E-Commerce Order Analysis

Importing Libraries

```
import os
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

Loading files

```
# Load the orders data
orders_data = pd.read_excel('orders.xlsx')

# Load the payments data
# if it's a csv file you would use pd.read_csv('filename.csv')
payments_data = pd.read_excel('order_payment.xlsx')

# Load the customers data
customers_data = pd.read_excel('customers.xlsx')
```

Describing the data

```
orders_data.info()
payments_data.info()
customers_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 99444 entries, 0 to 99443
Data columns (total 8 columns):
 #   Column                         Non-Null Count  Dtype         
---  ------                         --------------  -----         
 0   order_id                       99444 non-null  object        
 1   customer_id                    99444 non-null  object        
 2   order_status                   99444 non-null  object        
 3   order_purchase_timestamp       99444 non-null  datetime64[ns]
 4   order_approved_at              99284 non-null  datetime64[ns]
 5   order_delivered_carrier_date   97661 non-null  datetime64[ns]
 6   order_delivered_customer_date  96479 non-null  datetime64[ns]
 7   order_estimated_delivery_date  99444 non-null  datetime64[ns]
dtypes: datetime64[ns](5), object(3)
memory usage: 6.1+ MB
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 103887 entries, 0 to 103886
Data columns (total 5 columns):
 #   Column                Non-Null Count   Dtype  
---  ------                --------------   -----  
```

```
 0   order_id               103887 non-null  object
 1   payment_sequential     103887 non-null  int64
 2   payment_type           103887 non-null  object
 3   payment_installments   103887 non-null  int64
 4   payment_value          103885 non-null  float64
dtypes: float64(1), int64(2), object(2)
memory usage: 4.0+ MB
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 99441 entries, 0 to 99440
Data columns (total 5 columns):
 #   Column                    Non-Null Count  Dtype
---  ------                    --------------  -----
 0   customer_id               99441 non-null  object
 1   customer_unique_id        99441 non-null  object
 2   customer_zip_code_prefix  99441 non-null  int64
 3   customer_city             99441 non-null  object
 4   customer_state            99441 non-null  object
dtypes: int64(1), object(4)
memory usage: 3.8+ MB
```

```
# Handling missing data
# Check for missing data in the orders data
orders_data.isnull().sum()
payments_data.isnull().sum()
customers_data.isnull().sum()
```

```
customer_id                 0
customer_unique_id          0
customer_zip_code_prefix    0
customer_city               0
customer_state              0
dtype: int64
```

```
# Filling in the missing values in orders data with a default value
orders_data2 = orders_data.fillna('N/A')
# Check if there are null values in orders_data2
orders_data2.isnull().sum()
```

```
order_id                        0
customer_id                     0
order_status                    0
order_purchase_timestamp        0
order_approved_at               0
order_delivered_carrier_date    0
order_delivered_customer_date   0
order_estimated_delivery_date   0
dtype: int64
```

```
# Drop rows with missing values in payments data
payments_data = payments_data.dropna()
```

```
# Check if there are null values in payments_data
payments_data.isnull().sum()
```

```
order_id                0
payment_sequential      0
payment_type            0
payment_installments    0
payment_value           0
dtype: int64
```

Removing duplicate data

```
# Check for duplicates in our orders data
orders_data.duplicated().sum()
```

```
3
```

```
# Remove duplicates from orders data
orders_data = orders_data.drop_duplicates()

# Check for duplicates in our payments data
payments_data.duplicated().sum()
```

```
1
```

```
# Remove duplicates from payments data
payments_data = payments_data.drop_duplicates()
```

Filtering the data

```
# Select a subset of the orders data based on the order status
invoiced_orders_data = orders_data[orders_data['order_status'] ==
'invoiced']
#reset the index
invoiced_orders_data = invoiced_orders_data.reset_index(drop=True)

# Select a subset of the payments data where payment type = Credit
Card and payment value > 1000
credit_card_payments_data = payments_data[
    (payments_data['payment_type'] == 'credit_card') &
    (payments_data['payment_value'] > 1000)
    ]

