Goal:
To explore and analyze the regional 5-year dataset in order to identify trends and improve decision-making for sales optimization.

Project Objectives:
- **Analyze Regional Performance:** Compare revenue and profits across U.S. regions to identify strengths and weaknesses.
- **Examine Seasonal Trends:** Investigate seasonal variations in sales to understand their impact.
- **Identify Top Products:** Determine which SKUs are driving sales in different regions.
- **Evaluate Sales Channels:** Assess the profitability of various sales channels to inform resource allocation.
- **Create Actionable Recommendation:** Use the findings to uncover insights and suggest growth opportunities.
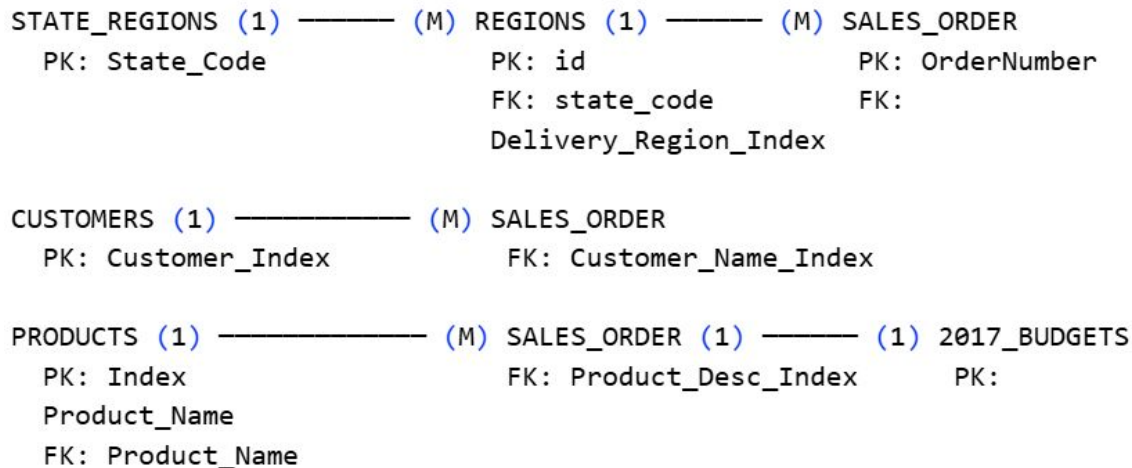
2. Approach

To address the problem of unclear regional sales performance, this project followed a structured data analysis workflow. First, the dataset was acquired and loaded, followed by a review of domain knowledge to understand the business context and objectives. Next, the data was explored to assess its structure, completeness, and relevance. Cleaning and preparation steps were applied to handle missing values, correct inconsistencies, and format the data for analysis.

The core of the project involved Exploratory Data Analysis (EDA), combining **statistical techniques** and **visual exploration** to uncover patterns and trends. Key areas of focus included regional revenue comparisons, seasonal sales fluctuations, SKU-level performance, and channel profitability. These findings were then synthesized into actionable insights to support strategic decision-making and resource optimization.

3. Data Overview

Dataset format: .xlxs
Missing Values: 0
Duplicates: 0

ER Diagram

```
STATE_REGIONS (1) ——— (M) REGIONS (1) ——— (M) SALES_ORDER
    PK: State_Code                PK: id              PK: OrderNumber
                                  FK: state_code      FK:
                                  Delivery_Region_Index


CUSTOMERS (1) ——————— (M) SALES_ORDER
    PK: Customer_Index           FK: Customer_Name_Index


PRODUCTS (1) ——————— (M) SALES_ORDER (1) ——— (1) 2017_BUDGETS
    PK: Index                    FK: Product_Desc_Index      PK:
    Product_Name
    FK: Product_Name


RELATIONSHIP KEY:
(1) ——— (M) = One-to-Many

(1) ——— (1) = One-to-One

PK = Primary Key, FK = Foreign Key
```

3. Data Overview

Key Metrics & Critical Variables

| Key Metric	Critical Variables	Analytical Objective
Regional Revenue Growth Rate	Line Total, Delivery Region Index	Analyze Regional Performance
Seasonal Sales Variance	OrderDate, Line Total, Delivery Region Index	Examine Seasonal Trends
Top SKUs Revenue Contribution	Product Description Index, Line Total, Delivery Region Index	Identify Top Products
Channel Profitability Ratio	Channel, Line Total, Total Unit Cost, Delivery Region Index	Evaluate Sales Channels

4. Project Workflow
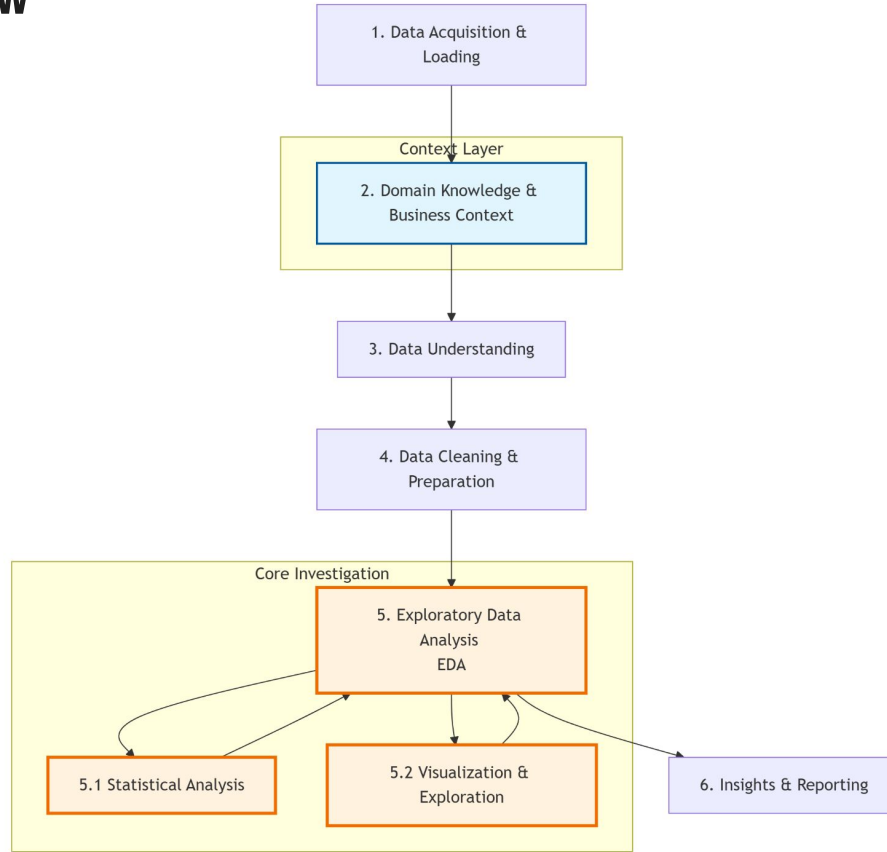
# 5. Exploratory Data Analysis (EDA)

5.1 Regional Revenue Growth Rate
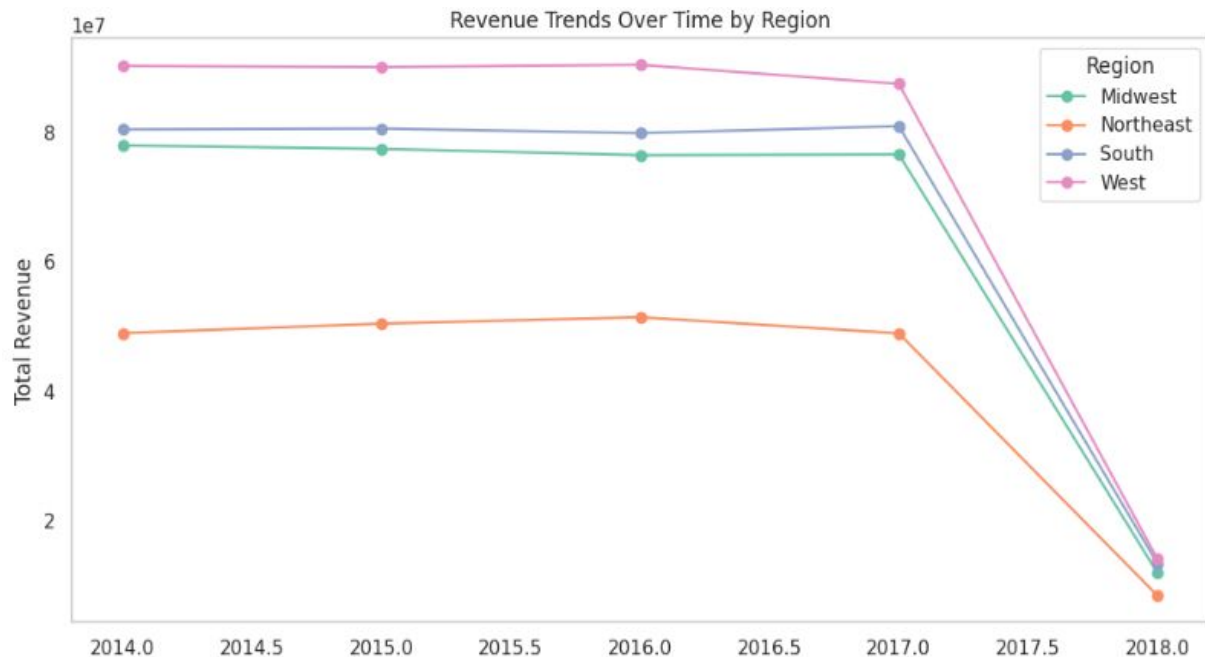
Regions with the Highest and Lowest Growth Rates:

Highest Growth Rate (2014-2017): The West region maintained the strongest performance, with consistently high revenue and modest year-over-year increases until 2017.

Lowest Growth Rate (2014-2018): The Midwest region experienced the steepest decline, dropping over 84% in 2018 compared to 2017 — the most severe contraction among all regions.

5. Exploratory Data Analysis (EDA)

5.1 Regional Revenue Growth Rate

Total Revenue Distribution by Region
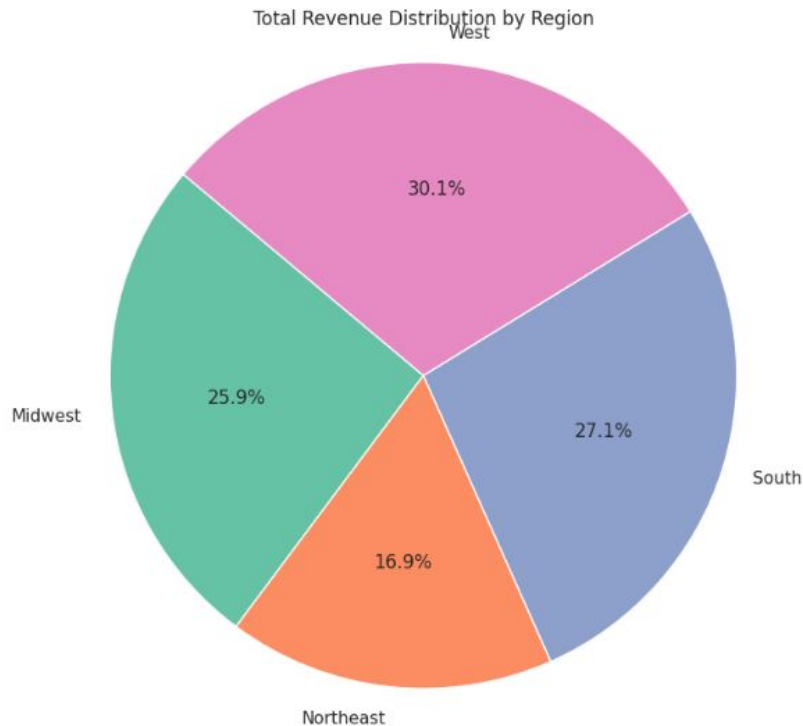
Highest sales and lowest sales:

Highest Sales: The **West region** had the highest cumulative revenue, totaling approximately **$372 million**, making it the top-performing region overall.

Lowest Sales: The **Northeast region** recorded the lowest cumulative revenue, with around **$210 million**, indicating the weakest sales performance among the four regions.

# 5. Exploratory Data Analysis (EDA)

5.2 Seasonal Sales Variance
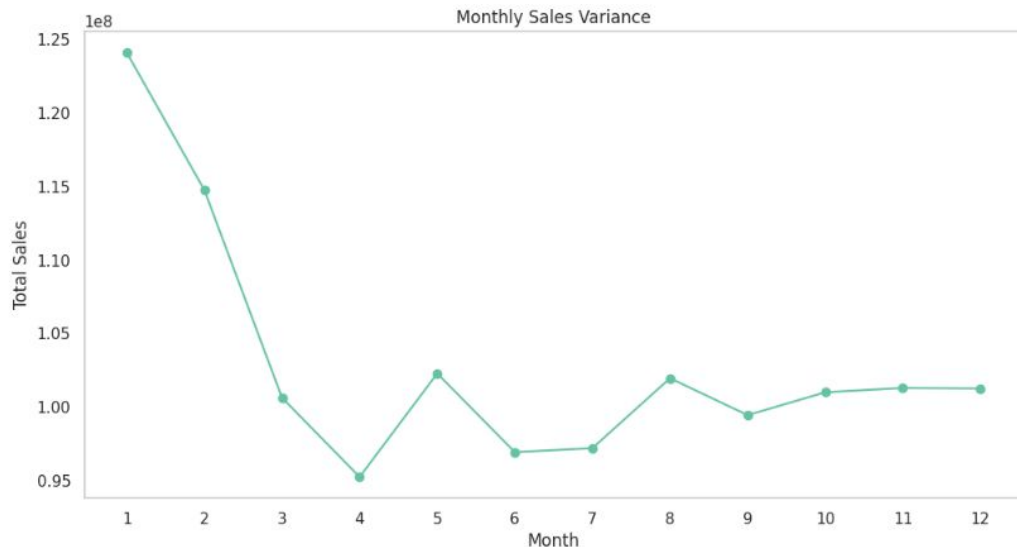
Monthly Sales Insights:

January recorded the highest monthly sales at $124.1 million, followed by February at $114.7 million, both significantly exceeding the average of approximately $103 million. This indicates a robust post-holiday or first-quarter surge, likely fueled by seasonal demand or promotional cycles.

April and June recorded below-average sales, suggesting seasonal slowdowns or dips in consumer engagement during these months.

5. Exploratory Data Analysis (EDA)

5.2 Seasonal Sales Variance
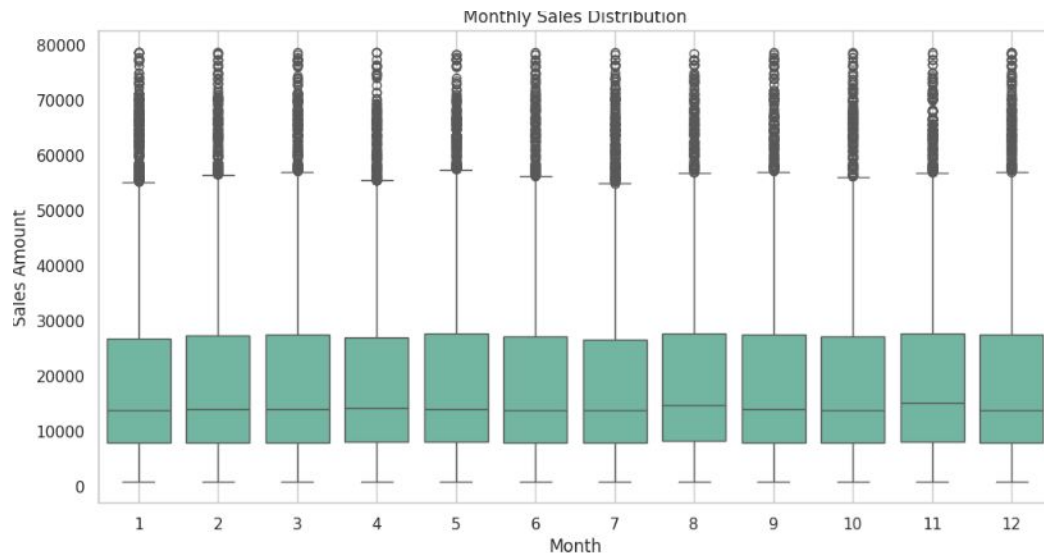
Quarterly Sales Insights:
From 2014 to 2017, Q4 consistently led in sales, peaking at ~$76.6M in 2015: This trend highlights strong seasonal buying behavior, likely driven by year-end holiday demand.

Q1 2018 saw a sharp drop to $48.1M, well below prior Q1 averages of ~$73M-$\74M: This decline may signal a broader business slowdown or changing seasonal patterns.

Variability & Stability:
With a coefficient of variation (CV) of ~8%, monthly sales exhibit **low volatility**, indicating stable seasonal patterns that support reliable forecasting and inventory planning.

5. Exploratory Data Analysis (EDA)
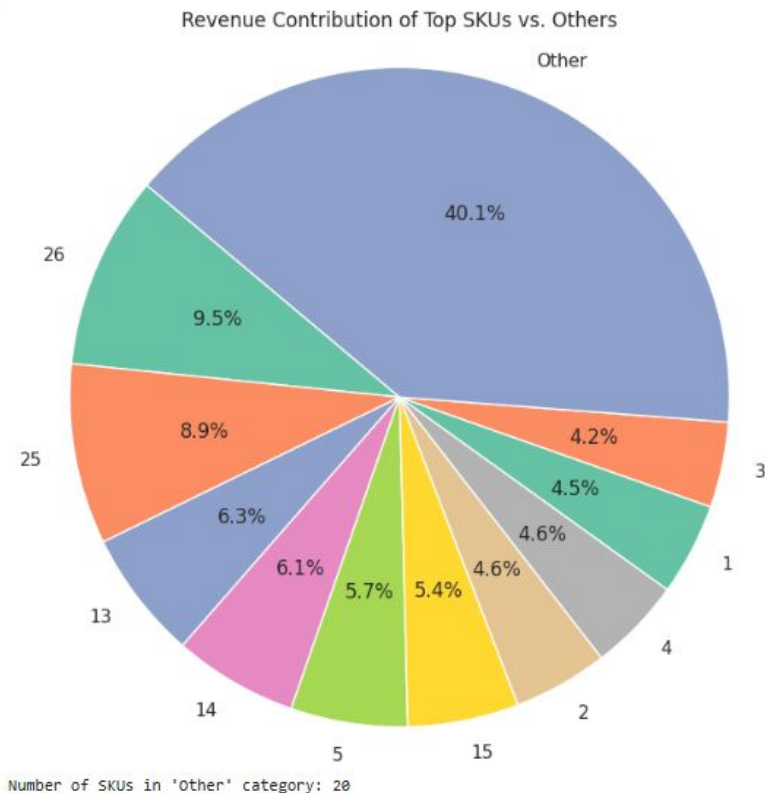
5.3 Top SKUs Revenue Contribution

Top SKUs Revenue Contribution
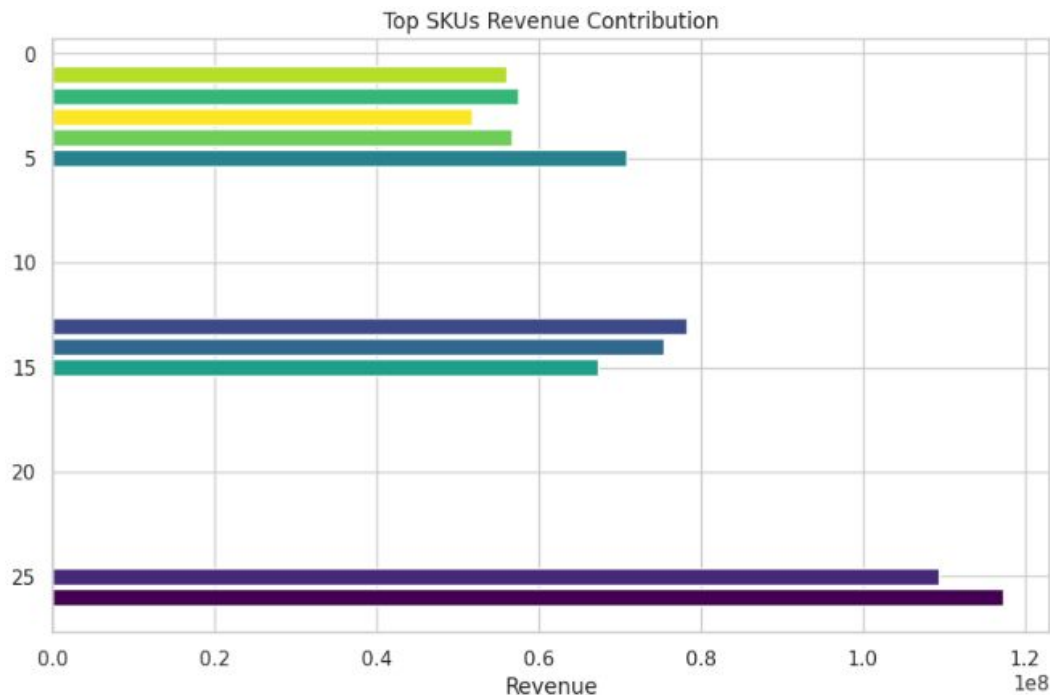
Top 10 SKUs Drive Nearly Half of Total Revenue:

The top 10 products generate a substantial 60.9% of total revenue, amounting to $763.6 million out of $1.253 billion, with the leading SKU (Product Description Index 26) contributing 9.5% and SKU 25 closely following at 8.9%.

5. Exploratory Data Analysis (EDA)

5.3 Top SKUs Revenue Contribution

Revenue Contribution of Top SKUs vs. Others

Number of SKUs in 'Other' category: 20

**Strong Revenue Concentration at the Top:**

The top 10 SKUs each contribute between 4.2% and 9.5% of total revenue, revealing a sharp decline after the leading few. This concentration reflects a classic Pareto pattern, where a small group of products disproportionately drives overall sales.

Long Tail of Low-Contributing SKUs

The remaining 20 SKUs account for just 39.1% of total revenue, with many contributing under 3% individually and some less than 2%. This long tail reflects a broad product mix with limited individual impact—valuable for niche or regional strategies, but less essential to driving core revenue.

5. Exploratory Data Analysis (EDA)

5.4 Channel Profitability Ratio
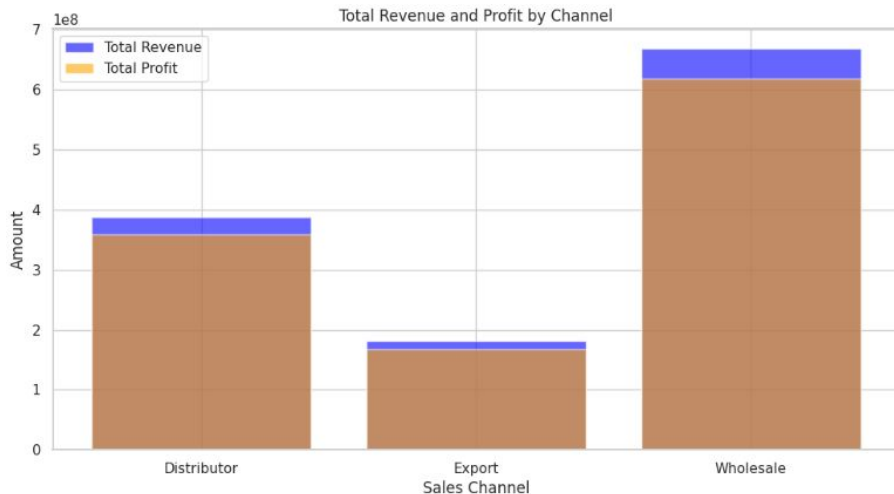
Revenue vs. Profit Trade-off While Export leads in profitability ratio, it generates the **lowest total revenue** and **lowest absolute profit**:

Channel	Total Revenue	Profit
Wholesale	$668.2M	$618.5M
Distributor	$387.1M	$358.3M
Export	$180.6M	$167.3M

Strategic Implications

Export is highly efficient but small-scale. Consider scaling this channel if market conditions allow.

Wholesale is the powerhouse—high volume and strong margins. It likely deserves continued or increased investment.

Distributor is solid but slightly less efficient. Investigate cost structures or pricing strategies to improve margins.

5. Exploratory Data Analysis (EDA)

5.4 Channel Profitability Ratio

Channel Profitability Ratio (%)

Profitability Ratio Comparison:
The profitability ratio measures how much profit is retained per dollar of revenue. Here's how the channels stack up:

Channel	Profitability Ratio (%)
Export	**92.64**
Wholesale	92.57
Distributor	92.54

Export is the most profitable channel, retaining the highest percentage of revenue as profit.

Wholesale and **Distributor** follow closely, with marginal differences in profitability.

6. Key Insights

This exploratory data analysis evaluates regional performance, seasonal trends, top-selling SKUs, and sales channel profitability to guide strategic decisions. The **West region** emerged as the strongest performer, generating **$372M** in cumulative revenue and maintaining consistent growth from **2014 to 2017**. In stark contrast, the **Midwest region** suffered an **84% revenue drop** in **2018**, marking the steepest decline and lowest growth rate overall.

Seasonal analysis revealed that **January and February** far exceeded the **~$103M monthly average**, while **Q4 consistently led** in quarterly sales, peaking at **$76.6M in Q4 2015**. Despite a dip in **Q1 2018** to **$48.1M**, overall monthly sales showed low volatility (**CV ~8%**), supporting stable forecasting and inventory planning.

Sales concentration is high, with the **top 10 SKUs contributing 60.9% of total revenue**—a classic Pareto pattern—while the remaining **20 SKUs** account for just **39.1%**. Among sales channels, all exhibit exceptional efficiency with profitability ratios above **92%**.

Export leads in margin efficiency (**92.64%**), but **Wholesale** dominates in scale, generating **$668.2M in revenue** and **$618.5M in profit**, making it the most financially impactful. **Distributor** performs steadily with **$387.1M in revenue**, though slightly lower margins suggest room for optimization.

7. Recommendations

1. **Seasonal & Regional Opportunities**
    a. **Boost Q1 & Q4:** Launch campaigns in January and Q4 to capitalize on peak sales. Prioritize top SKUs and Wholesale channel.
    b. **Target the West:** Focus investments and promotions in the West region, your strongest performer.
    c. **Forecast Confidently:** Use stable seasonal patterns (CV ~8%) to optimize inventory and staffing.

2. **Fix Underperformance** Midwest Recovery: Investigate 2018's drop. Test niche SKUs and alternative channels like Export.

3. **Spring Slumps (April/June):** Run clearance sales, seasonal events, or pilot new products.

4. **SKU Strategy:** Double down on top 10 SKUs. Use long-tail SKUs for regional or seasonal experiments.

5. **Channel Optimization:**
    a. **Scale Export:** High margin, low volume—expand if feasible.
    b. **Invest in Wholesale:** High revenue and profit—keep growing.
    c. **Improve Distributor** Margins: Audit costs and pricing.