```python
#STEP 1:EXTRACT

import pandas as pd

# Load the dataset
df = pd.read_csv('amazon_sales_data.csv')

# Display the first few rows to understand the structure
df.head()
```

```
                              Region                 Country
Item Type  \
0              Australia and Oceania                  Tuvalu
Baby Food
1  Central America and the Caribbean                 Grenada
Cereal
2                              Europe                  Russia  Office
Supplies
3                  Sub-Saharan Africa  Sao Tome and Principe
Fruits
4                  Sub-Saharan Africa                 Rwanda  Office
Supplies

  Sales Channel Order Priority Order Date   Order ID  Ship Date  Units
Sold  \
0       Offline              H  5/28/2010  669165933  6/27/2010
9925
1        Online              C  8/22/2012  963881480  9/15/2012
2804
2       Offline              L   5/2/2014  341417157   5/8/2014
1779
3        Online              C  6/20/2014  514321792   7/5/2014
8102
4       Offline              L   2/1/2013  115456712   2/6/2013
5062

   Unit Price  Unit Cost  Total Revenue  Total Cost  Total Profit
0      255.28     159.42     2533654.00  1582243.50     951410.50
1      205.70     117.11      576782.80   328376.44     248406.36
2      651.21     524.96     1158502.59   933903.84     224598.75
3        9.33       6.92       75591.66    56065.84      19525.82
4      651.21     524.96     3296425.02  2657347.52     639077.50
```

```python
# STEP2:TRANSFORM

#Converting Date Columns
#We have two date columns: Order Date and Ship Date . We'll convert
them to datetime format.

df['Order Date'] = pd.to_datetime(df['Order Date'], errors='coerce')
df['Ship Date'] = pd.to_datetime(df['Ship Date'], errors='coerce')
```

```
#Adding Month and Year Columns
# Extract month and year from order_date
df['order_month'] = df['Order Date'].dt.month
df['order_year'] = df['Order Date'].dt.year

# create a column for year-month for easier grouping
df['year_month'] = df['Order Date'].dt.to_period('M')

#Handling Missing Values
# Check for missing values
print(df.isnull().sum())

# Drop rows with missing order_date or ship_date
df = df.dropna(subset=['Order Date', 'Ship Date'])
```

```
Region             0
Country            0
Item Type          0
Sales Channel      0
Order Priority     0
Order Date         0
Order ID           0
Ship Date          0
Units Sold         0
Unit Price         0
Unit Cost          0
Total Revenue      0
Total Cost         0
Total Profit       0
order_month        0
order_year         0
year_month         0
dtype: int64
```

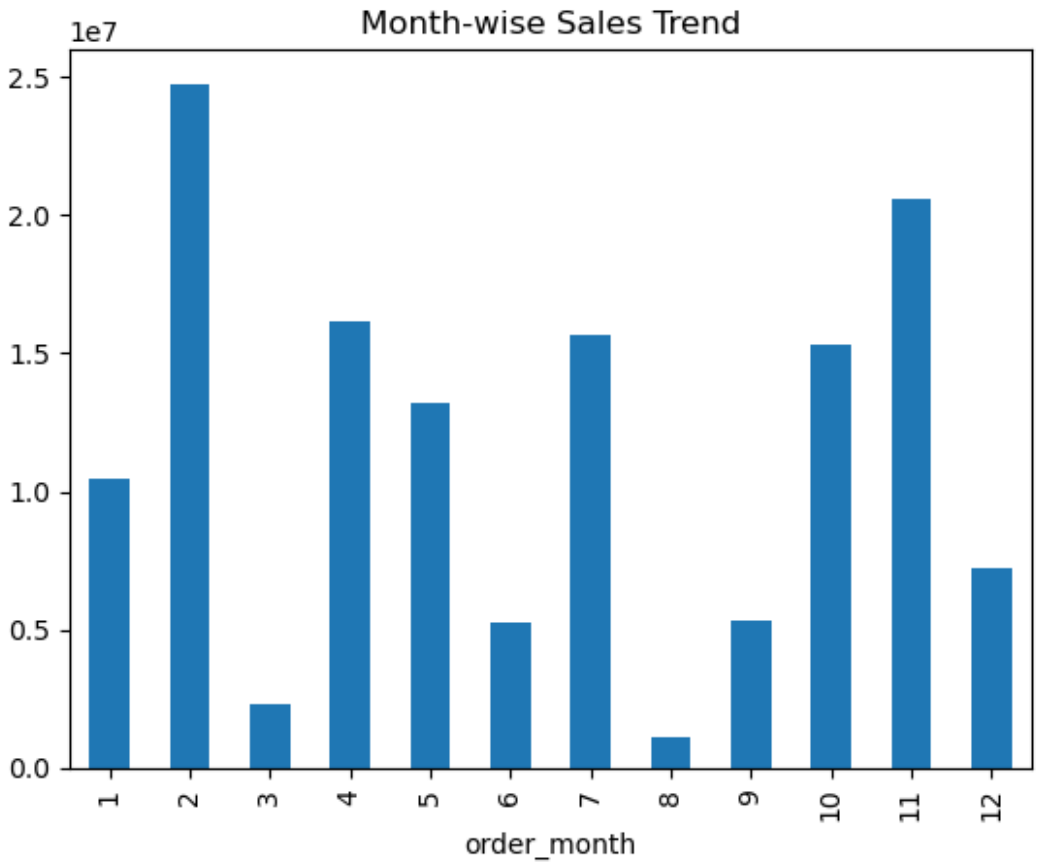
```
#STEP3: LOAD

# Display the cleaned DataFrame
df.head()
```

```
                               Region                 Country
Item Type  \
0             Australia and Oceania                  Tuvalu
Baby Food
1  Central America and the Caribbean                 Grenada
Cereal
2                             Europe                  Russia  Office
Supplies
3                 Sub-Saharan Africa  Sao Tome and Principe
Fruits
4                 Sub-Saharan Africa                 Rwanda  Office
Supplies
```

```
  Sales Channel Order Priority Order Date   Order ID  Ship Date  Units
Sold  \
0       Offline              H 2010-05-28  669165933 2010-06-27
9925
1        Online              C 2012-08-22  963881480 2012-09-15
2804
2       Offline              L 2014-05-02  341417157 2014-05-08
1779
3        Online              C 2014-06-20  514321792 2014-07-05
8102
4       Offline              L 2013-02-01  115456712 2013-02-06
5062

   Unit Price  Unit Cost  Total Revenue  Total Cost  Total Profit  \
0      255.28     159.42     2533654.00  1582243.50     951410.50
1      205.70     117.11      576782.80   328376.44     248406.36
2      651.21     524.96     1158502.59   933903.84     224598.75
3        9.33       6.92       75591.66    56065.84      19525.82
4      651.21     524.96     3296425.02  2657347.52     639077.50

   order_month  order_year year_month
0            5        2010    2010-05
1            8        2012    2012-08
2            5        2014    2014-05
3            6        2014    2014-06
4            2        2013    2013-02
```

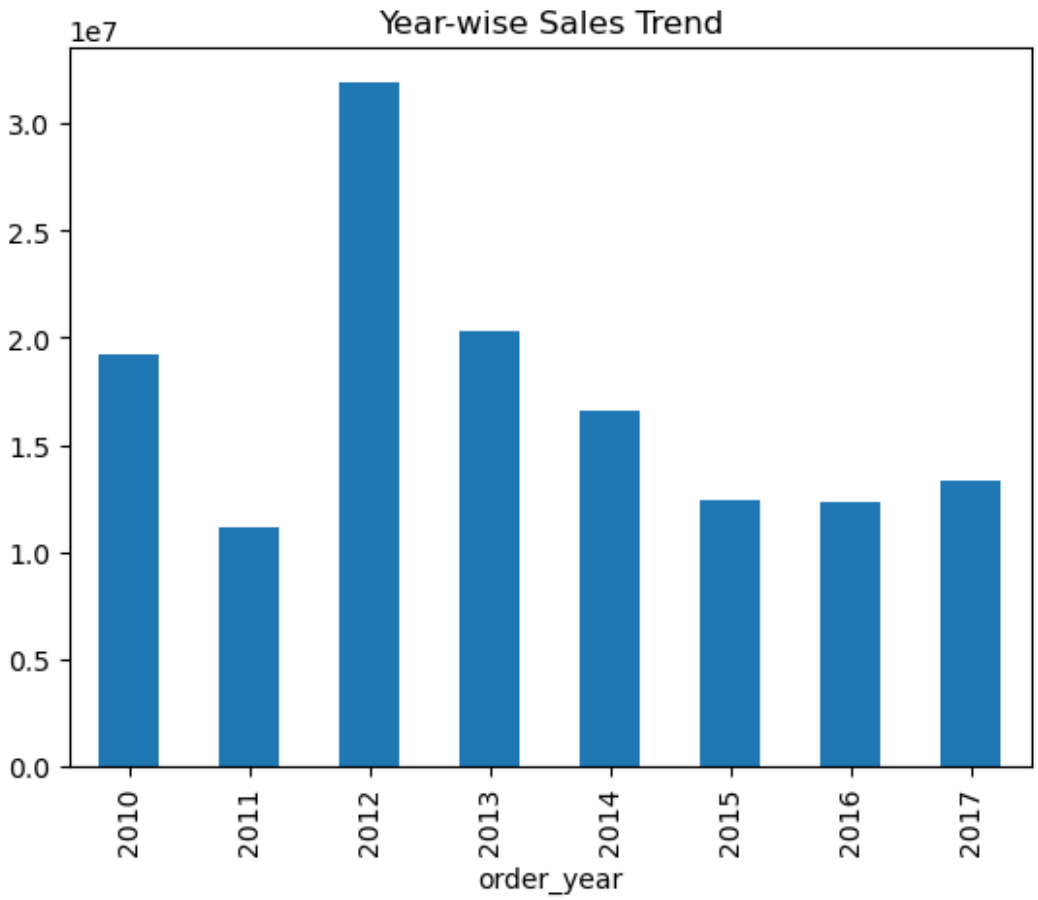
```
#STEP4:ANALYSIS

#Sales Trends
#Month-wise Sales Trend:
# Group by month and sum the total revenue
month_wise_sales = df.groupby('order_month')['Total Revenue'].sum()

# Plot month-wise sales trend
month_wise_sales.plot(kind='bar', title='Month-wise Sales Trend')
```

```
<AxesSubplot:title={'center':'Month-wise Sales Trend'},
xlabel='order_month'>
```



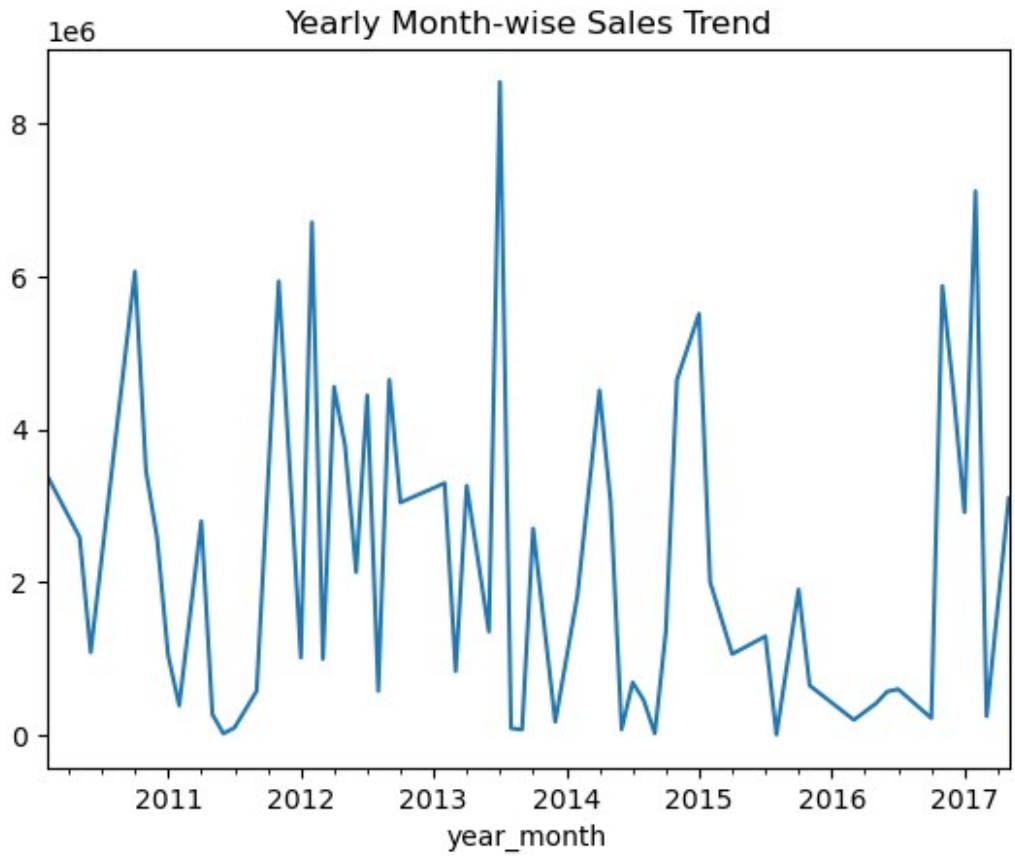

```
#Year-wise Sales Trend
# Group by year and sum the total revenue
year_wise_sales = df.groupby('order_year')['Total Revenue'].sum()

# Plot year-wise sales trend
year_wise_sales.plot(kind='bar', title='Year-wise Sales Trend')
```

```
<AxesSubplot:title={'center':'Year-wise Sales Trend'},
xlabel='order_year'>
```




```
#Yearly Month-wise Sales Trend:
# Group by year and month and sum the total revenue
yearly_month_wise_sales = df.groupby('year_month')['Total
Revenue'].sum()

# Plot yearly month-wise sales trend
yearly_month_wise_sales.plot(kind='line', title='Yearly Month-wise
Sales Trend')
```

```
<AxesSubplot:title={'center':'Yearly Month-wise Sales Trend'},
xlabel='year_month'>
```




```
#Key Metrics

#Total Sales
total_sales = df['Total Revenue'].sum()
print(f"Total Sales: ${total_sales}")
```

```
Total Sales: $137348768.31
```

```
#Average Sales per Transaction:
average_sales_per_transaction = df['Total Revenue'].mean()
print(f"Average Sales per Transaction: $
{average_sales_per_transaction}")
```

```
Average Sales per Transaction: $1373487.6830999998
```

```
#Top Selling Regions/Countries
# Group by region and sum the total revenue
top_regions = df.groupby('Region')['Total
Revenue'].sum().sort_values(ascending=False)
print("Top Selling Regions:\n", top_regions)

# Group by country and sum the total revenue
top_countries = df.groupby('Country')['Total
```

```
Revenue'].sum().sort_values(ascending=False)
print("Top Selling Countries:\n", top_countries)
```

```
Top Selling Regions:
 Region
Sub-Saharan Africa                    39672031.43
Europe                                33368932.11
Asia                                  21347091.02
Australia and Oceania                 14094265.13
Middle East and North Africa          14052706.58
Central America and the Caribbean      9170385.49
North America                          5643356.55
Name: Total Revenue, dtype: float64
Top Selling Countries:
 Country
Honduras        6336545.48
Myanmar         6161257.90
Djibouti        6052890.86
Turkmenistan    5822036.20
Mexico          5643356.55
                   ...
Syria             35304.72
Slovakia          26344.26
New Zealand       20404.71
Kyrgyzstan        19103.44
Kuwait             4870.26
Name: Total Revenue, Length: 76, dtype: float64
```

```
#Relationships Between Attributes

#Correlation Matrix
correlation_matrix = df.corr()
print(correlation_matrix)
```

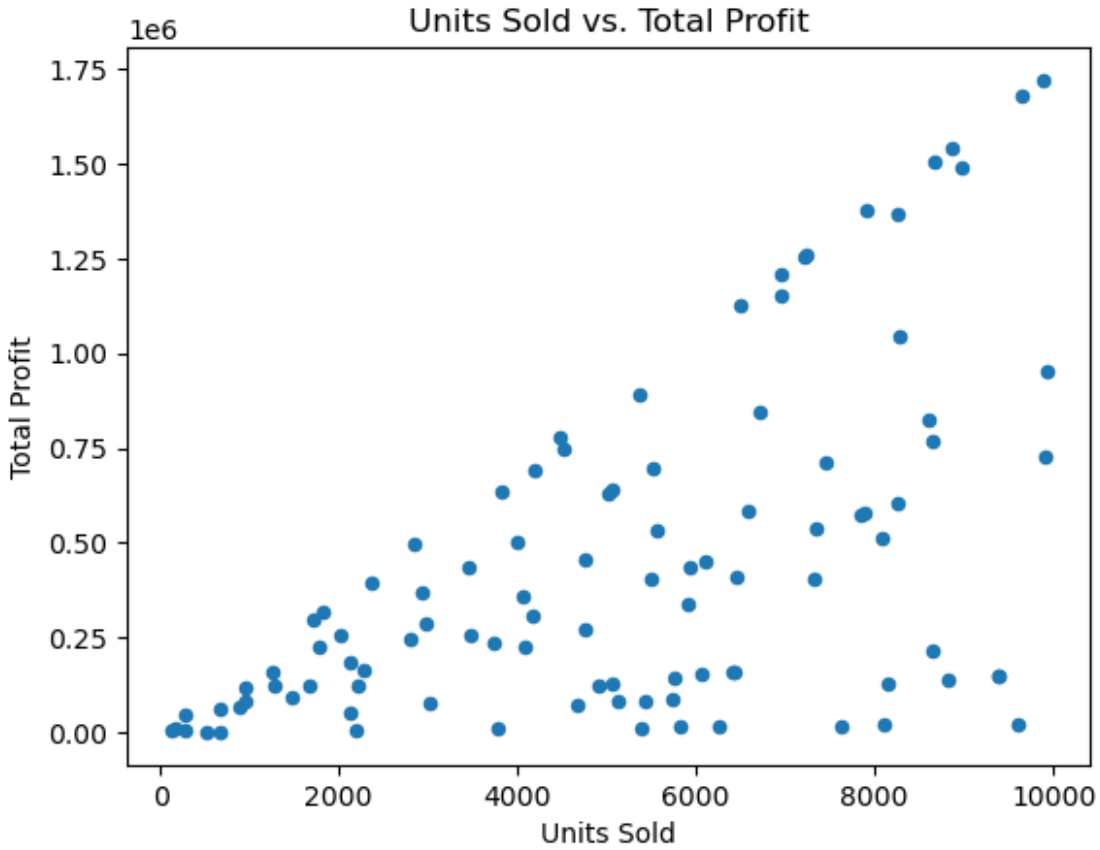
```
               Order ID  Units Sold  Unit Price  Unit Cost  Total
Revenue  \
Order ID       1.000000   -0.222907   -0.190941  -0.213201      -
0.314688
Units Sold    -0.222907    1.000000   -0.070486  -0.092232
0.447784
Unit Price    -0.190941   -0.070486    1.000000   0.987270
0.752360
Unit Cost     -0.213201   -0.092232    0.987270   1.000000
0.715623
Total Revenue -0.314688    0.447784    0.752360   0.715623
1.000000
Total Cost    -0.328944    0.374746    0.787905   0.774895
0.983928
Total Profit  -0.234638    0.564550    0.557365   0.467214
0.897327
```

```
order_month    -0.111219    -0.007995    -0.031917   -0.042016
0.003835
order_year      0.081752     0.012455    -0.061791   -0.071567      -
0.037128
```

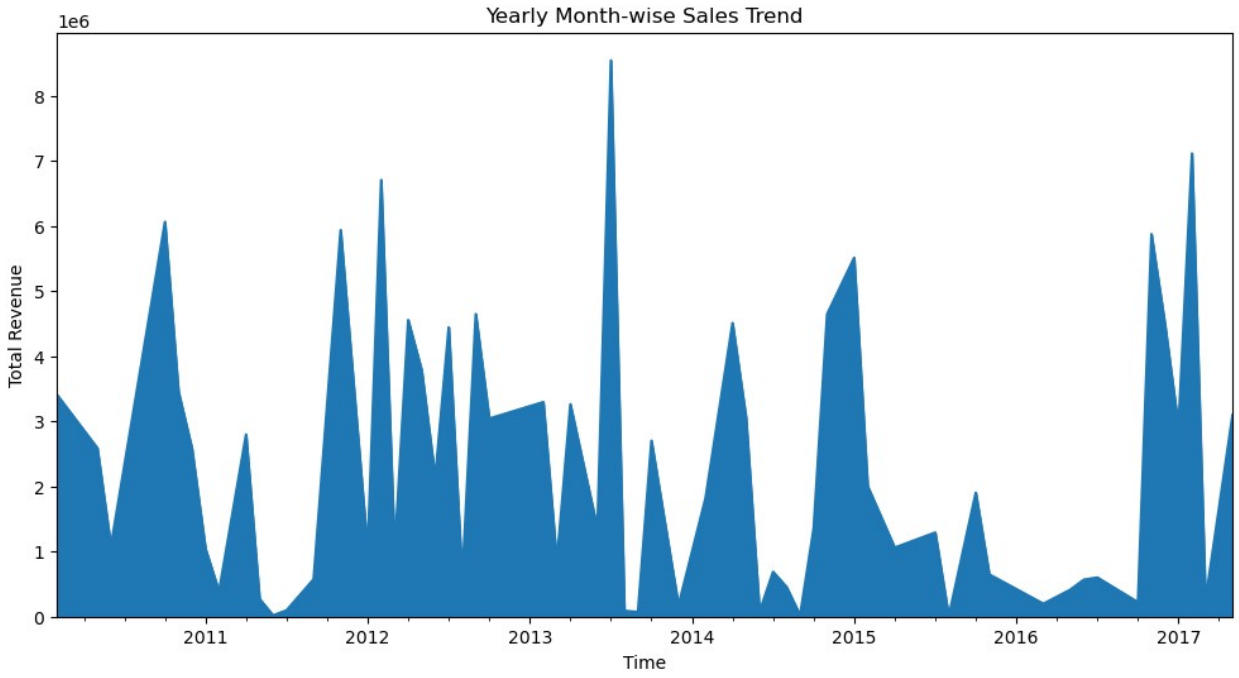
	Total Cost	Total Profit	order_month	order_year
Order ID	-0.328944	-0.234638	-0.111219	0.081752
Units Sold	0.374746	0.564550	-0.007995	0.012455
Unit Price	0.787905	0.557365	-0.031917	-0.061791
Unit Cost	0.774895	0.467214	-0.042016	-0.071567
Total Revenue	0.983928	0.897327	0.003835	-0.037128
Total Cost	1.000000	0.804091	-0.015617	-0.050899
Total Profit	0.804091	1.000000	0.051366	0.002196
order_month	-0.015617	0.051366	1.000000	-0.106715
order_year	-0.050899	0.002196	-0.106715	1.000000

```
#Example plot
df.plot(kind='scatter', x='Units Sold', y='Total Profit', title='Units
Sold vs. Total Profit')
```

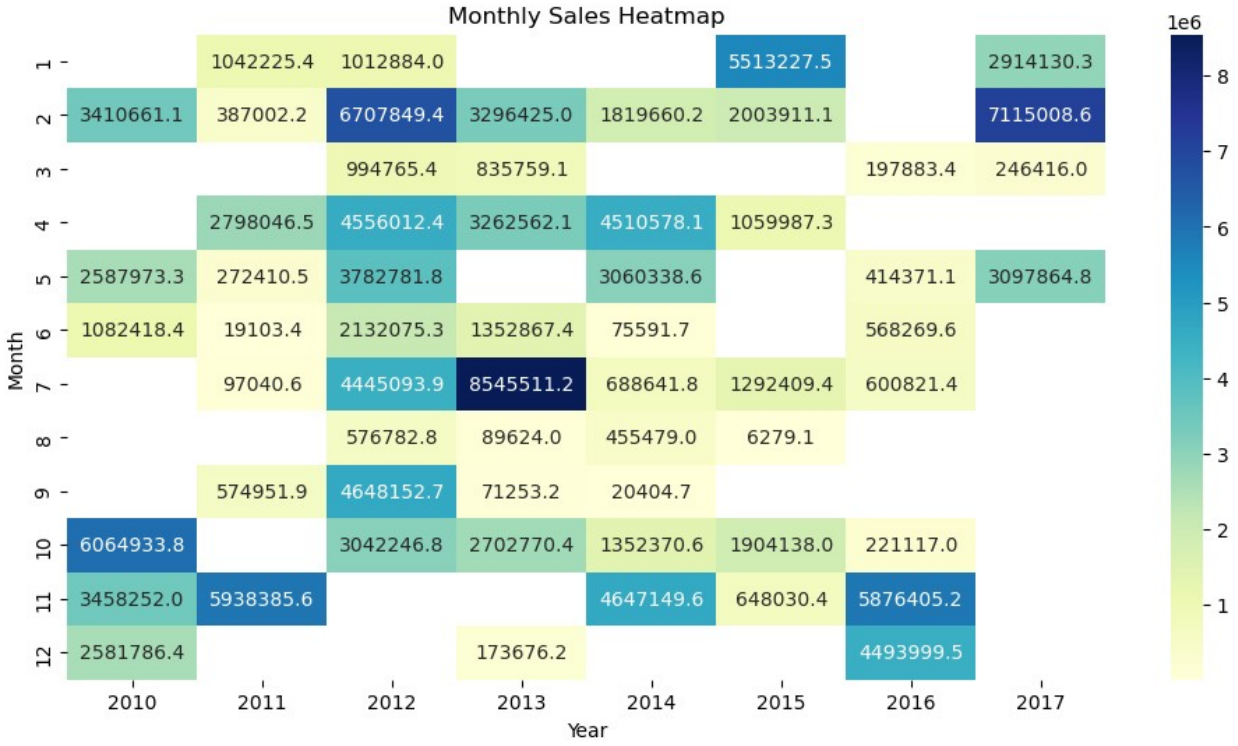
```
<AxesSubplot:title={'center':'Units Sold vs. Total Profit'},
xlabel='Units Sold', ylabel='Total Profit'>
```



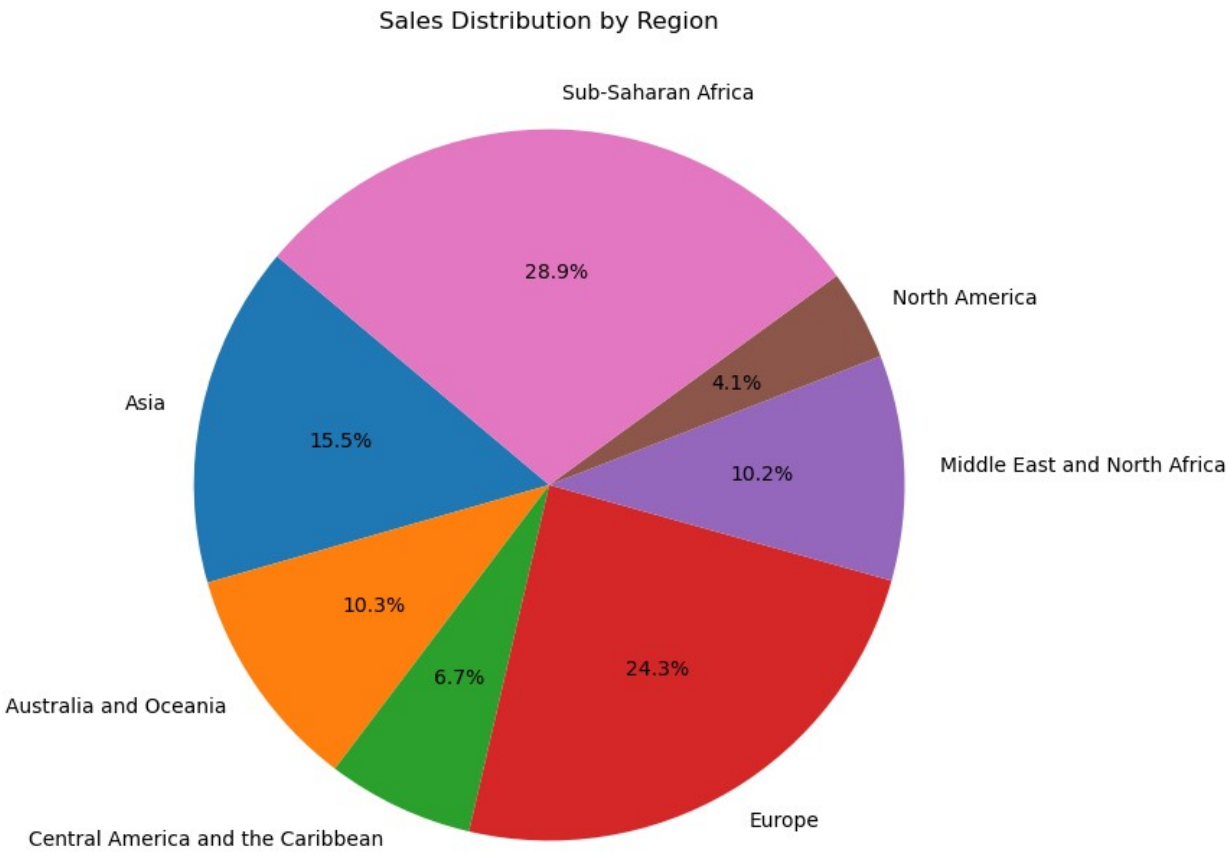
```
#SOME MORE ANALYSIS PLOTS

#Area Chart
import matplotlib.pyplot as plt
# Plot area chart
yearly_month_wise_sales.plot(kind='area', title='Yearly Month-wise
Sales Trend', figsize=(12, 6))
plt.ylabel('Total Revenue')
plt.xlabel('Time')
plt.show()
```



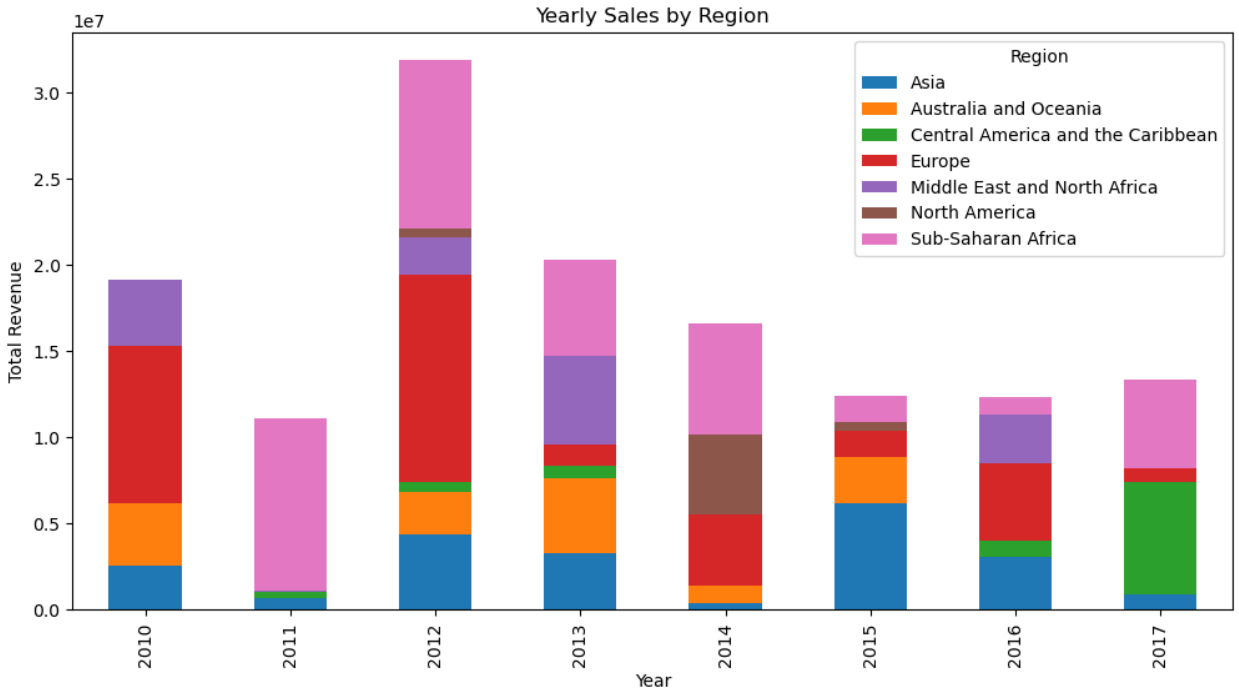

```
#Heatmap
import seaborn as sns

# Pivot the data to get year-month as rows and years as columns
heatmap_data = df.pivot_table(values='Total Revenue',
index='order_month', columns='order_year', aggfunc='sum')

# Plot heatmap
plt.figure(figsize=(12, 6))
sns.heatmap(heatmap_data, annot=True, fmt=".1f", cmap='YlGnBu')
plt.title('Monthly Sales Heatmap')
plt.xlabel('Year')
plt.ylabel('Month')
plt.show()
```



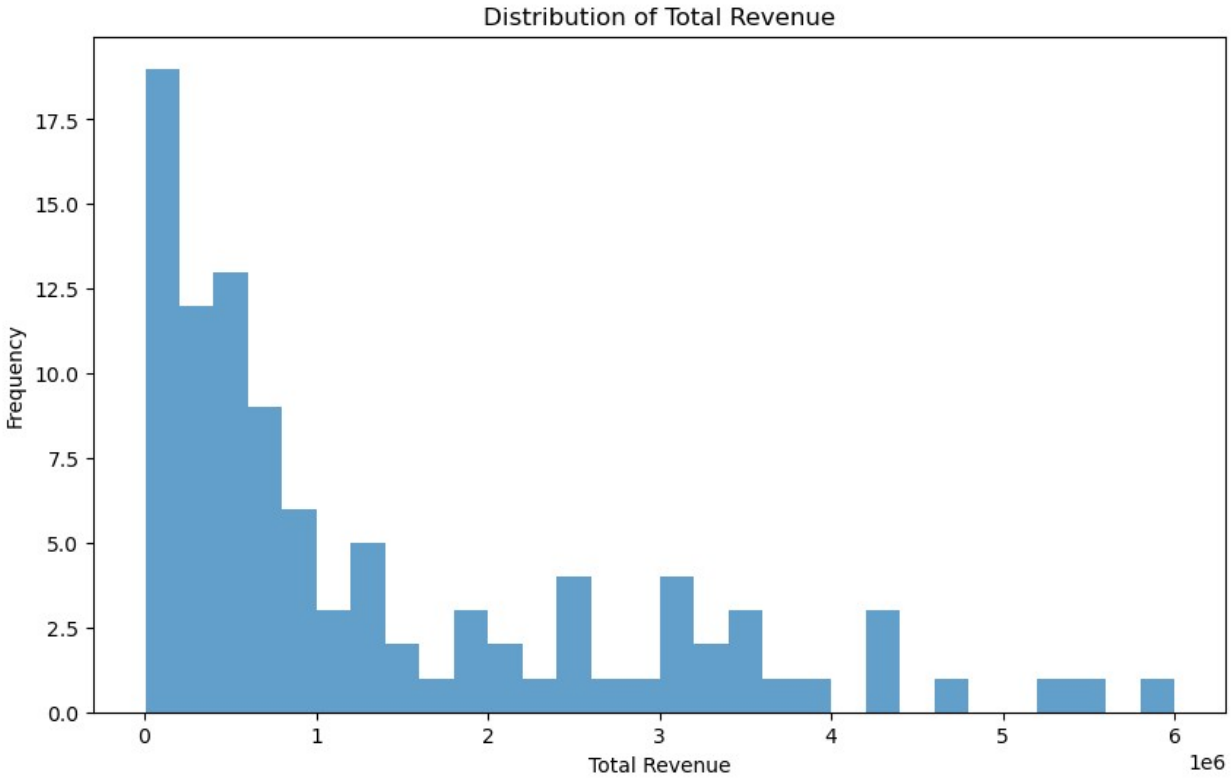

```
#Pie Chart
# Sum total revenue by region
region_sales = df.groupby('Region')['Total Revenue'].sum()

# Plot pie chart
plt.figure(figsize=(8, 8))
region_sales.plot(kind='pie', autopct='%1.1f%%', startangle=140)
plt.title('Sales Distribution by Region')
plt.ylabel('')
plt.show()
```



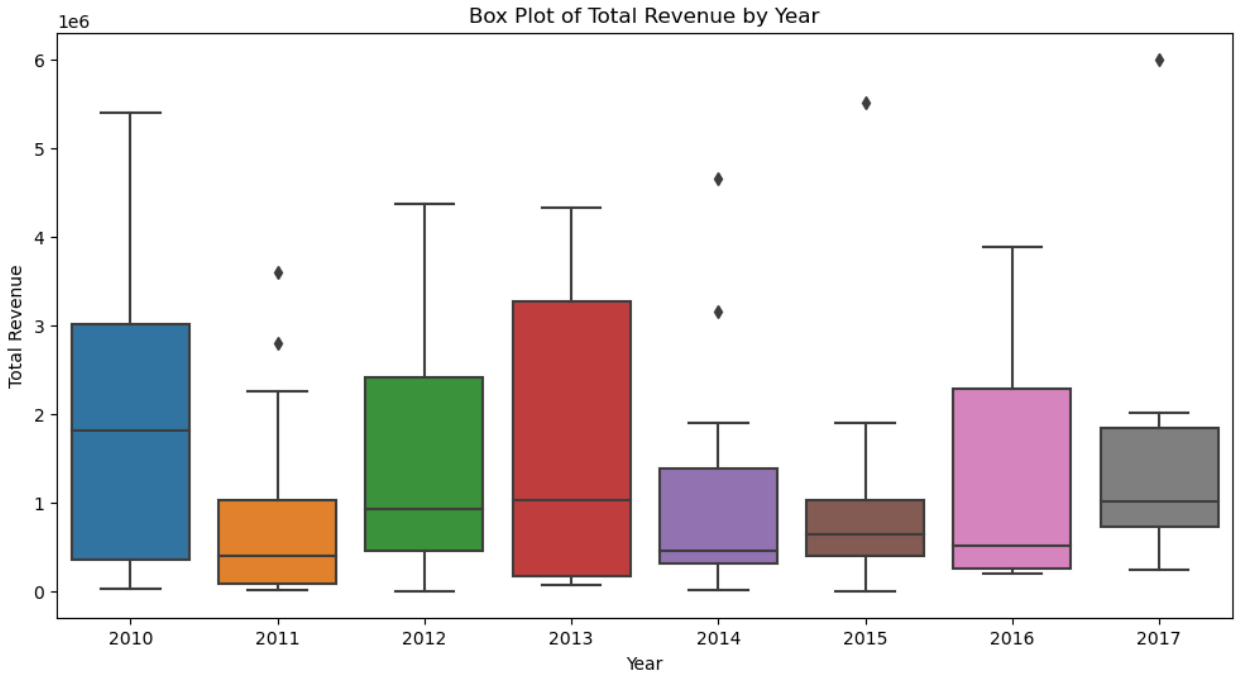

```
#Stacked Bar Chart
# Sum total revenue by year and region
year_region_sales = df.pivot_table(values='Total Revenue',
index='order_year', columns='Region', aggfunc='sum')

# Plot stacked bar chart
year_region_sales.plot(kind='bar', stacked=True, figsize=(12, 6))
plt.title('Yearly Sales by Region')
plt.ylabel('Total Revenue')
plt.xlabel('Year')
plt.show()
```



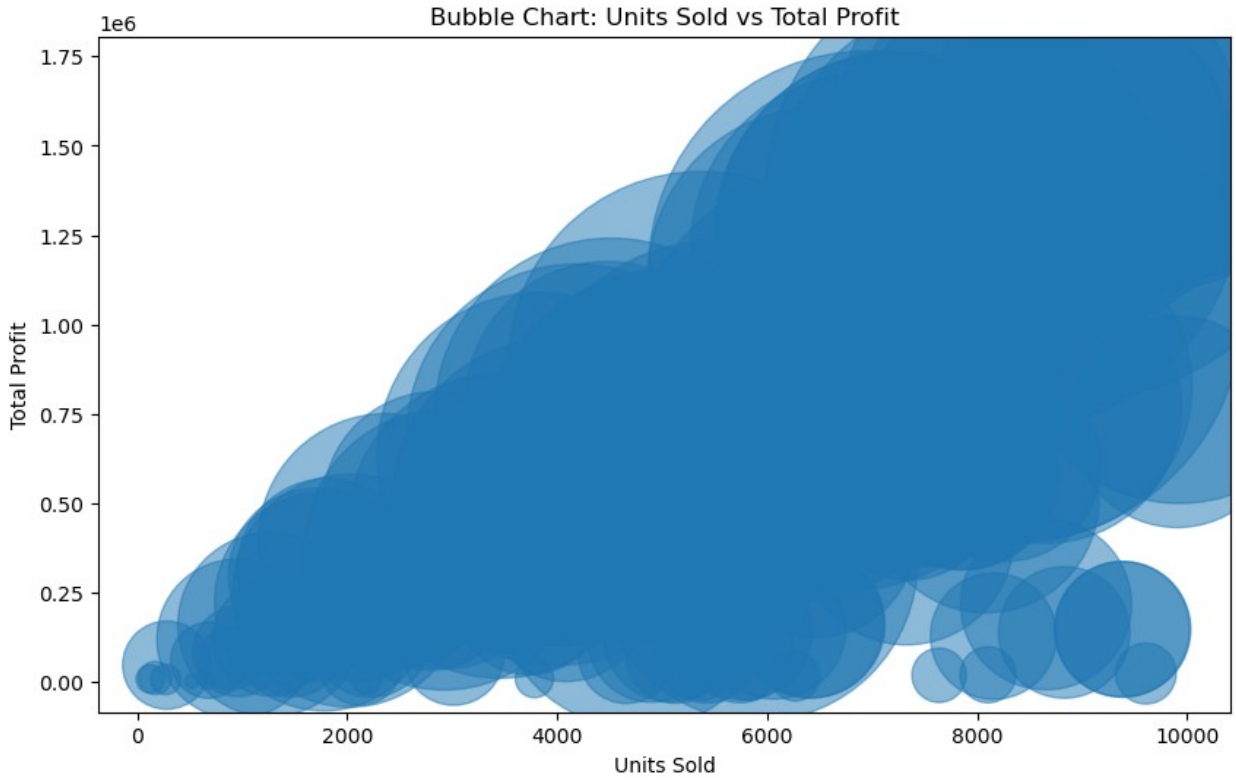

```
#Histogram
# Plot histogram of total revenue
plt.figure(figsize=(10, 6))
df['Total Revenue'].plot(kind='hist', bins=30, alpha=0.7)
plt.title('Distribution of Total Revenue')
plt.xlabel('Total Revenue')
plt.ylabel('Frequency')
plt.show()
```




```
#Box Plot
# Plot box plot of total revenue by year
plt.figure(figsize=(12, 6))
sns.boxplot(x='order_year', y='Total Revenue', data=df)
plt.title('Box Plot of Total Revenue by Year')
plt.xlabel('Year')
plt.ylabel('Total Revenue')
plt.show()
```




```
#Bubble Chart
# Sample data for bubble chart
bubble_data = df.sample(100)  # taking a sample for better
visualization

# Plot bubble chart
plt.figure(figsize=(10, 6))
plt.scatter(bubble_data['Units Sold'], bubble_data['Total Profit'],
s=bubble_data['Total Revenue'] / 100, alpha=0.5)
plt.title('Bubble Chart: Units Sold vs Total Profit')
plt.xlabel('Units Sold')
plt.ylabel('Total Profit')
plt.show()
```


Bubble Chart: Units Sold vs Total Profit
1e6
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Total Profit
0
2000
4000
6000
8000
10000
Units Sold