Carga de librerías y dataset

In [127…
```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

In [128…
```
import kagglehub

# Download latest version
path = kagglehub.dataset_download("neuromusic/avocado-prices")

print("Path to dataset files:", path)
```

```
Path to dataset files: /kaggle/input/avocado-prices
```

Cambios a realizar

- Normalización, estandarización, log transform

In [129…
```
df = pd.read_csv(path + "/avocado.csv")
```

In [130…
```
df.head()
```

Out[130…

	Unnamed: 0	Date	AveragePrice	Total Volume	4046	4225	4770	To B
0	0	2015-12-27	1.33	64236.62	1036.74	54454.85	48.16	8696
1	1	2015-12-20	1.35	54876.98	674.28	44638.81	58.33	9505
2	2	2015-12-13	0.93	118220.22	794.70	109149.67	130.50	8145
3	3	2015-12-06	1.08	78992.15	1132.00	71976.41	72.58	5811
4	4	2015-11-29	1.28	51039.60	941.48	43838.39	75.78	6183

La columnas 'Unnamed: 0' y 'year' no son necesarias

In [131…
```
df.drop(['Unnamed: 0', 'year'], axis = 1, inplace=True)
```

Imputación de valores varios

In [112…
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 18249 entries, 0 to 18248
Data columns (total 12 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   Date          18249 non-null  object 
 1   AveragePrice  18249 non-null  float64
 2   Total Volume  18249 non-null  float64
 3   4046          18249 non-null  float64
 4   4225          18249 non-null  float64
 5   4770          18249 non-null  float64
 6   Total Bags    18249 non-null  float64
 7   Small Bags    18249 non-null  float64
 8   Large Bags    18249 non-null  float64
 9   XLarge Bags   18249 non-null  float64
 10  type          18249 non-null  object 
 11  region        18249 non-null  object 
dtypes: float64(9), object(3)
memory usage: 1.7+ MB
```

Se observa que no hay valores nulos, por lo que no se realiza ningún cambio

Transformación de datos

In [113…
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 18249 entries, 0 to 18248
Data columns (total 12 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   Date          18249 non-null  object 
 1   AveragePrice  18249 non-null  float64
 2   Total Volume  18249 non-null  float64
 3   4046          18249 non-null  float64
 4   4225          18249 non-null  float64
 5   4770          18249 non-null  float64
 6   Total Bags    18249 non-null  float64
 7   Small Bags    18249 non-null  float64
 8   Large Bags    18249 non-null  float64
 9   XLarge Bags   18249 non-null  float64
 10  type          18249 non-null  object 
 11  region        18249 non-null  object 
dtypes: float64(9), object(3)
memory usage: 1.7+ MB
```

El tipo de valor de la fecha debería de ser de tipo datetime

In [114…
```
df['Date'] = pd.to_datetime(df['Date'])
```

In [115…
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 18249 entries, 0 to 18248
Data columns (total 12 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   Date          18249 non-null  datetime64[ns]
 1   AveragePrice  18249 non-null  float64
 2   Total Volume  18249 non-null  float64
 3   4046          18249 non-null  float64
 4   4225          18249 non-null  float64
 5   4770          18249 non-null  float64
 6   Total Bags    18249 non-null  float64
 7   Small Bags    18249 non-null  float64
 8   Large Bags    18249 non-null  float64
 9   XLarge Bags   18249 non-null  float64
 10  type          18249 non-null  object
 11  region        18249 non-null  object
dtypes: datetime64[ns](1), float64(9), object(2)
memory usage: 1.7+ MB
```

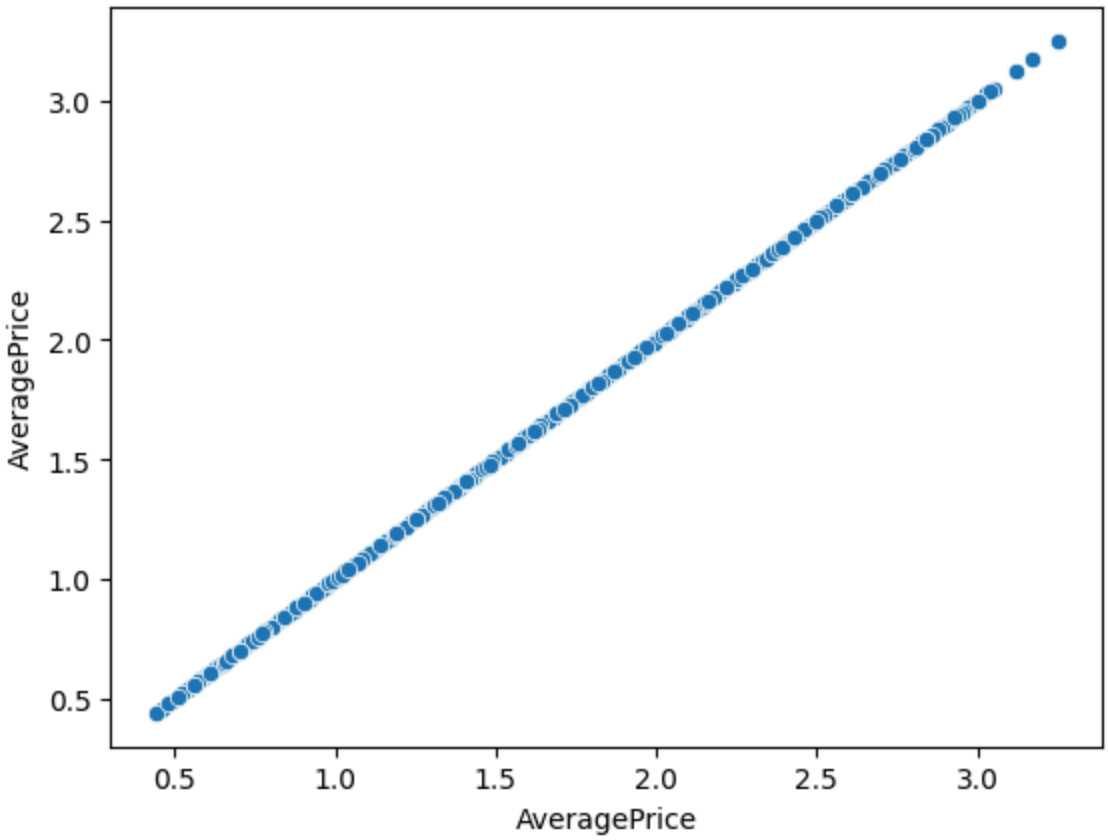
Detección y eliminación de valores atípicos

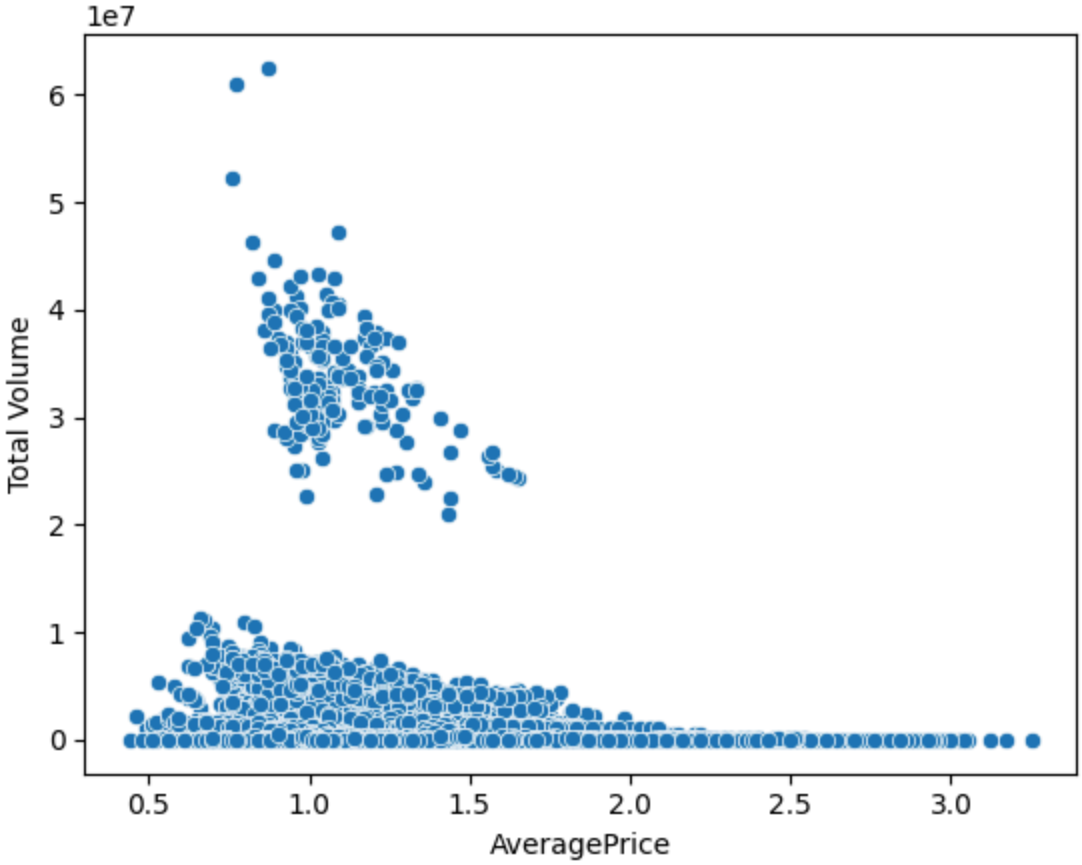
In [98]:
```
df.head()
```

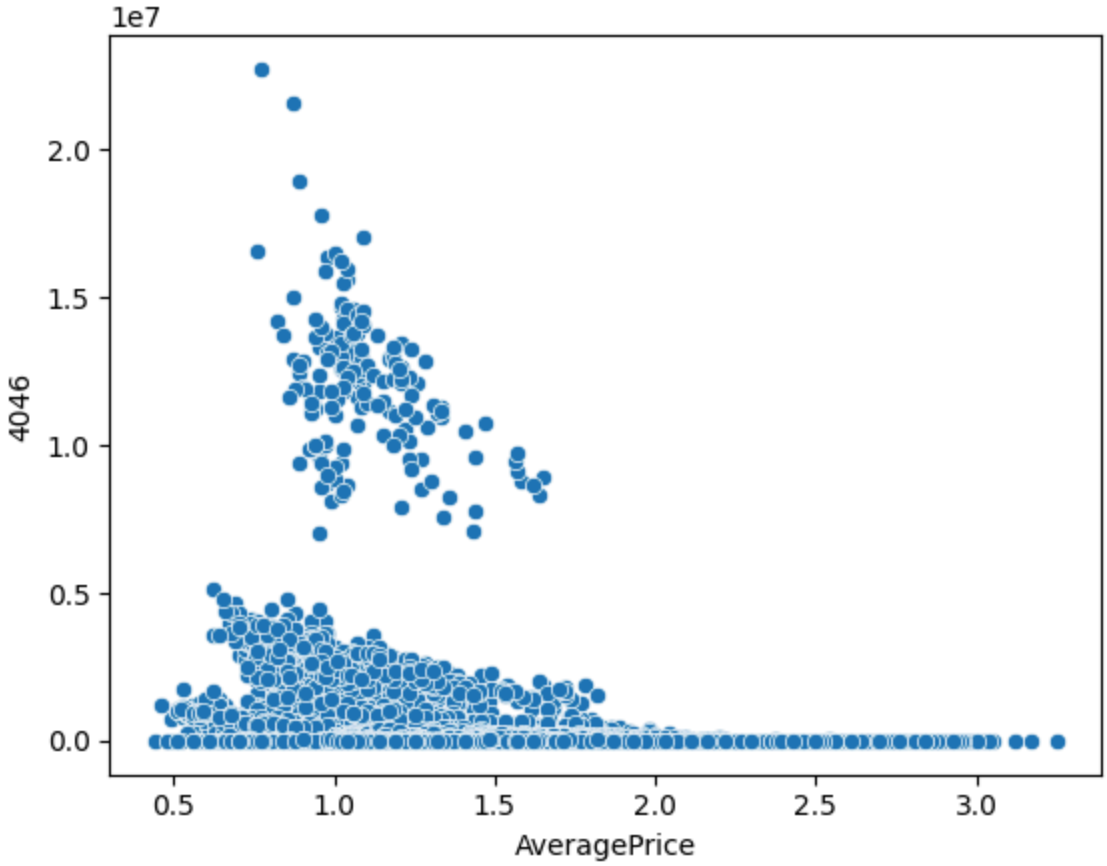
Out[98]:

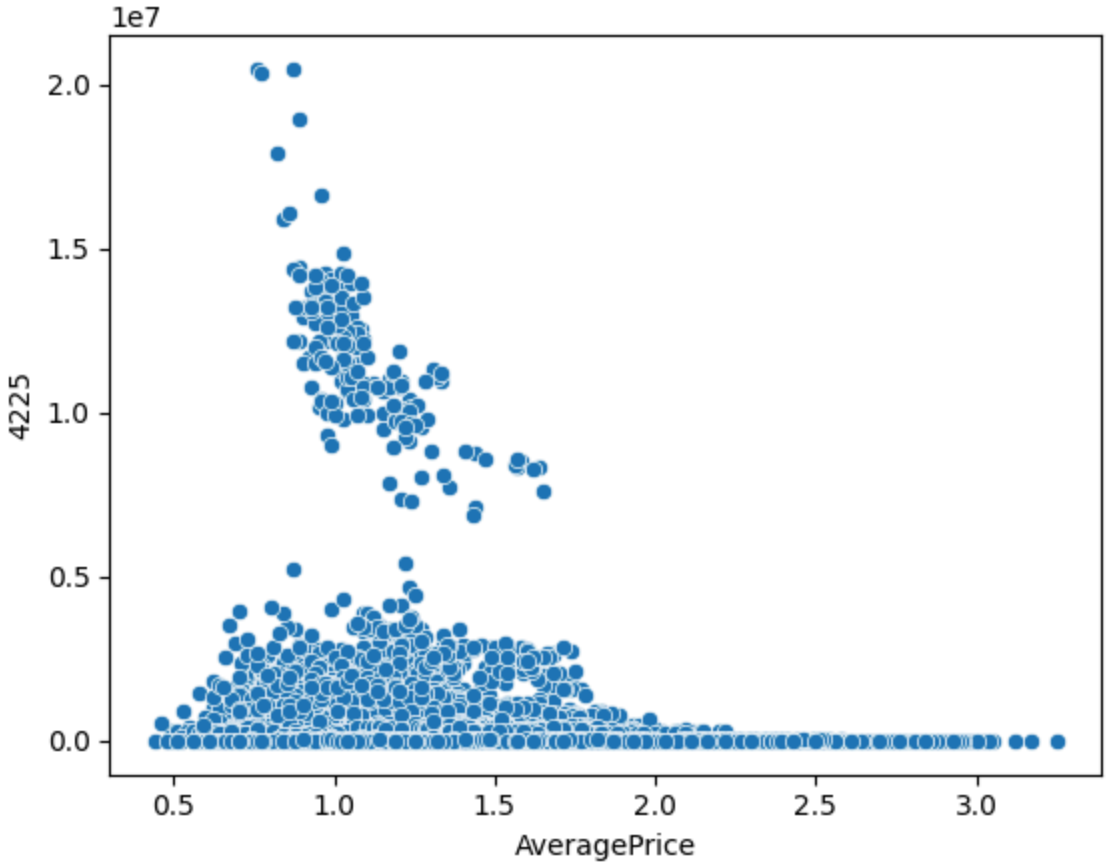
	Date	AveragePrice	Total Volume	4046	4225	4770	Total Bags	Smal Bags
0	2015-12-27	1.33	64236.62	1036.74	54454.85	48.16	8696.87	8603.62
1	2015-12-20	1.35	54876.98	674.28	44638.81	58.33	9505.56	9408.07
2	2015-12-13	0.93	118220.22	794.70	109149.67	130.50	8145.35	8042.21
3	2015-12-06	1.08	78992.15	1132.00	71976.41	72.58	5811.16	5677.40
4	2015-11-29	1.28	51039.60	941.48	43838.39	75.78	6183.95	5986.26

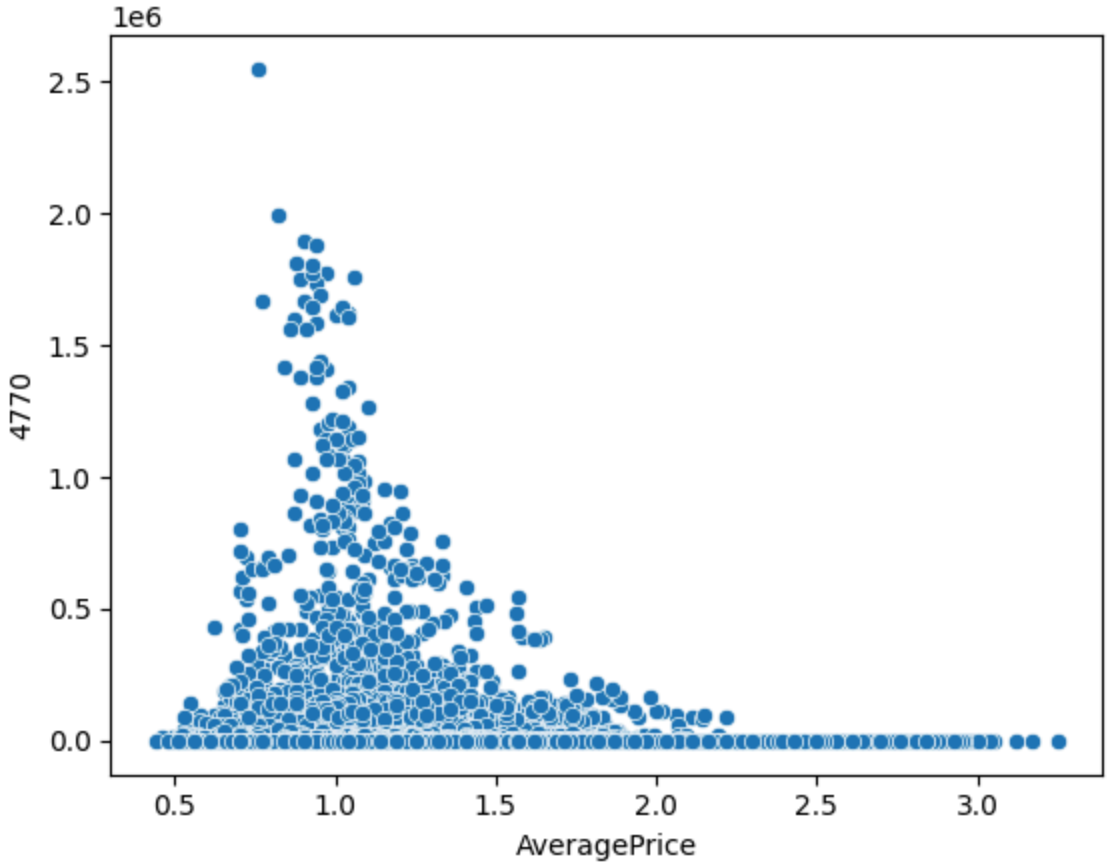
In [132…
```
numerical_columns = df.select_dtypes(include=['number']).columns

for column in numerical_columns:
  sns.scatterplot(x='AveragePrice', y =column, data=df)
  plt.show()
```

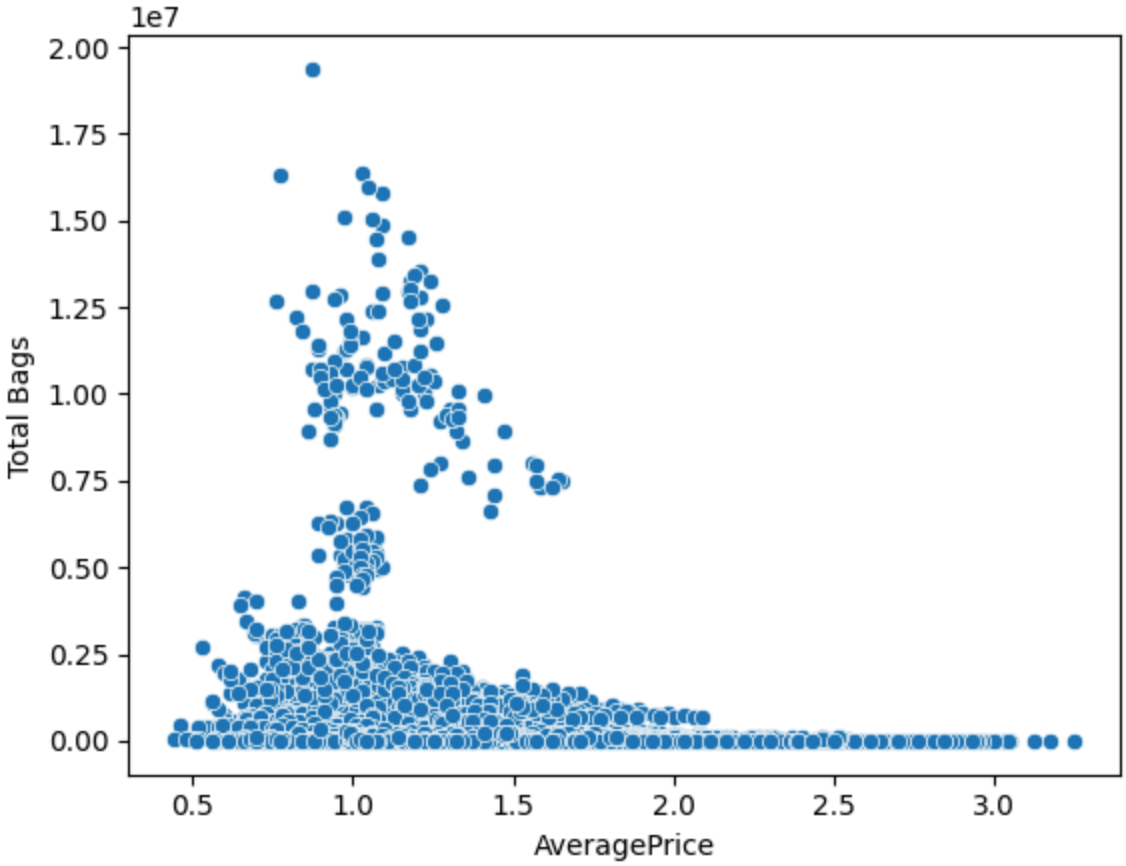

AveragePrice
3.0
2.5
2.0
1.5
1.0
0.5
0.5
1.0
1.5
2.0
2.5
3.0
AveragePrice

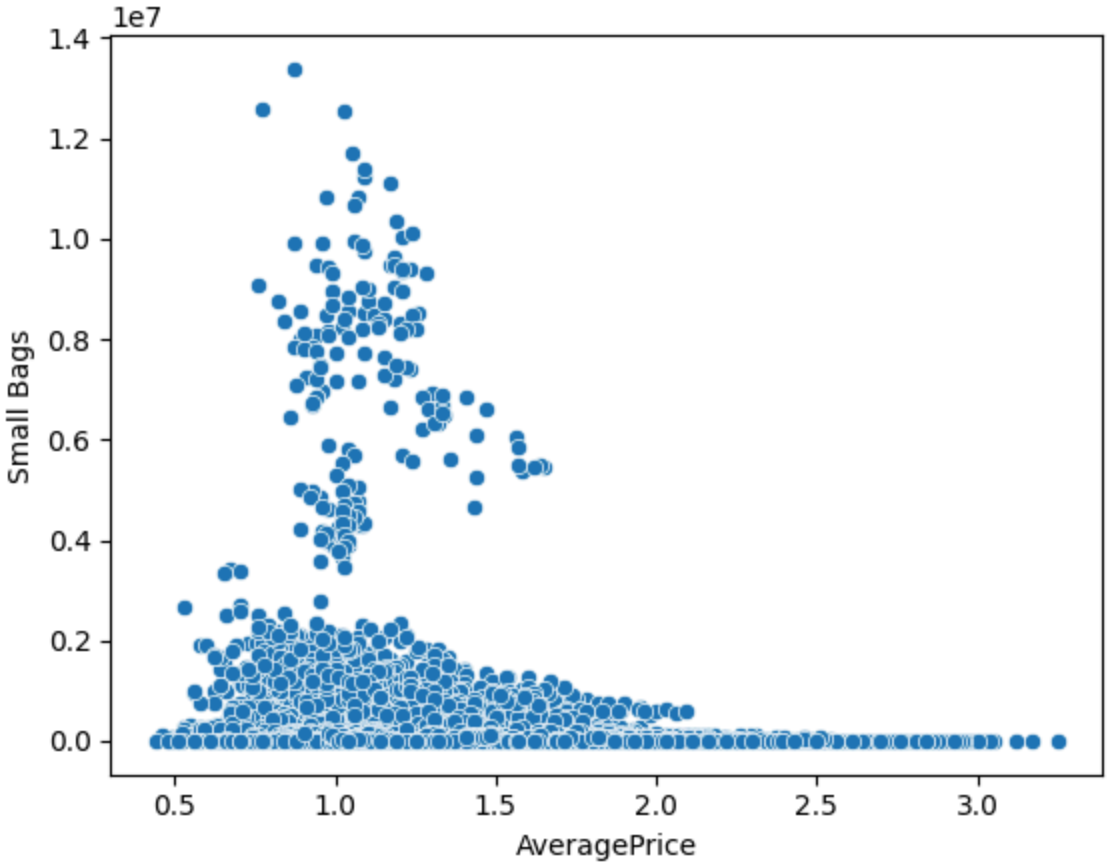

1e7
Total Volume
6
5
4
3
2
1
0
0.5
1.0
1.5
2.0
2.5
3.0
AveragePrice

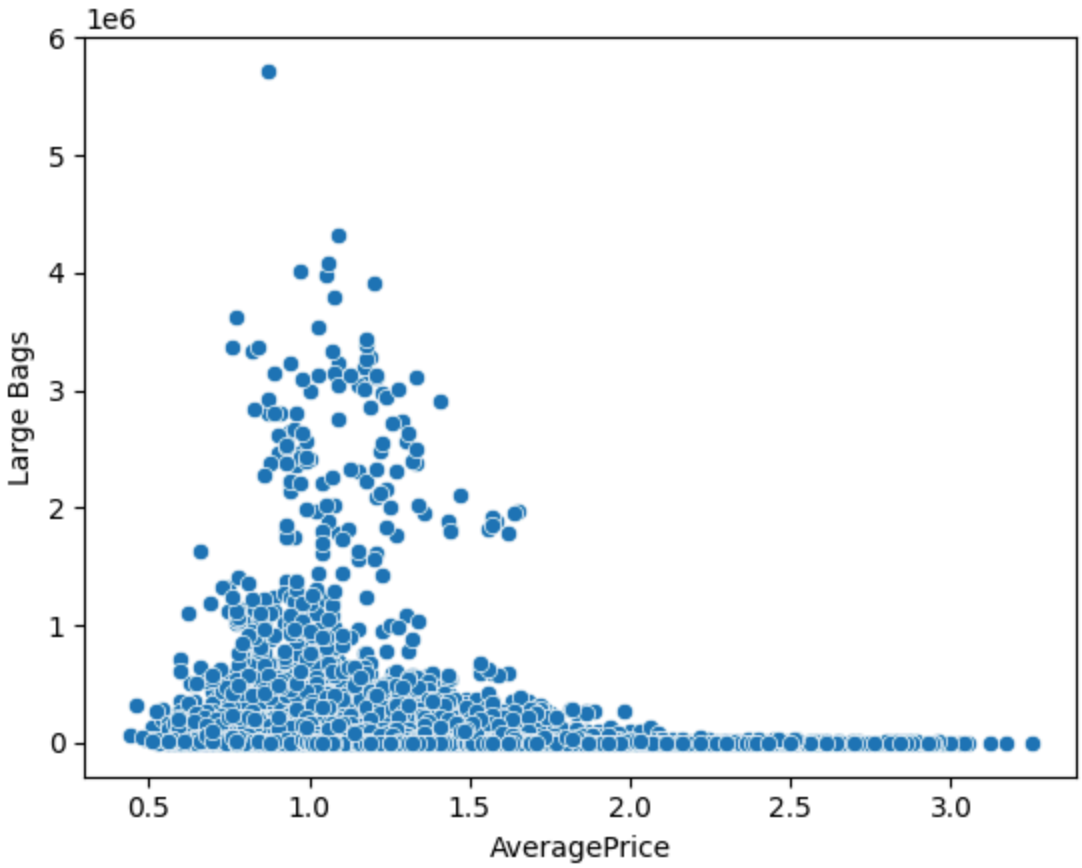

1e7
2.0
1.5
1.0
0.5
0.0
4046
0.5
1.0
1.5
2.0
2.5
3.0
AveragePrice

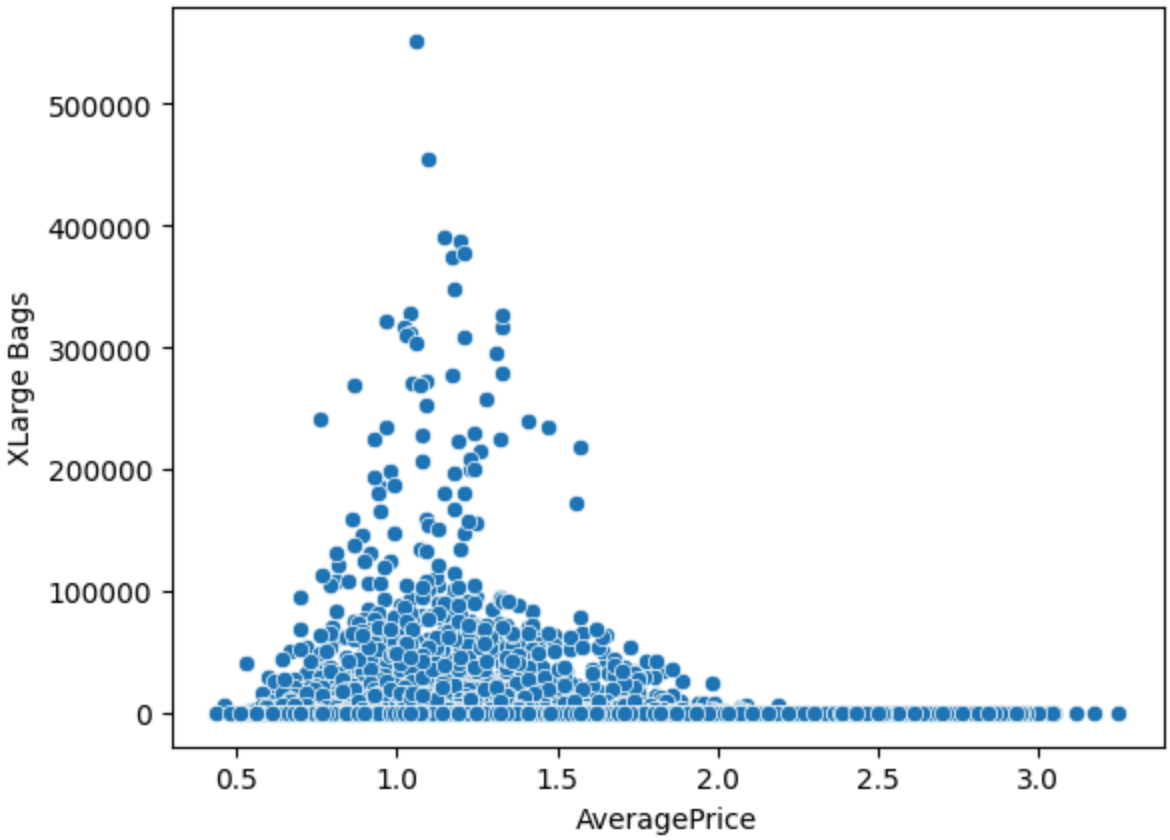

1e7
2.0
1.5
1.0
0.5
0.0
4225
0.5
1.0
1.5
2.0
2.5
3.0
AveragePrice


1e6
2.5
2.0
1.5
1.0
0.5
0.0
4770
0.5
1.0
1.5
2.0
2.5
3.0
AveragePrice


1e7
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Total Bags
0.5
1.0
1.5
2.0
2.5
3.0
AveragePrice


1e7
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Small Bags
0.5
1.0
1.5
2.0
2.5
3.0
AveragePrice

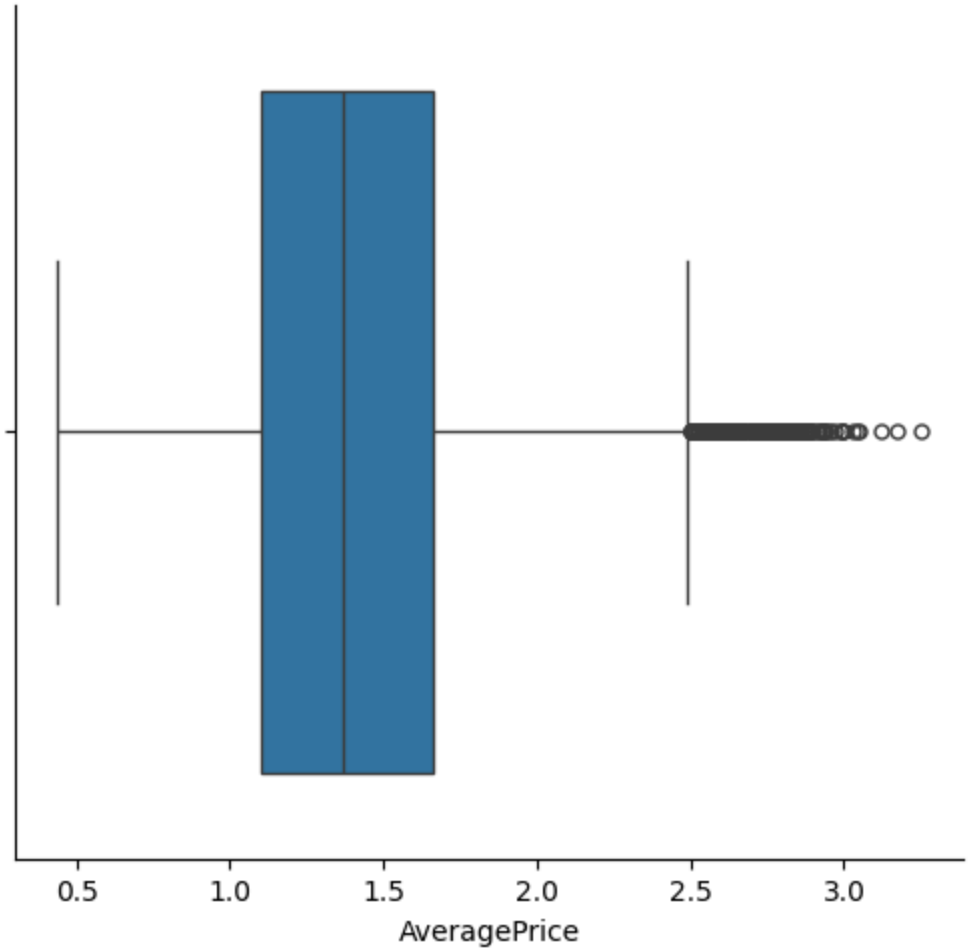

1e6
6
5
4
3
2
1
0
Large Bags
0.5
1.0
1.5
2.0
2.5
3.0
AveragePrice

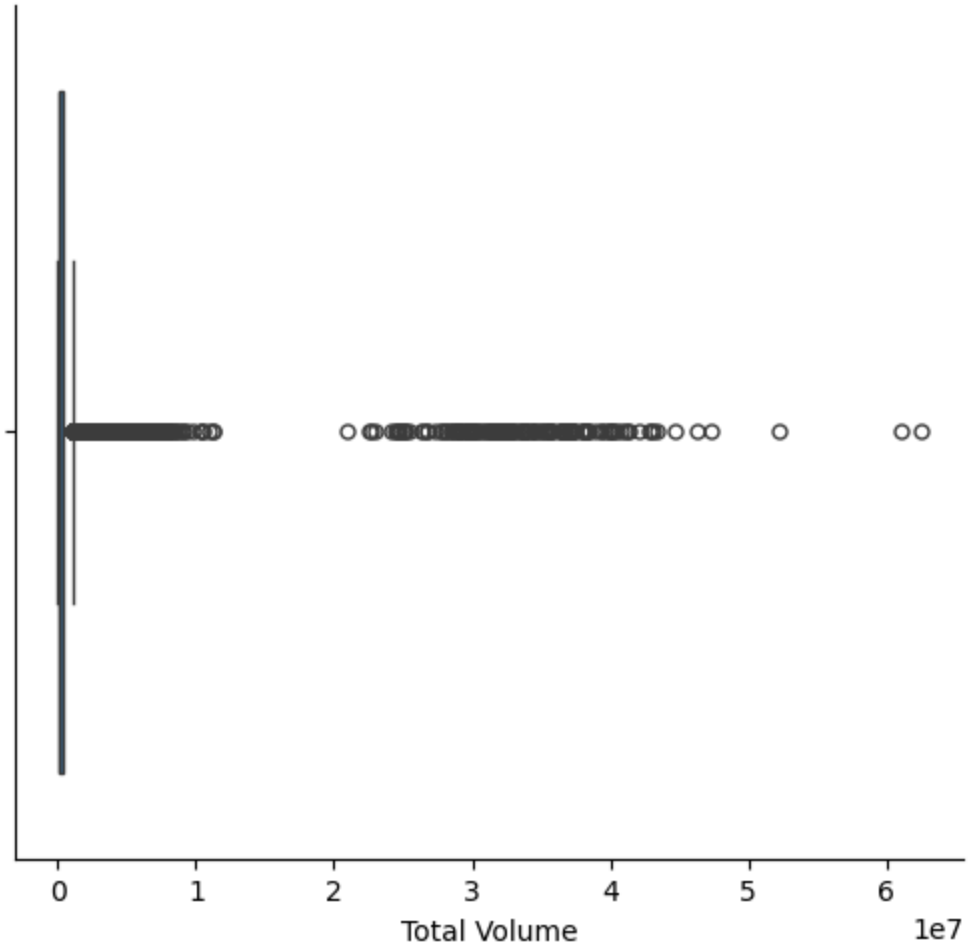


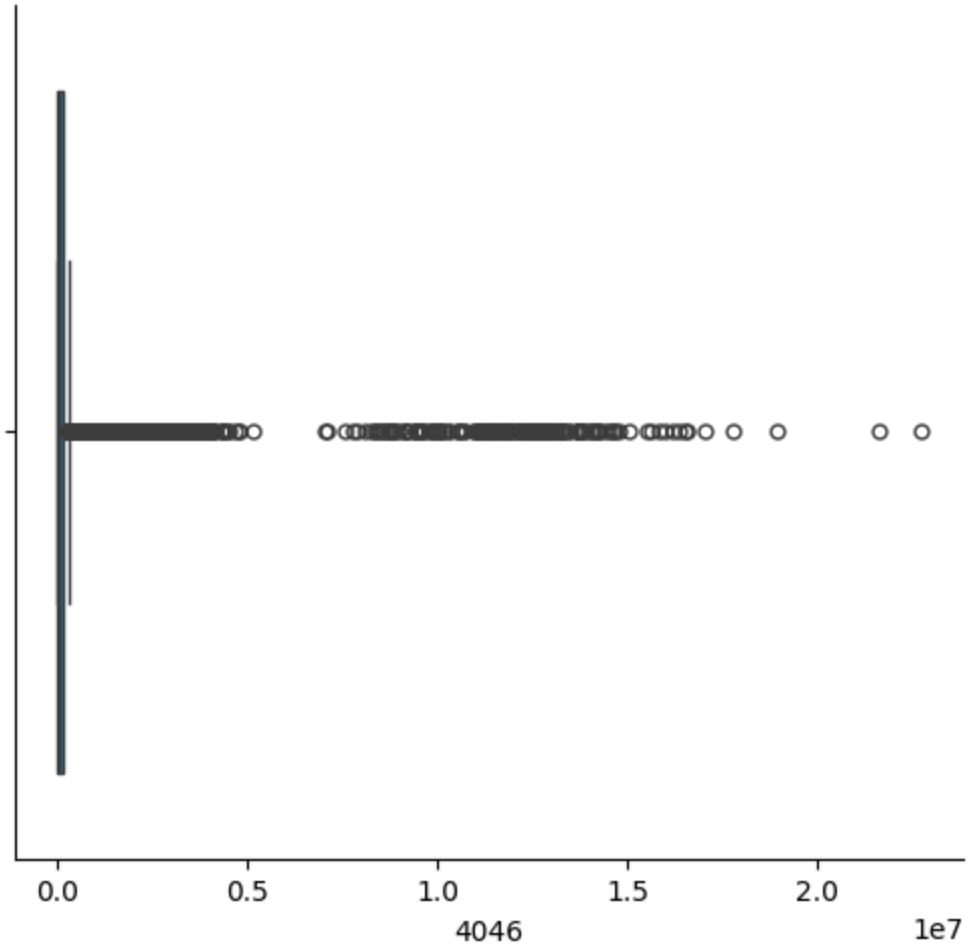
Una estadística que podría aportar información importante inclusive si es un valor atípico es el precio promedio del aguacate, ya que, por conocimiento básico de mercado, se sabe que a mayor demanda, mayor el precio del producto, y viceversa.Con estas gráficas se observa que, si bien la cantidad vendida de bolsas de aguacate y volumen vendido si depende de el precio promedio del aguacate (para valores muy altos, directamente no se vende), la información más significativa parece estar conglomerada en donde la mayoría de puntos se encuentran. Entonces, se aplicará de igual forma el método IQR para limpiar los datos atípicos del precio promedio.

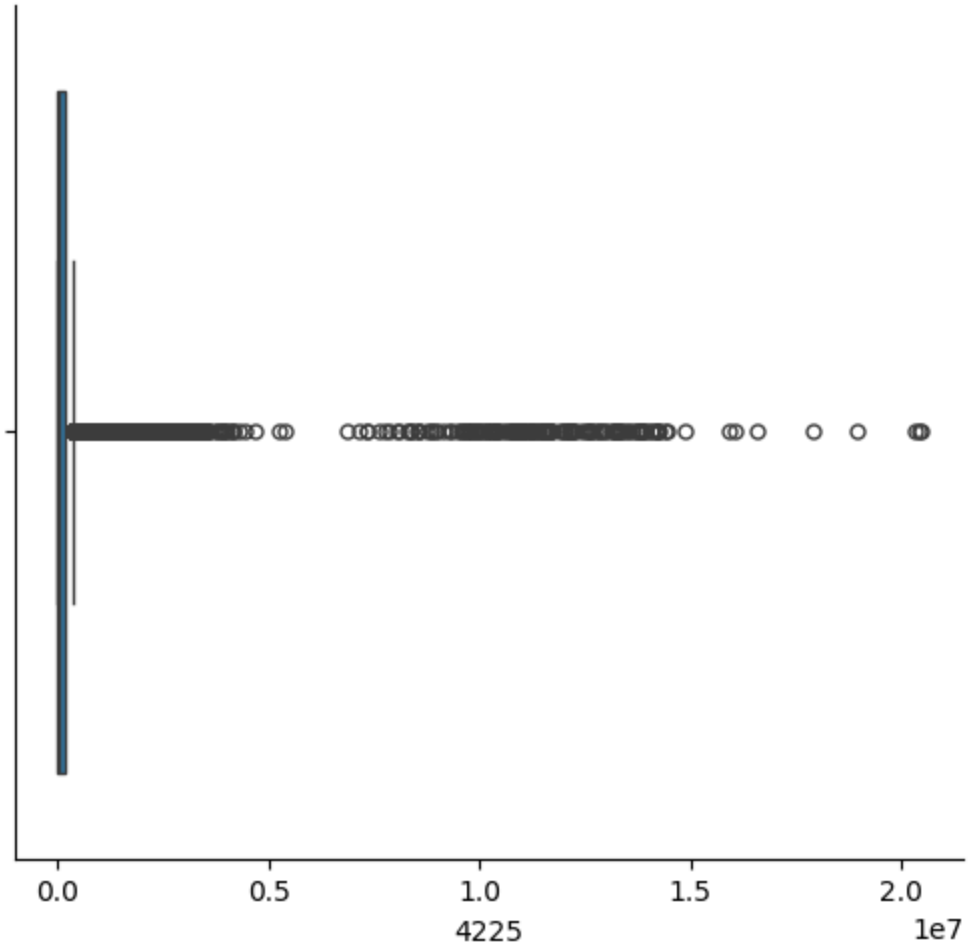
Método IQR

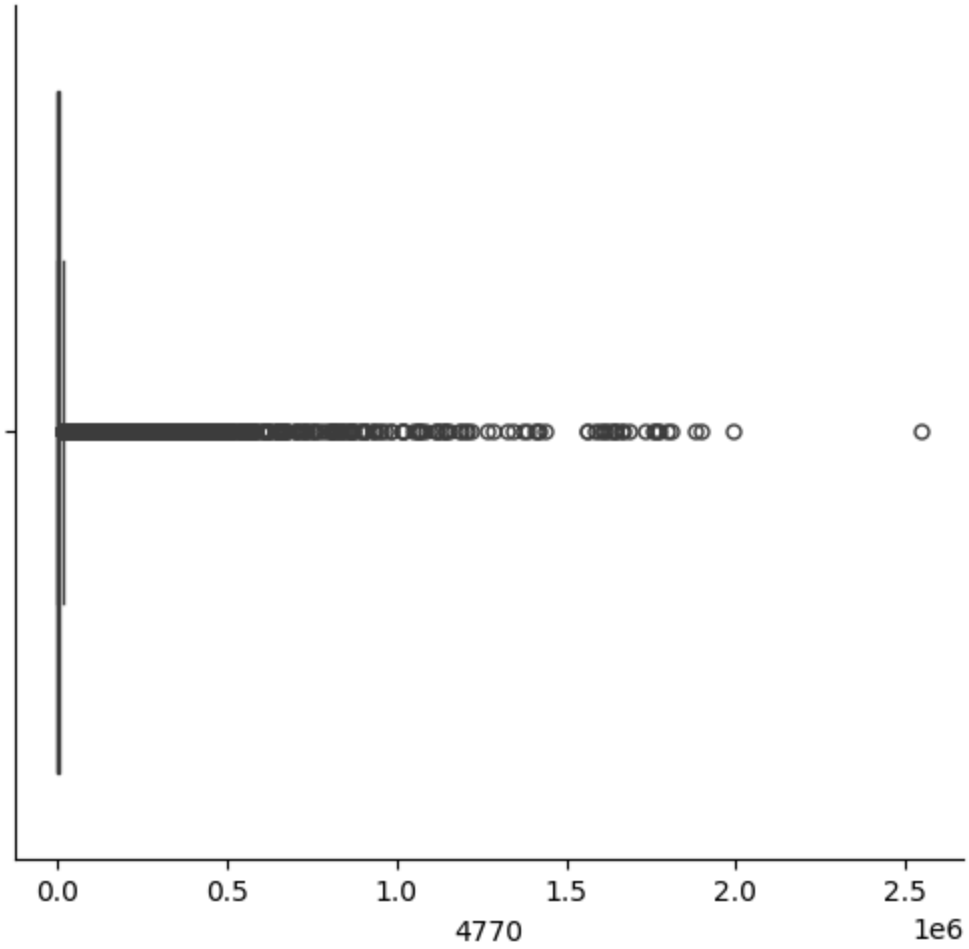
In [99]:
```
numerical_columns = df.select_dtypes(include=['number']).columns

for column in numerical_columns:
  sns.catplot(x=column, kind="box", data=df)
```

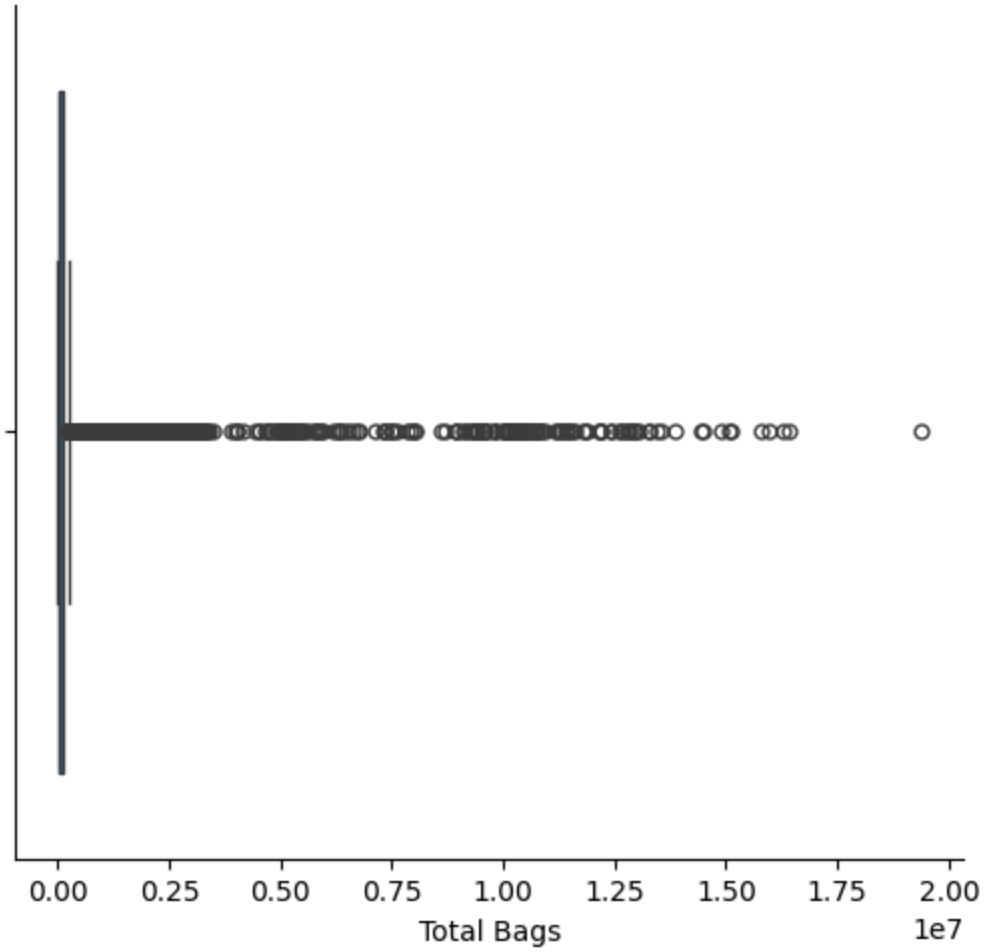

0.5
1.0
1.5
2.0
2.5
3.0
AveragePrice

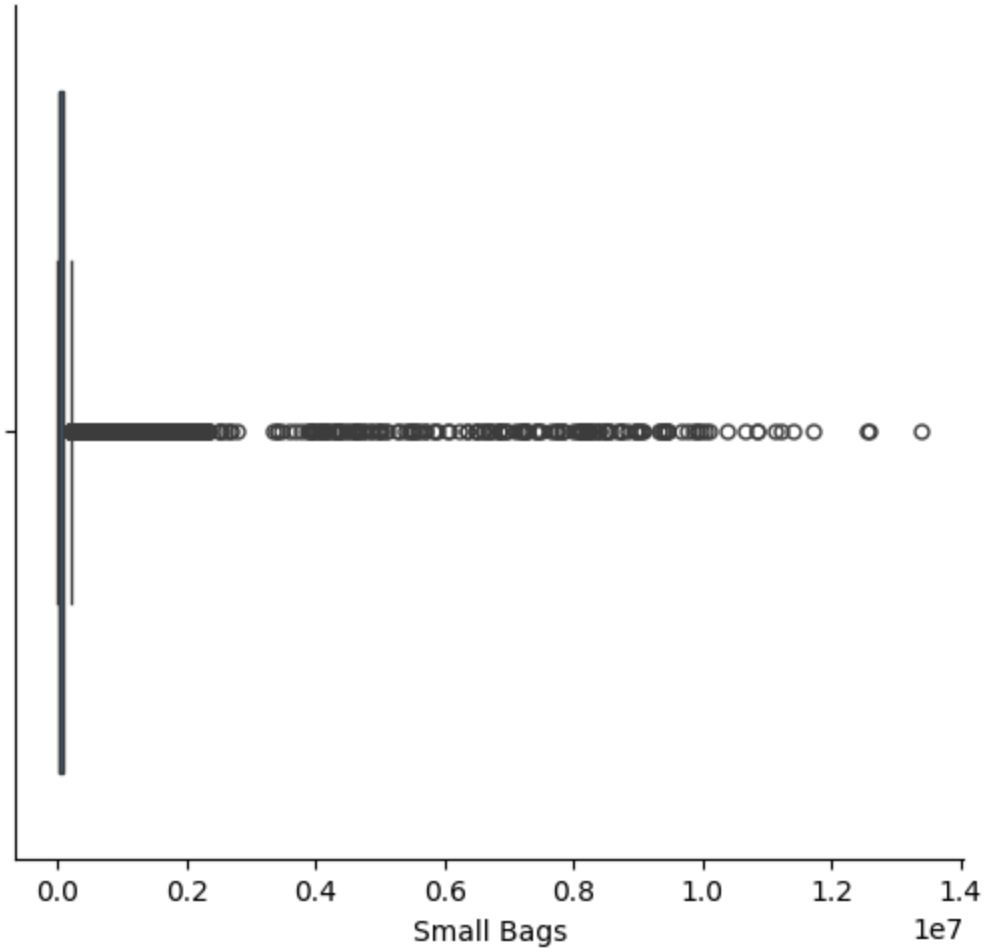

0
1
2
3
4
5
6
Total Volume
1e7

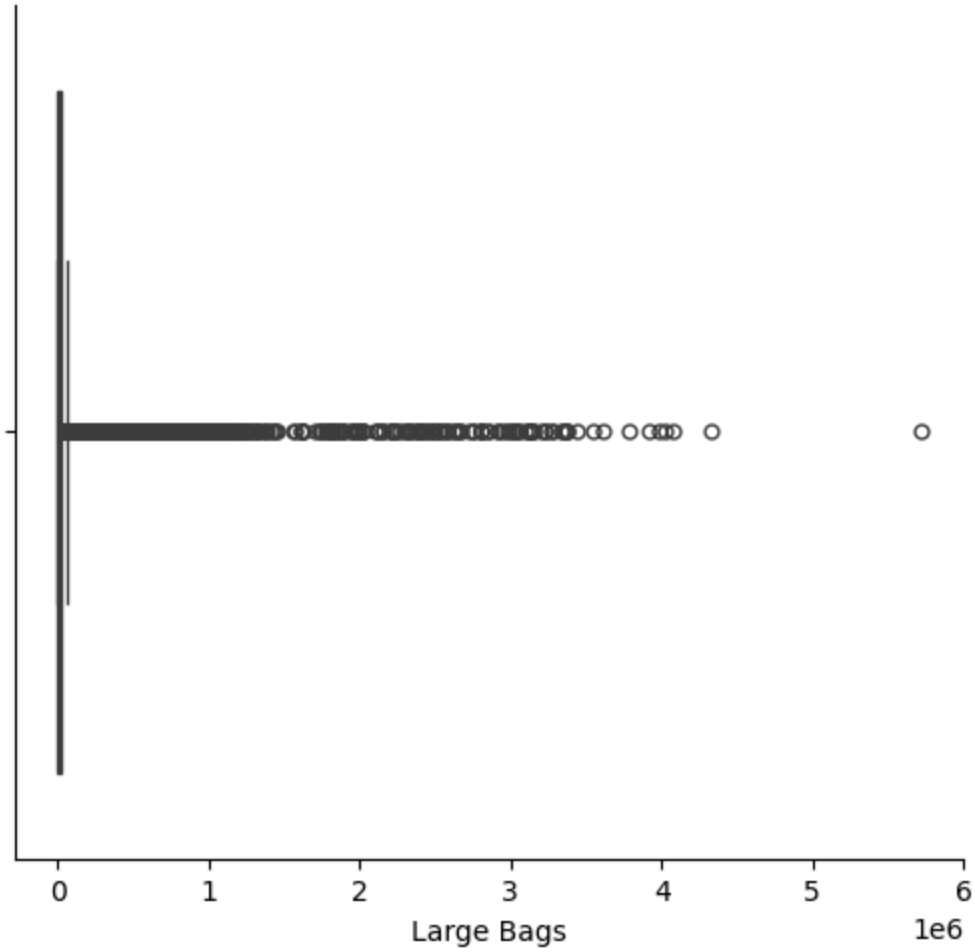

0.0
0.5
1.0
1.5
2.0
4046
1e7

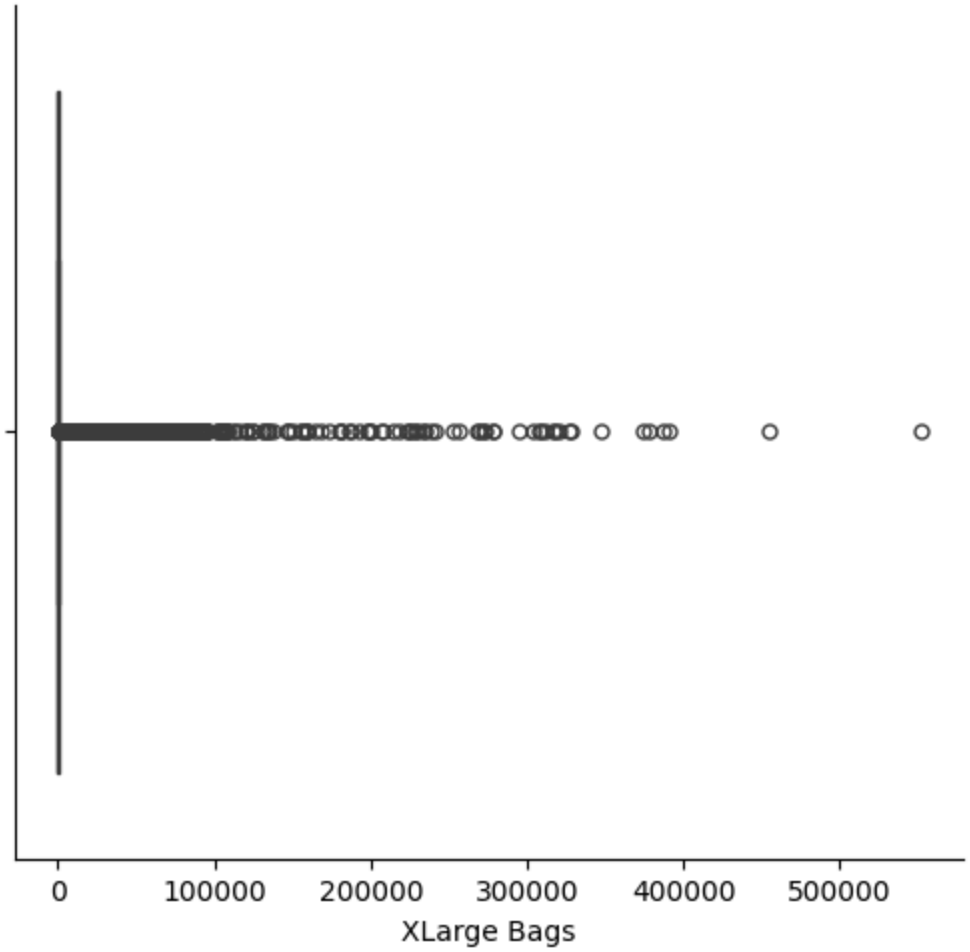

0.0
0.5
1.0
1.5
2.0
4225
1e7


0.0
0.5
1.0
1.5
2.0
2.5
4770
1e6


0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
Total Bags
1e7


0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Small Bags
1e7


0
1
2
3
4
5
6
Large Bags
1e6

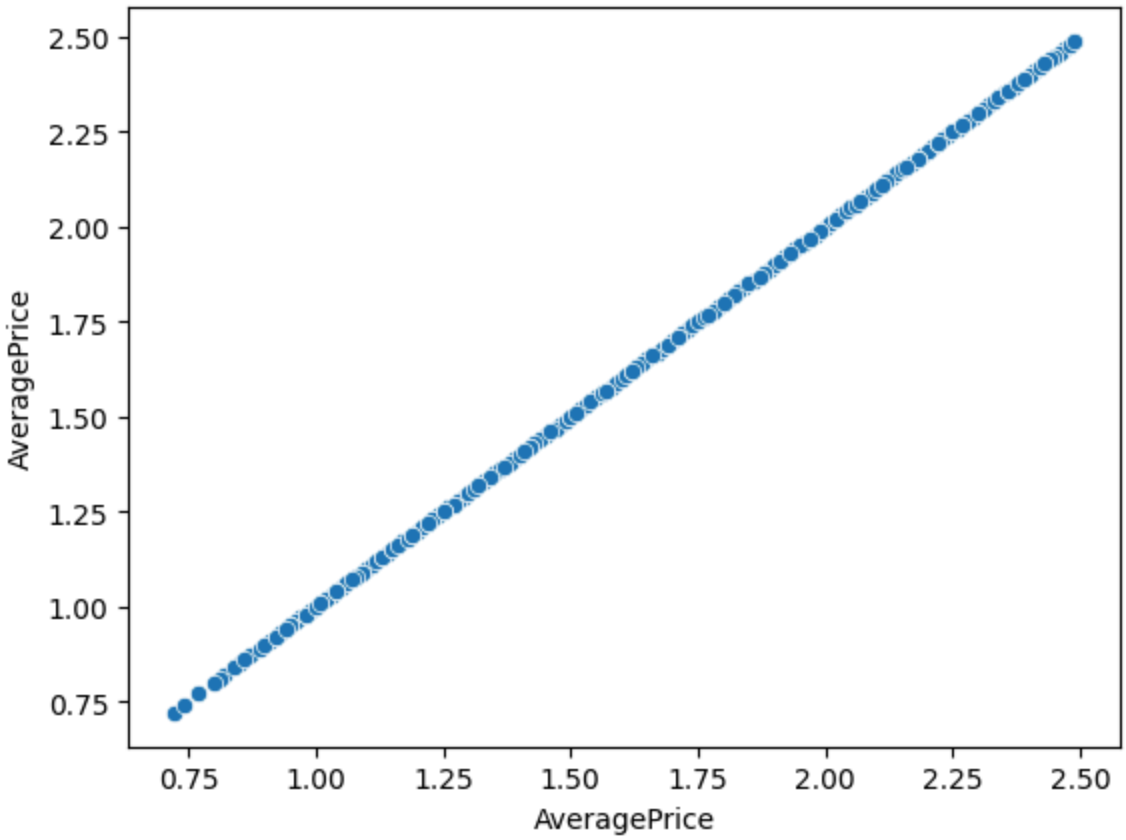


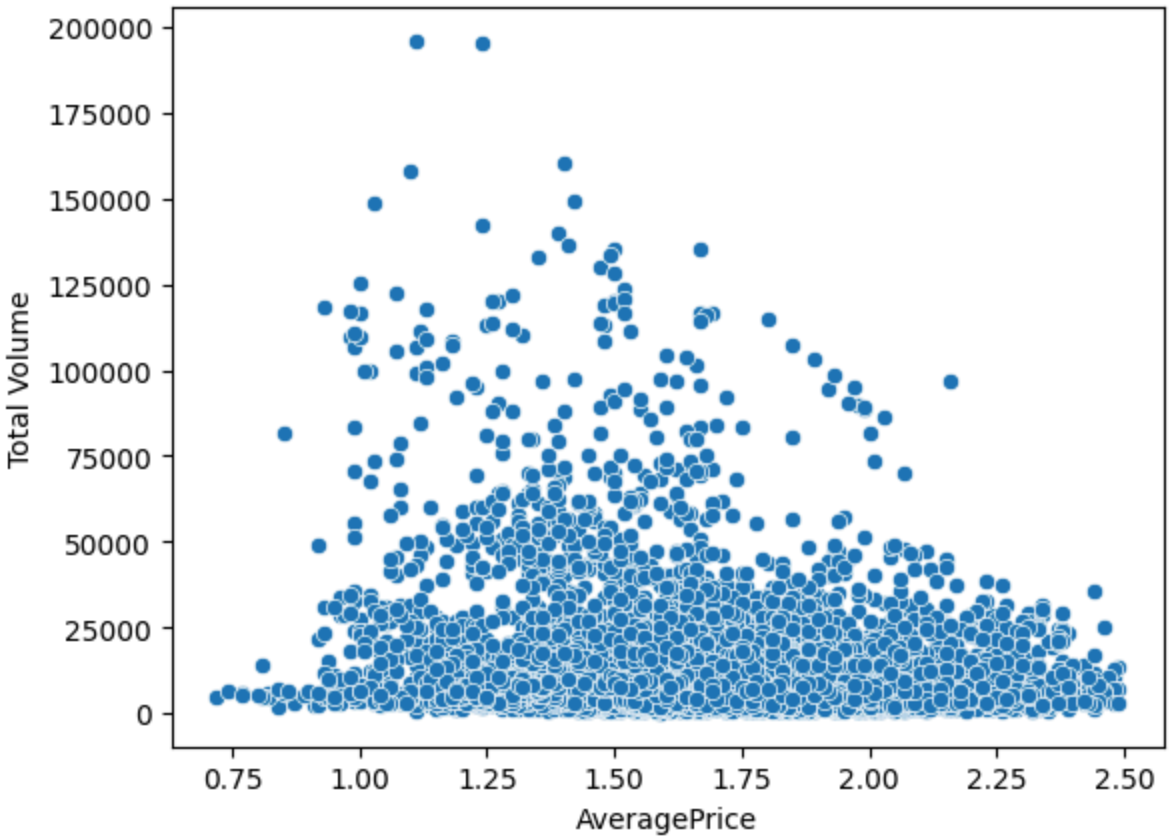
Se observan muchos valores atípicos en todos los valores numéricos

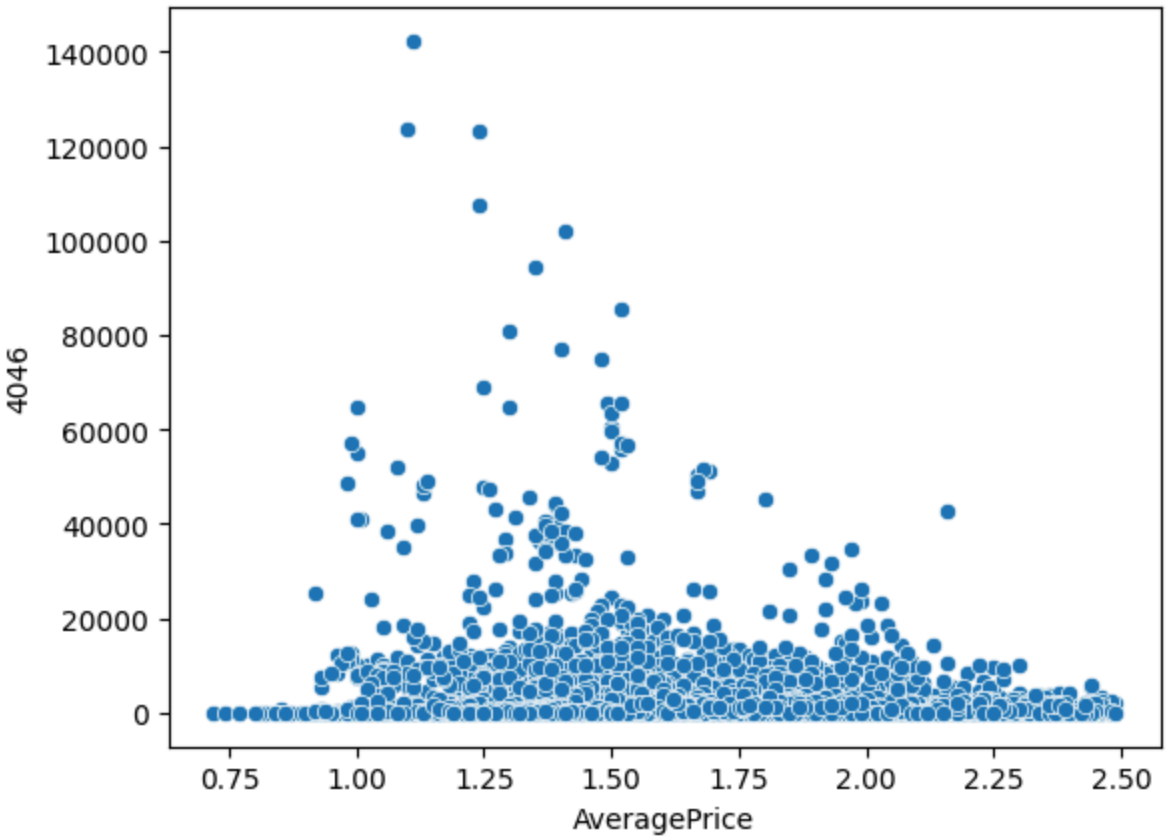
Eliminación de valores atípicos

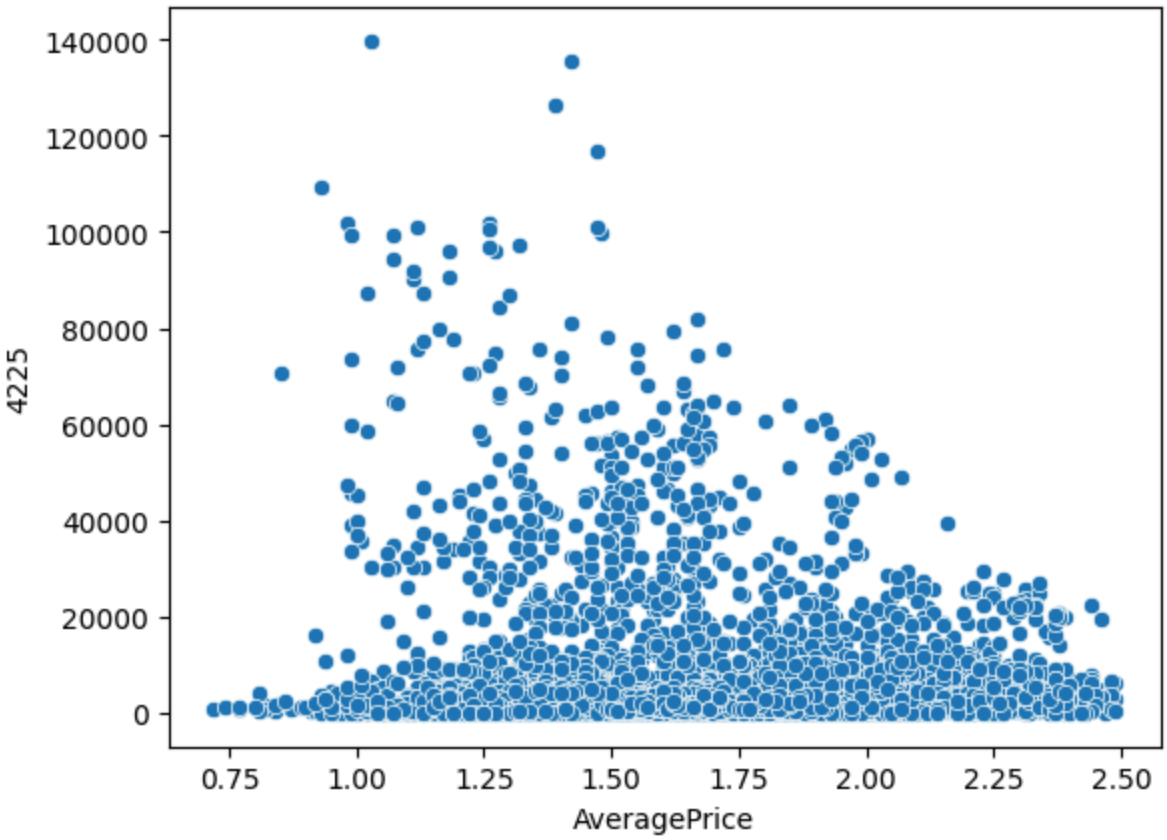
In [143…
```
df_aux = df.copy()

for column in numerical_columns:
  Q1 = df_aux[column].quantile(0.25)
  Q3 = df_aux[column].quantile(0.75)
  IQR = Q3 - Q1

  fences = [Q1 - IQR*1.5, Q3 + IQR*1.5]

  df_aux = df_aux[(df_aux[column] >= fences[0]) & (df_aux[column] <= fences[
```

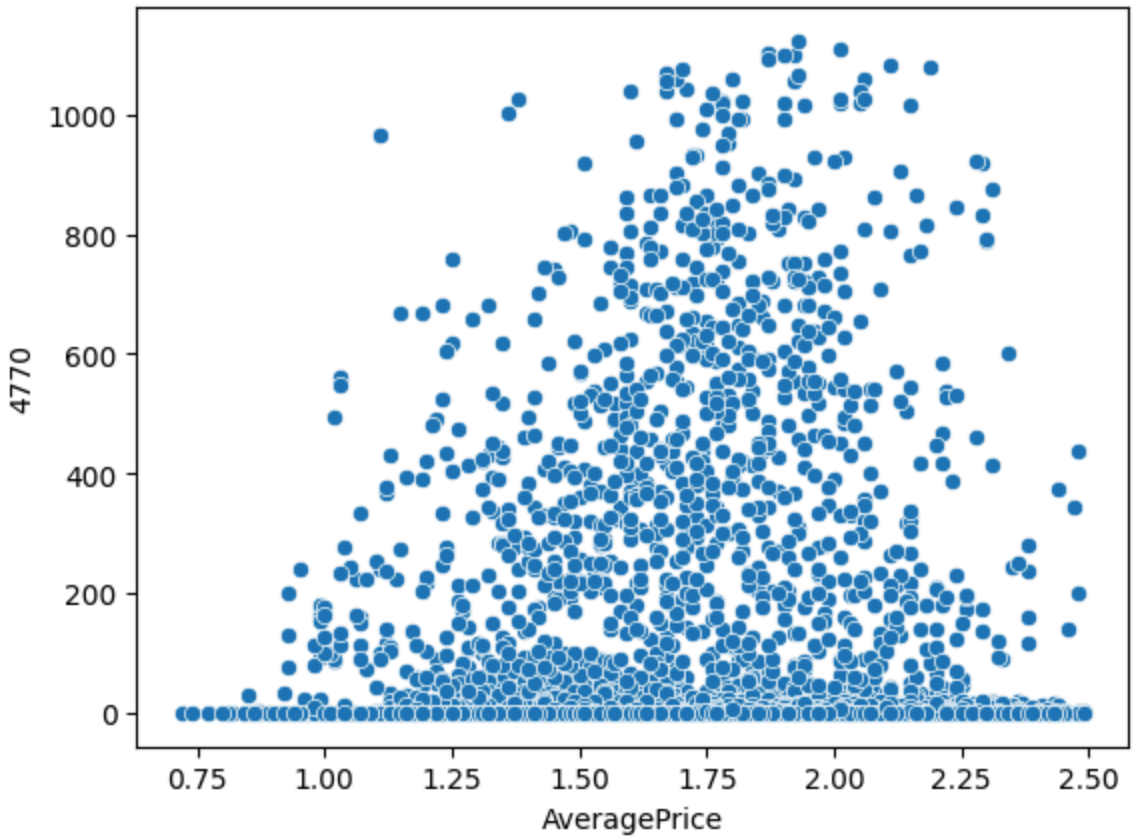
In [134…
```
numerical_columns = df.select_dtypes(include=['number']).columns

for column in numerical_columns:
  sns.scatterplot(x='AveragePrice', y =column, data=df_aux)
  plt.show()
```

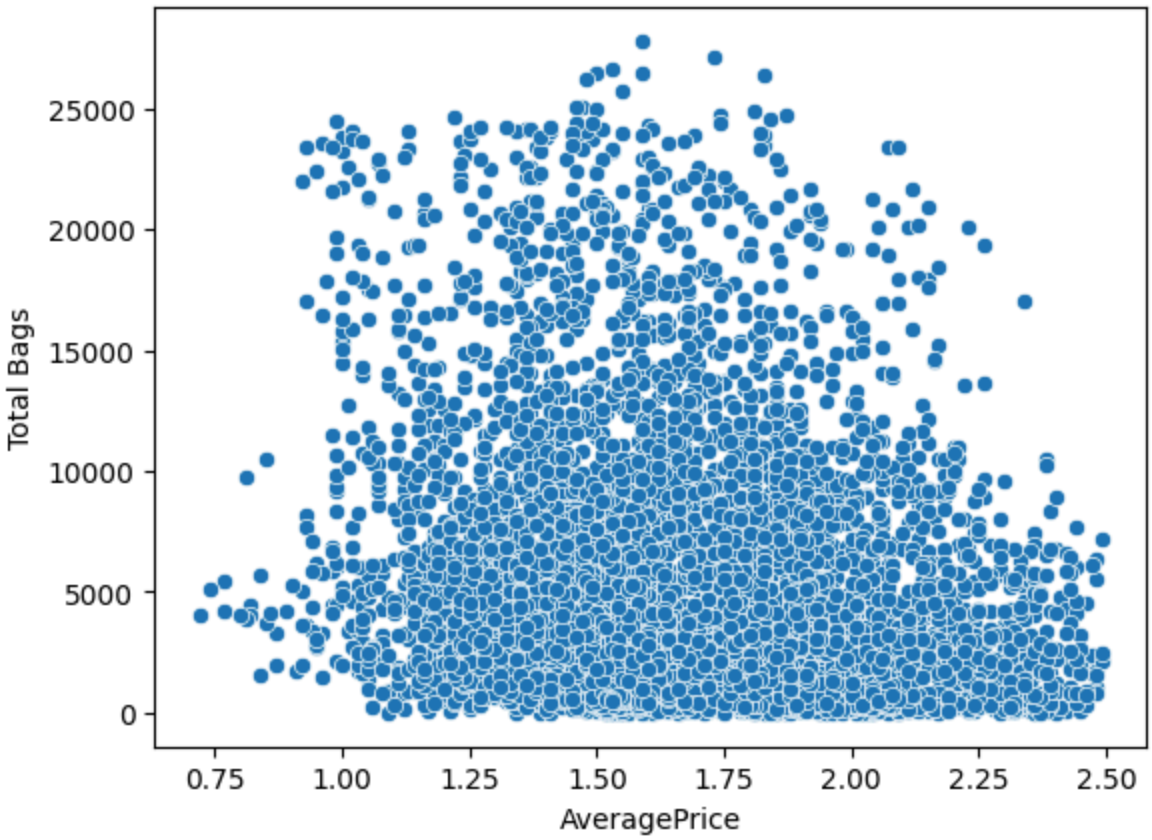

2.50
2.25
2.00
1.75
1.50
1.25
1.00
0.75
AveragePrice
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
AveragePrice

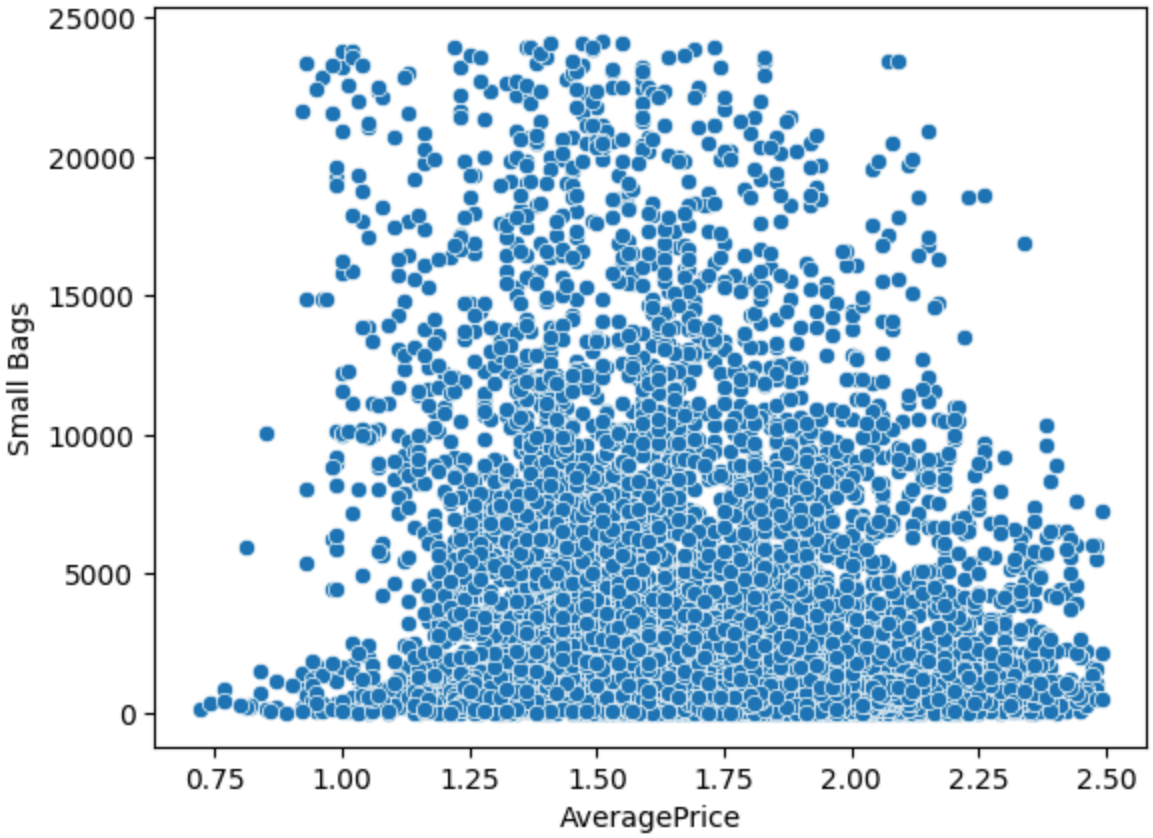

200000
175000
150000
125000
100000
75000
50000
25000
0
Total Volume
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
AveragePrice

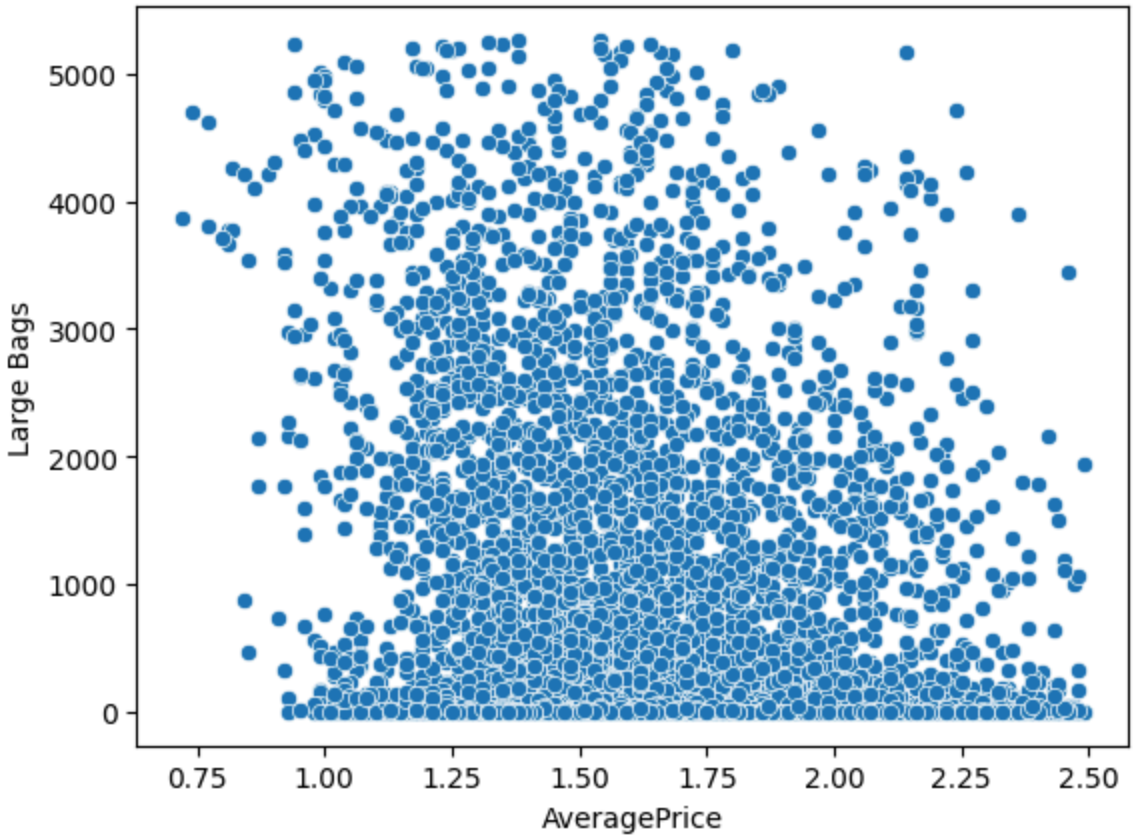

140000
120000
100000
80000
60000
40000
20000
0
4046
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
AveragePrice

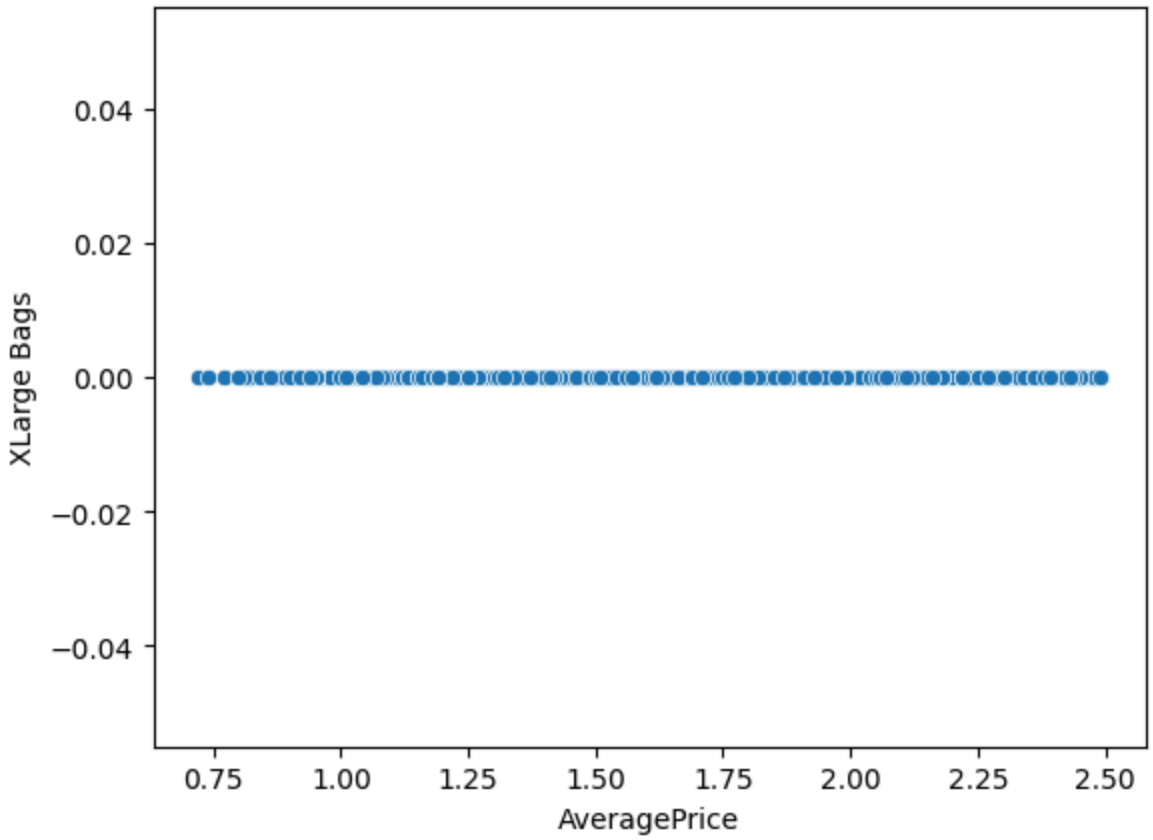

140000
120000
100000
80000
60000
40000
20000
0
4225
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
AveragePrice


4770
1000
800
600
400
200
0
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
AveragePrice


Total Bags
25000
20000
15000
10000
5000
0
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
AveragePrice

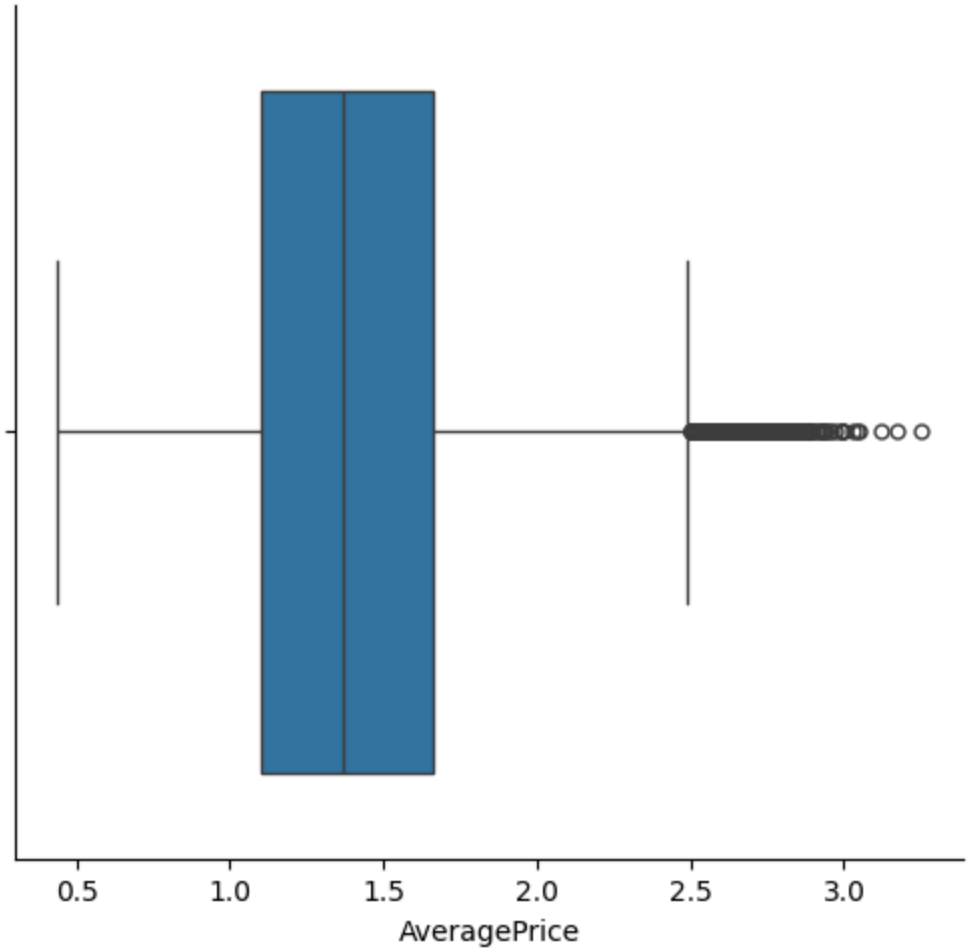

25000
20000
15000
10000
5000
0
Small Bags
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
AveragePrice

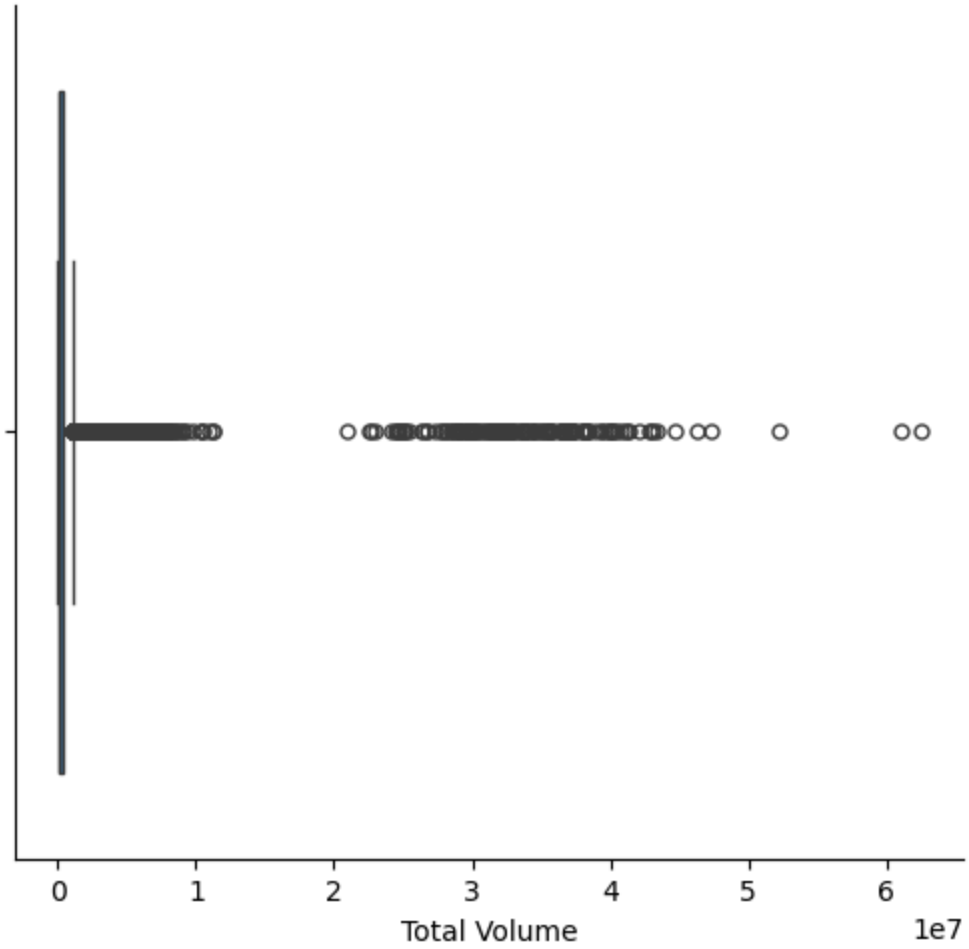

5000
4000
3000
2000
1000
0
Large Bags
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
AveragePrice

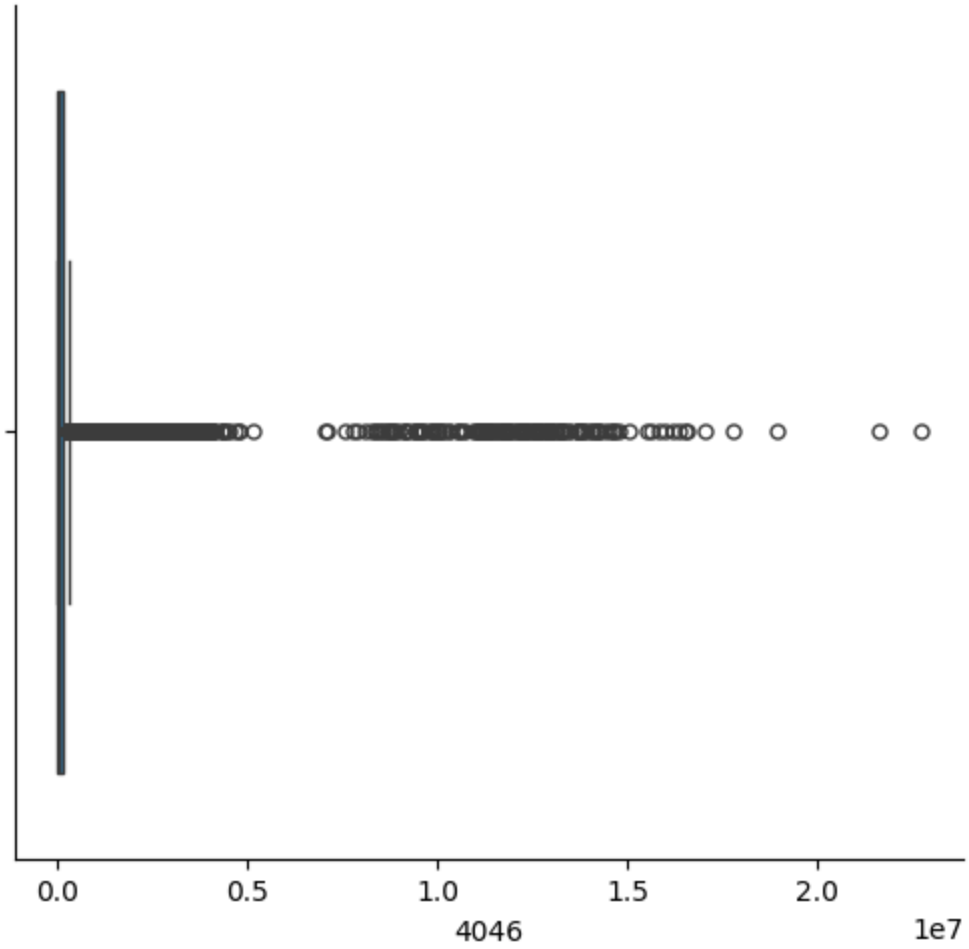


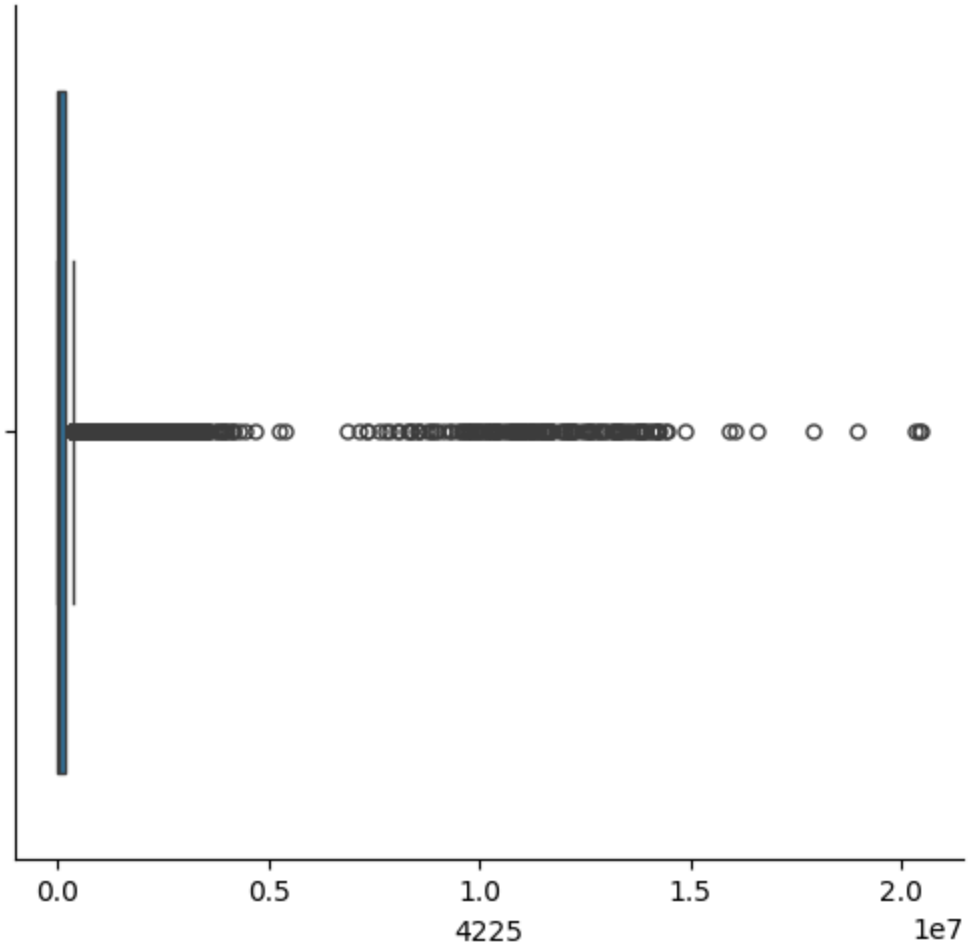
In [135…

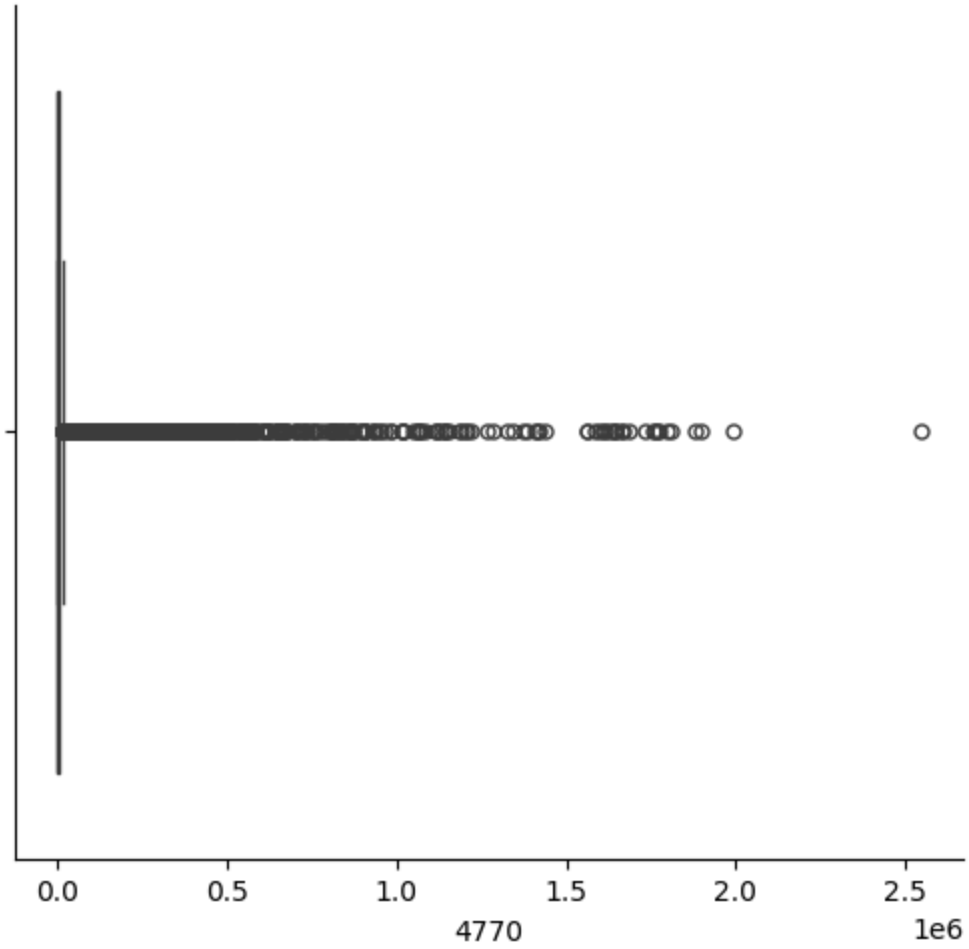
```
numerical_columns = df.select_dtypes(include=['number']).columns

for column in numerical_columns:
  sns.catplot(x=column, kind="box", data=df)
```

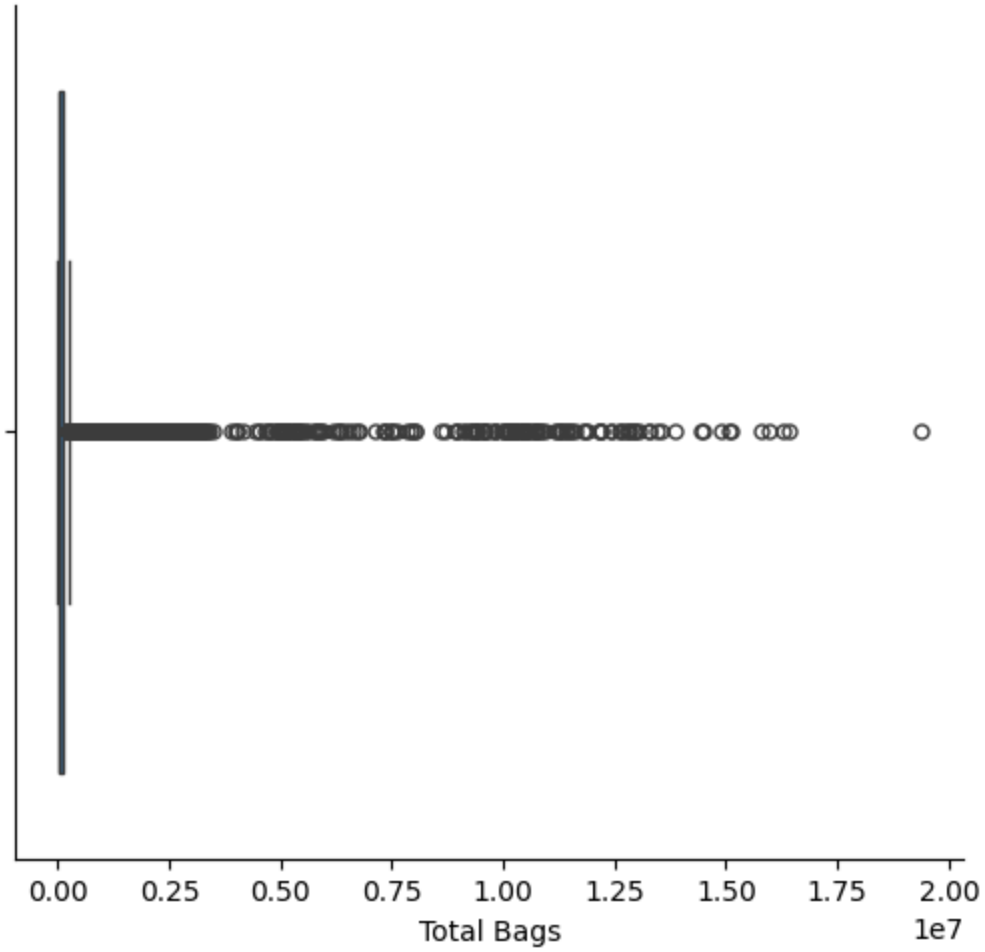

0.5
1.0
1.5
2.0
2.5
3.0
AveragePrice

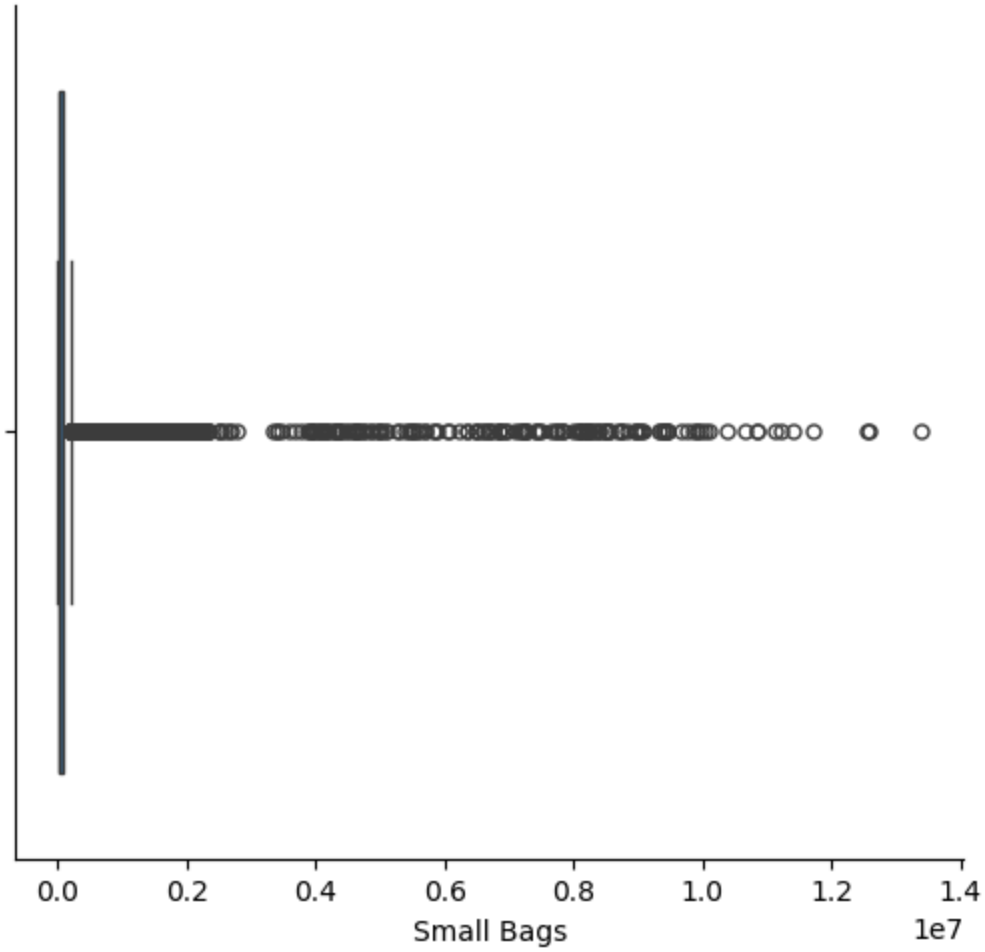

0
1
2
3
4
5
6
Total Volume
1e7

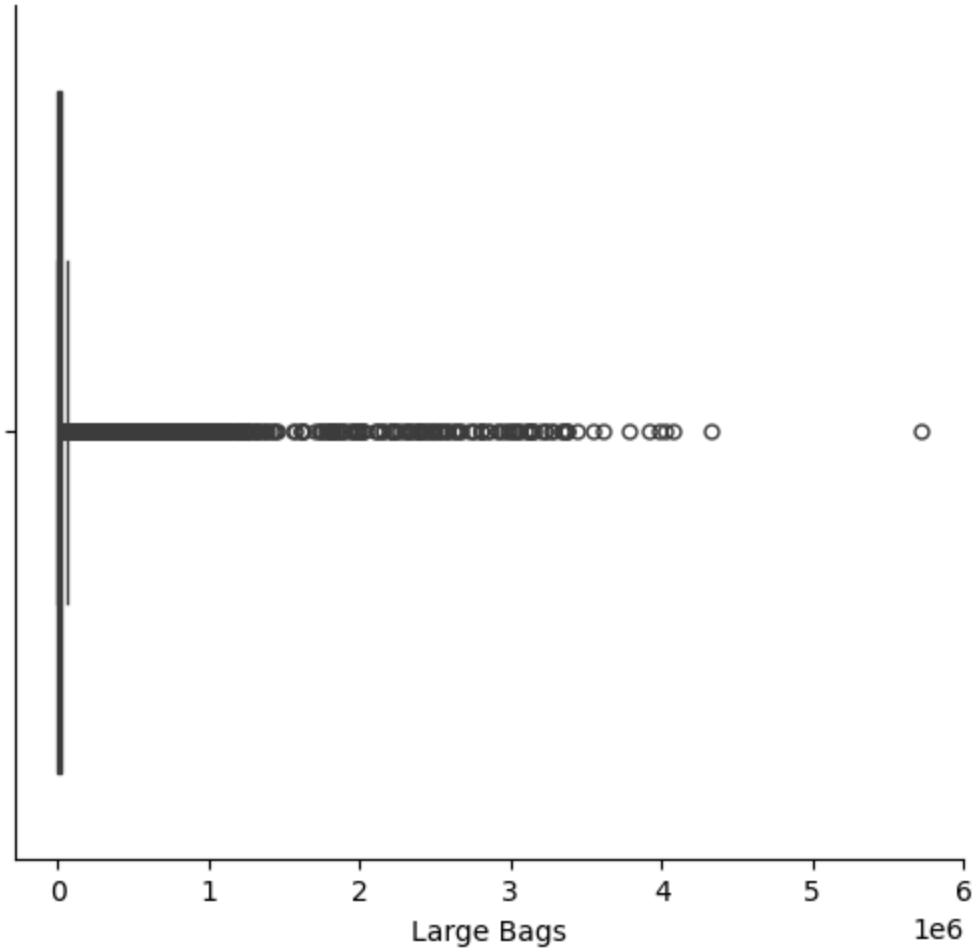

0.0
0.5
1.0
1.5
2.0
4046
1e7

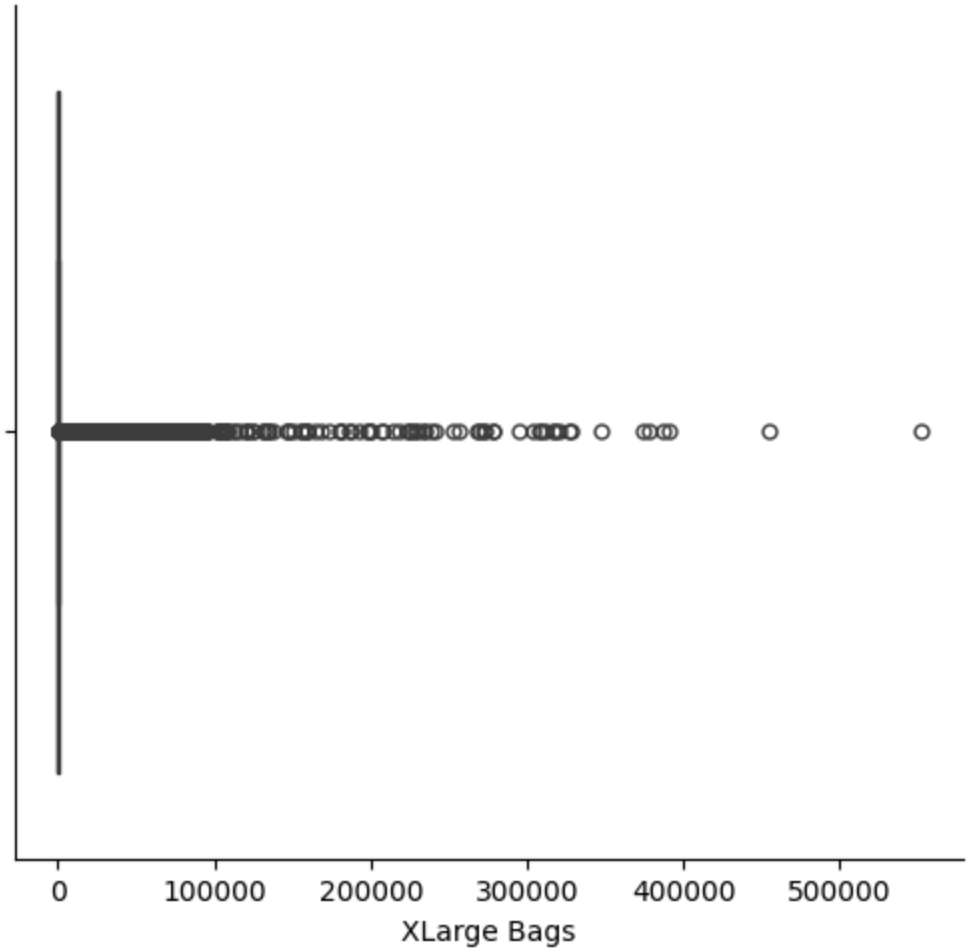

0.0
0.5
1.0
1.5
2.0
4225
1e7


0.0
0.5
1.0
1.5
2.0
2.5
4770
1e6


0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
Total Bags
1e7


0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Small Bags
1e7


0
1
2
3
4
5
6
Large Bags
1e6



In [126…

```
display(df_aux['Total Volume'].describe())
display(df_aux['4046'].describe())
display(df_aux['4225'].describe())
display(df_aux['4770'].describe())
display(df_aux['Total Bags'].describe())
display(df_aux['Small Bags'].describe())
display(df_aux['Large Bags'].describe())
display(df_aux['XLarge Bags'].describe())
```

	Total Volume
count	6725.000000
mean	13071.896764
std	17417.794571
min	84.560000
25%	3752.940000
50%	7728.450000
75%	14482.570000
max	196031.900000

dtype: float64

	4046
count	6725.000000
mean	2422.381022
std	6786.473328
min	0.000000
25%	88.020000
50%	503.140000
75%	1816.690000
max	142332.450000

dtype: float64

	4225
count	6725.000000
mean	5577.586097
std	11818.559671
min	0.000000
25%	322.960000
50%	1862.680000
75%	4643.120000
max	139735.900000

dtype: float64

	4770
count	6725.000000
mean	62.795949
std	176.623292
min	0.000000
25%	0.000000
50%	0.000000
75%	8.130000
max	1123.580000

dtype: float64

	Total Bags
count	6725.000000
mean	5008.511868
std	5209.367054
min	0.000000
25%	1249.860000
50%	3170.150000
75%	6981.280000
max	27784.670000

dtype: float64

	Small Bags
count	6725.000000
mean	4283.506717
std	5139.174462
min	0.000000
25%	669.690000
50%	2083.750000
75%	6267.020000
max	24150.680000

dtype: float64

	Large Bags
count	6725.000000
mean	725.005300
std	1142.089477
min	0.000000
25%	0.000000
50%	107.090000
75%	1022.660000
max	5262.240000

dtype: float64

	XLarge Bags
count	6725.0
mean	0.0
std	0.0
min	0.0
25%	0.0
50%	0.0
75%	0.0
max	0.0

dtype: float64

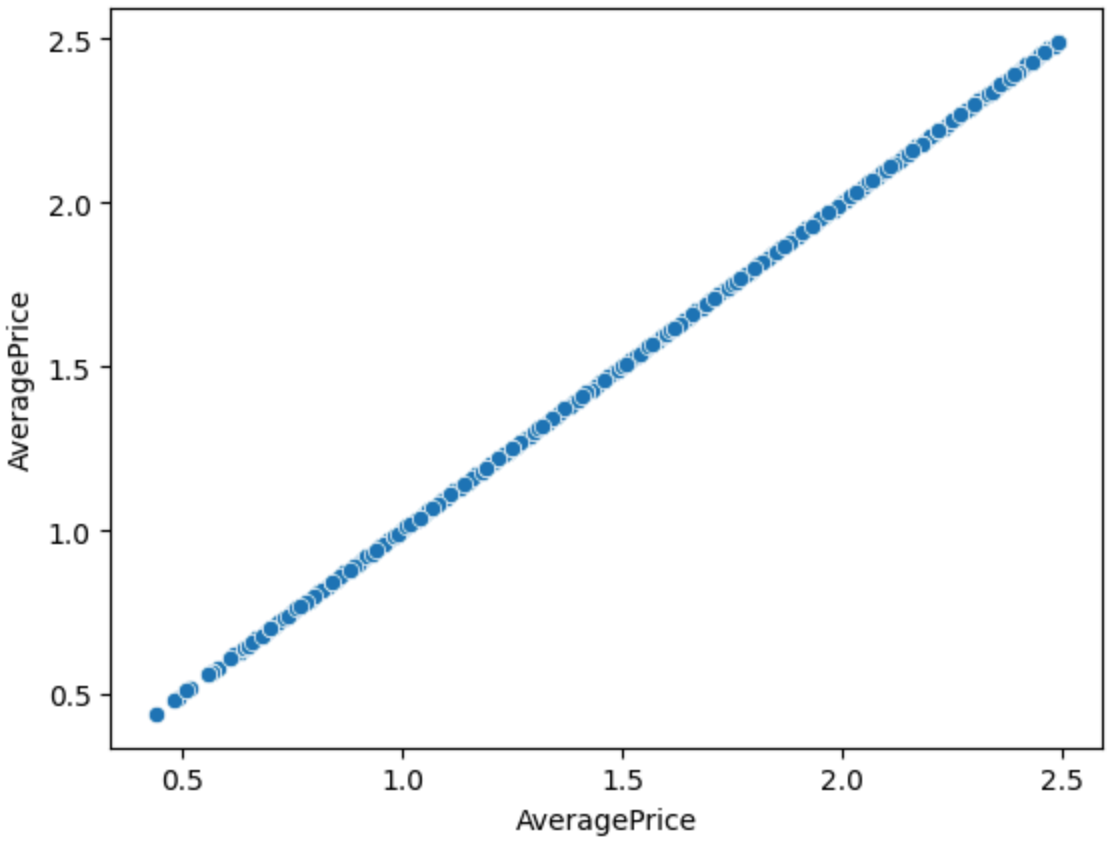
Después de la eliminación de valores atípicos, se observa que la columna 'XLarge Bags' ya no es necesaria. Básicamente la mayoría de valores en dicha variable eran 0, por lo que se eliminó cualquier otro que no fuese 0. Las columnas '4770' y 'Large Bags' podrían ser removidas, ya que una tiene la mitad de valores como cero, y la otra tiene un cuarto de valores como 0, respectivamente. Esto puede implicar que desde el inicio sus datos eran en su mayoría 0. Se puede volver a hacer el proceso de IQR con el dataset original sin estas columnas para eliminar menos valores.

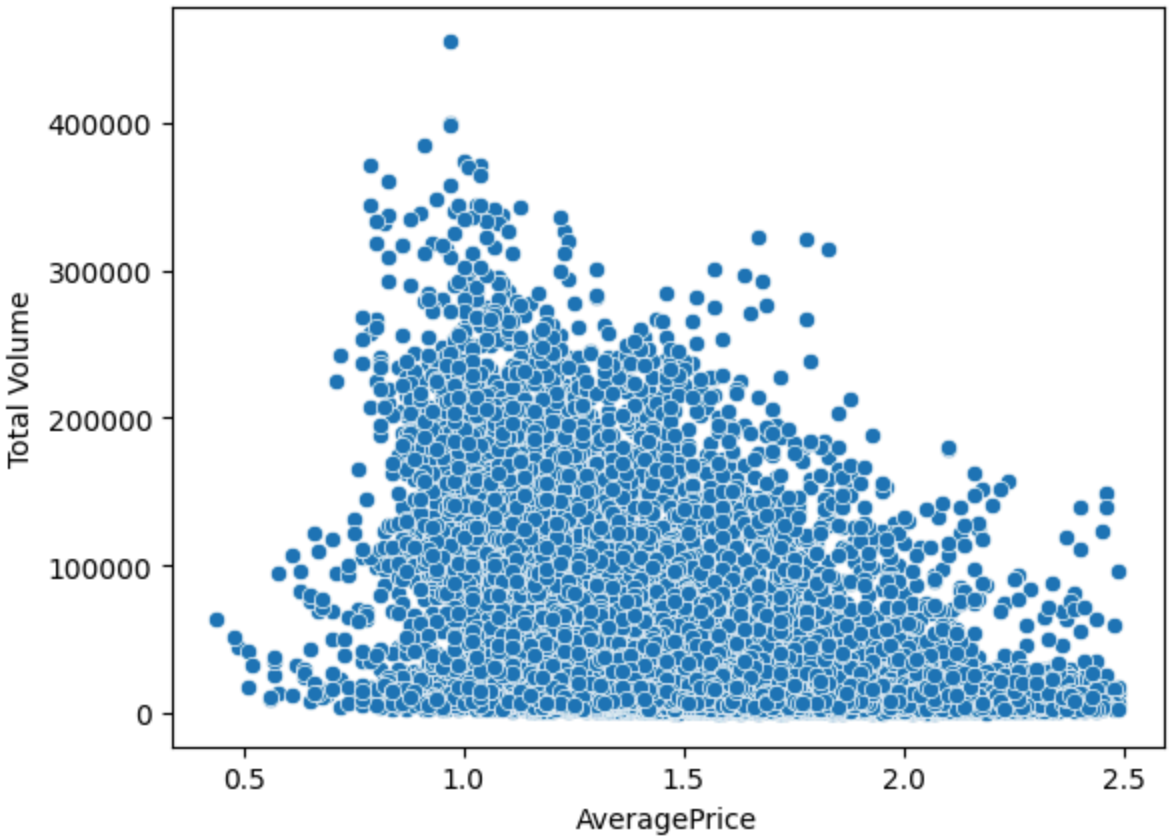
In [146…
```
df_aux.columns
```

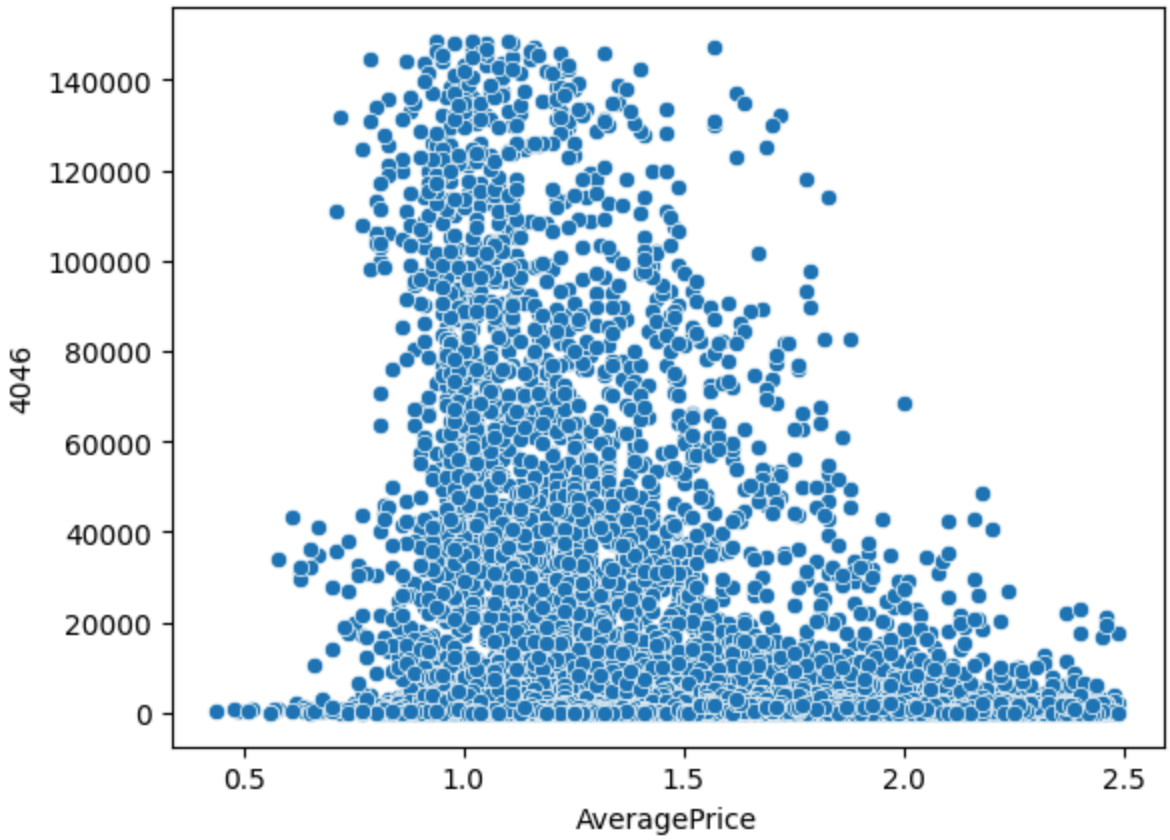
Out[146…
```
Index(['Date', 'AveragePrice', 'Total Volume', '4046', '4225', '4770',
       'Total Bags', 'Small Bags', 'Large Bags', 'XLarge Bags', 'type',
       'region'],
      dtype='object')
```

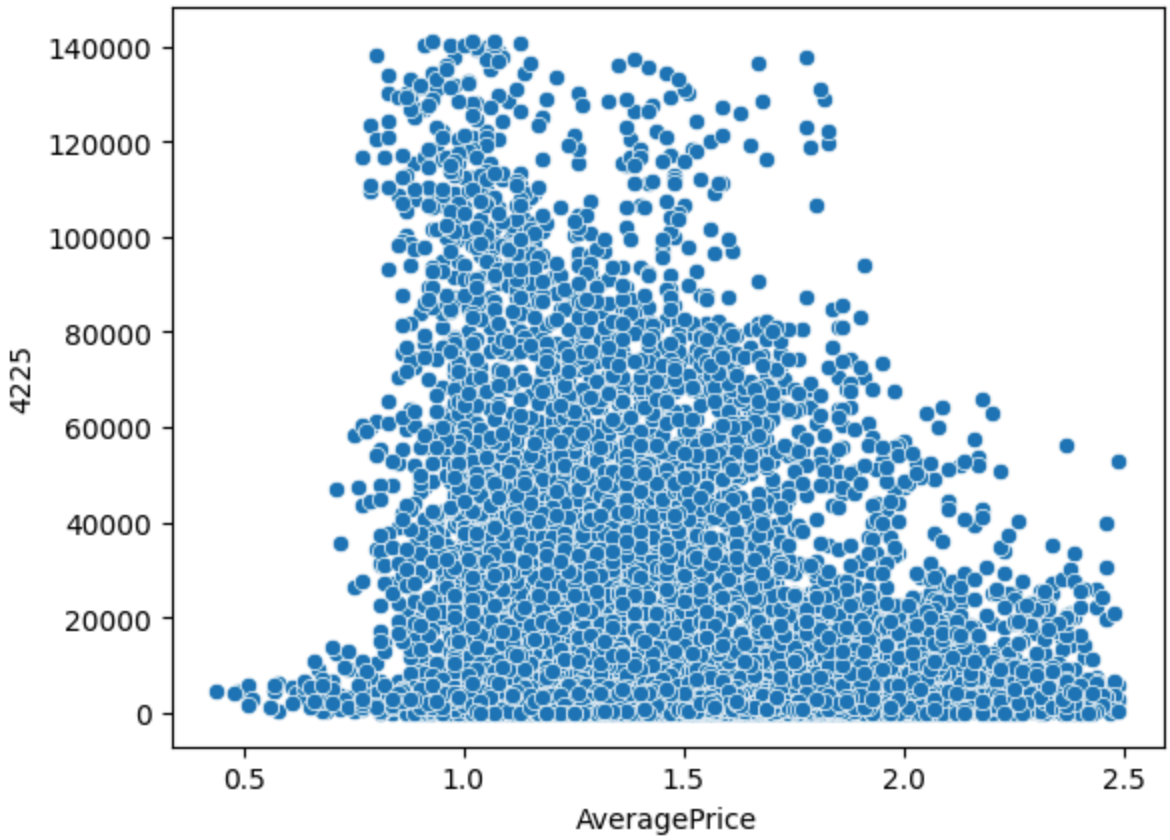
In [148…
```
df_aux = df.copy()

df_aux.drop(['XLarge Bags', '4770', 'Large Bags'], axis = 1, inplace=True)
numerical_columns = df_aux.select_dtypes(include=['number']).columns

for column in numerical_columns:
  Q1 = df_aux[column].quantile(0.25)
  Q3 = df_aux[column].quantile(0.75)
  IQR = Q3 - Q1

  fences = [Q1 - IQR*1.5, Q3 + IQR*1.5]

  df_aux = df_aux[(df_aux[column] >= fences[0]) & (df_aux[column] <= fences[
```

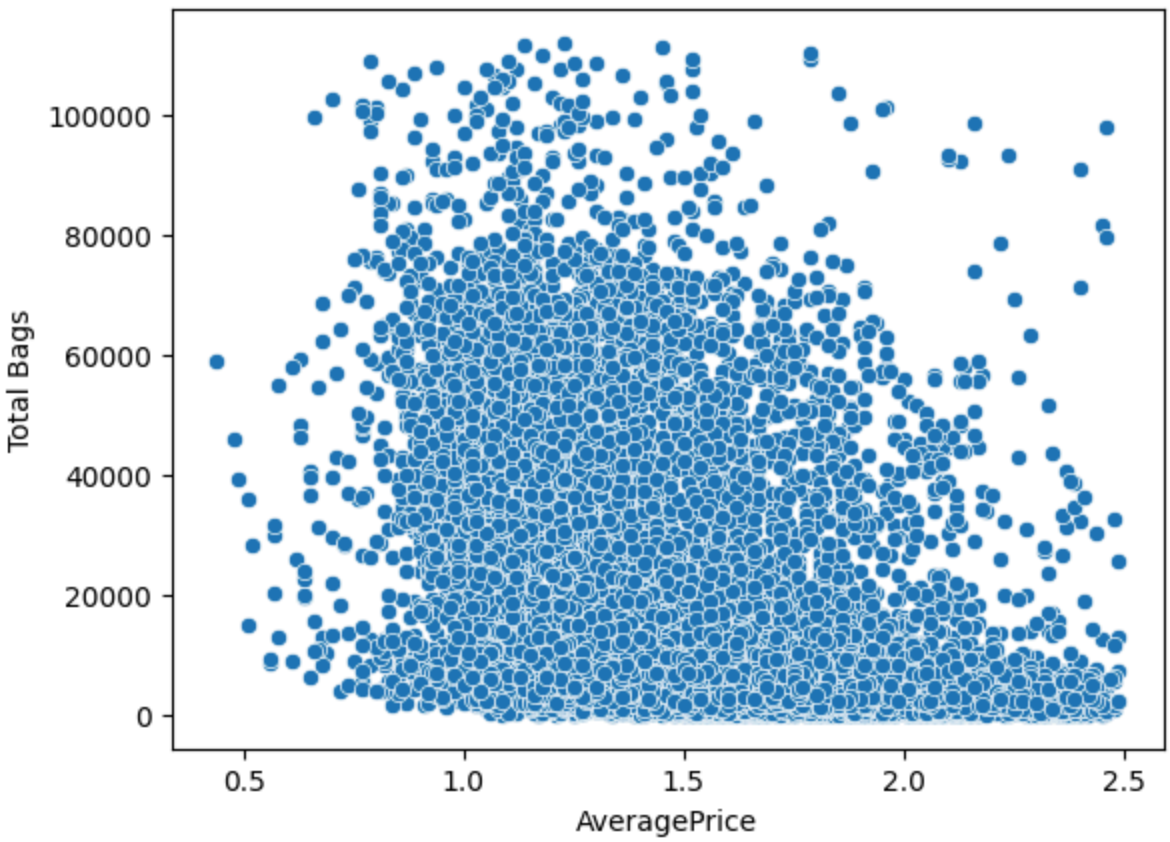
In [153…
```
numerical_columns = df_aux.select_dtypes(include=['number']).columns

for column in numerical_columns:
  sns.scatterplot(x='AveragePrice', y =column, data=df_aux)
  plt.show()
```

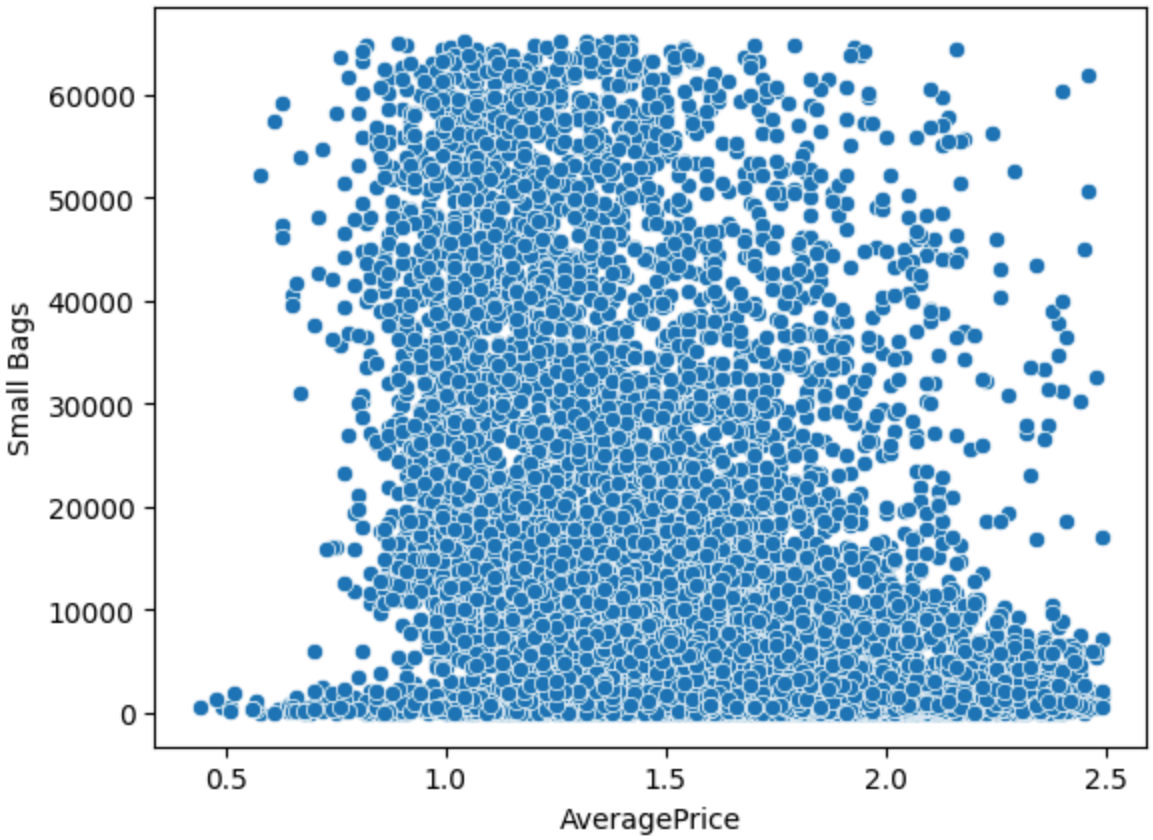



Total Volume
400000
300000
200000
100000
0
0.5
1.0
1.5
2.0
2.5
AveragePrice


4046
140000
120000
100000
80000
60000
40000
20000
0
0.5
1.0
1.5
2.0
2.5
AveragePrice

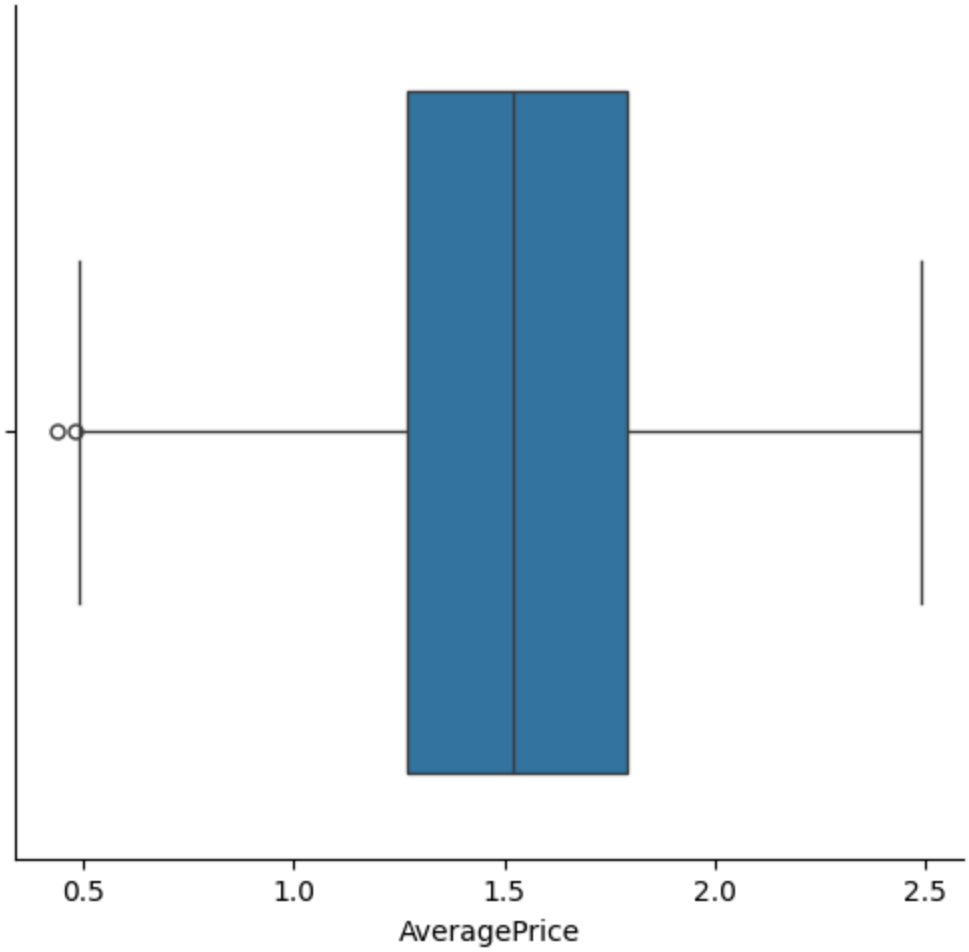

140000
120000
100000
80000
60000
40000
20000
0
4225
0.5
1.0
1.5
2.0
2.5
AveragePrice

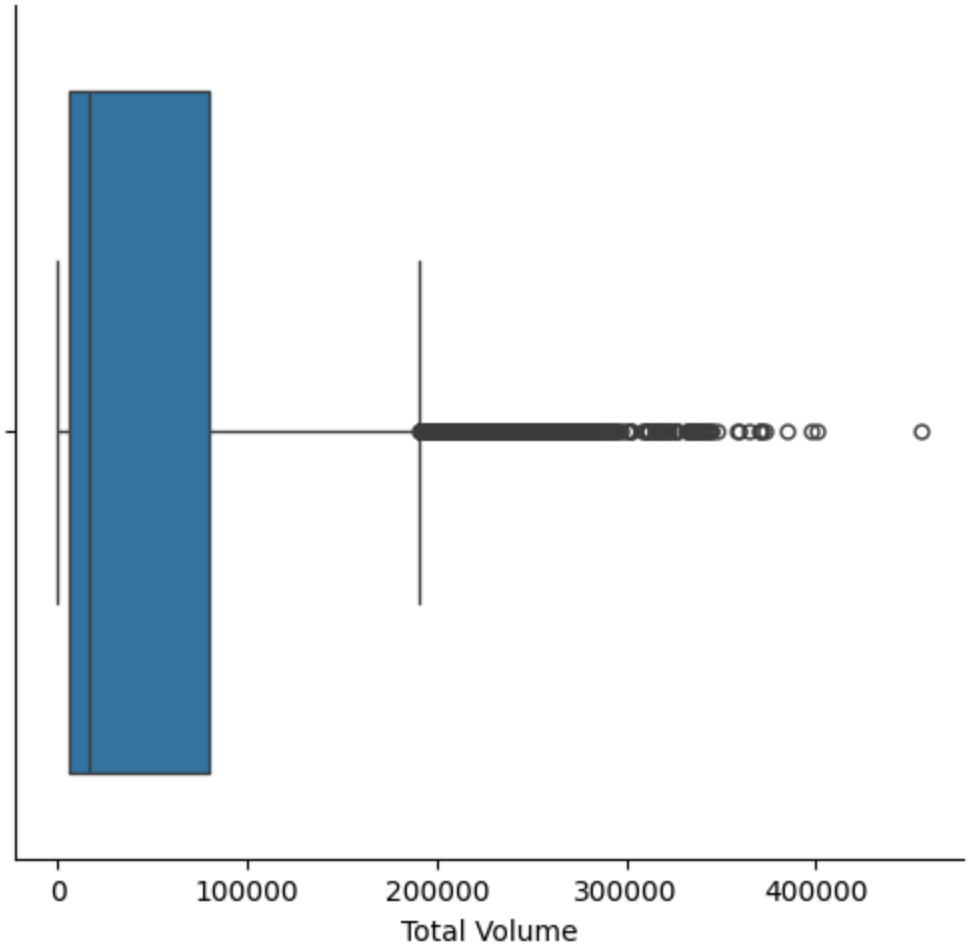

100000
80000
60000
40000
20000
0
Total Bags
0.5
1.0
1.5
2.0
2.5
AveragePrice

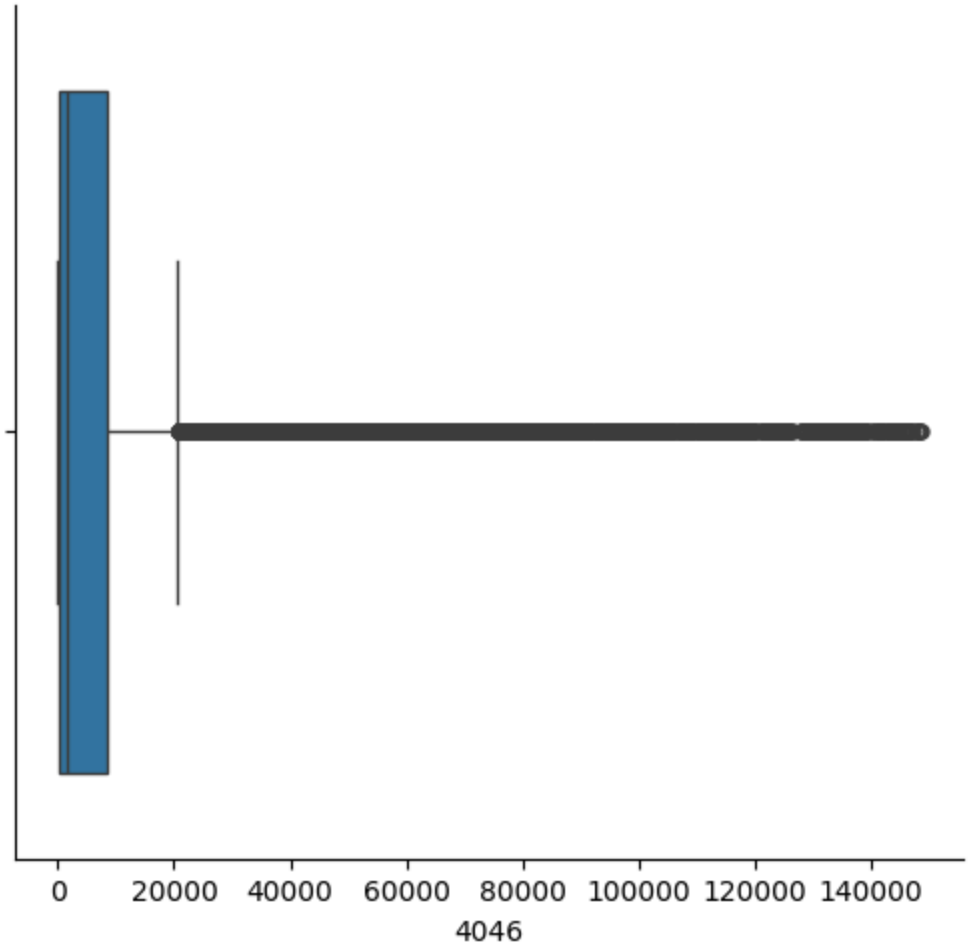


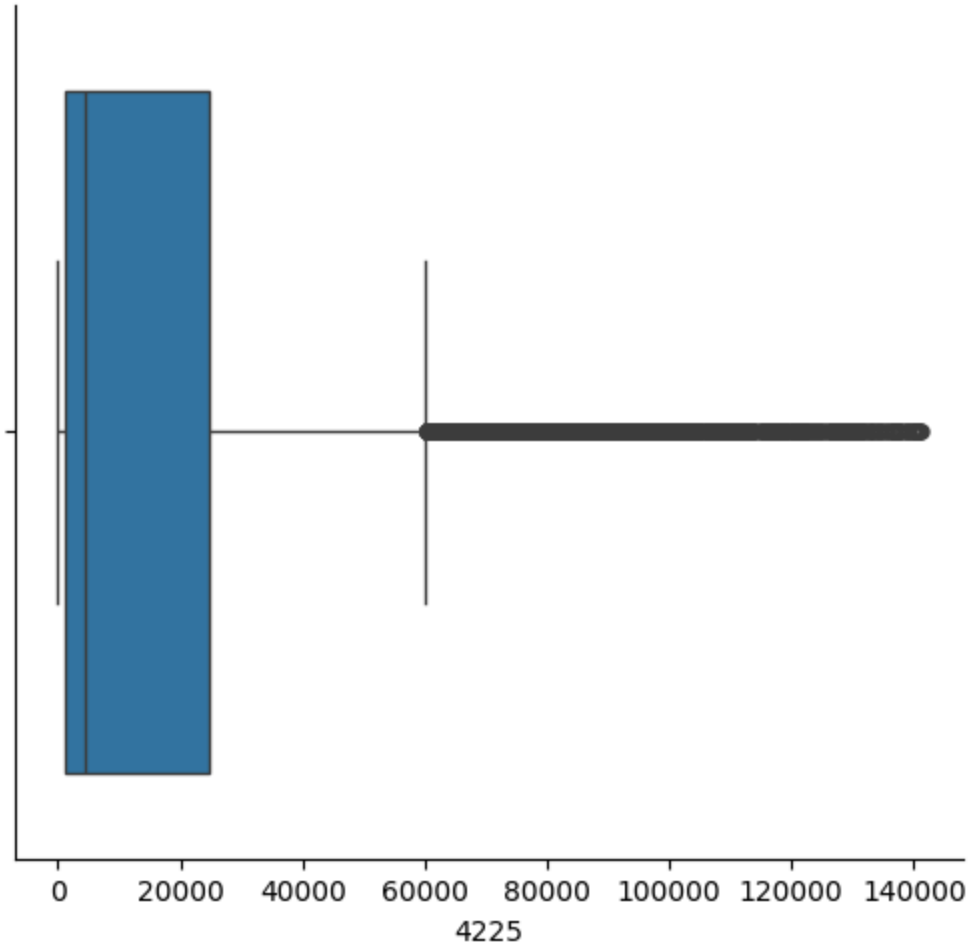
In [154…

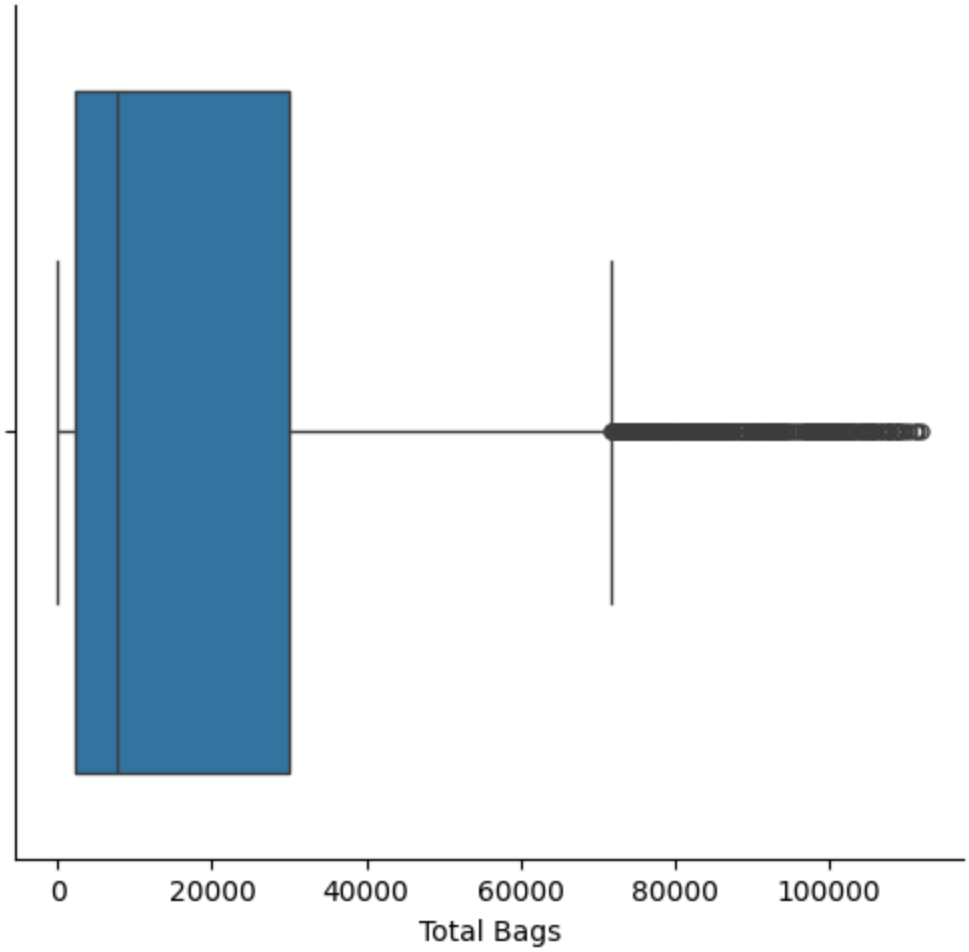
```
numerical_columns = df_aux.select_dtypes(include=['number']).columns

for column in numerical_columns:
  sns.catplot(x=column, kind="box", data=df_aux)
```

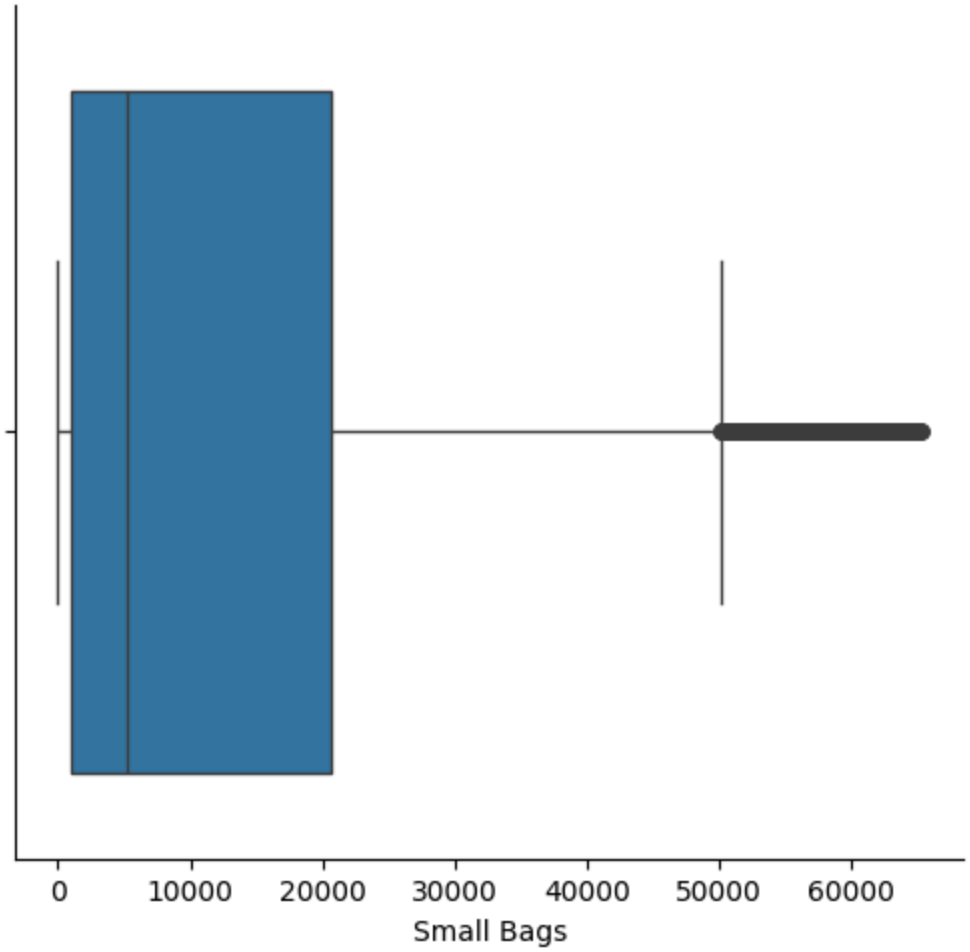

0.5
1.0
1.5
2.0
2.5
AveragePrice


0
100000
200000
300000
400000
Total Volume


0
20000
40000
60000
80000
100000
120000
140000
4046


0
20000
40000
60000
80000
100000
120000
140000
4225


0
20000
40000
60000
80000
100000
Total Bags



In [155…

```
display(df_aux['Total Volume'].describe())
display(df_aux['4046'].describe())
display(df_aux['4225'].describe())
display(df_aux['Total Bags'].describe())
display(df_aux['Small Bags'].describe())
```

	Total Volume
count	10950.000000
mean	51930.609233
std	67694.446342
min	84.560000
25%	5986.670000
50%	16174.650000
75%	80026.595000
max	455372.430000

dtype: float64

	4046
count	10950.000000
mean	13106.127513
std	27335.221020
min	0.000000
25%	257.647500
50%	1487.730000
75%	8435.472500
max	148633.900000

dtype: float64

	4225
count	10950.000000
mean	18230.428082
std	27379.219388
min	0.000000
25%	1077.670000
50%	4496.300000
75%	24730.580000
max	141141.800000

dtype: float64

	Total Bags
count	10950.000000
mean	18907.945361
std	22827.736716
min	0.000000
25%	2266.482500
50%	7777.965000
75%	30079.192500
max	111968.710000

dtype: float64

	Small Bags
count	10950.000000
mean	13440.854276
std	17021.144630
min	0.000000
25%	1060.155000
50%	5263.625000
75%	20676.117500
max	65222.610000

dtype: float64

En general, se obtuvieron mejores resultados al eliminar dichas columnas

In [156…
```
df = df_aux.copy()
```

Transformación de datos (Estandarización)

In [158…
```
df.describe()
```

Out[158…

	AveragePrice	Total Volume	4046	4225	Total B
count	10950.000000	10950.000000	10950.000000	10950.000000	10950.000
mean	1.533528	51930.609233	13106.127513	18230.428082	18907.945
std	0.360203	67694.446342	27335.221020	27379.219388	22827.736
min	0.440000	84.560000	0.000000	0.000000	0.000
25%	1.270000	5986.670000	257.647500	1077.670000	2266.482
50%	1.520000	16174.650000	1487.730000	4496.300000	7777.965
75%	1.790000	80026.595000	8435.472500	24730.580000	30079.192
max	2.490000	455372.430000	148633.900000	141141.800000	111968.710

Debido a la gran diferencia entre los valores de volumen y precio promedio, se estandarizaran cada una de las columnas numéricas del dataset. Aun así, se crearan dos datasets en formato .csv: Uno sin estandarizar y otro estandarizado en caso de ser necesario el original.

In [162…
```
df_estandar = df.copy()
```

```
numerical_columns = df_estandar.select_dtypes(include=['number']).columns


for column in numerical_columns:

  min_value = df_estandar[column].min()
  max_value = df_estandar[column].max()
  df_estandar[column] = (df_estandar[column] - min_value) / (max_value - mir
```

In [164…

```
df_estandar.describe()
```

Out[164…

	AveragePrice	Total Volume	4046	4225	Total Bags
count	10950.000000	10950.000000	10950.000000	10950.000000	10950.000000
mean	0.533428	0.113875	0.088177	0.129164	0.168868
std	0.175709	0.148685	0.183910	0.193984	0.203876
min	0.000000	0.000000	0.000000	0.000000	0.000000
25%	0.404878	0.012963	0.001733	0.007635	0.020242
50%	0.526829	0.035340	0.010009	0.031857	0.069466
75%	0.658537	0.175586	0.056753	0.175218	0.268639
max	1.000000	1.000000	1.000000	1.000000	1.000000

Guardado de ambos datasets

In [165…

```
df_aux.to_csv('avocado_clean.csv', index=False)
df_estandar.to_csv('avocado_standarized.csv', index=False)
```