Task 1

January 8, 2025

0.1 Data Importing

[1]:
```
# Import Libraries
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt

# Import Data
transaction_data = pd.read_csv('QVI_transaction_data.csv')
transaction_data.head()
```

[1]:
```
    DATE  STORE_NBR  LYLTY_CARD_NBR  TXN_ID  PROD_NBR  \
0  43390          1            1000       1         5
1  43599          1            1307     348        66
2  43605          1            1343     383        61
3  43329          2            2373     974        69
4  43330          2            2426    1038       108

                                  PROD_NAME  PROD_QTY  TOT_SALES
0    Natural Chip        Compny SeaSalt175g         2        6.0
1                  CCs Nacho Cheese    175g         3        6.3
2    Smiths Crinkle Cut  Chips Chicken 170g         2        2.9
3    Smiths Chip Thinly  S/Cream&Onion 175g         5       15.0
4  Kettle Tortilla ChpsHny&Jlpno Chili 150g         3       13.8
```

[2]:
```
# Import Data
purchase_behaviour = pd.read_csv('QVI_purchase_behaviour.csv')
purchase_behaviour.head()
```

[2]:
```
   LYLTY_CARD_NBR               LIFESTAGE PREMIUM_CUSTOMER
0            1000   YOUNG SINGLES/COUPLES          Premium
1            1002   YOUNG SINGLES/COUPLES       Mainstream
2            1003          YOUNG FAMILIES           Budget
3            1004   OLDER SINGLES/COUPLES       Mainstream
4            1005  MIDAGE SINGLES/COUPLES       Mainstream
```

0.2 High-Level Summary

[3]:
```
# Summary Statistics
transaction_data.describe()
```

[3]:
```
                DATE     STORE_NBR  LYLTY_CARD_NBR        TXN_ID  \
count  264836.000000  264836.00000    2.648360e+05  2.648360e+05
mean    43464.036260     135.08011    1.355495e+05  1.351583e+05
std       105.389282      76.78418    8.057998e+04  7.813303e+04
min     43282.000000       1.00000    1.000000e+03  1.000000e+00
25%     43373.000000      70.00000    7.002100e+04  6.760150e+04
50%     43464.000000     130.00000    1.303575e+05  1.351375e+05
75%     43555.000000     203.00000    2.030942e+05  2.027012e+05
max     43646.000000     272.00000    2.373711e+06  2.415841e+06

            PROD_NBR       PROD_QTY      TOT_SALES
count  264836.000000  264836.000000  264836.000000
mean       56.583157       1.907309       7.304200
std        32.826638       0.643654       3.083226
min         1.000000       1.000000       1.500000
25%        28.000000       2.000000       5.400000
50%        56.000000       2.000000       7.400000
75%        85.000000       2.000000       9.200000
max       114.000000     200.000000     650.000000
```

[4]:
```
# Summary Statistics
purchase_behaviour.describe()
```

[4]:
```
       LYLTY_CARD_NBR
count    7.263700e+04
mean     1.361859e+05
std      8.989293e+04
min      1.000000e+03
25%      6.620200e+04
50%      1.340400e+05
75%      2.033750e+05
max      2.373711e+06
```

0.3 Data Cleaning and Format Checks

[5]:
```
# Check for Missing Values
print(transaction_data.isnull().sum())
print(purchase_behaviour.isnull().sum())
```

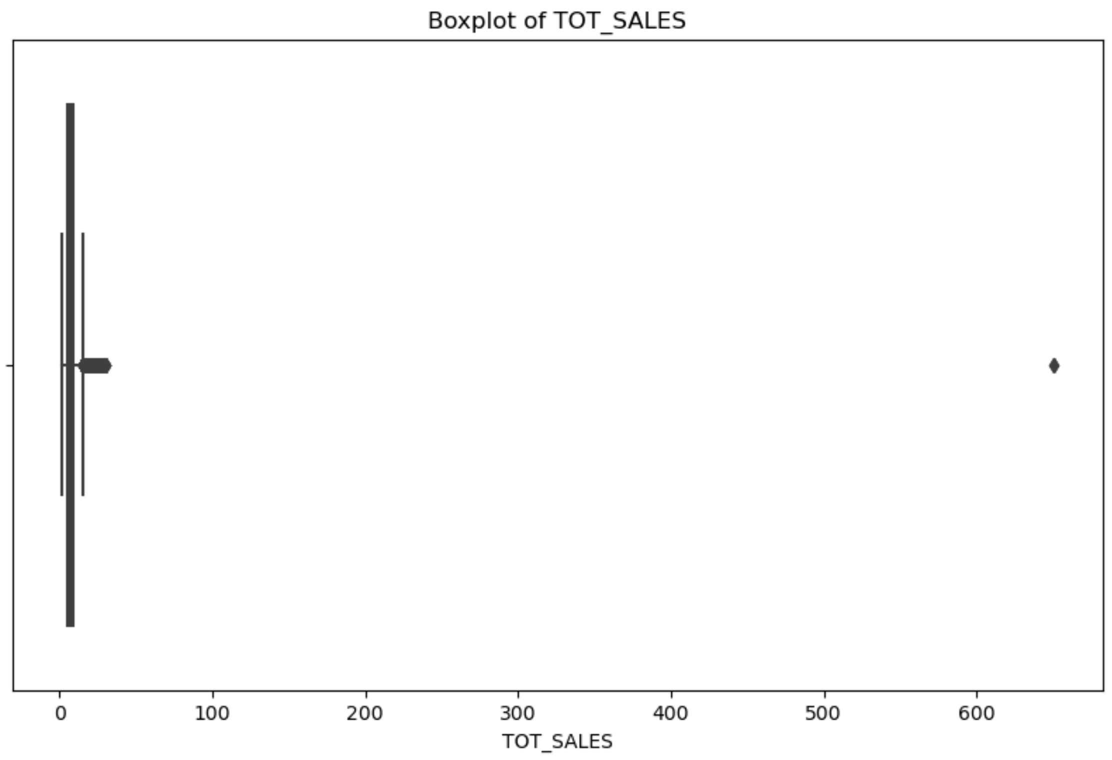
```
DATE              0
STORE_NBR         0
LYLTY_CARD_NBR    0
TXN_ID            0
```

```
PROD_NBR          0
PROD_NAME         0
PROD_QTY          0
TOT_SALES         0
dtype: int64
LYLTY_CARD_NBR      0
LIFESTAGE           0
PREMIUM_CUSTOMER    0
dtype: int64
```

[6]:
```
# Check Data Type
print(transaction_data.dtypes)
print(purchase_behaviour.dtypes)
```

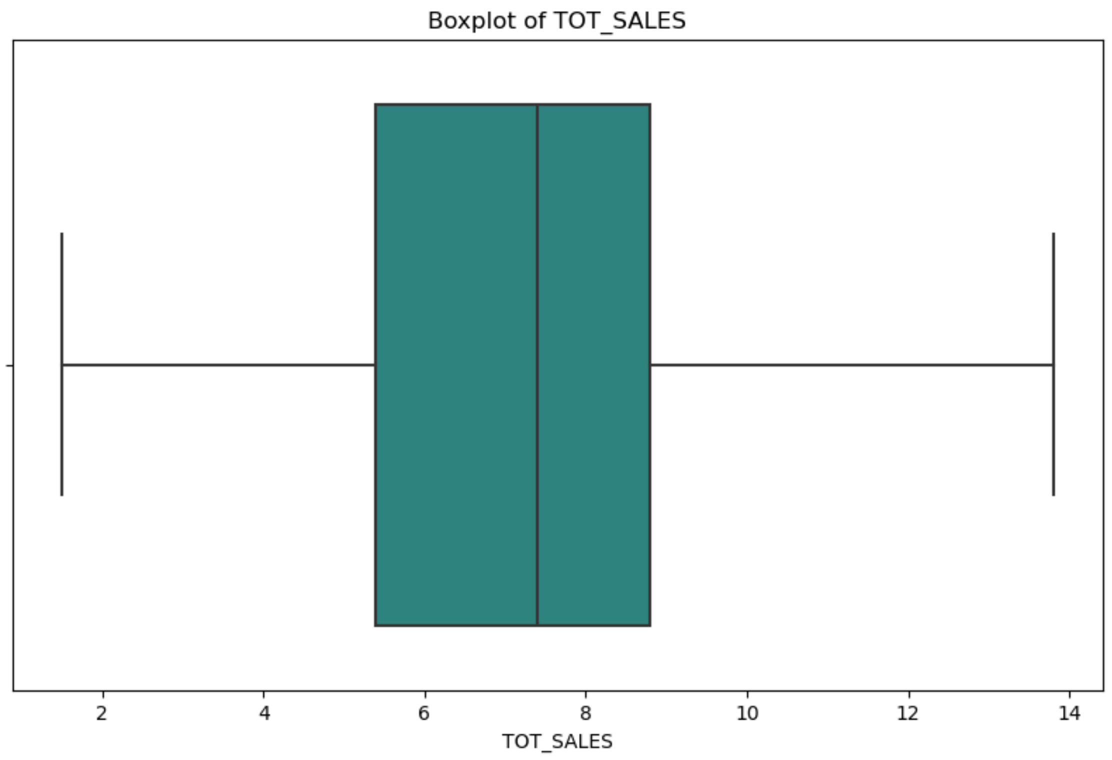
```
DATE                int64
STORE_NBR           int64
LYLTY_CARD_NBR      int64
TXN_ID              int64
PROD_NBR            int64
PROD_NAME          object
PROD_QTY            int64
TOT_SALES         float64
dtype: object
LYLTY_CARD_NBR       int64
LIFESTAGE           object
PREMIUM_CUSTOMER    object
dtype: object
```

[47]:
```
# Check for Outliers
plt.figure(figsize=(10, 6))
sns.boxplot(x=transaction_data['TOT_SALES'])
plt.title('Boxplot of TOT_SALES')
plt.xlabel('TOT_SALES')
plt.show()
```



[75]:
```
# Remove Outliers
Q1 = filtered_transaction_data['TOT_SALES'].quantile(0.25)
Q3 = filtered_transaction_data['TOT_SALES'].quantile(0.75)
IQR = Q3 - Q1
lower_bound = Q1 - (1.5 * IQR)
upper_bound = Q3 + (1.5 * IQR)
filtered_transaction_data =␣
  ↪filtered_transaction_data[(filtered_transaction_data['TOT_SALES'] >␣
  ↪lower_bound) & (filtered_transaction_data['TOT_SALES'] < upper_bound)]

plt.figure(figsize=(10, 6))
sns.boxplot(x=filtered_transaction_data['TOT_SALES'], palette='viridis')
plt.title('Boxplot of TOT_SALES')
plt.xlabel('TOT_SALES')
plt.show()
```



0.4 Data Analysis and Data Visualization

[61]:
```
# Extract pack size
filtered_transaction_data['PACK_SIZE'] = filtered_transaction_data['PROD_NAME'].
↪str.extract('(\d+)').astype(float)

# Extract brand name
filtered_transaction_data['BRAND'] = filtered_transaction_data['PROD_NAME'].str.
↪split().str[0]

filtered_transaction_data[['PACK_SIZE', 'BRAND']].head()
```

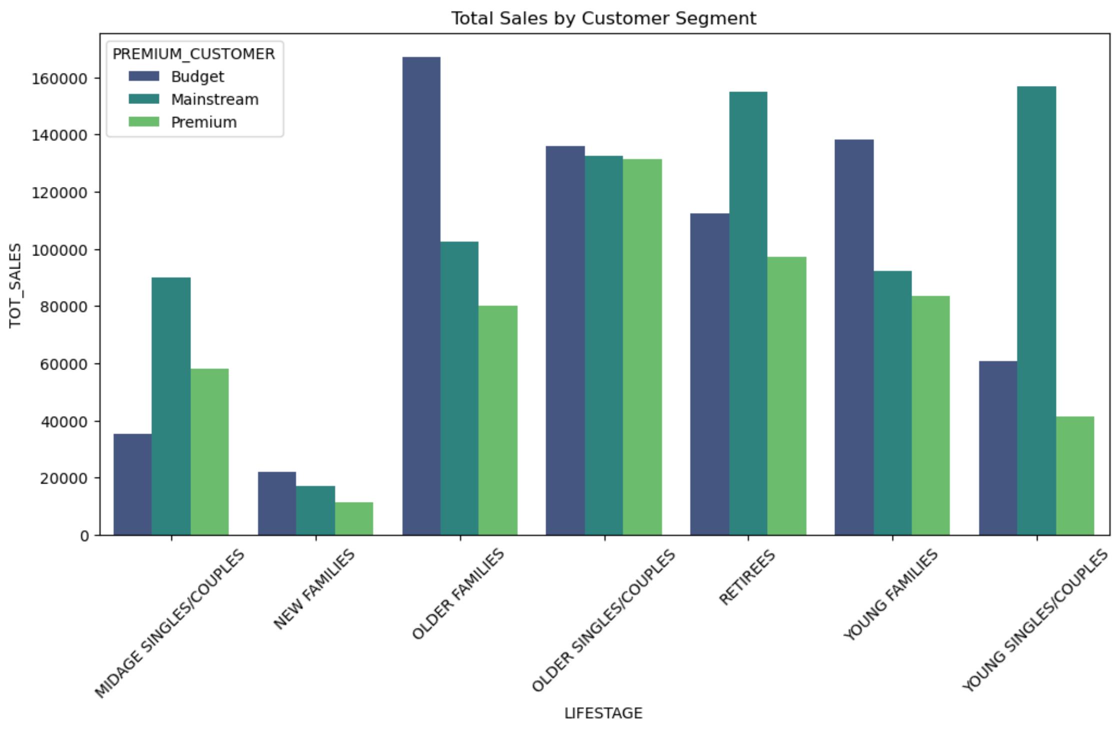
[61]:
```
   PACK_SIZE    BRAND
0      175.0  Natural
1      175.0      CCs
2      170.0   Smiths
4      150.0   Kettle
5      300.0      Old
```

[67]:
```
# Merge transaction data with purchase behavior data
merged_data = filtered_transaction_data.merge(purchase_behaviour,␣
↪on='LYLTY_CARD_NBR', how='left')
```

[77]:

```python
# Summarize Customer Segments
segment_summary = merged_data.groupby(['LIFESTAGE', 'PREMIUM_CUSTOMER']).agg({
    'TOT_SALES': 'sum',
    'PROD_QTY': 'sum',
    'TXN_ID': 'nunique'
}).rename(columns={'TXN_ID': 'UNIQUE_TRANSACTIONS'})
segment_summary['AVG_SPEND_PER_TRANSACTION'] = (
    segment_summary['TOT_SALES'] / segment_summary['UNIQUE_TRANSACTIONS']
)
segment_summary = segment_summary.reset_index()

# Plot total sales by customer segment
plt.figure(figsize=(12, 6))
sns.barplot(data=segment_summary, x='LIFESTAGE', y='TOT_SALES',␣
 ↪hue='PREMIUM_CUSTOMER', palette='viridis')
plt.title("Total Sales by Customer Segment")
plt.xticks(rotation=45)
plt.show()
```

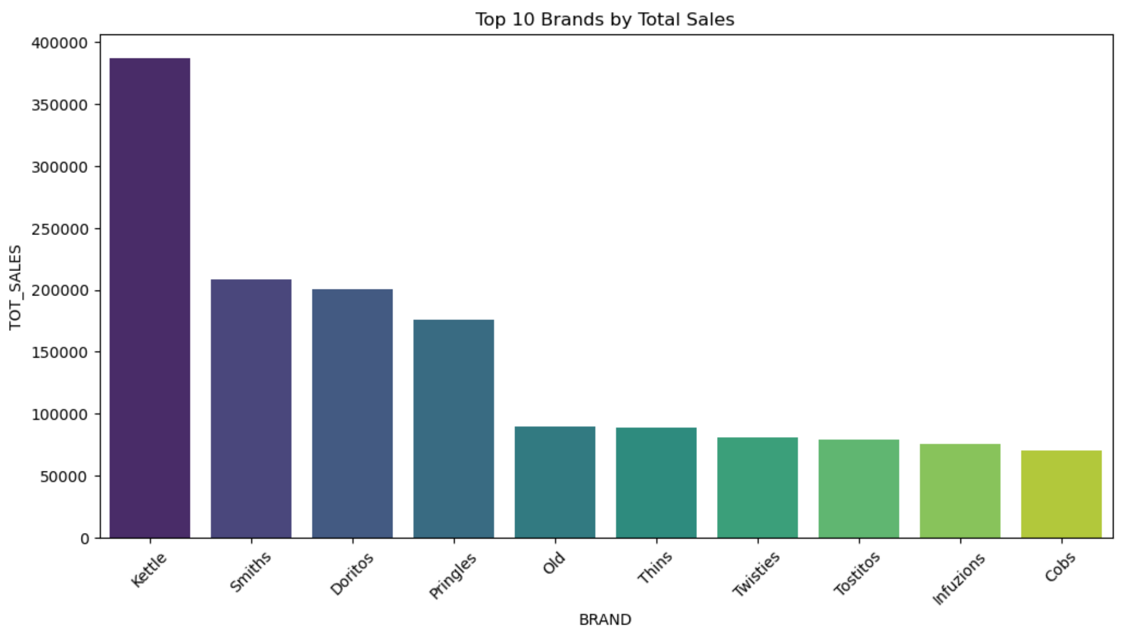


[71]:

```python
# Identify Top Brands
top_brands = merged_data.groupby('BRAND').agg({'TOT_SALES': 'sum'}).sort_values(
    by='TOT_SALES', ascending=False
).head(10)
```

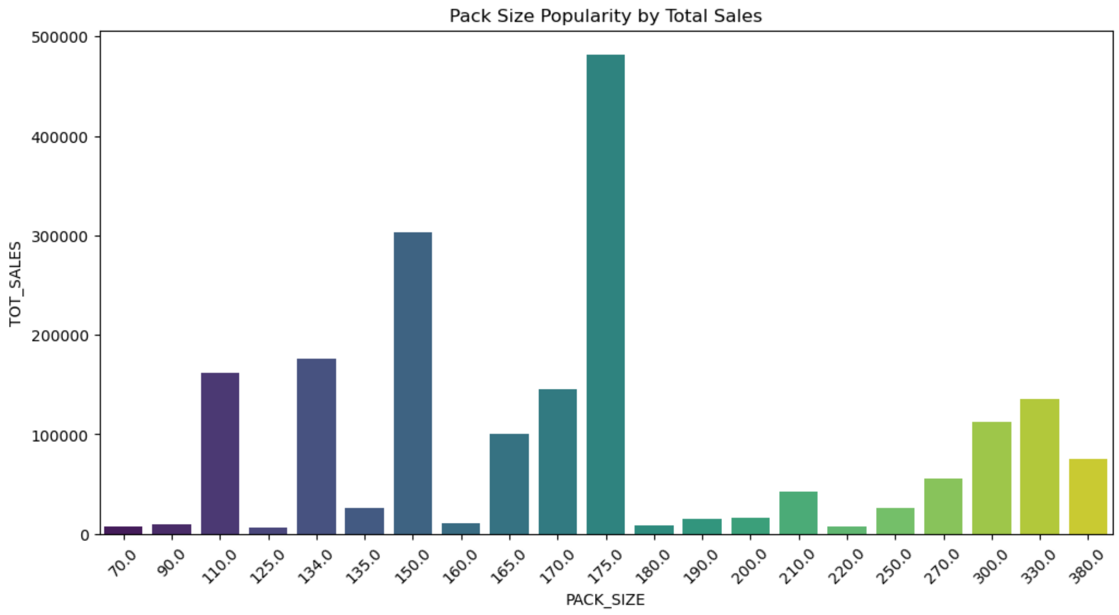
```
top_brands = top_brands.reset_index()

# Plot top brands
plt.figure(figsize=(12, 6))
sns.barplot(data=top_brands, x='BRAND', y='TOT_SALES', palette='viridis')
plt.title("Top 10 Brands by Total Sales")
plt.xticks(rotation=45)
plt.show()
```



[73]:
```
# Analyze Pack Size Popularity
pack_size_summary = merged_data.groupby('PACK_SIZE').agg({'TOT_SALES': 'sum'}).
  ↪sort_index()
pack_size_summary = pack_size_summary.reset_index()

# Plot pack size popularity
plt.figure(figsize=(12, 6))
sns.barplot(data=pack_size_summary, x='PACK_SIZE', y='TOT_SALES',␣
  ↪palette='viridis')
plt.title("Pack Size Popularity by Total Sales")
plt.xticks(rotation=45)
plt.show()
```


Pack Size Popularity by Total Sales
TOT_SALES
0
100000
200000
300000
400000
500000
PACK_SIZE
70.0
90.0
110.0
125.0
134.0
135.0
150.0
160.0
165.0
170.0
175.0
180.0
190.0
200.0
210.0
220.0
250.0
270.0
300.0
330.0
380.0