Basic Exploratory Data Analysis on Lagos House Prices

- The dataset contains 5336 records of rental properties around 7 location in Lagos.The dataset was sourced from a Nigeria real estate company.

In [1]:

```
# import the necessary libraries
import numpy as np
import pandas as pd

# for visuals
import seaborn as sns
import matplotlib.pyplot as plt
```

In [2]:

```
# load and read the dataset file
'''inside the quotation mark, paste your file path of the dataset'''
lagos_data = pd.read_csv(r'C:\Users\user\OneDrive\Documents\ML Notebooks\Python_for_Da
lagos_data
```

Out[2]:

	location	bed	bath	toilet	price	Property_Type	Parking_Space	Security	Electricity	Furn
0	yaba	1	1	2	700000.0	Mini flat	0	0	0	
1	yaba	1	1	2	700000.0	Mini flat	0	0	0	
2	yaba	1	1	2	650000.0	Mini flat	0	0	0	
3	yaba	1	1	1	450000.0	Mini flat	0	0	0	
4	yaba	3	3	4	800000.0	Detached duplex	0	1	0	
...	...	...	...	...	...	...	...	...	...	
5331	ajah	1	1	2	600000.0	Mini flat	1	0	0	
5332	ajah	2	2	2	700000.0	Mini flat	1	0	0	
5333	ajah	4	4	5	1700000.0	Semi detached duplex	1	0	0	
5334	ajah	1	1	2	500000.0	Mini flat	0	0	0	
5335	ajah	4	4	5	1800000.0	Semi detached duplex	1	1	0	

5336 rows × 15 columns

In [3]:

```
# check first 5 rows
lagos_data.head()
```

Out[3]:

	location	bed	bath	toilet	price	Property_Type	Parking_Space	Security	Electricity	Furnishec
0	yaba	1	1	2	700000.0	Mini flat	0	0	0	0
1	yaba	1	1	2	700000.0	Mini flat	0	0	0	0
2	yaba	1	1	2	650000.0	Mini flat	0	0	0	0
3	yaba	1	1	1	450000.0	Mini flat	0	0	0	0
4	yaba	3	3	4	800000.0	Detached duplex	0	1	0	0

In [4]:

```
# check last 5 rows
lagos_data.tail()
```

Out[4]:

	location	bed	bath	toilet	price	Property_Type	Parking_Space	Security	Electricity	Furn
5331	ajah	1	1	2	600000.0	Mini flat	1	0	0	
5332	ajah	2	2	2	700000.0	Mini flat	1	0	0	
5333	ajah	4	4	5	1700000.0	Semi detached duplex	1	0	0	
5334	ajah	1	1	2	500000.0	Mini flat	0	0	0	
5335	ajah	4	4	5	1800000.0	Semi detached duplex	1	1	0	

Data Inspection and Manipulation

In [5]:

```
# shape of the dataset
lagos_data.shape
```

Out[5]:

```
(5336, 15)
```

In [6]:

```
# check the columns
lagos_data.columns
```

Out[6]:

```
Index(['location', 'bed', 'bath', 'toilet', 'price', 'Property_Type',
       'Parking_Space', 'Security', 'Electricity', 'Furnished',
       'Security_Doors', 'CCTV', 'Pool', 'Gym', 'BQ'],
      dtype='object')
```

In [7]:

```
# check the data types
lagos_data.dtypes
```

Out[7]:

```
location            object
bed                  int64
bath                 int64
toilet               int64
price              float64
Property_Type       object
Parking_Space        int64
Security             int64
Electricity          int64
Furnished            int64
Security_Doors       int64
CCTV                 int64
Pool                 int64
Gym                  int64
BQ                   int64
dtype: object
```

In [8]:

```
# info of the data
lagos_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5336 entries, 0 to 5335
Data columns (total 15 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   location        5336 non-null   object 
 1   bed             5336 non-null   int64  
 2   bath            5336 non-null   int64  
 3   toilet          5336 non-null   int64  
 4   price           5336 non-null   float64
 5   Property_Type   5336 non-null   object 
 6   Parking_Space   5336 non-null   int64  
 7   Security        5336 non-null   int64  
 8   Electricity     5336 non-null   int64  
 9   Furnished       5336 non-null   int64  
 10  Security_Doors  5336 non-null   int64  
 11  CCTV            5336 non-null   int64  
 12  Pool            5336 non-null   int64  
 13  Gym             5336 non-null   int64  
 14  BQ              5336 non-null   int64  
dtypes: float64(1), int64(12), object(2)
memory usage: 625.4+ KB
```

In [9]:

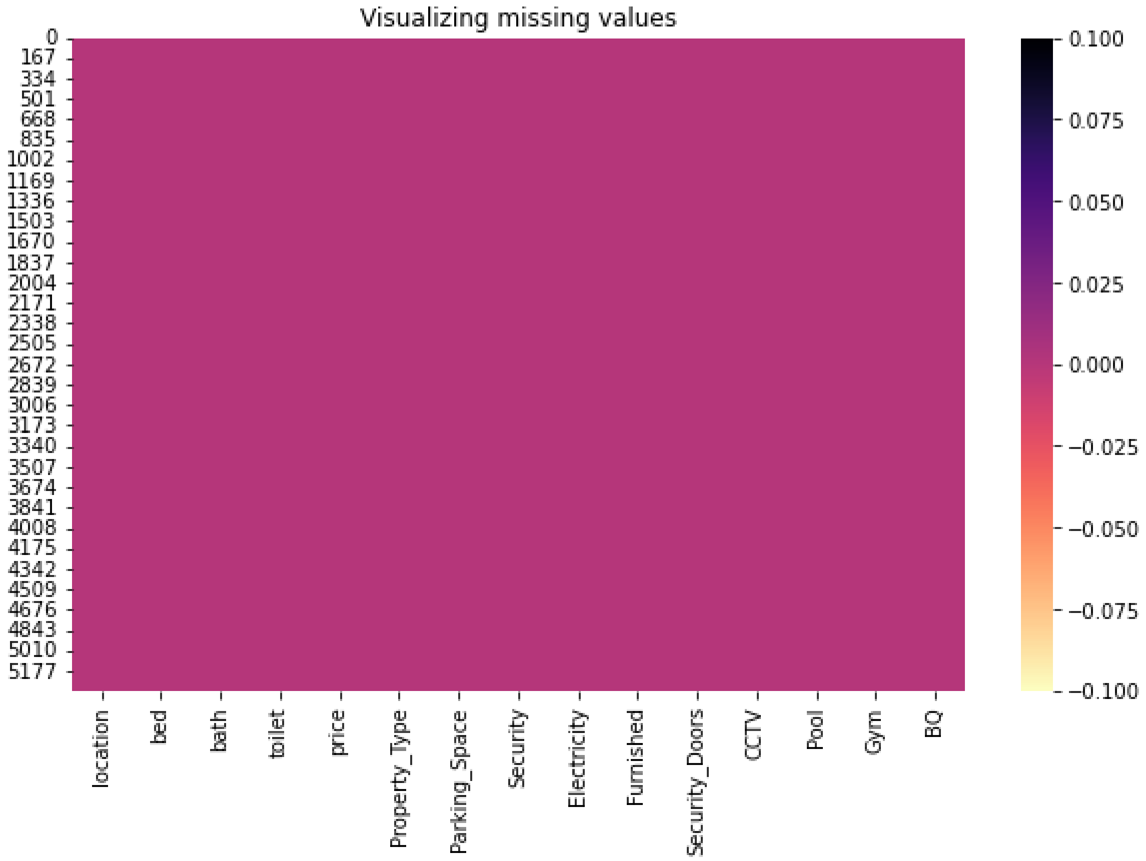
```
# checking for missing values
lagos_data.isnull().sum() # isna().sum()
```

Out[9]:

```
location          0
bed               0
bath              0
toilet            0
price             0
Property_Type     0
Parking_Space     0
Security          0
Electricity       0
Furnished         0
Security_Doors    0
CCTV              0
Pool              0
Gym               0
BQ                0
dtype: int64
```

In [10]:

```python
# visualize the missing values
plt.figure(figsize = (10, 6))
plt.title('Visualizing missing values')
sns.heatmap(lagos_data.isnull(), cbar = True, cmap = 'magma_r')
plt.show()
```



In [11]:

```python
# statistical descriptive analysis of the numerical features
lagos_data.describe().astype('int')
```

Out[11]:

	bed	bath	toilet	price	Parking_Space	Security	Electricity	Furnished	Security_Doors	CC
count	5336	5336	5336	5336	5336	5336	5336	5336	5336	53
mean	1	1	1	645566	0	0	0	0	0	
std	0	0	0	469305	0	0	0	0	0	
min	1	1	1	150	0	0	0	0	0	
25%	1	1	1	350000	0	0	0	0	0	
50%	1	1	1	500000	0	0	0	0	0	
75%	1	2	2	800000	0	0	0	0	0	
max	5	5	5	2450000	1	1	1	1	1	

Exploratory Data Analysis: Relationship, Insights and Visualization

- Univariate Analysis
- Bivariate Analysis
- Multivariate Analysis

Univariate Analysis

- considering one feature of the dataset

In [12]:
```
lagos_data.columns
```

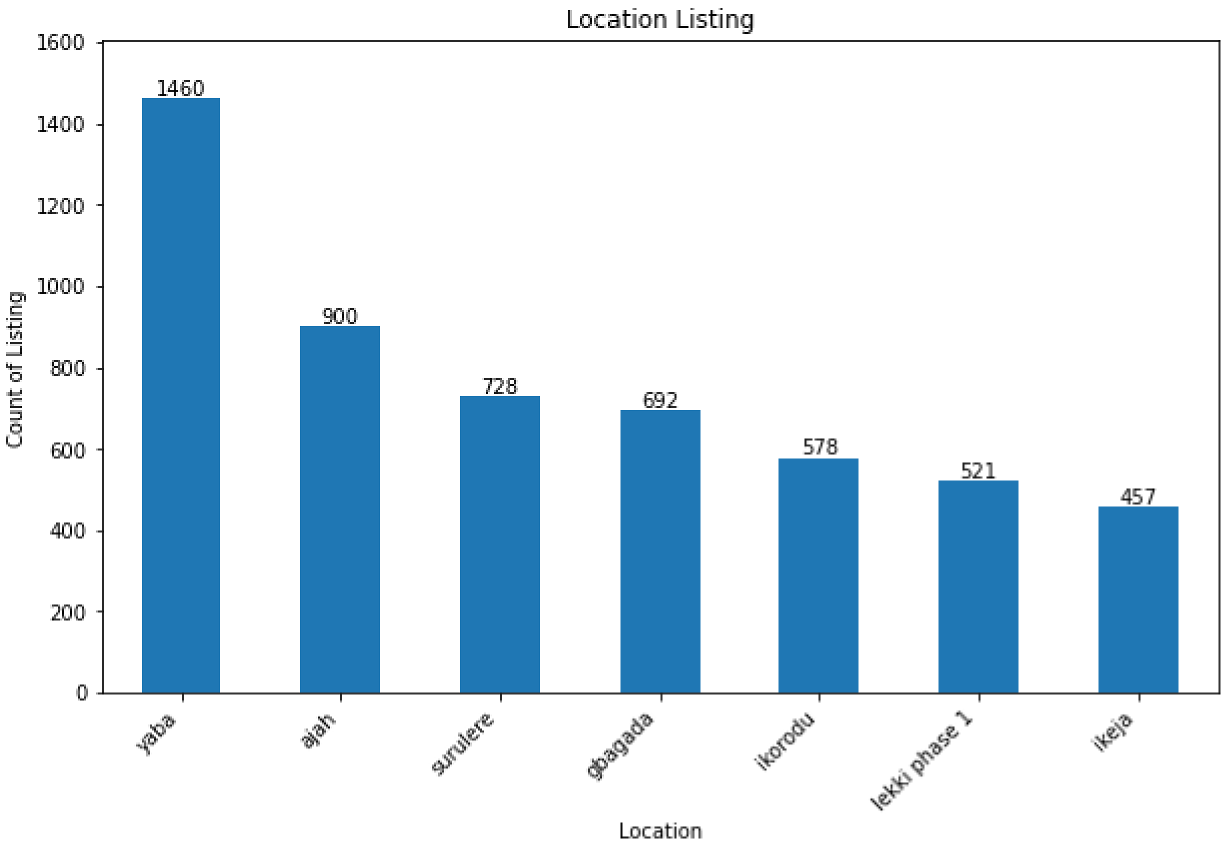
Out[12]:
```
Index(['location', 'bed', 'bath', 'toilet', 'price', 'Property_Type',
       'Parking_Space', 'Security', 'Electricity', 'Furnished',
       'Security_Doors', 'CCTV', 'Pool', 'Gym', 'BQ'],
      dtype='object')
```

In [13]:
```
# How many listing are there per location?
count_listing = lagos_data['location'].value_counts().sort_values(ascending = False)
count_listing
```

Out[13]:
```
location
yaba              1460
ajah               900
surulere           728
gbagada            692
ikorodu            578
lekki phase 1      521
ikeja              457
Name: count, dtype: int64
```

In [14]:
```
# visualize using bar chart
ax = count_listing.plot(kind='bar', figsize=(10, 6), title='Location Listing',
                        xlabel='Location', ylabel='Count of Listing', legend=False)

# annotate
ax.bar_label(ax.containers[0], label_type='edge')
```

```
# pad the spacing between the number and edge of the figure
ax.margins(y=0.1)

# rotate the x-labels
ax.set_xticklabels(ax.get_xticklabels(), rotation=45, ha='right')

# show the visual
plt.show()
```



Observation

Yaba has the highest count of listing with a total value of 1460 while Ikeja has the lowest count of listing with total value of 457

Bivariate Analysis

- Considering two features, their relationship and its visualization

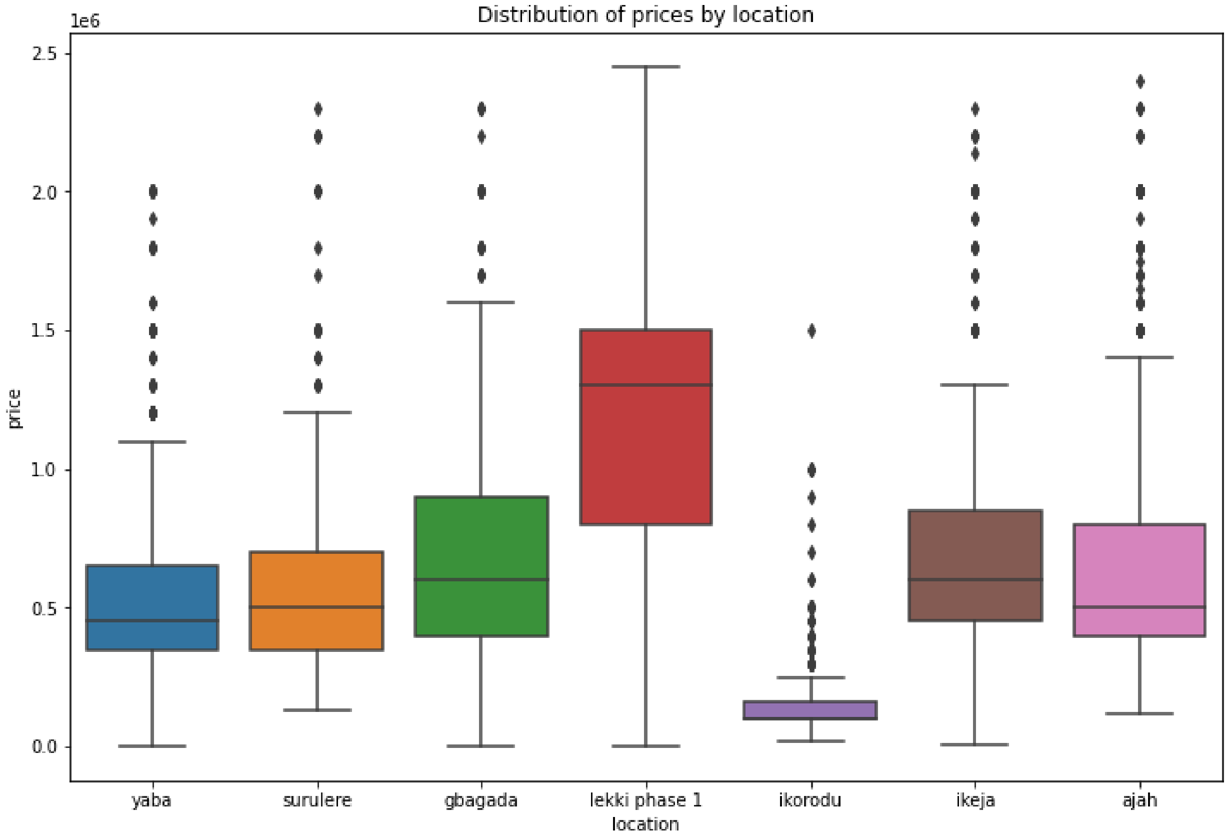
In [15]:
```
# summary statistics per location and price
lagos_data.groupby(['location'])['price'].describe().astype('int')
```

Out[15]:

location	count	mean	std	min	25%	50%	75%	max
ajah	900	693335	475287	120000	400000	500000	800000	2400000
gbagada	692	742290	451011	150	400000	600000	900000	2300000
ikeja	457	772700	506704	4000	450000	600000	850000	2300000
ikorodu	578	155095	138067	16000	100000	100000	160000	1500000
lekki phase 1	521	1211013	489304	3000	800000	1300000	1500000	2450000
surulere	728	589189	335065	130000	350000	500000	700000	2300000
yaba	1460	550986	331439	250	350000	450000	650000	2000000

In [16]:

```
#view distribution of prices by location
plt.figure(figsize = (12, 8))
sns.boxplot(x = 'location', y = 'price', data = lagos_data)
plt.title('Distribution of prices by location')
plt.show()
```

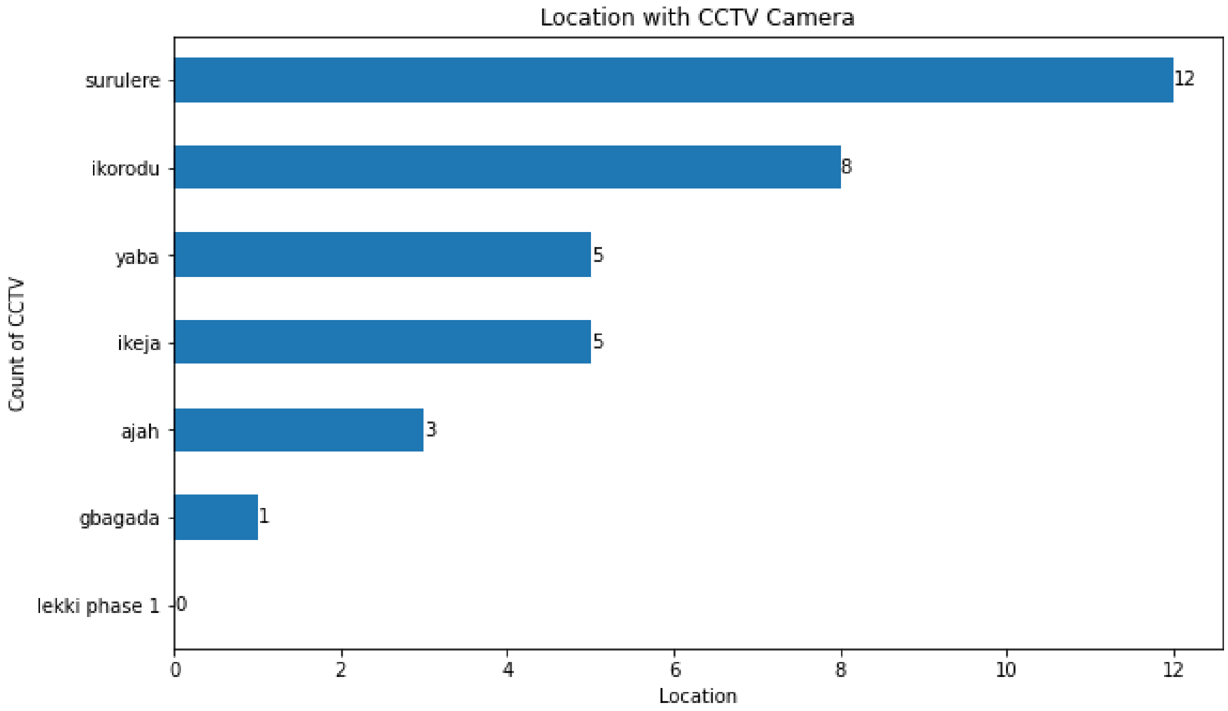


In [17]:

```
# which location is with more security facilities like CCTV Camera?
cctv_loc = lagos_data.groupby(['location'])['CCTV'].sum().sort_values(ascending = True
cctv_loc
```

Out[17]:
```
location
lekki phase 1     0
gbagada           1
ajah              3
ikeja             5
yaba              5
ikorodu           8
surulere         12
Name: CCTV, dtype: int64
```

In [18]:
```
# visualize using bar chart
ax = cctv_loc.plot(kind='barh', figsize=(10, 6), title='Location with CCTV Camera',
                        ylabel='Count of CCTV', xlabel='Location', legend=False)

# annotate
ax.bar_label(ax.containers[0], label_type='edge')

# pad the spacing between the number and edge of the figure
ax.margins(y=0.1)


# show the visual
plt.show()
```



In [19]:
```
lagos_data.columns
```

Out[19]:
```
Index(['location', 'bed', 'bath', 'toilet', 'price', 'Property_Type',
       'Parking_Space', 'Security', 'Electricity', 'Furnished',
       'Security_Doors', 'CCTV', 'Pool', 'Gym', 'BQ'],
      dtype='object')
```

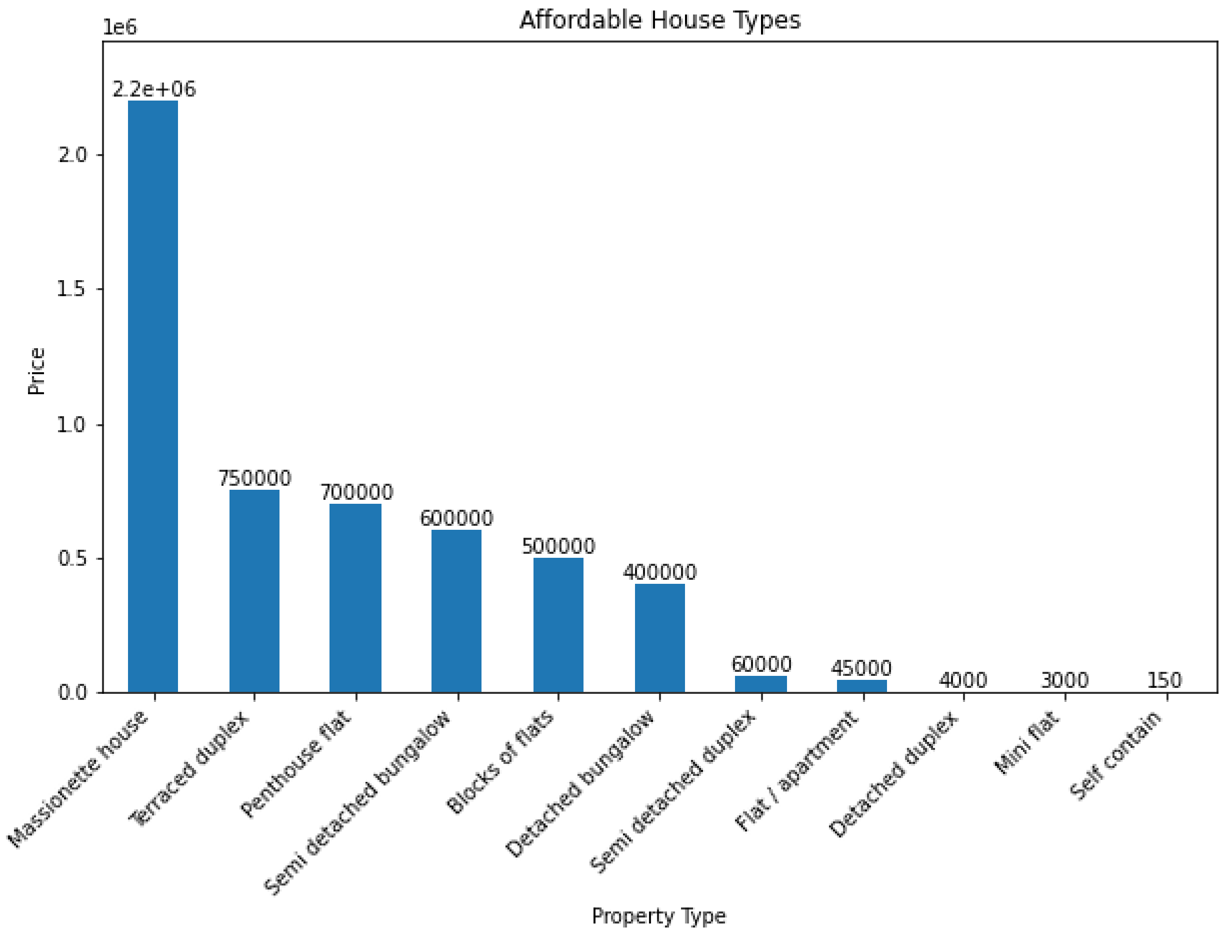
In [21]:
```
# What houses type are the cheapest for the highest number of rooms for families that
min_loc = lagos_data.groupby('Property_Type')['price'].min().sort_values(ascending = F
min_loc
```

Out[21]:

```
Property_Type
Massionette house          2200000.0
Terraced duplex             750000.0
Penthouse flat              700000.0
Semi detached bungalow      600000.0
Blocks of flats             500000.0
Detached bungalow           400000.0
Semi detached duplex         60000.0
Flat / apartment             45000.0
Detached duplex               4000.0
Mini flat                     3000.0
Self contain                   150.0
Name: price, dtype: float64
```

In [23]:

```python
# visualize using bar chart
ax = min_loc.plot(kind='bar', figsize=(10, 6), title='Affordable House Types',
                        xlabel='Property Type', ylabel='Price', legend=False)

# set x-axis tick labels and rotation
ax.set_xticklabels(min_loc.index, rotation = 45, ha = 'right')

# annotate
ax.bar_label(ax.containers[0], label_type='edge')

# pad the spacing between the number and edge of the figure
ax.margins(y=0.1)


# show the visual
plt.show()
```



Observation

Self contain is the cheapest house type with a price of 150 followed by Mini-flat with a price of 3000.

In [24]:

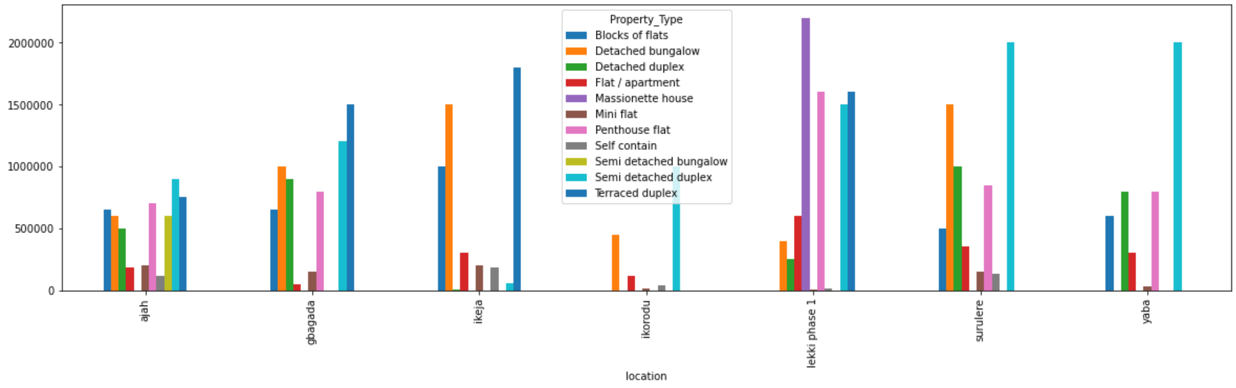
```
# To know the location for the cheapest self contain
self_loc = lagos_data.groupby(['location', 'Property_Type'])['price'].min().astype('ir
self_loc
```

Out[24]:

Property_Type	Blocks of flats	Detached bungalow	Detached duplex	Flat / apartment	Massionette house	Mini flat	Penthouse flat	S conta
location								
ajah	650000.0	600000.0	500000.0	180000.0	NaN	200000.0	700000.0	12000
gbagada	650000.0	1000000.0	900000.0	45000.0	NaN	150000.0	800000.0	15
ikeja	1000000.0	1500000.0	4000.0	300000.0	NaN	200000.0	NaN	18000
ikorodu	NaN	450000.0	NaN	120000.0	NaN	16000.0	NaN	3600
lekki phase 1	NaN	400000.0	250000.0	600000.0	2200000.0	3000.0	1600000.0	1000
surulere	500000.0	1500000.0	1000000.0	350000.0	NaN	150000.0	850000.0	13000
yaba	600000.0	NaN	800000.0	300000.0	NaN	35000.0	800000.0	25

In [25]:

```
# plot a pivot table
self_loc.plot.bar(figsize = (20, 5))
plt.ticklabel_format(style = 'plain', axis = 'y')
plt.show()
```



In [29]:

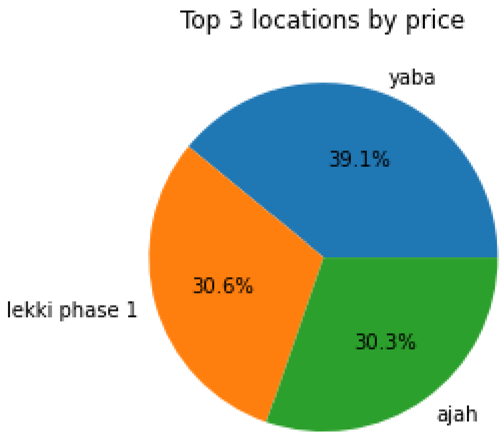
```
# Top 3 location by Price
top3_loc = lagos_data.groupby('location')['price'].sum().sort_values(ascending = False
top3_loc
```

Out[29]:

```
location
yaba             804440839.0
lekki phase 1    630938000.0
ajah             624002009.0
Name: price, dtype: float64
```

In [30]:

```
# Create a list of labels for the pie chart
labels = list(top3_loc.index)

# Create a list of values for the pie chart
values = list(top3_loc.values)

# Create the pie chart
plt.pie(values, labels=labels, autopct='%1.1f%%')

# Add a title to the pie chart
plt.title('Top 3 locations by price')

# Display the pie chart
plt.show()
```



In [32]:

```
# Bottom 3 location by Price
bot3_loc = lagos_data.groupby('location')['price'].sum().sort_values(ascending = False
bot3_loc
```

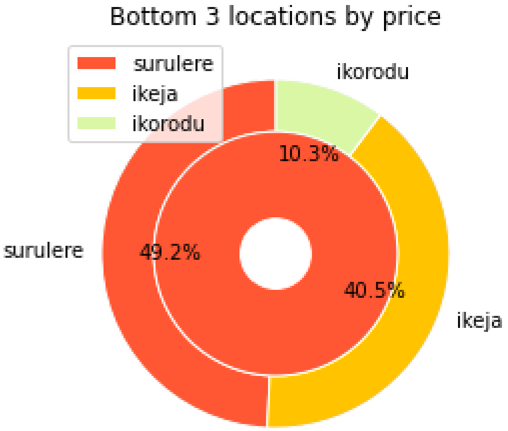
Out[32]:

```
location
surulere    428930009.0
ikeja       353124000.0
ikorodu      89645000.0
Name: price, dtype: float64
```

In [33]:

```
# Create a list of labels for the donut chart
labels = list(bot3_loc.index)

# Create a list of values for the donut chart
values = list(bot3_loc.values)

# Create the outer ring of the donut chart
outer_colors = ['#FF5733', '#FFC300', '#DAF7A6']

# Create the inner ring of the donut chart
inner_colors = ['#FF5733', '#FFC300', '#DAF7A6']

# Create the donut chart with two rings
fig, ax = plt.subplots()

# Set the width of the outer ring to 0.3
wedgeprops = {'width': 0.3, 'edgecolor': 'white'}
```

```
# Create the outer ring
outer = ax.pie(values, labels=labels, colors=outer_colors, wedgeprops=wedgeprops, star

# Set the width of the inner ring to 0.5
wedgeprops = {'width': 0.5, 'edgecolor': 'white'}

# Create the inner ring
inner = ax.pie([sum(values)], colors=inner_colors, radius=0.7, wedgeprops=wedgeprops,

# Add a title to the donut chart
ax.set_title('Bottom 3 locations by price')

# Add a legend to the donut chart
ax.legend(outer[0], labels, loc='upper left')

# Display the donut chart
plt.show()
```



In [35]:

```
# Locations with swimming pool facilities
pool_loc = lagos_data.groupby('location')['Pool'].sum().sort_values(ascending = False)
pool_loc
```

Out[35]:

```
location
lekki phase 1    15
gbagada           7
ikeja             5
surulere          3
ajah              1
yaba              1
ikorodu           0
Name: Pool, dtype: int64
```

In [36]:

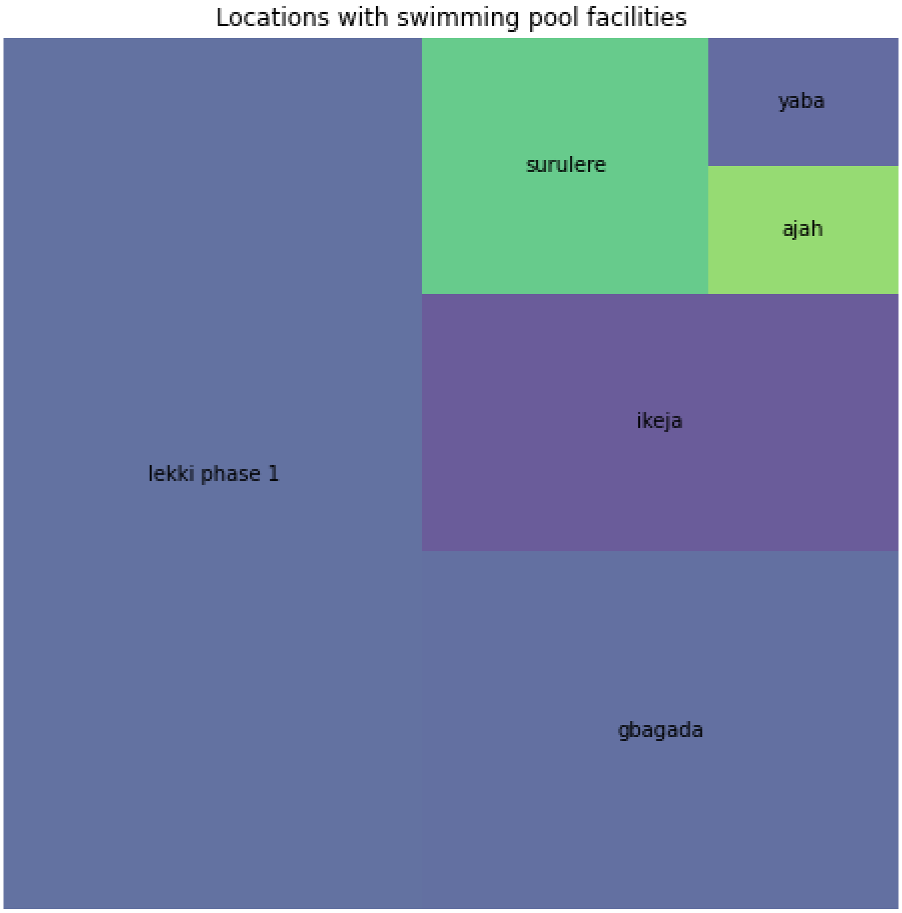
```
!pip install squarify
```

```
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: squarify in c:\users\user\appdata\roaming\python\pytho
n39\site-packages (0.4.3)
```

In [42]:

```
import squarify
# filter out zero values
pool_loc = pool_loc[pool_loc > 0]

# Define the treemap layout
fig, ax = plt.subplots(figsize=(8, 8))
```

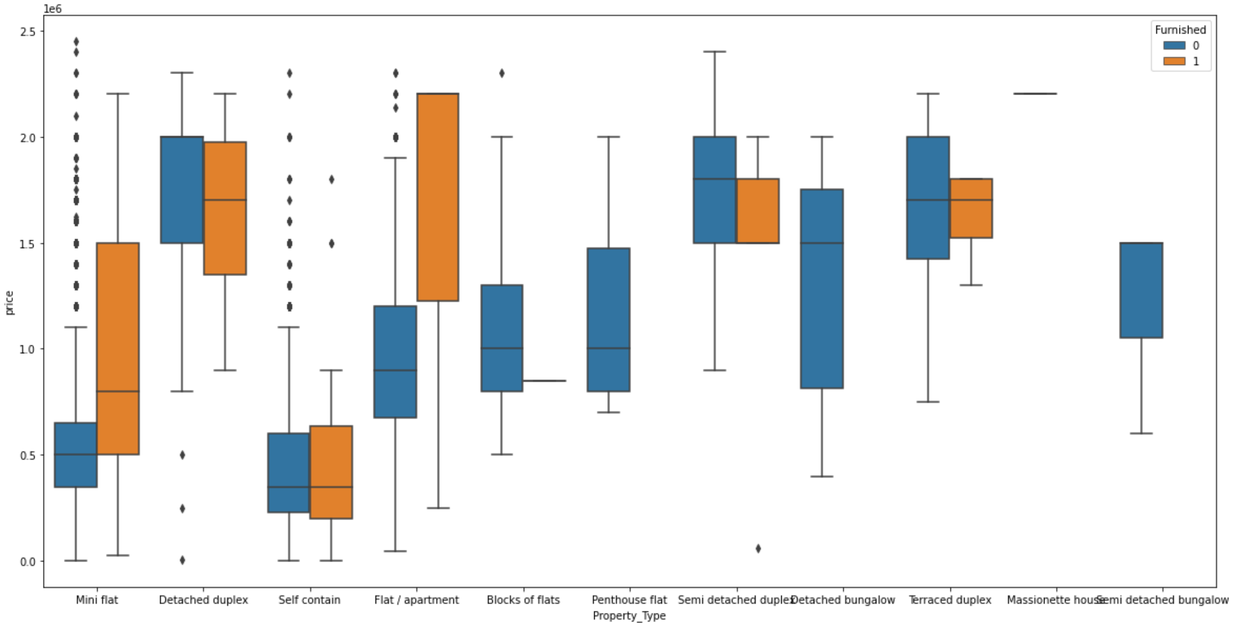
```
squarify.plot(sizes=pool_loc.values, label=pool_loc.index, alpha=0.8)

# Add a title to the treemap chart
ax.set_title('Locations with swimming pool facilities')

# Remove axis ticks and labels
plt.axis('off')

# Display the treemap chart
plt.show()
```