# Select a subset of customers based on customer state = SP
customers_data_state = customers_data[customers_data['customer_state']
== 'SP']
```

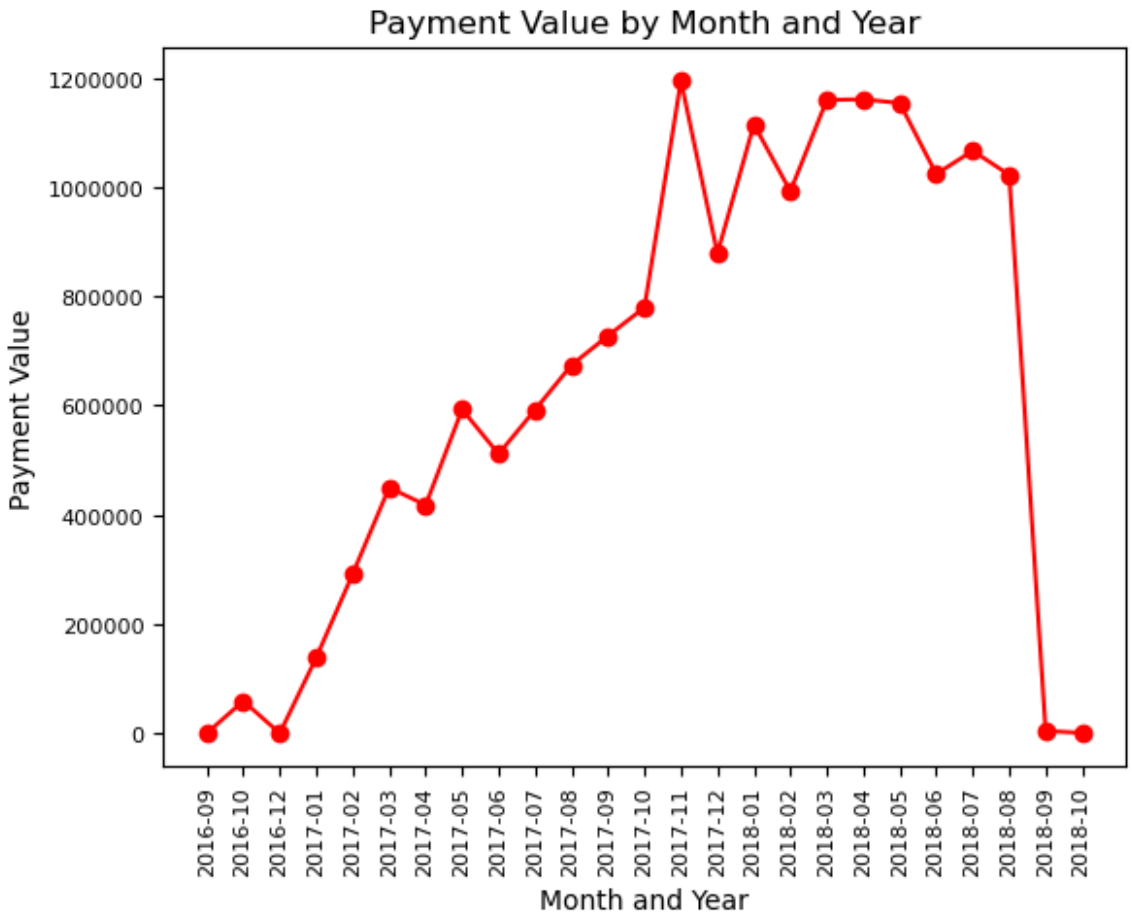
Merge and Join Dataframes

```
# Merge orders data with payments data on order_id column
merged_data = pd.merge(orders_data, payments_data, on='order_id')

# Join the merged data with our customers data on the customer_id
column
joined_data = pd.merge(merged_data, customers_data, on='customer_id')
```

Data visualization

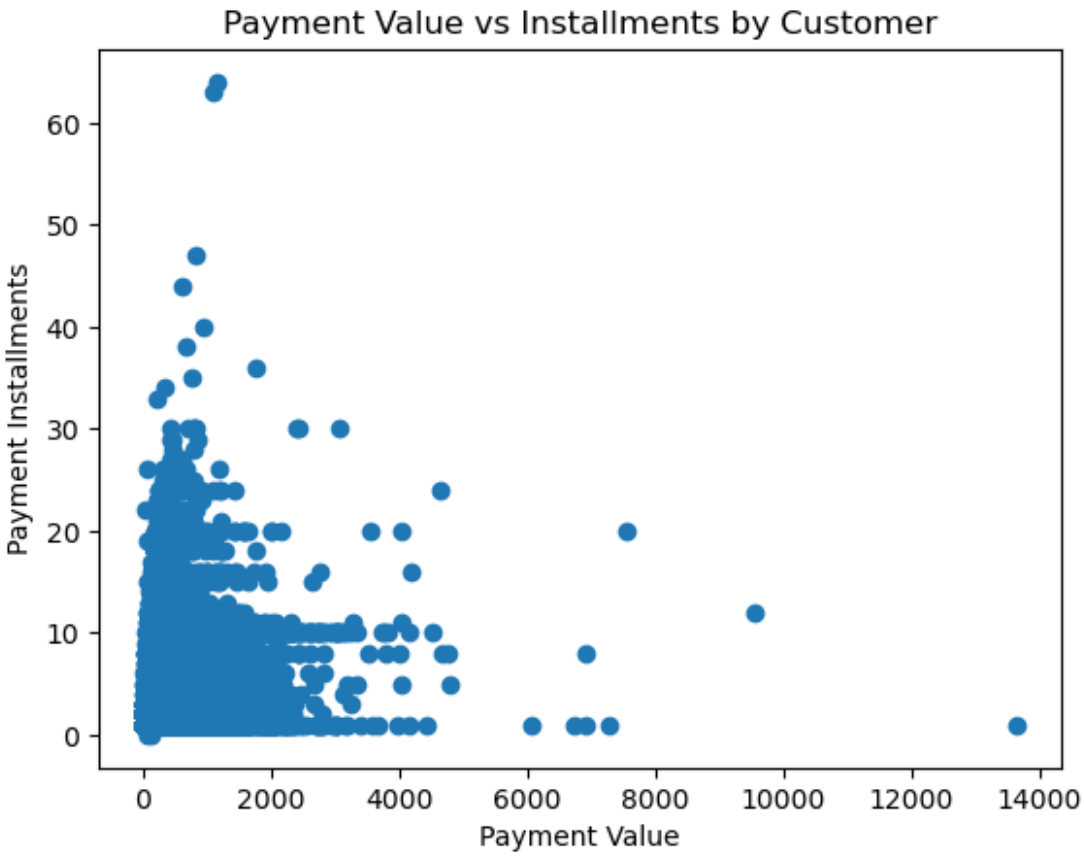
```
# Create a field called month_year from order_purchase_timestamp
joined_data['month_year'] =
joined_data['order_purchase_timestamp'].dt.to_period('M')
joined_data['week_year'] =
joined_data['order_purchase_timestamp'].dt.to_period('W')
joined_data['year'] =
joined_data['order_purchase_timestamp'].dt.to_period('Y')

grouped_data = joined_data.groupby('month_year')
['payment_value'].sum()
grouped_data = grouped_data.reset_index()

#convert month_year from period into string
grouped_data['month_year'] = grouped_data['month_year'].astype(str)

#creating a plot
plt.plot(grouped_data['month_year'], grouped_data['payment_value'],
color='red', marker='o')
plt.ticklabel_format(useOffset=False, style='plain', axis='y')
plt.xlabel('Month and Year')
plt.ylabel('Payment Value')
plt.title('Payment Value by Month and Year')
plt.xticks(rotation = 90, fontsize=8)
plt.yticks(fontsize=8)
```

```
(array([-200000.,       0.,  200000.,  400000.,  600000.,  800000.,
        1000000., 1200000., 1400000.]),
 [Text(0, -200000.0, '−200000'),
  Text(0, 0.0, '0'),
  Text(0, 200000.0, '200000'),
  Text(0, 400000.0, '400000'),
  Text(0, 600000.0, '600000'),
  Text(0, 800000.0, '800000'),
  Text(0, 1000000.0, '1000000'),
  Text(0, 1200000.0, '1200000'),
  Text(0, 1400000.0, '1400000')])
```

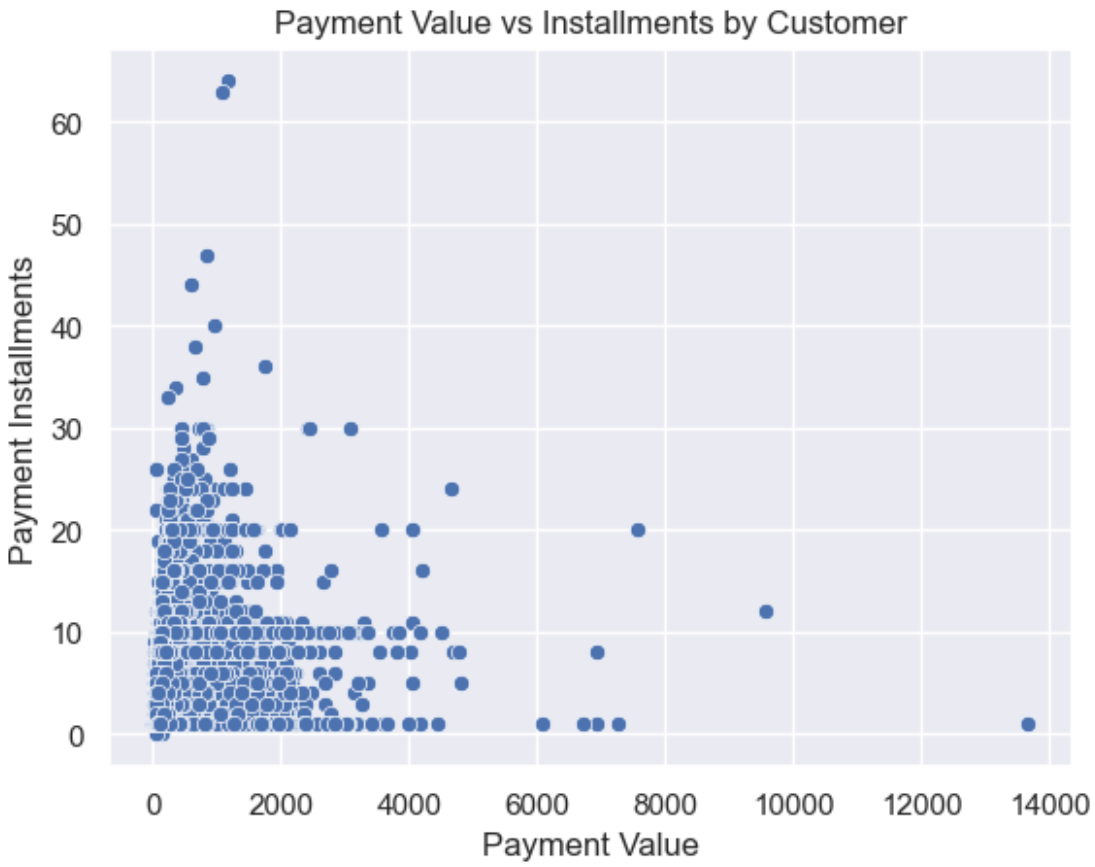


Scatter Plot

```
# create the DataFrame
scatter_df =
joined_data.groupby('customer_unique_id').agg({'payment_value' :
'sum', 'payment_installments' : 'sum'})

plt.scatter(scatter_df['payment_value'],
scatter_df['payment_installments'])
plt.xlabel('Payment Value')
plt.ylabel('Payment Installments')
plt.title('Payment Value vs Installments by Customer')
plt.show()
```

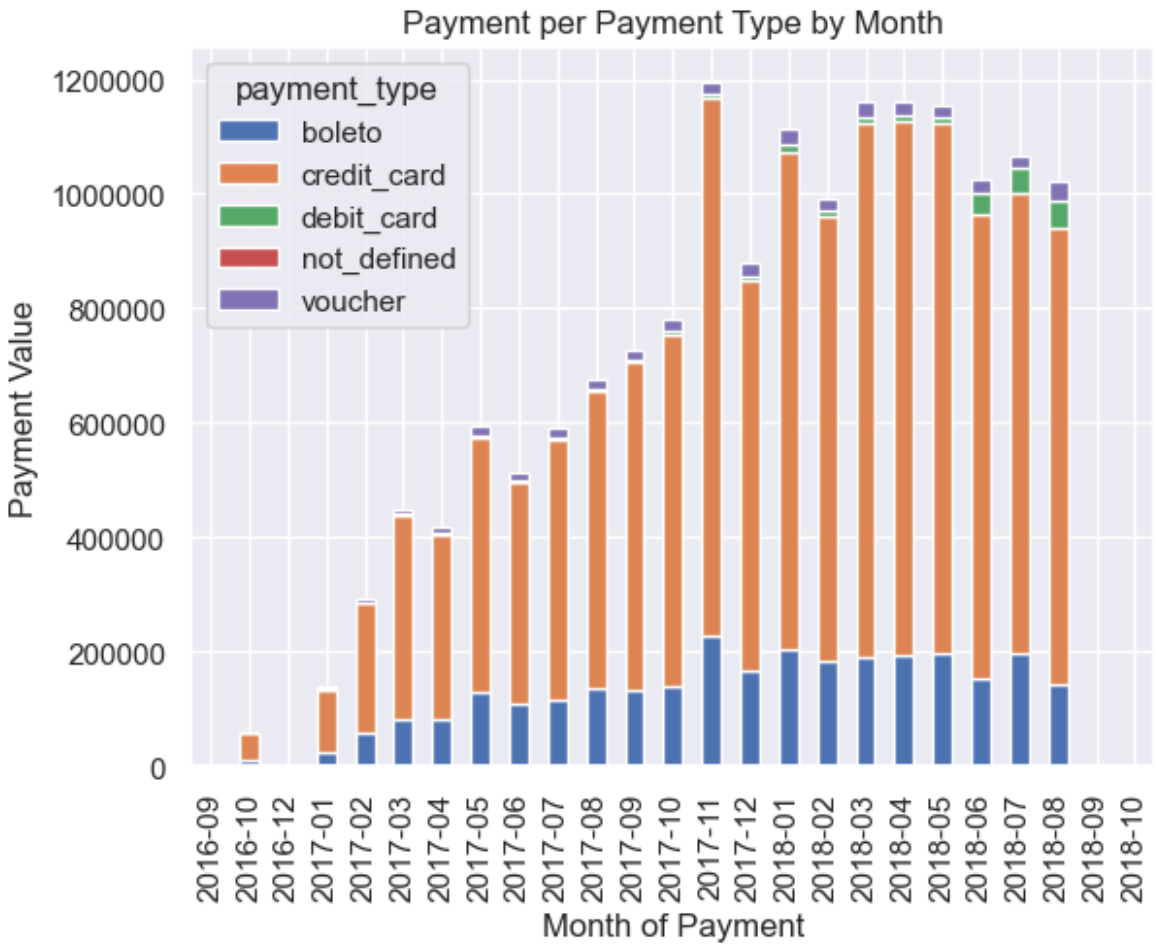



```
# Using seaborn to create a scatterplot

sns.set_theme(style='darkgrid') #whitegrid, darkgrid, dark, white

sns.scatterplot(data=scatter_df, x='payment_value',
y='payment_installments')
plt.xlabel('Payment Value')
plt.ylabel('Payment Installments')
plt.title('Payment Value vs Installments by Customer')
plt.show()
```



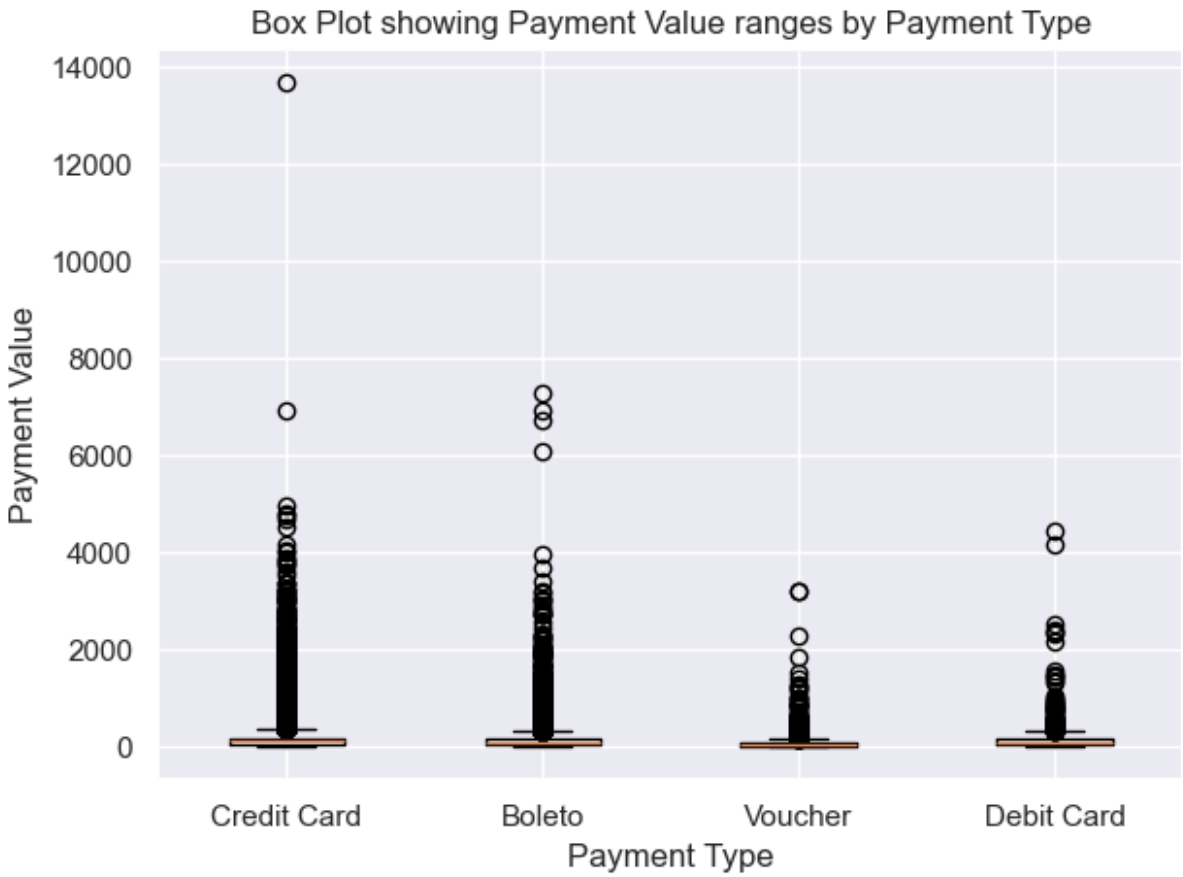
Creating a bar chart

```
bar_chart_df = joined_data.groupby(['payment_type', 'month_year'])
['payment_value'].sum()
bar_chart_df = bar_chart_df.reset_index()

pivot_data = bar_chart_df.pivot(index='month_year',
columns='payment_type', values='payment_value')

pivot_data.plot(kind='bar', stacked='True')
plt.ticklabel_format(useOffset=False, style='plain', axis='y')
plt.xlabel('Month of Payment')
plt.ylabel('Payment Value')
plt.title('Payment per Payment Type by Month')

Text(0.5, 1.0, 'Payment per Payment Type by Month')
```



Creating a box plot

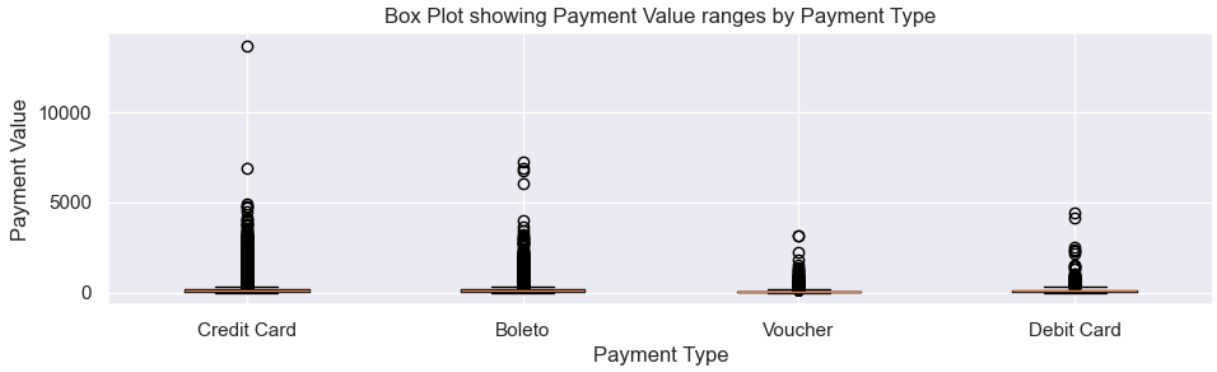
```
payment_values = joined_data['payment_value']
payment_types = joined_data['payment_type']

# creating a separate box plot per payment type
plt.boxplot([ payment_values[payment_types == 'credit_card'],
              payment_values[payment_types == 'boleto'],
              payment_values[payment_types == 'voucher'],
              payment_values[payment_types == 'debit_card']],
             labels = ['Credit Card', 'Boleto', 'Voucher', 'Debit
Card']
             )

# set labels and titles
plt.xlabel('Payment Type')
plt.ylabel('Payment Value')
plt.title('Box Plot showing Payment Value ranges by Payment Type')
plt.tight_layout()

plt.show()
```

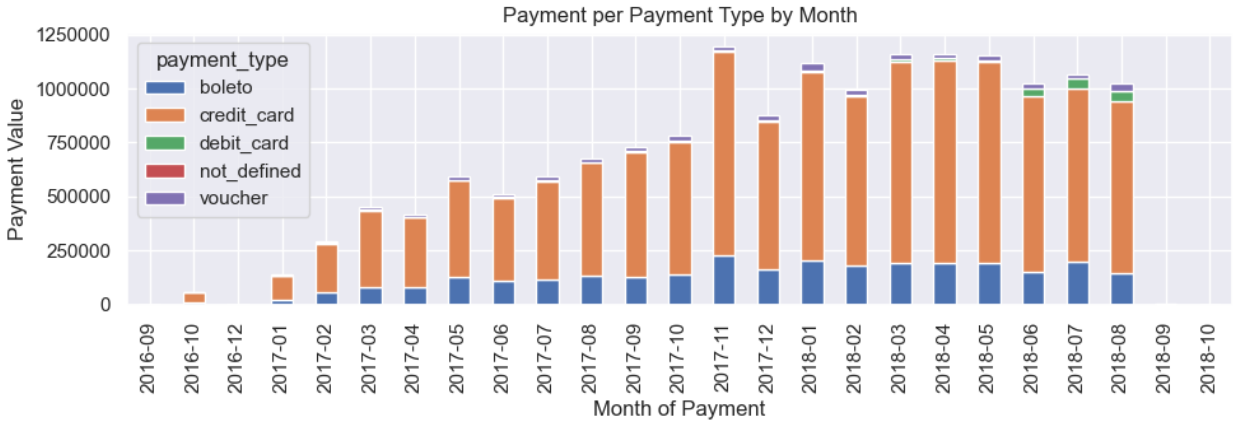


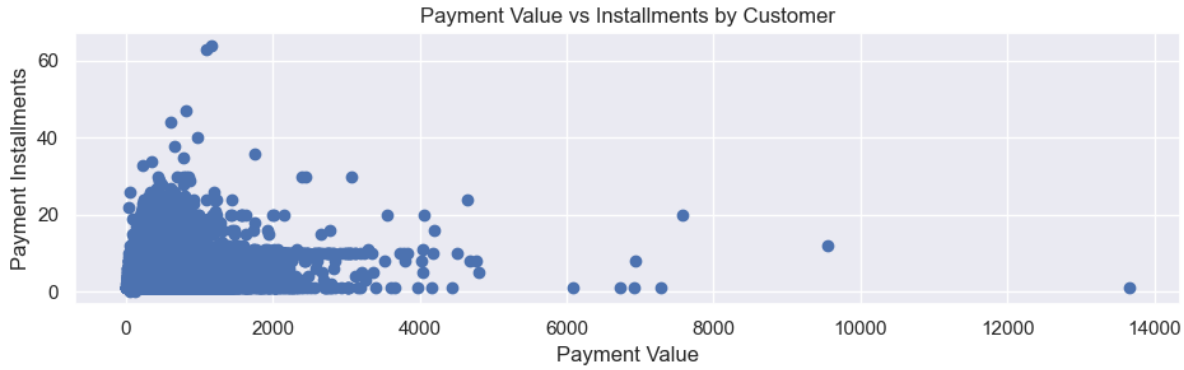
Creating a subplot (3 plots in one)

```
fig, (ax1, ax2, ax3) = plt.subplots(3, 1, figsize=(10,10))

# ax which is boxplot

ax1.boxplot([ payment_values[payment_types == 'credit_card'],
              payment_values[payment_types == 'boleto'],
              payment_values[payment_types == 'voucher'],
              payment_values[payment_types == 'debit_card']],
             labels = ['Credit Card', 'Boleto', 'Voucher', 'Debit
Card']
             )

# set labels and titles

ax1.set_xlabel('Payment Type')
ax1.set_ylabel('Payment Value')
ax1.set_title('Box Plot showing Payment Value ranges by Payment Type')

# ax2 is the stacked bar chart

pivot_data.plot(kind='bar', stacked='True', ax=ax2)
```

```
ax2.ticklabel_format(useOffset=False, style='plain', axis='y')

# set labels and titles
ax2.set_xlabel('Month of Payment')
ax2.set_ylabel('Payment Value')
ax2.set_title('Payment per Payment Type by Month')

# ax3 is a scatterplot

ax3.scatter(scatter_df['payment_value'],
scatter_df['payment_installments'])

# set labels and titles
ax3.set_xlabel('Payment Value')
ax3.set_ylabel('Payment Installments')
ax3.set_title('Payment Value vs Installments by Customer')

fig.tight_layout()

plt.savefig('my_plot.png')
```


Box Plot showing Payment Value ranges by Payment Type
Payment Value
10000
5000
0
Credit Card
Boleto
Voucher
Debit Card
Payment Type


Payment per Payment Type by Month
Payment Value
1250000
1000000
750000
500000
250000
0
payment_type
boleto
credit_card
debit_card
not_defined
voucher
2016-09
2016-10
2016-12
2017-01
2017-02
2017-03
2017-04
2017-05
2017-06
2017-07
2017-08
2017-09
2017-10
2017-11
2017-12
2018-01
2018-02
2018-03
2018-04
2018-05
2018-06
2018-07
2018-08
2018-09
2018-10
Month of Payment


Payment Value vs Installments by Customer
Payment Installments
60
40
20
0
0
2000
4000
6000
8000
10000
12000
14000
Payment Value