AWS Saas Sales

Sales Performance Analysis

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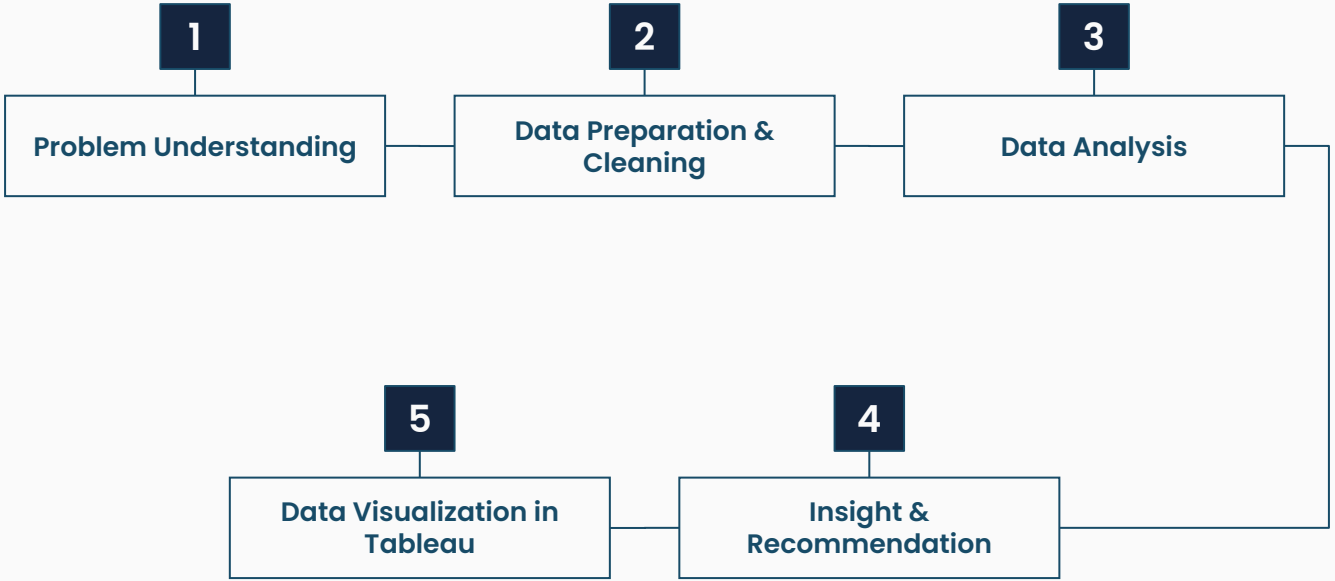
Background

Amazon Web Services (AWS) is a comprehensive and widely adopted cloud platform that offers a variety of infrastructure and application services. As part of its offerings, AWS provides Software-as-a-Service (SaaS) solutions designed to help businesses develop their products in a scalable and efficient manner. AWS SaaS is a developed product that allows organizations to deploy applications quickly, enhance operational efficiency, and foster innovation, making it suitable for startups and large enterprises alike.

The AWS SaaS approach promotes agility by providing tools and best practices that assist companies in **building, migrating, and modernizing their applications on the cloud.** This flexibility enables organizations to address customer challenges effectively while ensuring security and compliance across different industries. By leveraging the AWS Marketplace, companies can further expand their reach and revenue, highlighting the potential for significant growth in the SaaS market.

For more details, you can explore the AWS SaaS resources:
https://aws.amazon.com/saas/

Methodology



Problem Statement

As global demand for cloud-based solutions grows, competition among SaaS providers intensifies, revealing significant profit differences across regions. While the SaaS industry is expanding, the Asia-Pacific and Japan (APJ) region faces unique challenges that limit its profit margins. Companies in APJ often struggle to achieve the same levels of profitability as their counterparts in the America (AMER) and Europe, the Middle East and Africa (EMEA) regions. This situation raises important questions about the factors affecting sales performance in APJ and underscores the need for focused analysis to identify areas for improvement.

Based on sales data from 2020 to 2023, the APJ region's profit margin (3%) lags significantly behind AMER (15%) and EMEA (14%). This analysis aims to investigate the key factors affecting sales performance in APJ to identify drivers of low profitability and recommend strategies for improvement.

As a data analyst, we will attempt to answer the following:
What specific strategies can be implemented to increase the profitability of the APJ region from 3% to 12% within the next 3 years?

Objectives

Here are the use cases that will be examined:

1. **Sales Performance Analysis:** Provide summary of sales performance and profitability in the APJ region compared to AMER and EMEA.
2. **Correlation Analysis:** Exploring the Relationship Between Discounts, Quantity, Sales Volume, and Profit in APJ to determine if discounting strategies are reducing profit margins.

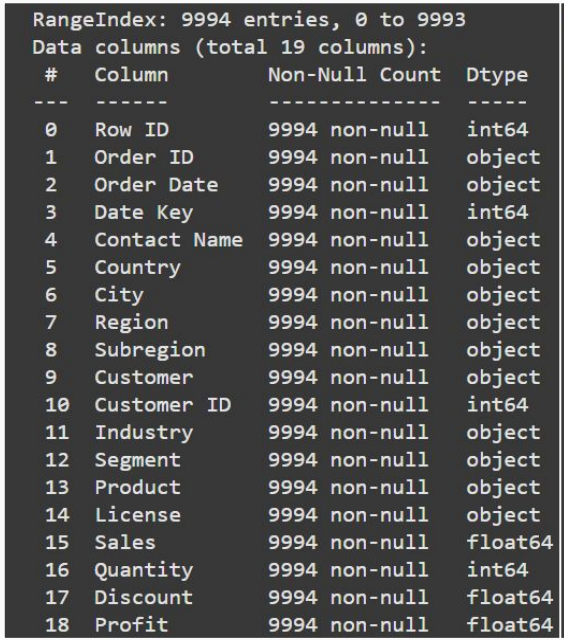
Data Preparation & Cleaning

1) **Change the data type of the column below:**

'Order Date' from 'object' to 'datetime'.
- Reason: it represents a date and time value, which is more appropriately stored as a datetime data type for easier manipulation

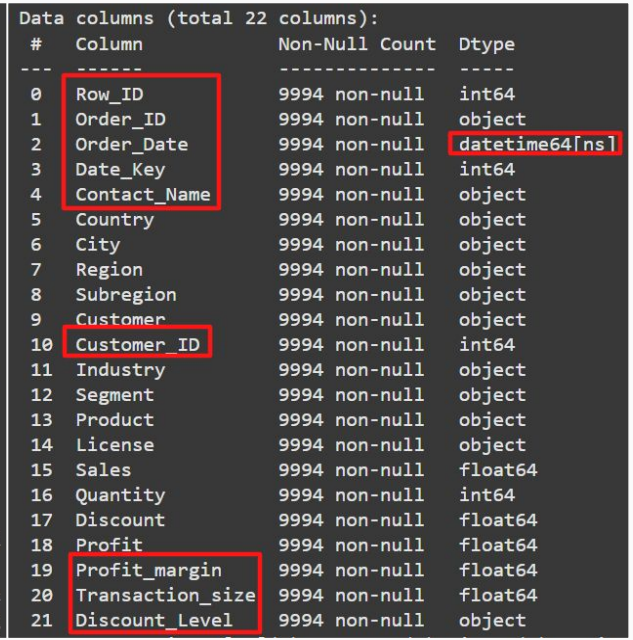
2) Change the label of the column below:
- Row ID -> Row_ID
- Order ID -> Order_ID
- Order Date -> Order_Date
- Date Key -> Date_Key
- Contact Name -> Contact_Name
- Customer ID -> Customer_ID

3) Adding data:
- profit margin, transaction size, and discount level



```
RangeIndex: 9994 entries, 0 to 9993
Data columns (total 19 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   Row ID         9994 non-null   int64
 1   Order ID       9994 non-null   object
 2   Order Date     9994 non-null   object
 3   Date Key       9994 non-null   int64
 4   Contact Name   9994 non-null   object
 5   Country        9994 non-null   object
 6   City           9994 non-null   object
 7   Region         9994 non-null   object
 8   Subregion      9994 non-null   object
 9   Customer       9994 non-null   object
 10  Customer ID    9994 non-null   int64
 11  Industry       9994 non-null   object
 12  Segment        9994 non-null   object
 13  Product        9994 non-null   object
 14  License        9994 non-null   object
 15  Sales          9994 non-null   float64
 16  Quantity       9994 non-null   int64
 17  Discount       9994 non-null   float64
 18  Profit         9994 non-null   float64
```

Before

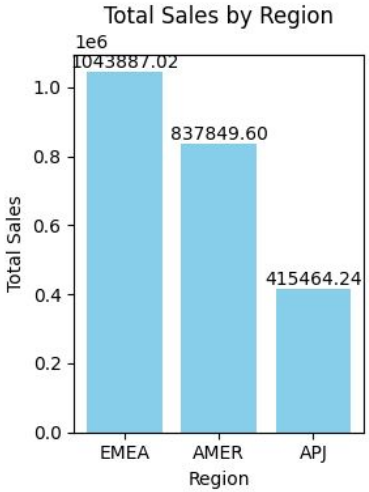


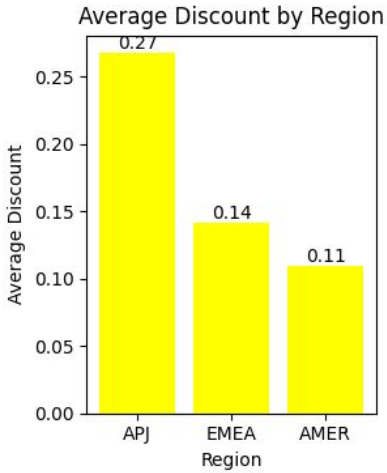
```
Data columns (total 22 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   Row_ID           9994 non-null   int64
 1   Order_ID         9994 non-null   object
 2   Order_Date       9994 non-null   datetime64[ns]
 3   Date_Key         9994 non-null   int64
 4   Contact_Name     9994 non-null   object
 5   Country          9994 non-null   object
 6   City             9994 non-null   object
 7   Region           9994 non-null   object
 8   Subregion        9994 non-null   object
 9   Customer         9994 non-null   object
 10  Customer_ID      9994 non-null   int64
 11  Industry         9994 non-null   object
 12  Segment          9994 non-null   object
 13  Product          9994 non-null   object
 14  License          9994 non-null   object
 15  Sales            9994 non-null   float64
 16  Quantity         9994 non-null   int64
 17  Discount         9994 non-null   float64
 18  Profit           9994 non-null   float64
 19  Profit_margin    9994 non-null   float64
 20  Transaction_size 9994 non-null   float64
 21  Discount_Level   9994 non-null   object
```

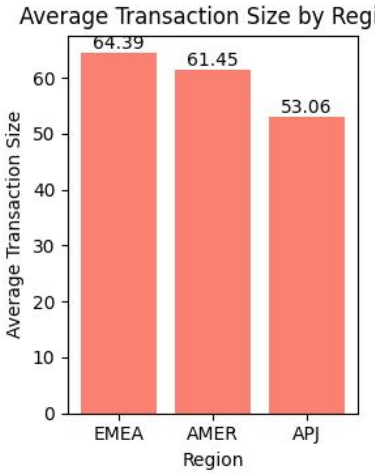
After

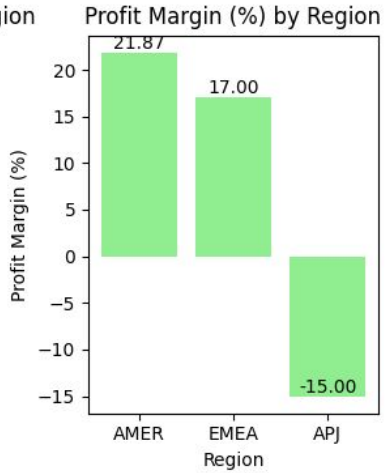
[Region-Level Analysis]

Sales Performance





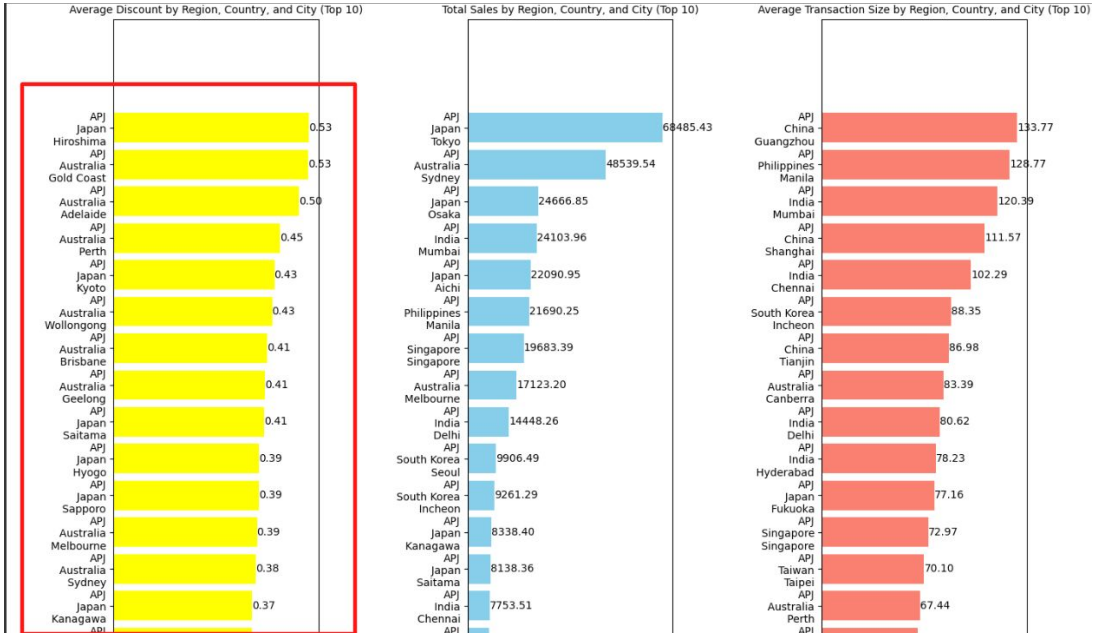




- **Compared to AMER and EMEA, APJ has the lowest total sales, average transaction size, and profit margin.**
- **APJ is the only region with an overall negative profit margin, despite having positive sales. This may be due to APJ having the highest average discount (0.27), which reduces the margin on each sale.**

[Country & city-Level Analysis]

Sales Performance

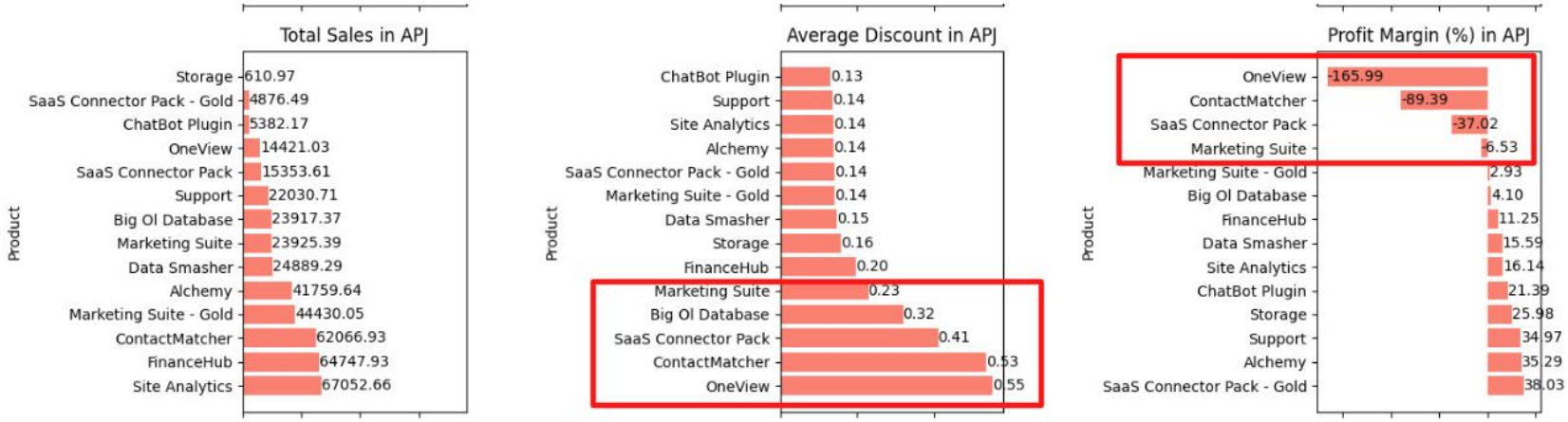


	Country	City	profit_margin
0	Japan	Hiroshima	-75.809333
1	Australia	Gold Coast	-72.545000
2	Australia	Adelaide	-63.571429
3	Japan	Kyoto	-57.932963
4	Australia	Perth	-55.267500
5	Japan	Sapporo	-48.736176
6	Japan	Saitama	-48.024894
7	Australia	Wollongong	-47.063333
8	Australia	Geelong	-41.750000
9	Japan	Hyogo	-41.576829
10	Australia	Brisbane	-40.613810

Japan and Australia have negative profit margins (all negative profit margins come from Japan and Australia — the top 22 by city and country) due to higher discounts (the top 23 discounts by city and country are dominated by Japan and Australia).

[Product-Level Analysis]

Sales Performance

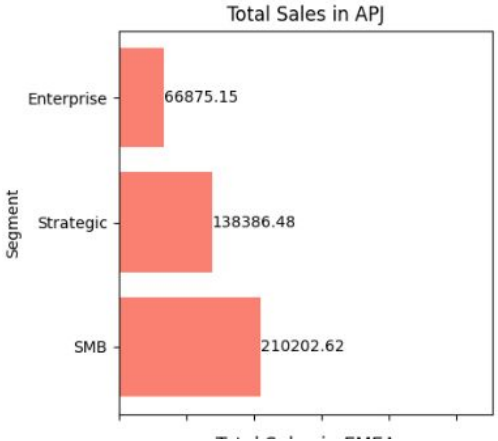


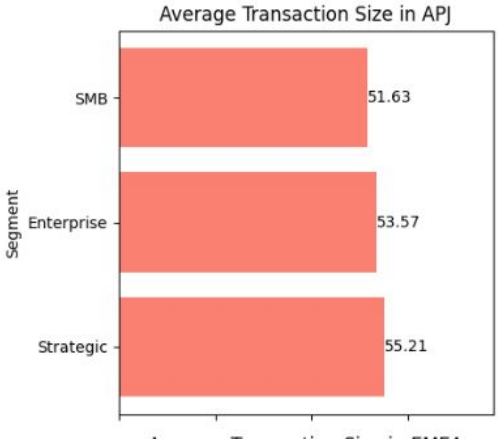
higher discounts are associated with lower profit margins, even leading to negative values. For instance, in the APJ region, the top five discounts (OneView, ContactMatcher, SaaS Connector Pack, Marketing suite) correspond to the top negative profit margins.

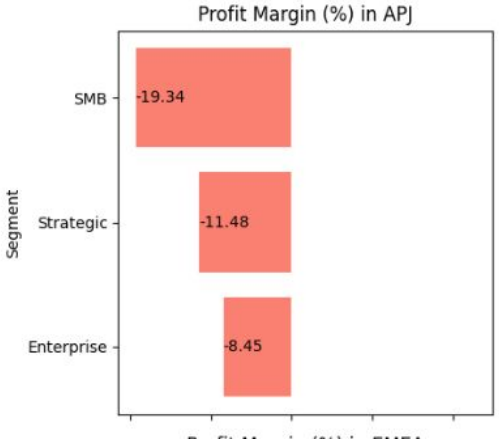
Reduce the high discount percentages on some products to a certain value so they don't cause a negative profit margin. Consider setting a maximum discount threshold.

[Market Segment-Level Analysis]

Sales Performance



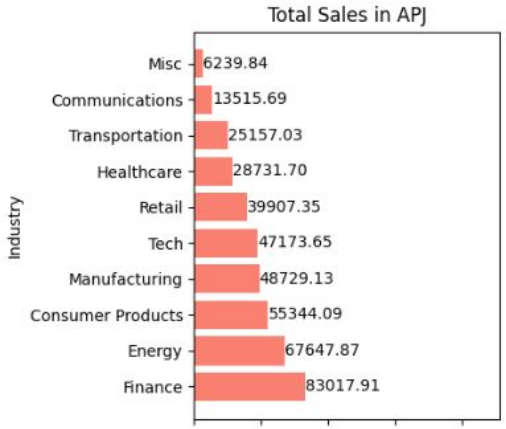


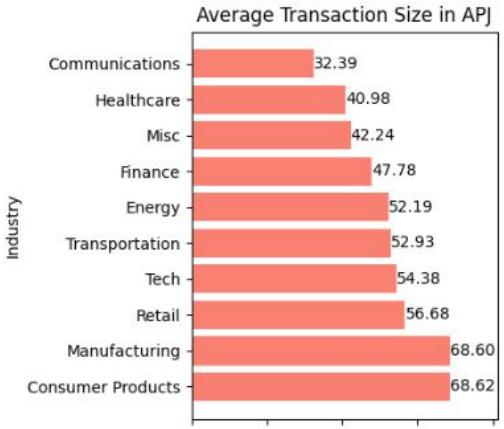


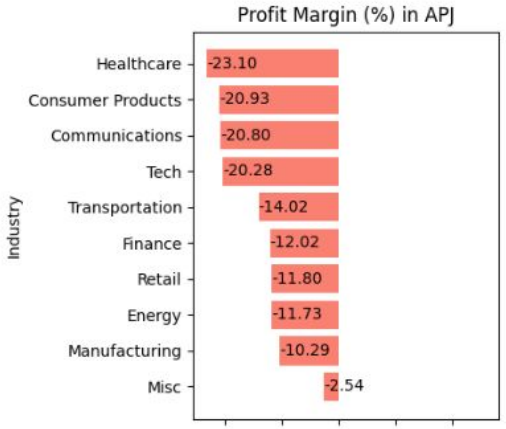
In the APJ region, every market segment shows a negative value, so all segments should be included in the upcoming strategy adjustments.

[Industry-Level Analysis]

Sales Performance

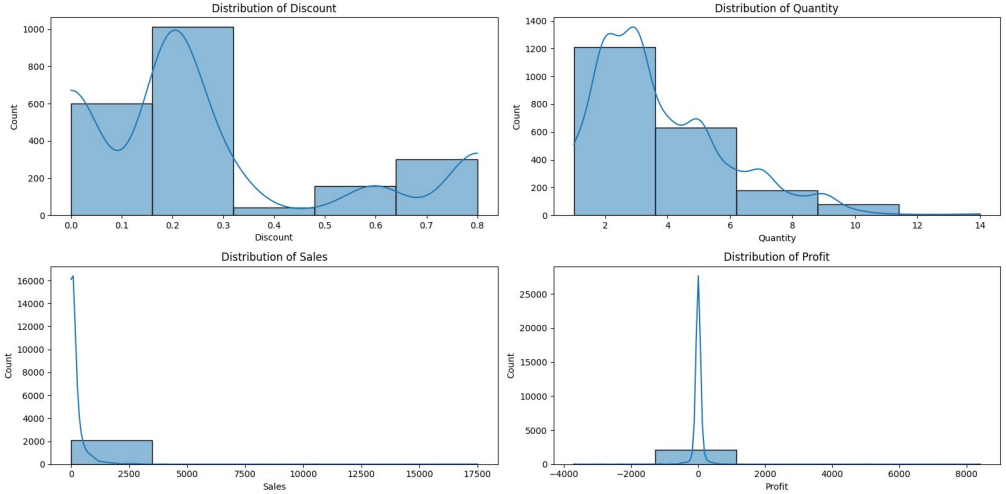






Every industry in the APJ region also shows a negative value, so all industry should be included in the upcoming strategy adjustments.

Correlation analysis



- There is a strong negative correlation between Discount and Profit (-0.74), indicating that as the discount increases, profit tends to decrease.
- There is a weak negative correlation between Sales and Discount (-0.21), suggesting that as Discount increase, Sales slightly decreases -> this might because of high Discounts Leading to Low Sales or increased Sales of Lower-Margin Products.
- There is a weak positive correlation between Quantity and Sales(0.31), suggesting that as quantity increase, Sales slightly increases.
- There is a weak positive correlation between Quantity and Profit (0.1), suggesting that as quantity increase, Profit slightly increases.

Hypothesis testing

```
discount_median: 0.2
    Discount Discount_Level
14       0.8           High
15       0.8           High
34       0.2           High
35       0.2           High
36       0.6           High
```

Discount_Level
Low
Low
Low
High
High

High: >= 0.2
Low: < 0.2

```
[ ]  from scipy.stats import ttest_ind

     # Separate the 'Profit' values for High and Low discount levels
     high_discount_profit = df_apj[df_apj['Discount_Level'] == 'High']['Profit']
     low_discount_profit = df_apj[df_apj['Discount_Level'] == 'Low']['Profit']

     # Perform an independent samples t-test
     t_stat, p_value = ttest_ind(high_discount_profit, low_discount_profit, equal_var=False)

     print(f"T-Statistic: {t_stat}")
     print(f"P-Value: {p_value}")
```

- **H0:There is no significant difference in Profit between High and Low discount levels.**
- **Ha: There is a significant difference in Profit between High and Low discount levels.**

```
T-Statistic: -6.272341636338483
P-Value: 6.234971312123289e-10
```

Reject the null hypothesis: There is a significant difference in Profit between High and Low discount levels.

Hypothesis testing

Since 0.2 was identified as the median discount.

This implies that discounts greater than or equal to 20% likely will cross a threshold (0.2) where they begin to negatively affect profitability

	Discount	Discount_Level	Profit
14	0.80	High	-123.8580
15	0.80	High	-3.8160
34	0.20	High	9.9468
35	0.20	High	123.4737
36	0.60	High	-147.9630
...	...	...	...
9962	0.32	High	-67.6704
9964	0.00	Low	6.4320
9965	0.00	Low	2.3406
9966	0.00	Low	51.5543
9972	0.20	High	33.6042

Summaries

- Compared to AMER and EMEA, **APJ has the lowest total sales, average transaction size, and profit margin, while having the highest average discount.For profit margin, only APJ has an overall negative value.**
- **In the APJ region, every market segment and industry shows a negative value.**
- **Japan and Australia have negative profit margins** (all negative profit margins come from Japan and Australia — the top 22 by city and country) **due to higher discounts** (the top 23 discounts by city and country are dominated by Japan and Australia).
- **The product data shows that higher discounts are linked to lower profit margins, sometimes causing losses (negative value).**
- There is a **strong negative correlation** between discount and profit (-0.74), indicating **that higher discounts significantly reduce profits.**
- **Sales show a weak negative correlation with discount (-0.21),**
- **Quantity has weak positive correlations with both sales (0.31) and profit (0.1)**
- **"High" discounts (above 20%) start to negatively affect profitability.**

Recommendations

1) Setting a cap to reduce High Discounts:
- consider setting a cap on discounts at or below 20% in order to prevent negative profit margin and boost profitability.

2) Adjust Discount Strategies by Product:
Try lowering discounts on low-margin products and offering moderate discounts on higher-margin products especially in APJ region.
- **set discount below 10% for OneView, ContactMatcher, SaaS Connector Pack, Marketing suite** due to negative profitability in the previous performance.
- set discount 20% or higher for product with high profit margin, but low sales to boost sales, for example support and storage.

3) Set Strategies for Japan and Australia:
These two markets drive the highest discounts and correlate with the highest negative profit margins.
- keep the discount below 20% cap to prevent negative profit margin.

4) Encourage Bulk Purchase / increase sales volume:
Given the weak positive correlation between quantity and both sales and profit, consider offering promotions for larger orders or high quantities with reasonable discounts.

5) Monitor Sales Impact of Discounts:
Since sales show a weak negative correlation with high discounts
- test smaller discounts or time-limited offers to boost sales.