In [1]:

```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import math
import re
```

In [8]:

```python
df = pd.read_csv(".\dataset\Bengaluru_House_Data.csv")
df.head()
```

Out[8]:

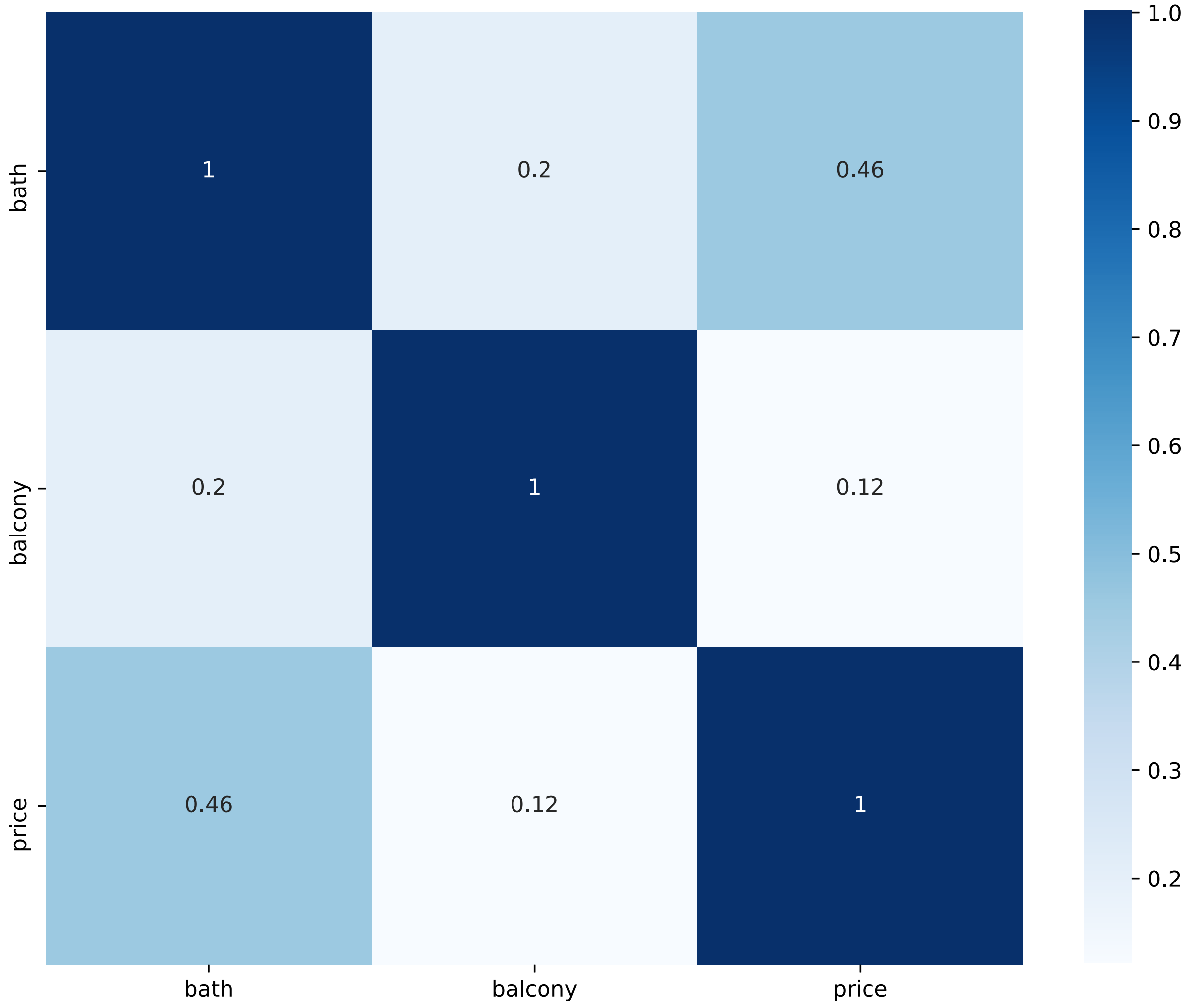
	area_type	availability	location	size	society	total_sqft	bath	balcony	price
0	Super built-up Area	19-Dec	Electronic City Phase II	2 BHK	Coomee	1056	2.0	1.0	39.07
1	Plot Area	Ready To Move	Chikka Tirupathi	4 Bedroom	Theanmp	2600	5.0	3.0	120.00
2	Built-up Area	Ready To Move	Uttarahalli	3 BHK	NaN	1440	2.0	3.0	62.00
3	Super built-up Area	Ready To Move	Lingadheeranahalli	3 BHK	Soiewre	1521	3.0	1.0	95.00
4	Super built-up Area	Ready To Move	Kothanur	2 BHK	NaN	1200	2.0	1.0	51.00

In [9]:

```python
#finding correlation values within the dataset
#we remove features which are highly related to each other as they do not provide
#any significance value to our Model
corr = df.corr()
plt.figure(figsize = (10,8))
sns.heatmap(corr ,annot=True,cmap='Blues')
```

Out[9]:

```
<AxesSubplot:>
```



In [10]:

```
data = df.drop(columns=['area_type', 'availability','society','bath','balcony'])
data.head()
```

Out[10]:

	location	size	total_sqft	price
0	Electronic City Phase II	2 BHK	1056	39.07
1	Chikka Tirupathi	4 Bedroom	2600	120.00
2	Uttarahalli	3 BHK	1440	62.00
3	Lingadheeranahalli	3 BHK	1521	95.00
4	Kothanur	2 BHK	1200	51.00

In [11]:

```
data.shape
```

Out[11]:

```
(13320, 4)
```

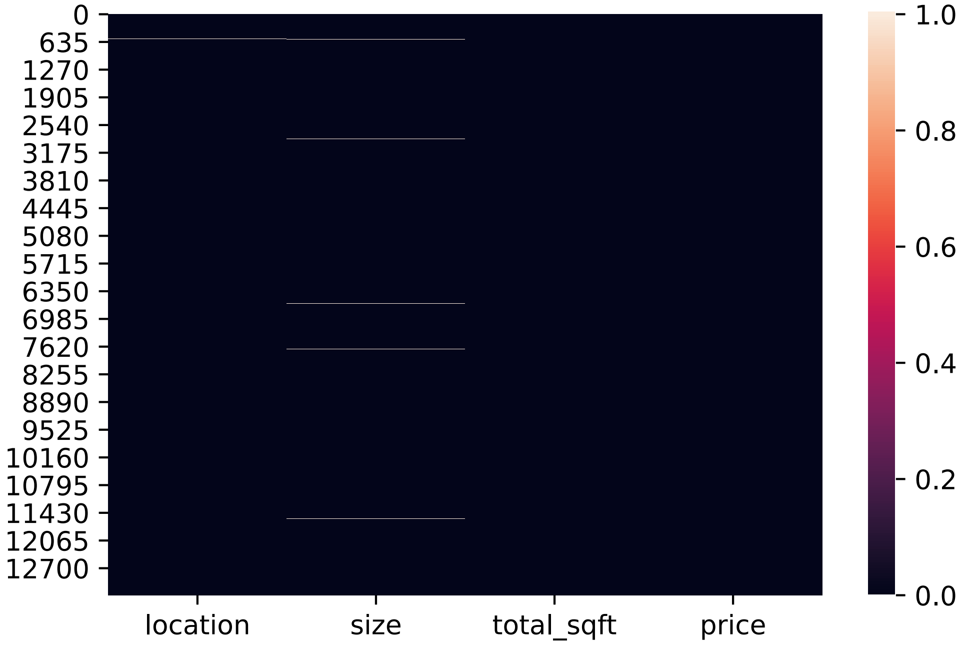
In [12]:

```
print(data.isnull().sum())
sns.heatmap(data.isnull())
```

```
location       1
size          16
total_sqft     0
price          0
dtype: int64
```

Out[12]:

```
<AxesSubplot:>
```



In [ ]:

In [13]:
```
# Handling Missing values
data['location'] = data['location'].fillna('Sarjapur  Road')
data['size'] = data['size'].fillna('3 BHK')
```

In [14]:
```
data.head()
```

Out[14]:

	location	size	total_sqft	price
0	Electronic City Phase II	2 BHK	1056	39.07
1	Chikka Tirupathi	4 Bedroom	2600	120.00
2	Uttarahalli	3 BHK	1440	62.00
3	Lingadheeranahalli	3 BHK	1521	95.00
4	Kothanur	2 BHK	1200	51.00

In [15]:
```
# Removing outliers in 'SIZE'
data['size']=data['size'].replace('1 Bedroom','1')
data['size']=data['size'].replace('2 Bedroom','2')
data['size']=data['size'].replace('3 Bedroom','3')
data['size']=data['size'].replace('4 Bedroom','4')
data['size']=data['size'].replace('5 Bedroom','5')
data['size']=data['size'].replace('6 Bedroom','6')
data['size']=data['size'].replace('1 BHK','1')
data['size']=data['size'].replace('2 BHK','2')
data['size']=data['size'].replace('3 BHK','3')
data['size']=data['size'].replace('4 BHK','4')
data['size']=data['size'].replace('5 BHK','5')
data['size']=data['size'].replace('6 BHK','6')
data['size']=data['size'].replace([s for s in data['size'] if s not in ['1','2','3',
data['size'].value_counts()
```

Out[15]:
```
2    5528
3    5155
4    1417
1     643
5     356
```

```
6     221
Name: size, dtype: int64
```

In [16]:

```
# Renaming the columns to correct names
data = data.rename(columns={'size':'BHK','total_sqft':'sqft'})
data.head()
```

Out[16]:

	location	BHK	sqft	price
0	Electronic City Phase II	2	1056	39.07
1	Chikka Tirupathi	4	2600	120.00
2	Uttarahalli	3	1440	62.00
3	Lingadheeranahalli	3	1521	95.00
4	Kothanur	2	1200	51.00

In [17]:

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 13320 entries, 0 to 13319
Data columns (total 4 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
 0   location  13320 non-null  object 
 1   BHK       13320 non-null  object 
 2   sqft      13320 non-null  object 
 3   price     13320 non-null  float64
dtypes: float64(1), object(3)
memory usage: 416.4+ KB
```

In [18]:

```
# Changing the incorrect data type
data['BHK']=data['BHK'].astype('category')
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 13320 entries, 0 to 13319
Data columns (total 4 columns):
 #   Column    Non-Null Count  Dtype   
---  ------    --------------  -----   
 0   location  13320 non-null  object  
 1   BHK       13320 non-null  category
 2   sqft      13320 non-null  object  
 3   price     13320 non-null  float64 
dtypes: category(1), float64(1), object(2)
memory usage: 325.5+ KB
```

In [19]:

```
def convert_sqft_to_num(x):
    tokens = x.split('-')
    if len(tokens) == 2:
        return (float(tokens[0])+float(tokens[1]))/2
    try:
        return float(x)
    except:
        return None
## applying the fucntion to the column: - 'total_sqft'
data.sqft = data.sqft.apply(convert_sqft_to_num)
# Taking only the Numeric values from the data and storing it in 'home'
data = data[data.sqft.notnull()]
# display the first 2 columns from the dataset
data.head(2)
```

Out[19]:

	location	BHK	sqft	price
0	Electronic City Phase II	2	1056.0	39.07

	location	BHK	sqft	price
1	Chikka Tirupathi	4	2600.0	120.00

In [20]:

```
#checking the dataset with highest location data provided
#because havind values for a location less than 10 wont give us good information on
data.location = data.location.str.strip()
location_stats = data['location'].value_counts(ascending=False)
location_stats
```

Out[20]:

```
Whitefield                                    539
Sarjapur  Road                                400
Electronic City                               304
Kanakpura Road                                271
Thanisandra                                   236
                                             ...
West of Chord Road                              1
Soppahalli                                      1
Bennigana Halli                                 1
Banashankari 3rd stage, Vivekanandanagar        1
Double Road                                     1
Name: location, Length: 1288, dtype: int64
```

In [21]:

```
#cretaing a Series of all the location having less than 10 entries against its
location_stats_less_than_10 = location_stats[location_stats<=10]
location_stats_less_than_10
```

Out[21]:

```
Nagadevanahalli                               10
Basapura                                      10
Kalkere                                       10
Naganathapura                                 10
Dodsworth Layout                              10
                                              ..
West of Chord Road                             1
Soppahalli                                     1
Bennigana Halli                                1
Banashankari 3rd stage, Vivekanandanagar       1
Double Road                                    1
Name: location, Length: 1048, dtype: int64
```

In [22]:

```
#using lambda function to naming 'location_stats_less_than_10' as 'other' and then r
data.location = data.location.apply(lambda x: 'other' if x in location_stats_less_th
data = data[data.location != 'other']
data.shape
```

Out[22]:

```
(10398, 4)
```

In [29]:

```
data['price_per_sqft'] = data['price']*100000/data['sqft']
data
```

Out[29]:

	location	BHK	sqft	price	price_per_sqft
0	1st Block Jayanagar	4	2850.0	428.00	15017.543860
1	1st Block Jayanagar	3	1630.0	194.00	11901.840491
2	1st Block Jayanagar	6	1200.0	125.00	10416.666667
3	1st Block Jayanagar	3	1875.0	235.00	12533.333333
4	1st Block Jayanagar	3	930.0	85.00	9139.784946
...	...	...	...	...	...
8620	Yeshwanthpur	3	1676.0	92.13	5497.016706

	location	BHK	sqft	price	price_per_sqft
8621	Yeshwanthpur	3	2503.0	138.00	5513.383939
8622	Yeshwanthpur	3	1855.0	135.00	7277.628032
8623	Yeshwanthpur	3	1876.0	160.00	8528.784648
8624	Yeshwanthpur	3	1675.0	92.13	5500.298507

8625 rows × 5 columns

In [30]:

```
data['price_per_sqft'].describe()
```

Out[30]:

```
count     8625.000000
mean      5741.547053
std       2480.502632
min       1150.172117
25%       4250.000000
50%       5210.526316
75%       6500.000000
max      26973.684211
Name: price_per_sqft, dtype: float64
```

In [25]:

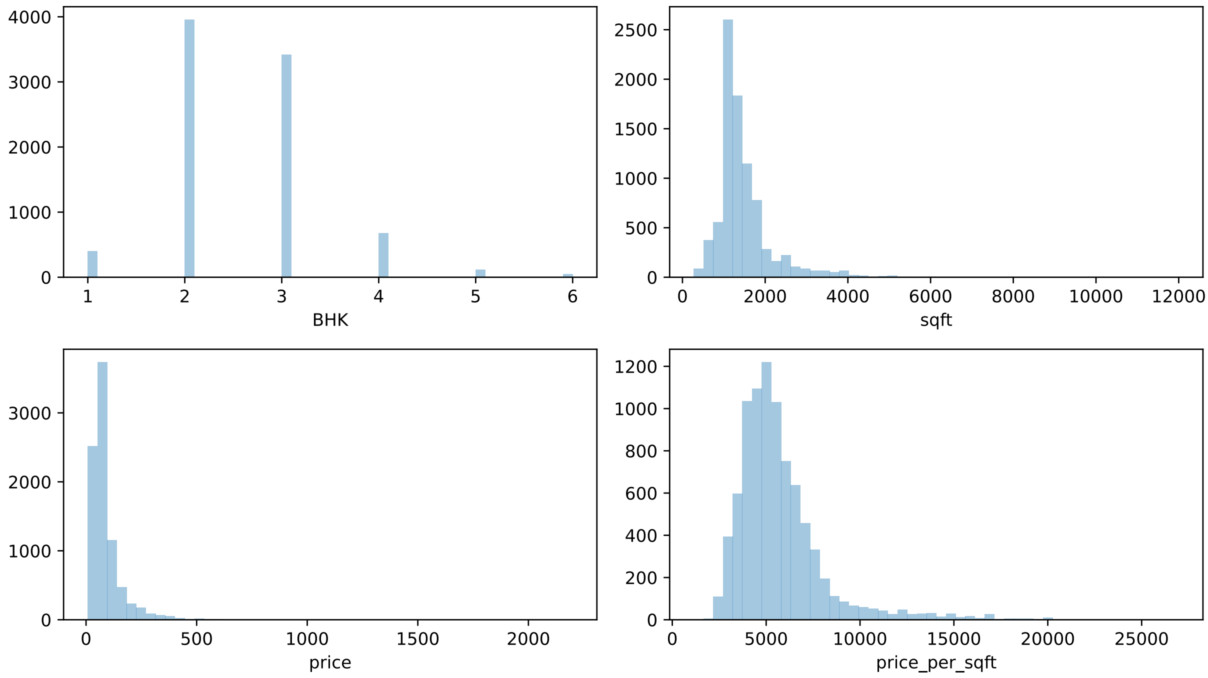
```
## as per Normal Distribution, 95% of our data lies within 1st Standard Deviation as
def remove_pps_outliers(df):
    df_out = pd.DataFrame()
    for key, subdf in df.groupby('location'):
        m = np.mean(subdf.price_per_sqft)
        st = np.std(subdf.price_per_sqft)
        reduced_df = subdf[(subdf.price_per_sqft>(m-st)) & (subdf.price_per_sqft<=(m
        df_out = pd.concat([df_out,reduced_df],ignore_index=True)
    return df_out
data = remove_pps_outliers(data)
data.shape
```

Out[25]:

```
(8625, 5)
```

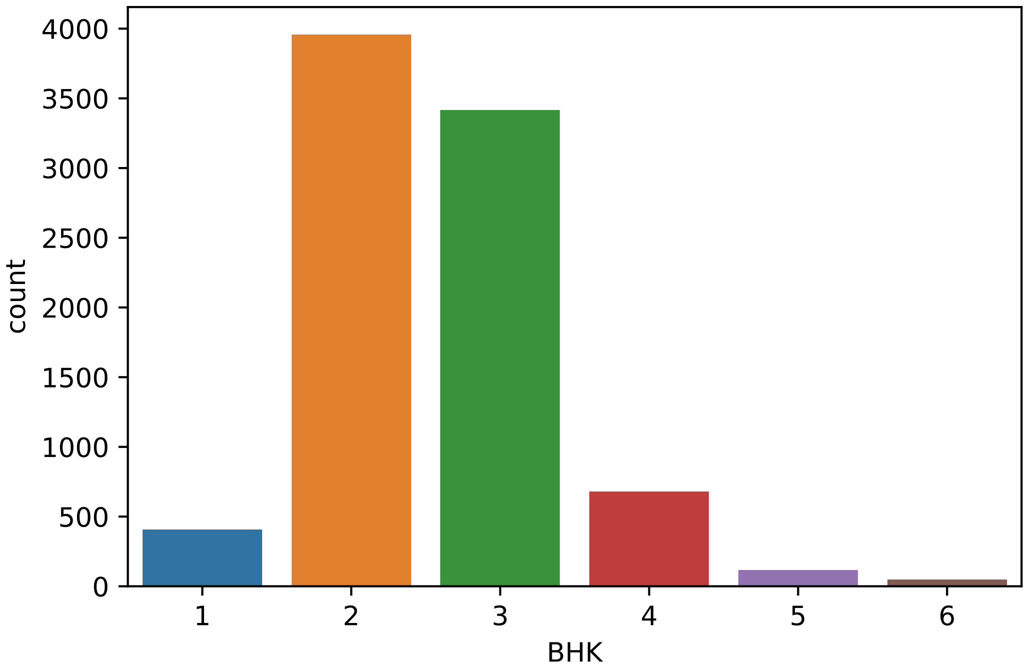
In [26]:

```
## representing Numerical Data and Visualizing the same usin Distplot to gain furthe
num_ = data.select_dtypes(exclude = 'object')
fig = plt.figure(figsize =(10,8))
for index, col in enumerate(num_):
    plt.subplot(3,2,index+1)
    sns.distplot(num_.loc[:,col],kde = False)
fig.tight_layout(pad = 1.0)
```



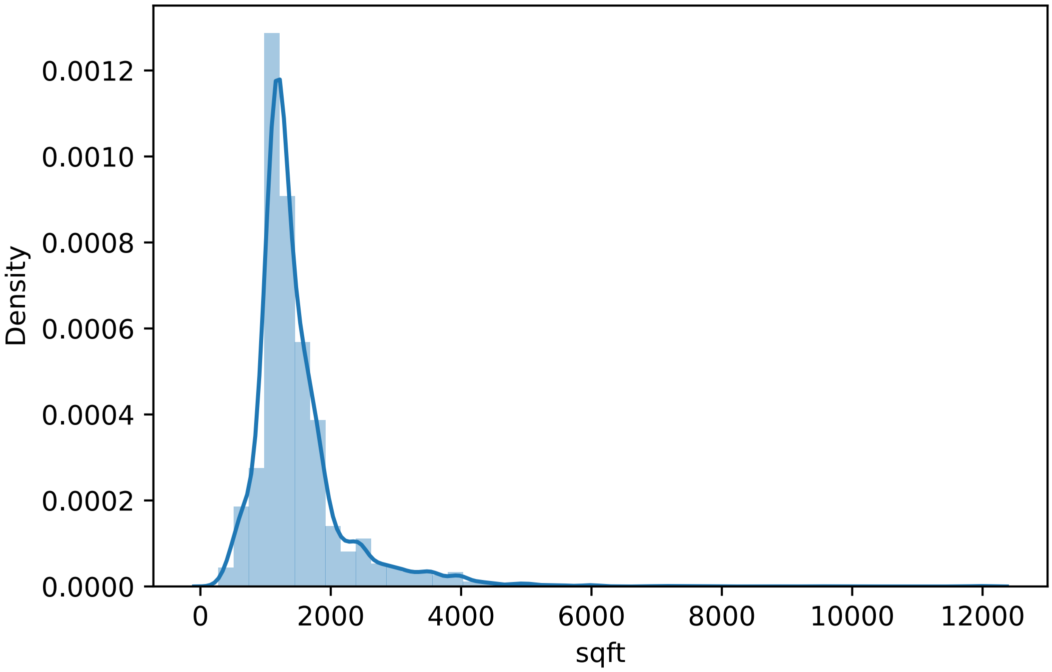
In [31]:
```
sns.countplot(x='BHK',data=data)
```

Out[31]:
```
<AxesSubplot:xlabel='BHK', ylabel='count'>
```



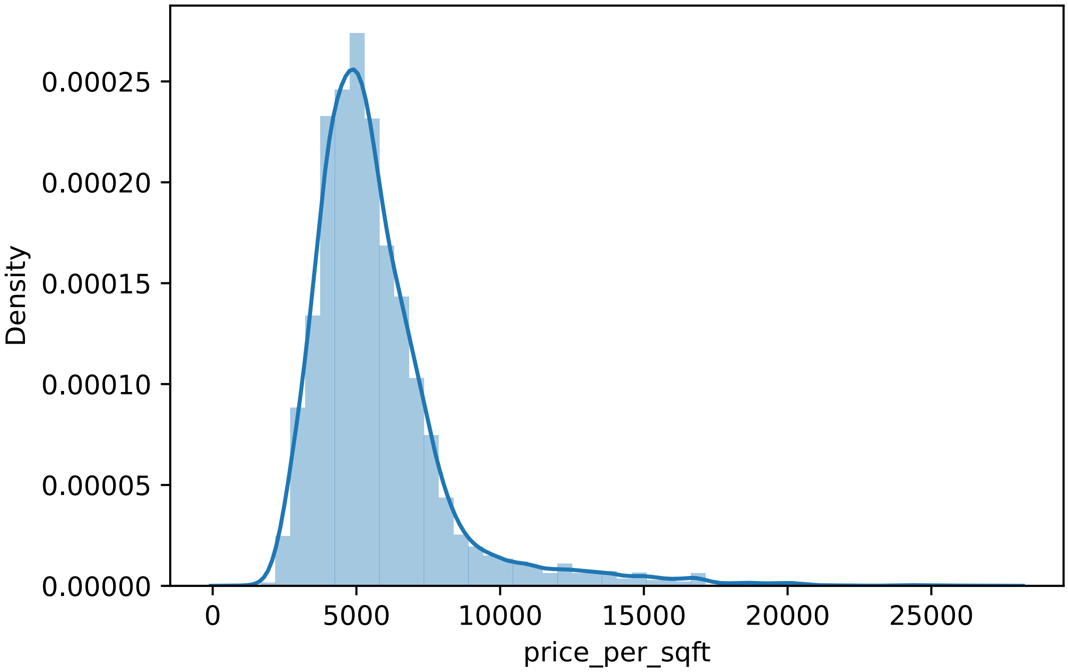
In [33]:
```
sns.distplot(data['sqft'],kde=True)
```

Out[33]:
```
<AxesSubplot:xlabel='sqft', ylabel='Density'>
```



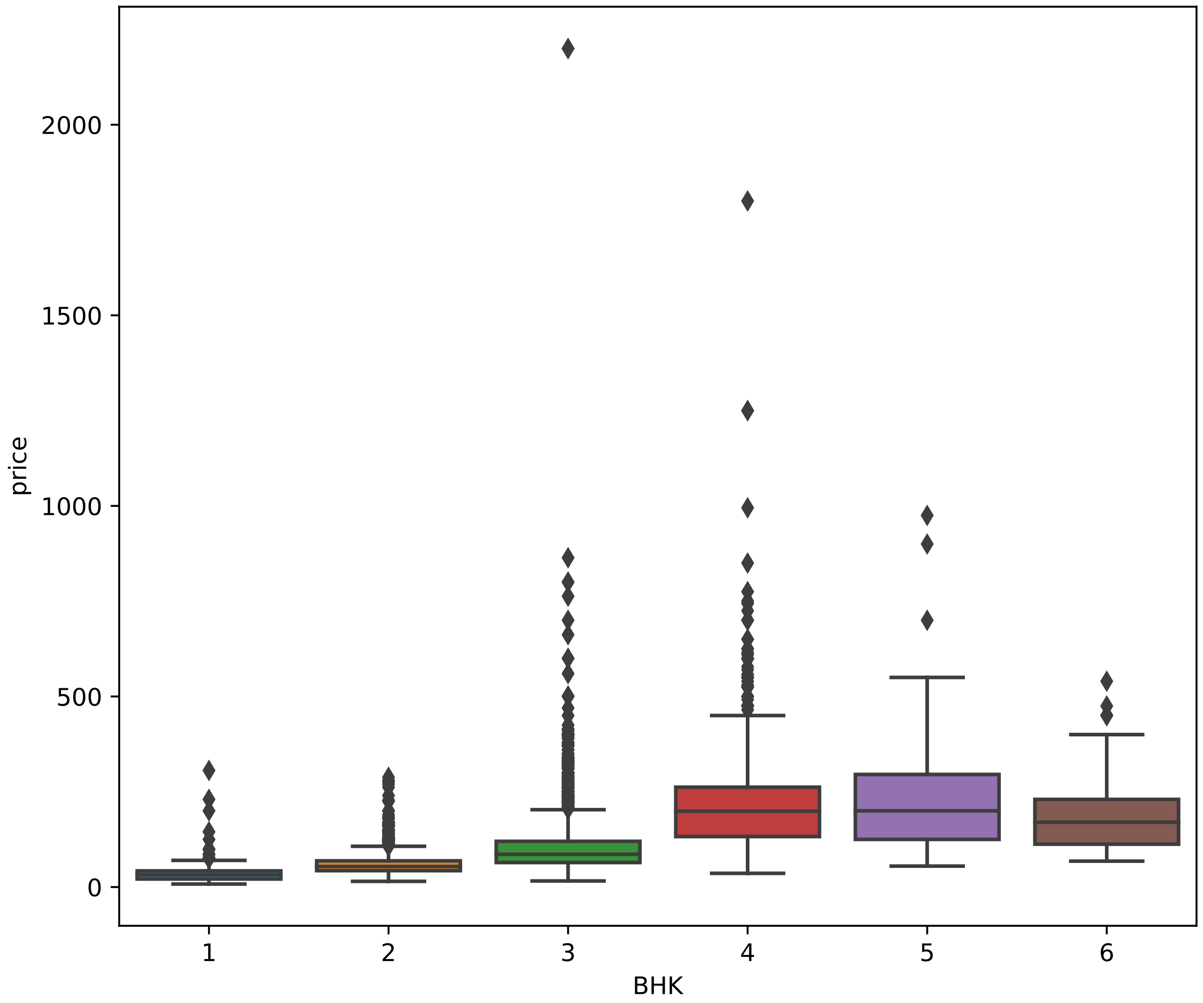
```
In [40]: sns.distplot(data['price_per_sqft'],kde=True)
```

```
Out[40]: <AxesSubplot:xlabel='price_per_sqft', ylabel='Density'>
```



```
In [39]: plt.subplots(figsize=(8,7))
         sns.boxplot(x='BHK',y='price',data=data)
```

```
Out[39]: <AxesSubplot:xlabel='BHK', ylabel='price'>
```



In [27]:

```
# To save dataframe to csv
# data.sort_values(by='location')
data = data.drop(columns=['price_per_sqft'])
data.reset_index(drop = True)
data.to_csv('Cleanned_data.csv', index=False)
data
```

Out[27]:

	location	BHK	sqft	price
0	1st Block Jayanagar	4	2850.0	428.00
1	1st Block Jayanagar	3	1630.0	194.00
2	1st Block Jayanagar	6	1200.0	125.00
3	1st Block Jayanagar	3	1875.0	235.00
4	1st Block Jayanagar	3	930.0	85.00
...	...	...	...	...
8620	Yeshwanthpur	3	1676.0	92.13
8621	Yeshwanthpur	3	2503.0	138.00
8622	Yeshwanthpur	3	1855.0	135.00
8623	Yeshwanthpur	3	1876.0	160.00
8624	Yeshwanthpur	3	1675.0	92.13

8625 rows × 4 columns

In [ ]: