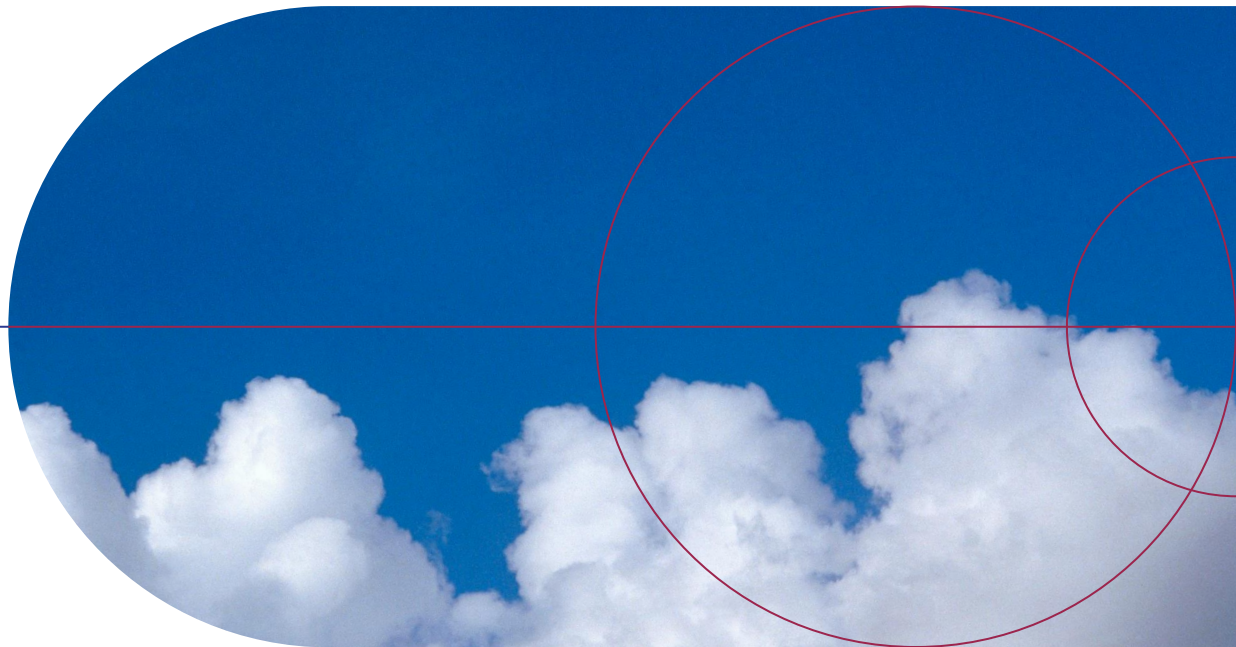# AWS SaaS Performance Analysis

Understanding What Drives Profitability and Growth

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Timeline

COMPANY BACKGROUND → BUSINESS UNDERSTANDING → DATA UNDERSTANDING → DATA CLEANING & TRANSFORMATION → DATA ANALYSIS & INSIGHTS → OVERALL SUMMARY → RECOMMENDATIONS

Company Background

AWS (Amazon Web Services) is the global leader in cloud computing, offering secure and scalable infrastructure that helps businesses innovate, boost efficiency, and reduce costs.

Its fast-growing SaaS (Software-as-a-Service) segment provides subscription-based software solutions for business clients, driving steady revenue and stronger customer relationships.

Crucially, with a **mission to empower every partner to innovate faster**, supporting a **vision to be the foundational platform for all future software solutions,** AWS generates revenue primarily through a *"pay-as-you-go"* model, billing partners for the exact cloud resources consumed, supplemented by transaction fees from the AWS Marketplace.

Business Stakeholders

Management

In order to make decision for pricing and profit goals, Management team need to understand about the profit leakage and margin risk.

Sales and Marketing Team

While Sales Team working on closing deals and setting the discount levels, Marketing Team could take part by running regional campaign. This action can help us align the promotion discounts with profitability data.

Finance Team

This analysis could help Finance Team overseeing the cash flows by tracking the revenue vs cost and evaluate the discounts strategies.

Business Understanding

Business Problem

Over the past four years, AWS SaaS has shown significant fluctuations in both sales and profitability. Transaction values range from just a few dollars to over $23 million, yet profit performance remains inconsistent — including several cases of negative profit, particularly in transactions with high discount rates.

These irregularities indicate inefficiencies in pricing and discount strategies. While discounts are commonly used to boost sales volume, the data suggests that in certain cases, they may actually reduce profitability instead.

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why negative profit transactions occur and how AWS SaaS can optimize its discount and pricing policy to achieve sustainable growth?

Data Understanding

Each row in the dataset represents **one AWS SaaS product transaction** made between 2020 and 2023.
The dataset contains customer, geographic, product, and financial information used to analyze sales and profitability patterns.

Order Information

- Order ID: A unique identifier for each order, which may include multiple product transactions.
- Order Date: The date the order was placed (DD/MM/YYYY).
- Date Key: Numeric representation of the order date (YYYYMMDD).

Customer Information

- Contact Name: The name of the individual placing the order.
- Customer: The company or organization making the purchase.
- Customer ID: A unique identifier for each customer.
- Segment: Customer classification based on business size (SMB, Strategic, Enterprise).
- Industry: The industry sector the customer belongs to

Data Understanding

Geographical Information

- Country: The country where the transaction occurred.
- Region: The broader region (e.g., APAC, EMEA, AMER).
- Subregion: A more specific regional breakdown.
- City: The city associated with the customer or transaction.

Product Details

- Product: The AWS SaaS product purchased.
- License: The unique license code assigned to the product.

Financial Metrics

- Sales: Total revenue from the transaction (in USD).
- Quantity: Number of units sold.
- Discount: Discount percentage applied to the transaction (0–1).
- Profit: Net profit after deducting costs (in USD).

Data Understanding

Exploratory Data Analysis

To understand the fluctuations in AWS SaaS's sales and profitability, this project begins by examining the dataset used for analysis.

- Total Records: 9,994 transactions
- Period Covered: 2020–2023
- Total Sales: $2.29M
- Total Profit: $286.40K
- Average Profit Margin: 12.5%
- Average Discount: 15.6%
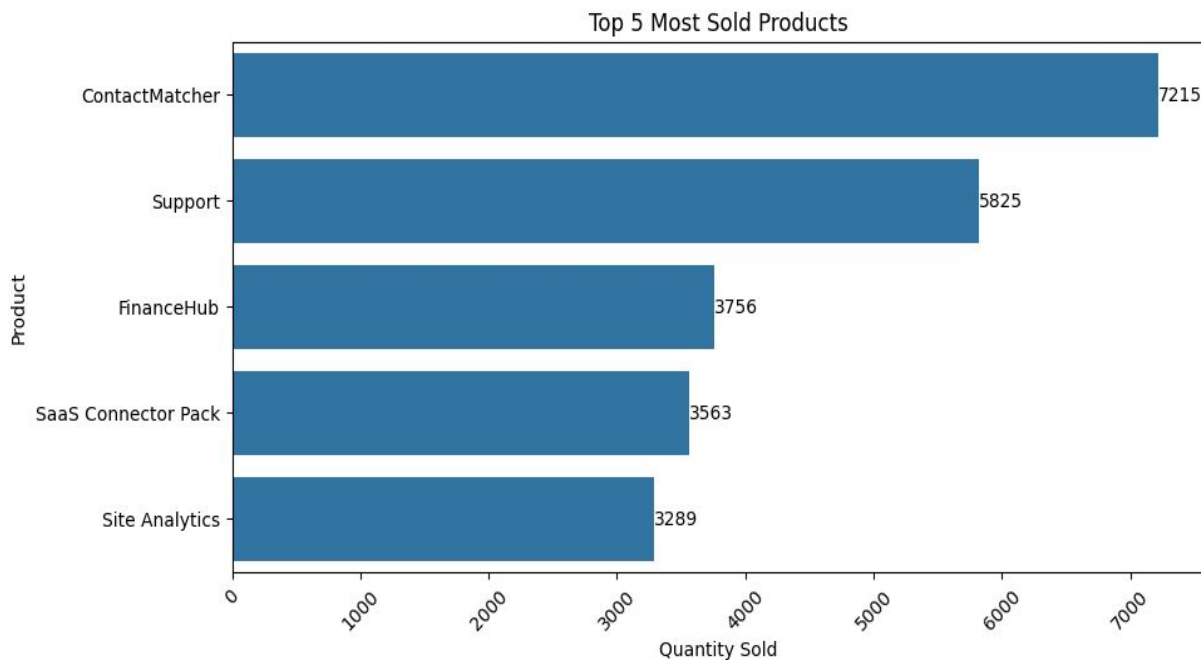- Number of Features: 19 columns

Data Cleaning
Data Transformation

Column(s) Used	Transformation Formula / Method	Transformed Feature / Purpose
Order Date, Date Key	Converted inconsistent date strings to datetime, standardized format, then re-encoded Date Key as integer	Ensures consistent date format for time-series analysis
Contact Name, City, Country	Applied .str.title() and removed irregular characters	Standardized categorical fields for better grouping
Sales, Profit	Removed currency symbols → converted to float → rounded to 2 decimals	Standardized numerical precision
License	Checked for duplicates, none found → used as potential unique identifier	Identifies transactions uniquely
Customer ID	Converted to object (string) type for categorical handling	Properly categorized non-numeric field
Row ID	Set as dataset index	Structured dataset for cleaner analysis
Profit, Sales	Added new column: (Profit / Sales) * 100, rounded to 2 decimals	Created **Profit Margin (%)** indicator
Sales, Quantity, Discount, Profit	Outlier detection using descriptive statistics and distribution check	Identified unusual transaction behavior

Data Analysis

Product Performance

Top 5 Most Sold Products

- **ContactMatcher** is the best-selling product, contributing **7,215 units sold**, followed by **Support (5,825)** and **FinanceHub (3,756)**.

- The gap between ContactMatcher and the rest is significant — indicating it is possible for strong market demand and potentially broad user adoption.
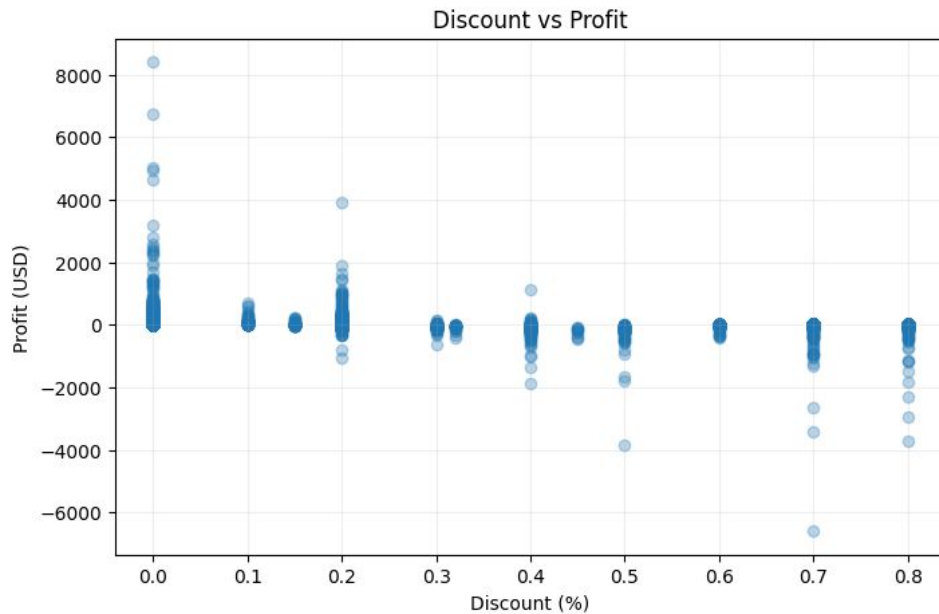
Product Performance

- There's a noticeable shift when we look at profit margin instead of sales volume. Products that dominated the previous chart, are **no longer in the top five**. Instead, **SaaS Connector Pack – Gold** leads with an **average profit margin above 40%**, despite relatively **low sales volume** (only around 900 units).
- This contrast highlights that **the most sold products are not necessarily the most profitable**.

It indicates that AWS SaaS may be relying on **high-volume, low-margin sales**, which could undermine long-term profitability.

Top 5 Products with Highest Profit Margin
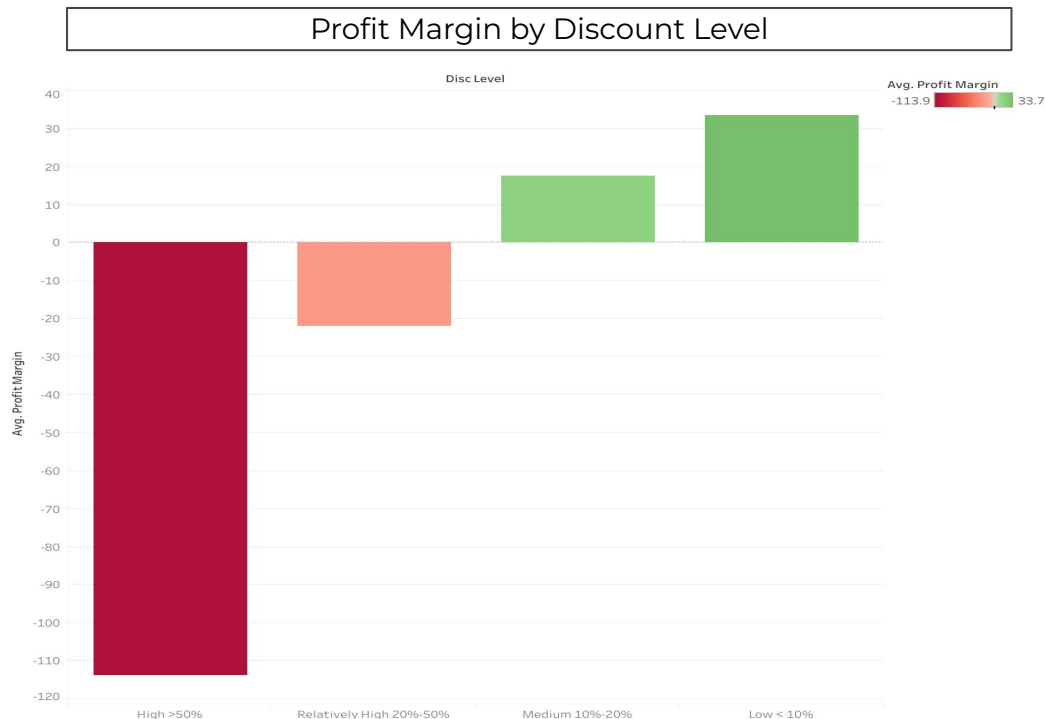
Discount Impact Analysis

Discount vs Profit

From this chart, we can clearly see an inverse relationship between discount and profit. As the discount rate increases, profit values tend to decline — even turning negative in several cases.

This suggests that **excessive discounting may harm profitability**, as the revenue gained from higher sales volume doesn't fully offset the loss from reduced margins.
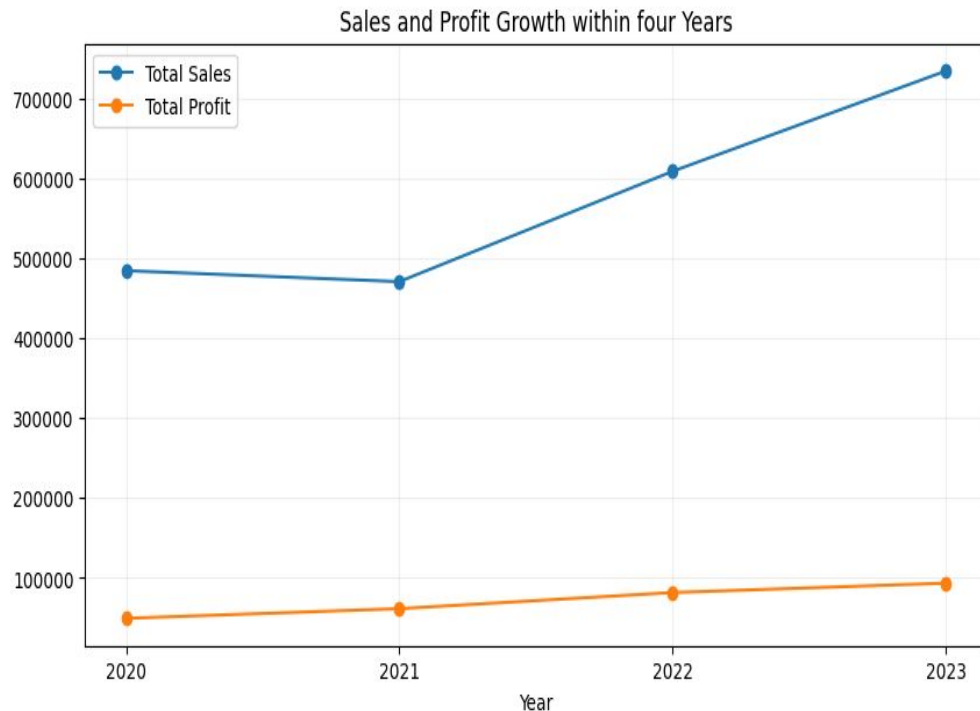
Discount Impact Analysis

Transactions with **high discounts (above 50%) show an average profit margin of around –113%**, meaning these sales generate *significant losses*. Meanwhile, moderate discounts between 10–20% still keep margins positive, and the **lowest discount group (<10%) achieves the healthiest profit margin** of about 33%.

This pattern confirms that **over-discounting drastically reduces profitability**, while keeping discount levels moderate helps maintain positive margins.

Profit Margin by Discount Level

Time Series Analysis

Sales and Profit Growth within four Years

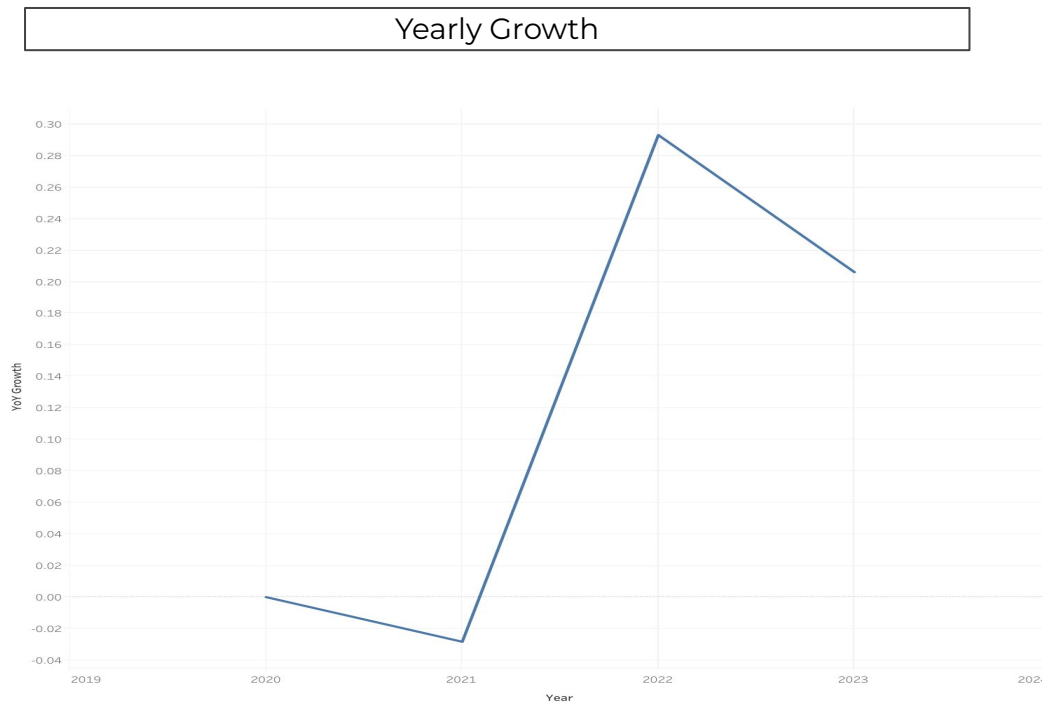Both **sales and profit have shown steady growth** from 2020 to 2023.

Profit also grew over time, though **at a much slower rate compared to sales** — suggesting that revenue growth hasn't fully translated into proportional profitability.

This widening gap between sales and profit highlights a **potential margin pressure**, possibly driven by discount strategies or rising costs.
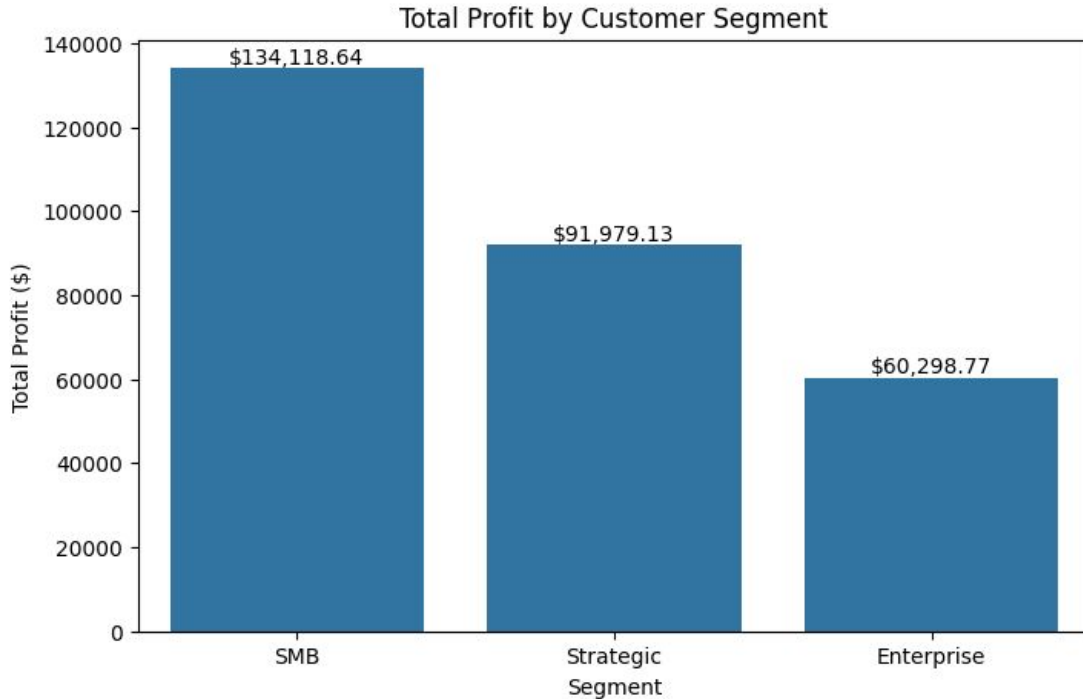
Time Series Analysis

- Sales growth fluctuated over the years.

- A **slight decline in 2021 (–3%)** was followed by a strong recovery in **2022 (+29%)**.

- Growth stabilized in **2023 (+21%)**, indicating a return to steady performance.

- Suggests a **post-recovery normalization** phase after sharp expansion.

Yearly Growth

Customer Segmentation

Total Profit by Customer Segment

- **SMB customers** generated the **highest total profit ($134K)**, followed by **Strategic ($91K)** and **Enterprise ($60K)** segments.

- Indicates that **smaller clients contribute more efficiently** to profit compared to larger accounts.

- Suggests focusing on **retention and upselling** in the SMB segment while **re-evaluating pricing or service costs** for Enterprise clients.

Negative Profit

	Total Transactions	Negative Profit Transactions	Percentage (%)
0	9994	1871	18.72

```
Profit          1.000000
Sales           0.479065
Profit Margin   0.223725
Quantity        0.066253
Year            0.004618
Date Key        0.004609
Discount       -0.219487
Name: Profit, dtype: float64
```

- Out of **9,994 transactions**, **1,871 (18.7%)** resulted in **negative profit**.

- Correlation analysis shows **Discount (–0.22)** has the strongest negative relationship with Profit.

- Reinforces that **high discounting is a major driver of losses**, reducing profitability despite strong sales activity.

High Discount Analysis

	Total Transactions	Total Sales	Total Profit	Average Profit Margin (%)
0	856	64228.61	-76559.13	-119.2

- **856 transactions** received discounts above 50%.

- These generated **total sales of $64K** but **a total loss of –$76K**, with an **average profit margin of –119%**.

- Demonstrates that **extreme discounts are unsustainable**, as they directly erode margins and overall business profitability.

Country Analysis

Weakest Countries Performance:

	Country	total_sales	total_profit	avg_discount	avg_profit_margin
0	Australia	80166.11	-12607.94	0.390041	-39.165996
1	Japan	170187.91	-25729.32	0.370193	-34.206335
2	Russia	32108.11	-6527.88	0.316484	-12.373791
3	France	116511.98	-15560.06	0.328620	-8.603833
4	Mexico	78258.19	-16971.38	0.324947	-7.378891

Strongest Countries Performance:

	Country	total_sales	total_profit	avg_discount	avg_profit_margin
0	Austria	2865.02	1059.59	0.000000	42.195000
1	United Arab Emirates	11678.13	4008.65	0.000000	37.949333
2	Croatia	1315.56	394.84	0.000000	37.758333
3	Netherlands	10169.11	3017.12	0.022222	37.046222
4	Denmark	1270.53	454.49	0.000000	36.373750

- Countries with **higher discounts** tend to record **lower or negative profit margins**.
- **Austria, UAE, and the Netherlands** remain profitable with **minimal discounts**.
- **Australia, Japan, and France** experience **losses despite large discounts**.
- This shows that **discounting doesn't always drive better performance**.
- **Efficient pricing and market-based discount control** are key to maintaining profitability

Overall Summary

- Sales performance continues to grow, but **profitability remains inconsistent** due to poor discount control and uneven regional performance.

- **Top-selling products ≠ top profit drivers.**
  ContactMatcher leads in sales, but *Support* and *SaaS Connector Pack – Gold* yield stronger margins.

- **Excessive discounts (>30%) lead to negative profits**, averaging –119%.

- **High-discount regions** (e.g., Australia, Japan, France) underperform compared to stable markets like Austria, UAE, and the Netherlands.

- **SMB customers generate the highest total profit**, suggesting that smaller clients offer better scalability and margin efficiency.

- Findings confirm that **volume-focused strategies hurt long-term profitability** if not balanced with margin optimization.

Negative profits are not caused by weak demand, they stem from **uncontrolled discounts and misaligned pricing strategies.** Sustainable growth for AWS SaaS depends on shifting from **sales expansion to profit optimization**

Recommendation

- **Cap discounts** within **30–40%**, aligning policies with margin thresholds.

- **Promote high-margin products** (*Support*, *SaaS Connector Pack – Gold*) in marketing and bundling.

- **Localize pricing** to reflect each region's market behavior and demand elasticity.

- **Focus on SMB retention** through loyalty and subscription-based programs.

- **Establish profit-tracking dashboards** to monitor performance across products, segments, and regions.