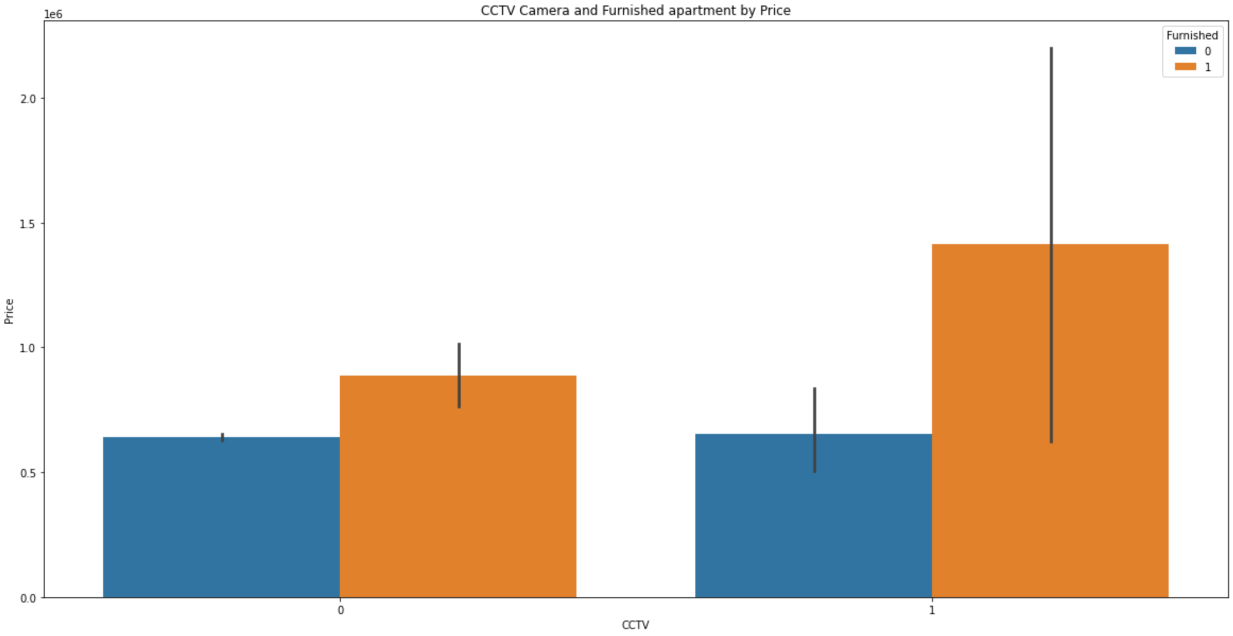
Multivariate Analysis

- it is considering two or more features, their relationship and its visualization

In [43]:
```
# visualize property type and furnished apartment by price
plt.figure(figsize = (20, 10))
sns.boxplot(x = 'Property_Type', y = 'price', data = lagos_data, hue = 'Furnished')
plt.show()
```



```
In [44]: # visualize CCTV Camera and Furnished apartment by Price
         plt.figure(figsize = (20, 10))
         sns.barplot(x = 'CCTV', y = 'price', data = lagos_data, hue = 'Furnished')

         # add labels and title
         plt.xlabel('CCTV')
         plt.ylabel('Price')
         plt.title('CCTV Camera and Furnished apartment by Price')

         # add legend
         plt.legend(title = 'Furnished', loc = 'upper right')

         # show the chart
         plt.show()
```


CCTV Camera and Furnished apartment by Price

```
In [46]: lagos_data.info()
```

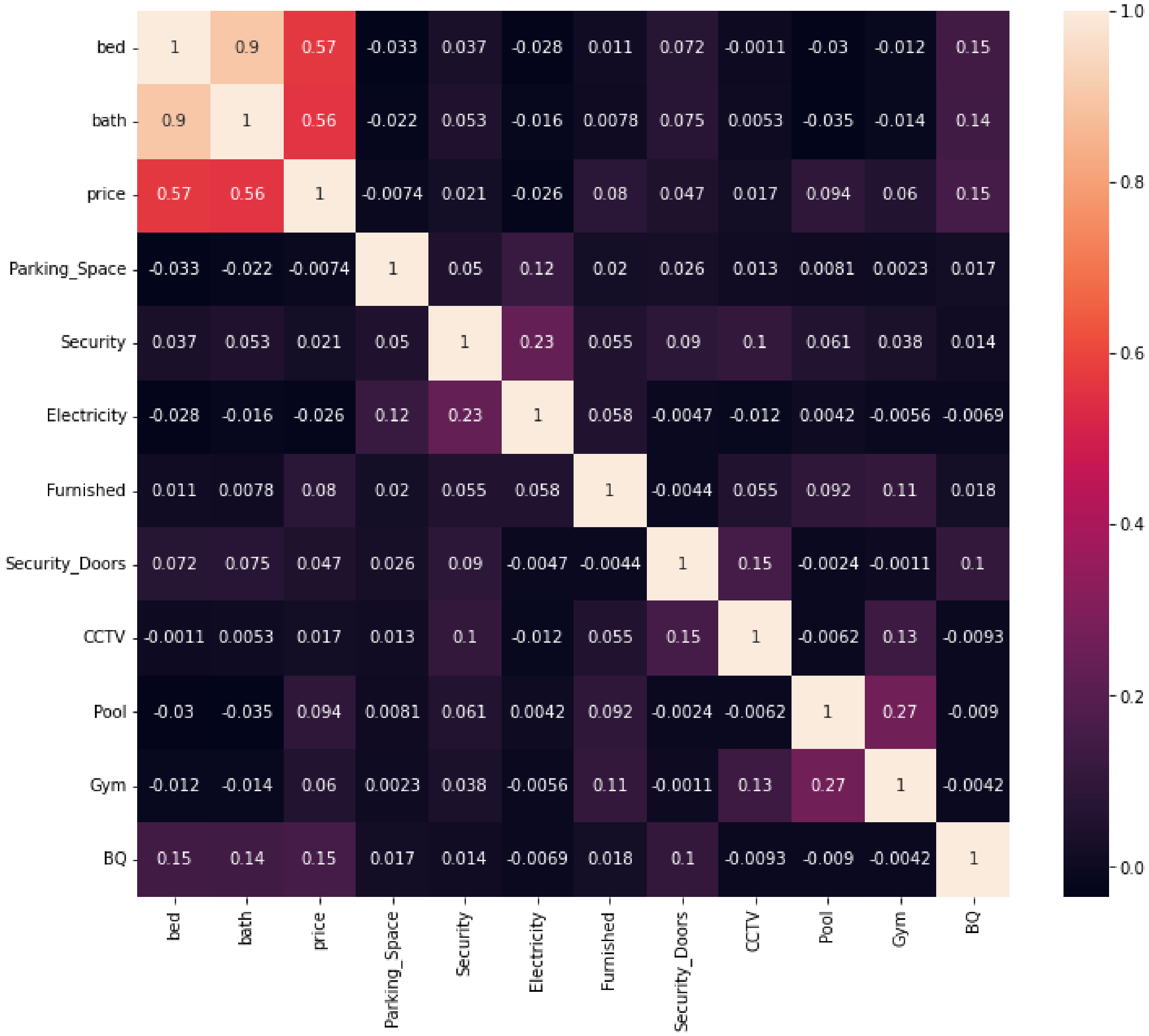
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5336 entries, 0 to 5335
Data columns (total 15 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   location        5336 non-null   object 
 1   bed             5336 non-null   int64  
 2   bath            5336 non-null   int64  
 3   toilet          5336 non-null   int64  
 4   price           5336 non-null   float64
 5   Property_Type   5336 non-null   object 
 6   Parking_Space   5336 non-null   int64  
 7   Security        5336 non-null   int64  
 8   Electricity     5336 non-null   int64  
 9   Furnished       5336 non-null   int64  
 10  Security_Doors  5336 non-null   int64  
 11  CCTV            5336 non-null   int64  
 12  Pool            5336 non-null   int64  
 13  Gym             5336 non-null   int64  
 14  BQ              5336 non-null   int64  
dtypes: float64(1), int64(12), object(2)
memory usage: 625.4+ KB
```

In [47]:

```python
# select numerical columns
num_cols = ['bed', 'bath', 'price', 'Parking_Space', 'Security', 'Electricity', 'Furni
           'Security_Doors', 'CCTV', 'Pool', 'Gym', 'BQ']

# calculate the correlation matrix
corr_matrix = lagos_data[num_cols].corr()

# visualize the correlation matrix
plt.figure(figsize = (12, 10))
sns.heatmap(corr_matrix, annot = True)
```

Out[47]:

```
<AxesSubplot:>
```

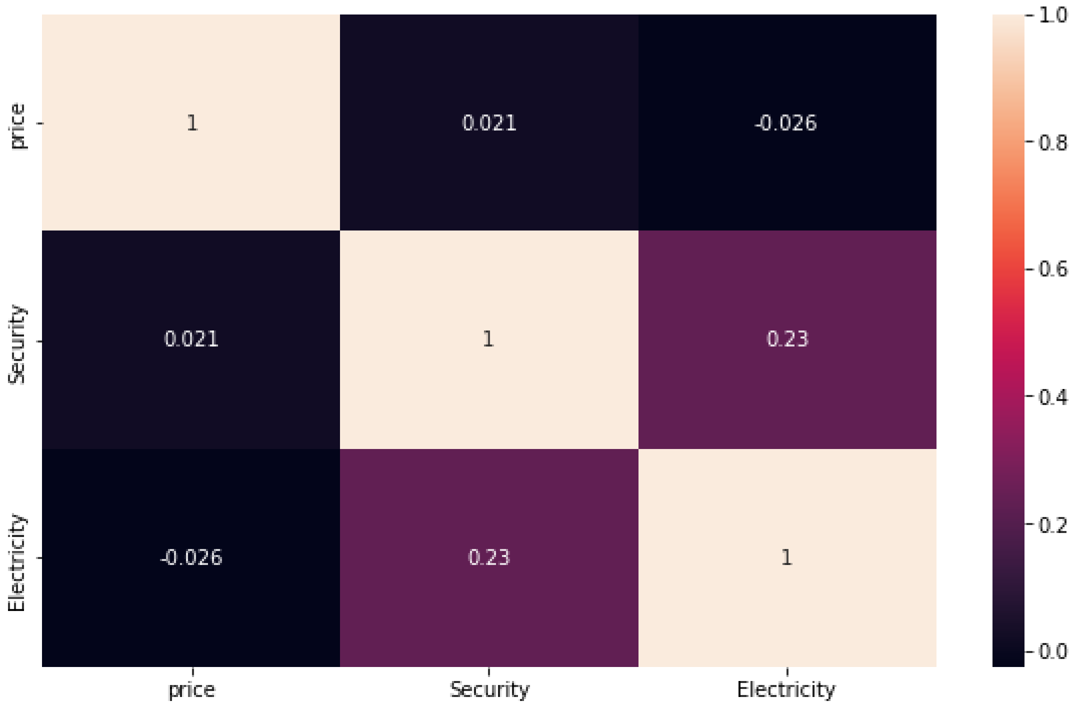


In [48]:

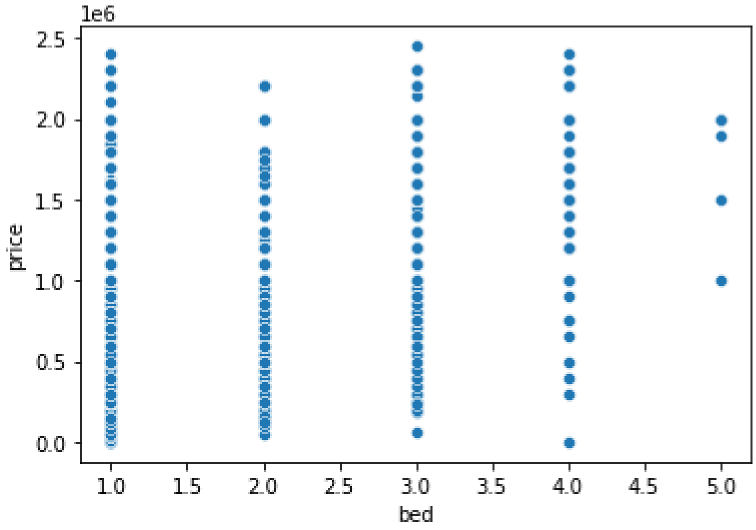
```
num_col1 = ['price','Security', 'Electricity']

# calculate the correlation matrix
corr_matrix = lagos_data[num_col1].corr()

# visualize the correlation matrix
plt.figure(figsize = (10, 6))
sns.heatmap(corr_matrix, annot = True)
```

Out[48]:

```
<AxesSubplot:>
```



In [53]:
```
# scatter plot
sns.scatterplot(x = 'bed', y = 'price', data = lagos_data)
plt.show()
```

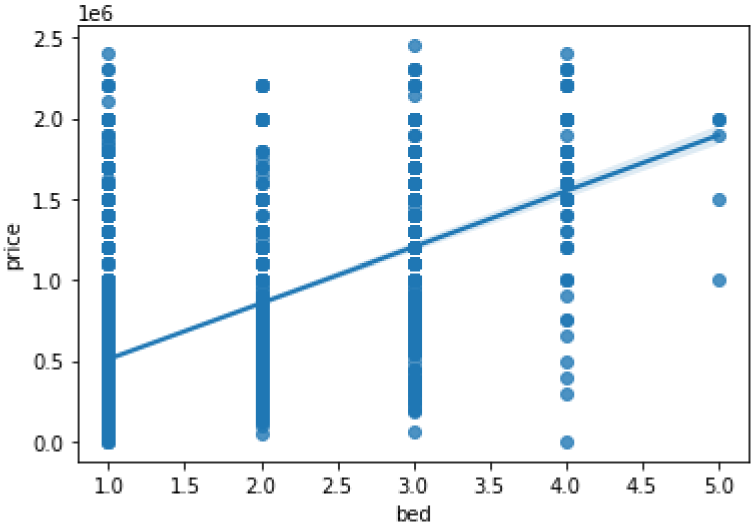


In [52]:
```
lagos_data['bed']
```

Out[52]:
```
0       1
1       1
2       1
3       1
4       3
       ..
5331    1
5332    2
5333    4
5334    1
5335    4
Name: bed, Length: 5336, dtype: int64
```

In [54]:

```
# regplot
sns.regplot(x = 'bed', y = 'price', data = lagos_data)
plt.show()
```



In [ ]: