In [1]:
```
#load in library
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:
```
#imported data set
train = pd.read_csv('paris_housing_train.csv')
train.drop(columns=['id','cityCode'], inplace=True) ##id and citycode
```

In [3]:
```
#overview the dataset
print(train)
```

```
       squareMeters  numberOfRooms  hasYard  hasPool  floors  cityPar
tRange  \
0             34291             24        1        0      47
2
1             95145             60        0        1      60
1
2             92661             45        1        1      62
4
3             97184             99        0        0      59
1
4             61752            100        0        0      57
8
...             ...            ...      ...      ...     ...
...
22725         55825             84        1        0      70
3
22726         65870             88        1        0      49
9
22727         93192             42        1        0      39
10
22728         65797             86        1        0      89
2
22729         82244             18        1        0      38
1

       numPrevOwners  made  isNewBuilt  hasStormProtector  basement
attic  \
0                  1  2000           0                  1         8
5196
1                  4  2000           0                  1       729
4496
2                  8  2020           1                  1      7473
8953
```

```
3                  1  2000           0                  1      6424
8522
4                  4  2018           1                  0      7151
2786
...              ...   ...         ...                ...       ...
...
22725             10  2000           0                  0      4477
786
22726              9  2015           0                  1      4811
2454
22727              5  2014           1                  0      5595
4072
22728             10  2000           1                  0      5358
2513
22729              9  2018           1                  0      6294
1291

       garage  hasStorageRoom  hasGuestRoom      price
0         369               0             3  3436795.2
1         277               0             6  9519958.0
2         245               1             9  9276448.1
3         256               1             9  9725732.2
4         863               0             7  6181908.8
...       ...             ...           ...        ...
22725     345               0             0  5594137.1
22726     755               0             7  6594705.0
22727     789               0             0  9321511.4
22728     411               0             0  6584708.2
22729     572               0             6  8231424.8

[22730 rows x 16 columns]
```

In [4]:

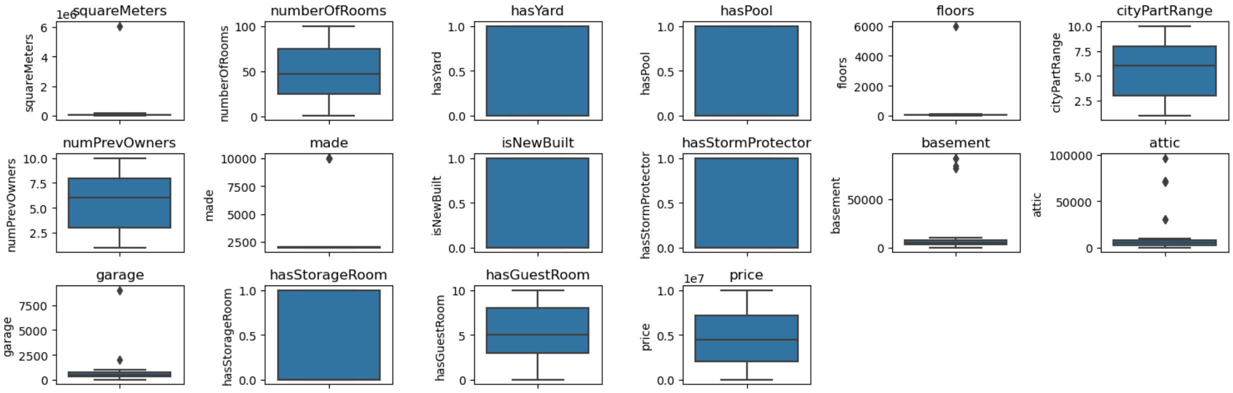
```
#Check for nulls
train.isnull().sum()
```

Out[4]:

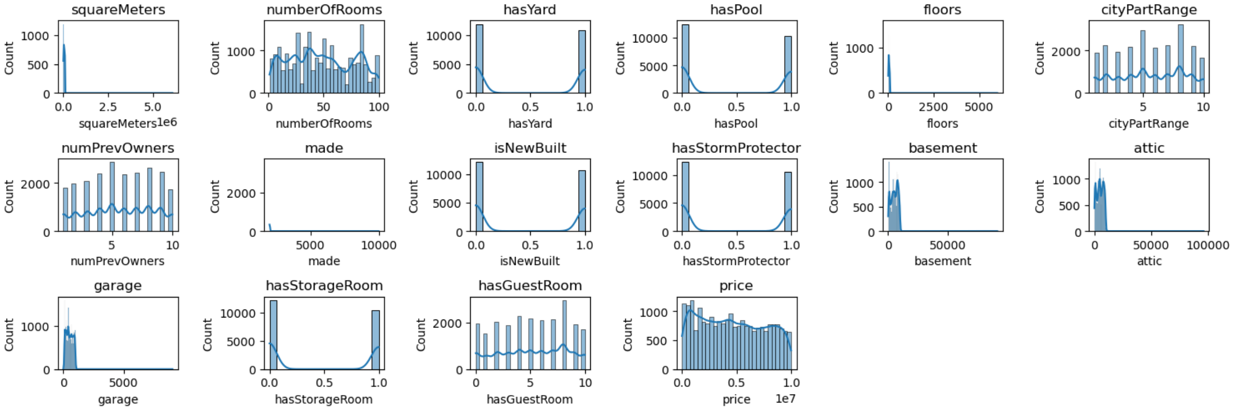
```
squareMeters         0
numberOfRooms        0
hasYard              0
hasPool              0
floors               0
cityPartRange        0
numPrevOwners        0
made                 0
isNewBuilt           0
hasStormProtector    0
basement             0
attic                0
garage               0
hasStorageRoom       0
hasGuestRoom         0
price                0
dtype: int64
```

In [5]:

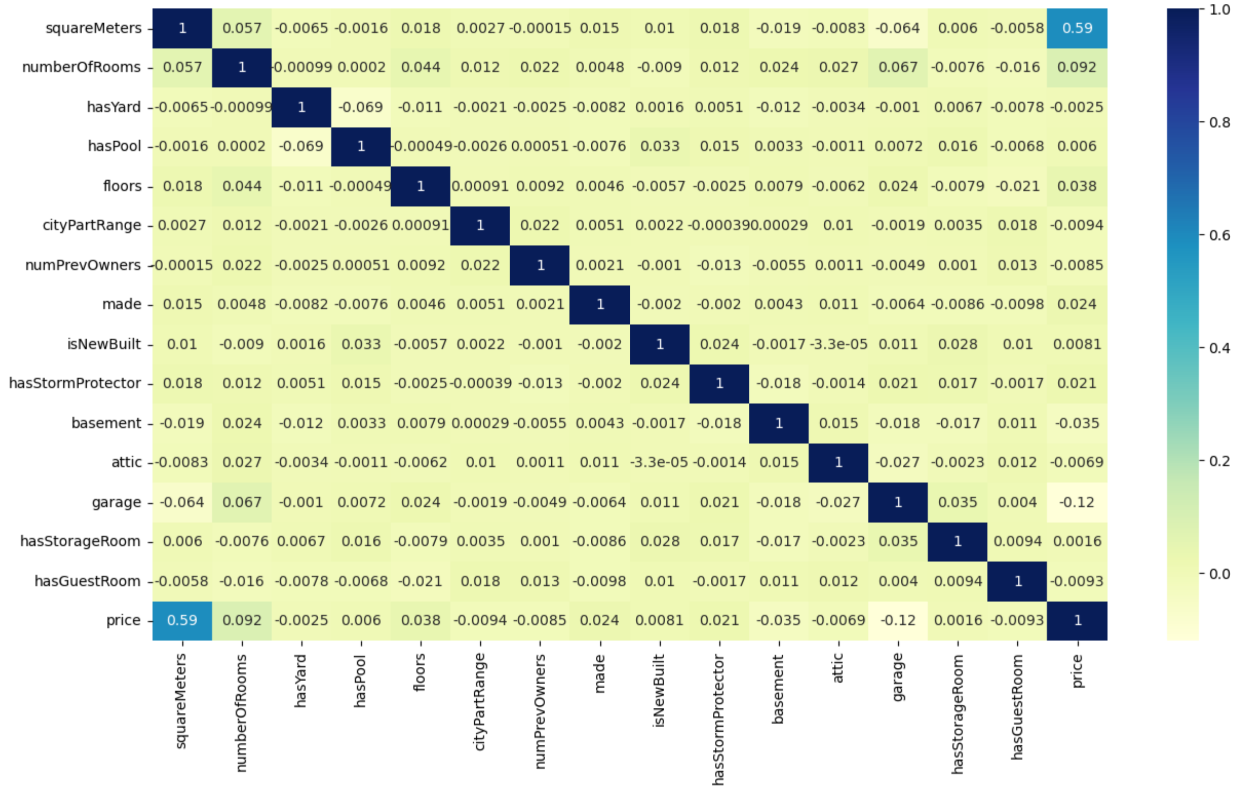
```
#1st look at boxplot
num_cols = train.columns.to_list()

def box_plot(dataframe, features, rows, cols):
    fig=plt.figure(figsize=(15,8))
    for i, feature in enumerate(features):
        ax=fig.add_subplot(rows,cols,i+1)
        sns.boxplot(y=dataframe[feature],data=train)
        ax.set_title(feature,color='black')
    fig.tight_layout()
    plt.show()

box_plot(train,num_cols,5,6)
```



In [6]:
```
#first look at histogram
def hist_plot(dataframe, features, rows, cols):
    fig=plt.figure(figsize=(15,8))
    for i, feature in enumerate(features):
        ax=fig.add_subplot(rows,cols,i+1)
        sns.histplot(x=dataframe[feature], fill=True, data=train, kde=
        ax.set_title(feature,color='black')
    fig.tight_layout()
    plt.show()

hist_plot(train,num_cols,5,6)
```



In [10]:
```
#1st look at the corr
plt.figure(figsize=(15,8))
train_corr = train.corr()
sns.heatmap(train_corr, annot=True, cmap="YlGnBu")
plt.show()
```



In [11]:
```
#import sk learn for modelling

from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error
```

In [12]:
```
#take independent variables (all of them)
X = train.drop(['price'], axis =1)
#take dependent variable
y = train['price']
```

In [13]:
```
#Divide train dataset into train and test subsets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.
```

In [14]:

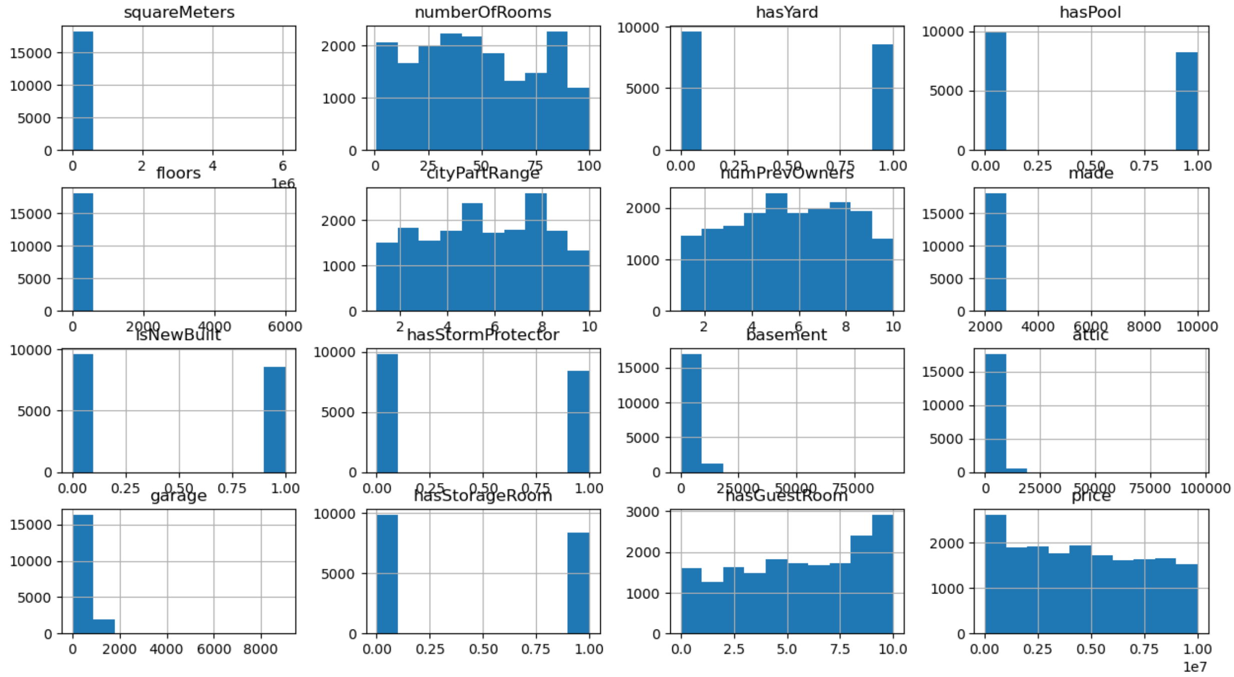
```python
train_data = X_train.join(y_train)
```

In [15]:

```python
#Check for histogram
train_data.hist(figsize=(15,8))
```

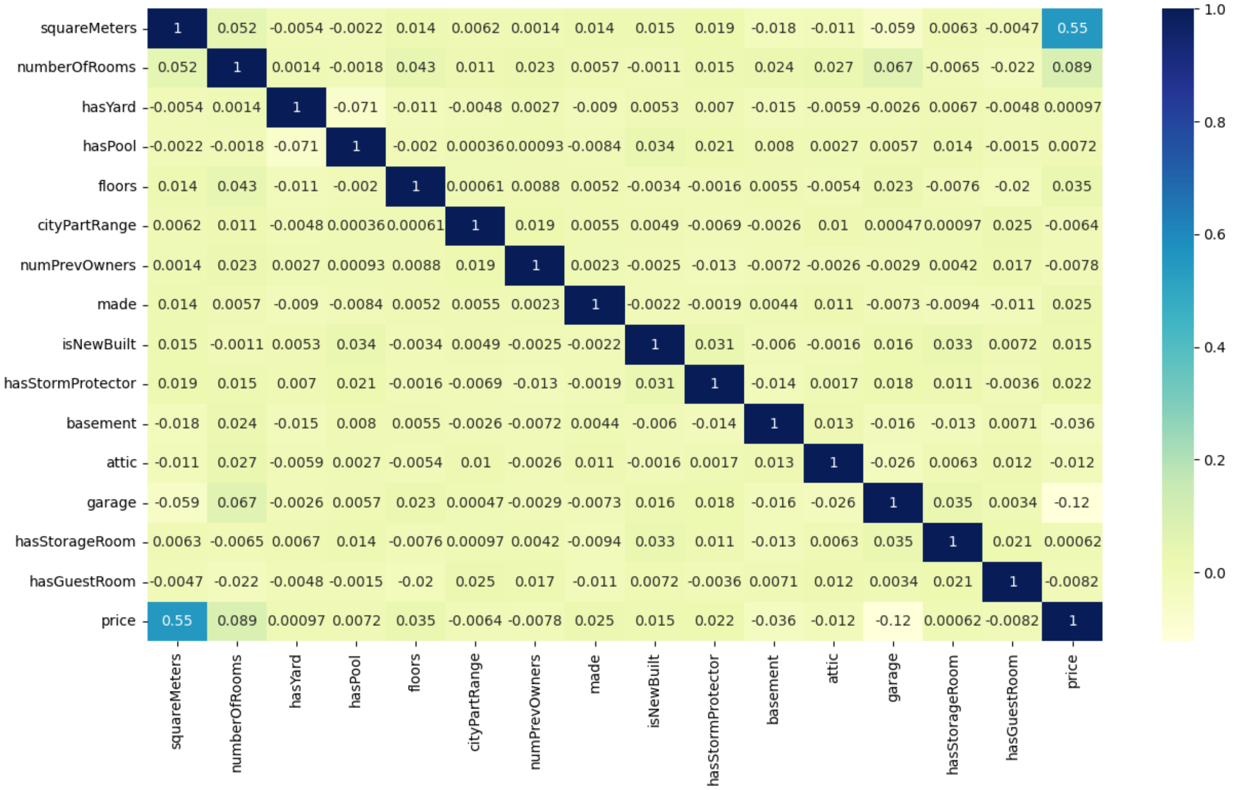
Out[15]:

```
array([[<AxesSubplot:title={'center':'squareMeters'}>,
        <AxesSubplot:title={'center':'numberOfRooms'}>,
        <AxesSubplot:title={'center':'hasYard'}>,
        <AxesSubplot:title={'center':'hasPool'}>],
       [<AxesSubplot:title={'center':'floors'}>,
        <AxesSubplot:title={'center':'cityPartRange'}>,
        <AxesSubplot:title={'center':'numPrevOwners'}>,
        <AxesSubplot:title={'center':'made'}>],
       [<AxesSubplot:title={'center':'isNewBuilt'}>,
        <AxesSubplot:title={'center':'hasStormProtector'}>,
        <AxesSubplot:title={'center':'basement'}>,
        <AxesSubplot:title={'center':'attic'}>],
       [<AxesSubplot:title={'center':'garage'}>,
        <AxesSubplot:title={'center':'hasStorageRoom'}>,
        <AxesSubplot:title={'center':'hasGuestRoom'}>,
        <AxesSubplot:title={'center':'price'}>]], dtype=object)
```



In [16]:
```
#check for correlation
plt.figure(figsize=(15,8))
sns.heatmap(train_data.corr(), annot=True, cmap="YlGnBu")
```

Out[16]:
```
<AxesSubplot:>
```



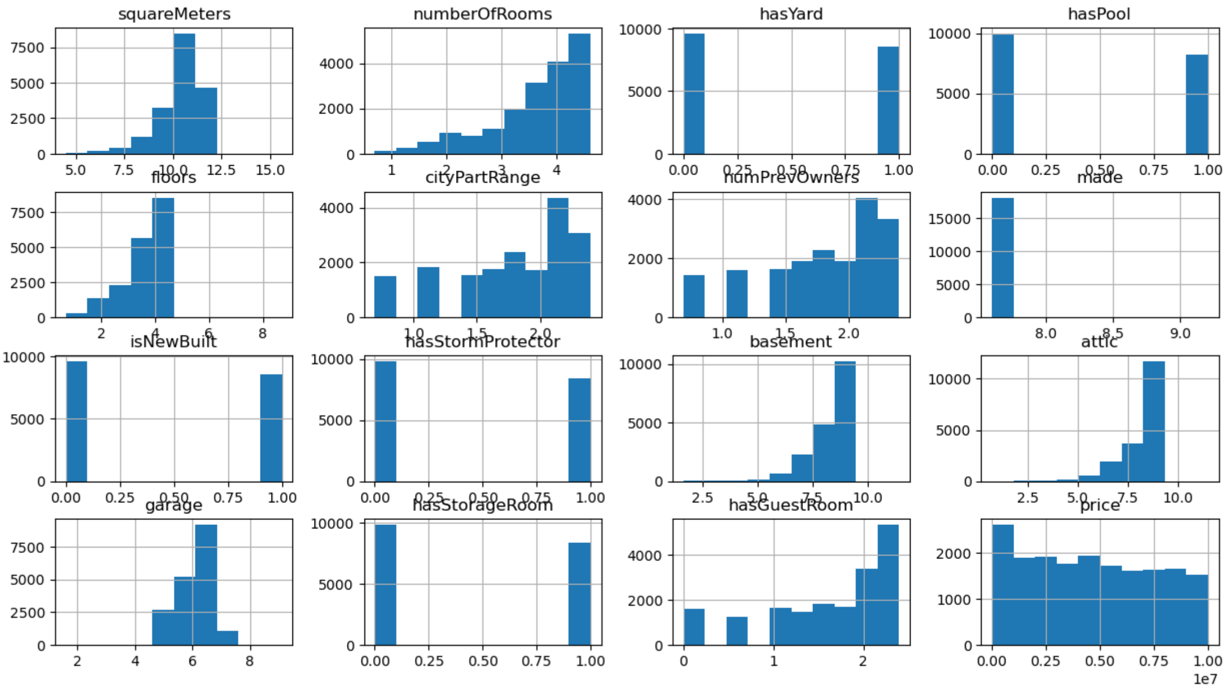
In [17]:
```
#normalization data with log function in numpy

train_data['squareMeters']=np.log(train_data['squareMeters']+1)
train_data['numberOfRooms']=np.log(train_data['numberOfRooms']+1)
train_data['floors']=np.log(train_data['floors']+1)
train_data['cityPartRange']=np.log(train_data['cityPartRange']+1)
train_data['numPrevOwners']=np.log(train_data['numPrevOwners']+1)
train_data['made']=np.log(train_data['made']+1)
train_data['basement']=np.log(train_data['basement']+1)
train_data['attic']=np.log(train_data['attic']+1)
train_data['garage']=np.log(train_data['garage']+1)
train_data['hasGuestRoom']=np.log(train_data['hasGuestRoom']+1)
```

In [18]:

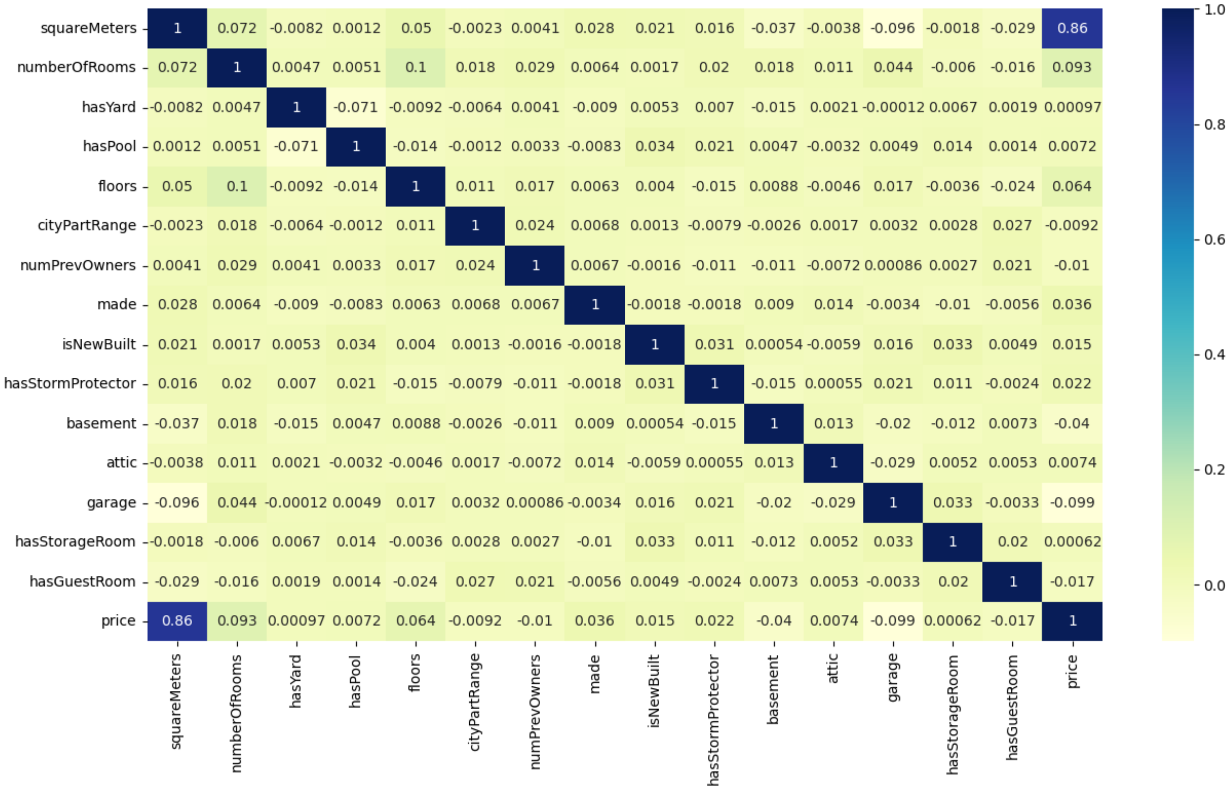
```
#check data again
train_data.hist(figsize=(15,8))
```

Out[18]:

```
array([[<AxesSubplot:title={'center':'squareMeters'}>,
        <AxesSubplot:title={'center':'numberOfRooms'}>,
        <AxesSubplot:title={'center':'hasYard'}>,
        <AxesSubplot:title={'center':'hasPool'}>],
       [<AxesSubplot:title={'center':'floors'}>,
        <AxesSubplot:title={'center':'cityPartRange'}>,
        <AxesSubplot:title={'center':'numPrevOwners'}>,
        <AxesSubplot:title={'center':'made'}>],
       [<AxesSubplot:title={'center':'isNewBuilt'}>,
        <AxesSubplot:title={'center':'hasStormProtector'}>,
        <AxesSubplot:title={'center':'basement'}>,
        <AxesSubplot:title={'center':'attic'}>],
       [<AxesSubplot:title={'center':'garage'}>,
        <AxesSubplot:title={'center':'hasStorageRoom'}>,
        <AxesSubplot:title={'center':'hasGuestRoom'}>,
        <AxesSubplot:title={'center':'price'}>]], dtype=object)
```



```
In [19]: #recheck correlation
         plt.figure(figsize=(15,8))
         sns.heatmap(train_data.corr(), annot=True, cmap="YlGnBu")

Out[19]: <AxesSubplot:>
```



```
In [20]: #regression model

         x_train, y_train = train_data.drop(['price'], axis = 1), train_data['p
         reg = LinearRegression()
         reg.fit(x_train,y_train)

Out[20]: LinearRegression()
```

In [21]:
```
# test subset

test_data = X_test.join(y_test)

test_data['squareMeters']=np.log(test_data['squareMeters']+1)
test_data['numberOfRooms']=np.log(test_data['numberOfRooms']+1)
test_data['floors']=np.log(test_data['floors']+1)
test_data['cityPartRange']=np.log(test_data['cityPartRange']+1)
test_data['numPrevOwners']=np.log(test_data['numPrevOwners']+1)
test_data['made']=np.log(test_data['made']+1)
test_data['basement']=np.log(test_data['basement']+1)
test_data['attic']=np.log(test_data['attic']+1)
test_data['garage']=np.log(test_data['garage']+1)
test_data['hasStorageRoom']=np.log(test_data['hasStorageRoom']+1)
test_data['hasGuestRoom']=np.log(test_data['hasGuestRoom']+1)

x_test, y_test = test_data.drop(['price'], axis = 1), test_data['price
```

In [22]:
```
#valuation check
reg.score(x_test,y_test)
```

Out[22]:
```
0.7341097685347969
```

In [23]:
```
### 0.7341 we move on to trying random forest
```

In [24]:
```
# random forest 2nd model
from sklearn.ensemble import RandomForestRegressor
forest = RandomForestRegressor()
forest.fit(x_train,y_train)
```

Out[24]:
```
RandomForestRegressor()
```

In [26]:
```
#evalution
forest.score(x_test,y_test)
```

Out[26]:
```
0.994028135080717
```

In [ ]:
```
# concluding that randomforest regression provides a better model for
```

In [ ]: