USA Housing

Problem Statement

A realestate agents want help to predict the house price for regions in the USA. He gave you the data set to work on and you the Linear Regression model. Create a model that will help him to estimate of what the house would sell for

Data collection

The data set contains 7 columns and 5000 rows with .csv extension The data contains the following columns. 'Avg.Area Income'-Avg.The income of the house holder of the city house is located; 'Avg.Area House Age'-Avg.Age of house in the same city; 'Avg.Area Number Of Rooms'-Avg.Number of houses in the same city; 'Avg.Area Number Of Bedrooms'-Avg Number of bedrooms of houses in the same city; 'Area Population'-population of the city; 'Price'-Price of that the house sold at; 'Address'-Address of the houses;

In [29]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

In [30]:
```
df=pd.read_csv(r"C:\Users\91756\Downloads\USA_Housing.csv")
df
```

Out[30]:

	Avg. Area Income	Avg. Area House Age	Avg. Area Number of Rooms	Avg. Area Number of Bedrooms	Area Population	Price	A
0	79545.458574	5.682861	7.009188	4.09	23086.800503	1.059034e+06	208 Michael Fe 674\nLaurab
1	79248.642455	6.002900	6.730821	3.09	40173.072174	1.505891e+06	188 Johnsor Suite 079 Kathleer
2	61287.067179	5.865890	8.512727	5.13	36882.159400	1.058988e+06	9127 Eli Stravenue\nDani WI 0
3	63345.240046	7.188236	5.586729	3.26	34310.242831	1.260617e+06	USS Barnett\nF
4	59982.197226	5.040555	7.839388	4.23	26354.109472	6.309435e+05	USNS Raymonc AE
...	...	...	...	...	...	...	
4995	60567.944140	7.830362	6.137356	3.46	22837.361035	1.060194e+06	USNS Williams AP 3015
4996	78491.275435	6.999135	6.576763	4.02	25616.115489	1.482618e+06	PSC 925 8489\nAPO AA
4997	63390.686886	7.250591	4.805081	2.13	33266.145490	1.030730e+06	4215 Tracy (Suite 076\nJoshu \
4998	68001.331235	5.534388	7.130144	5.44	42625.620156	1.198657e+06	USS Wallace\nF
4999	65510.581804	5.992305	6.792336	4.07	46501.283803	1.298950e+06	37778 George Apt. 509\nEas

5000 rows × 7 columns

In [31]:
```
df.head()
```

Out[31]:

	Avg. Area Income	Avg. Area House Age	Avg. Area Number of Rooms	Avg. Area Number of Bedrooms	Area Population	Price	Addre
0	79545.458574	5.682861	7.009188	4.09	23086.800503	1.059034e+06	208 Michael Ferry A 674\nLaurabury, 370
1	79248.642455	6.002900	6.730821	3.09	40173.072174	1.505891e+06	188 Johnson Vie Suite 079\nLa Kathleen, C
2	61287.067179	5.865890	8.512727	5.13	36882.159400	1.058988e+06	9127 Elizab Stravenue\nDanielto WI 0648
3	63345.240046	7.188236	5.586729	3.26	34310.242831	1.260617e+06	USS Barnett\nFPO 448
4	59982.197226	5.040555	7.839388	4.23	26354.109472	6.309435e+05	USNS Raymond\nF AE 093

In [32]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5000 entries, 0 to 4999
Data columns (total 7 columns):
 #   Column                       Non-Null Count  Dtype  
---  ------                       --------------  -----  
 0   Avg. Area Income             5000 non-null   float64
 1   Avg. Area House Age          5000 non-null   float64
 2   Avg. Area Number of Rooms    5000 non-null   float64
 3   Avg. Area Number of Bedrooms 5000 non-null   float64
 4   Area Population              5000 non-null   float64
 5   Price                        5000 non-null   float64
 6   Address                      5000 non-null   object 
dtypes: float64(6), object(1)
memory usage: 273.6+ KB
```

In [33]:
```
df.describe()
```

Out[33]:

	Avg. Area Income	Avg. Area House Age	Avg. Area Number of Rooms	Avg. Area Number of Bedrooms	Area Population	Price
count	5000.000000	5000.000000	5000.000000	5000.000000	5000.000000	5.000000e+03
mean	68583.108984	5.977222	6.987792	3.981330	36163.516039	1.232073e+06
std	10657.991214	0.991456	1.005833	1.234137	9925.650114	3.531176e+05
min	17796.631190	2.644304	3.236194	2.000000	172.610686	1.593866e+04
25%	61480.562388	5.322283	6.299250	3.140000	29403.928702	9.975771e+05
50%	68804.286404	5.970429	7.002902	4.050000	36199.406689	1.232669e+06
75%	75783.338666	6.650808	7.665871	4.490000	42861.290769	1.471210e+06
max	107701.748378	9.519088	10.759588	6.500000	69621.713378	2.469066e+06

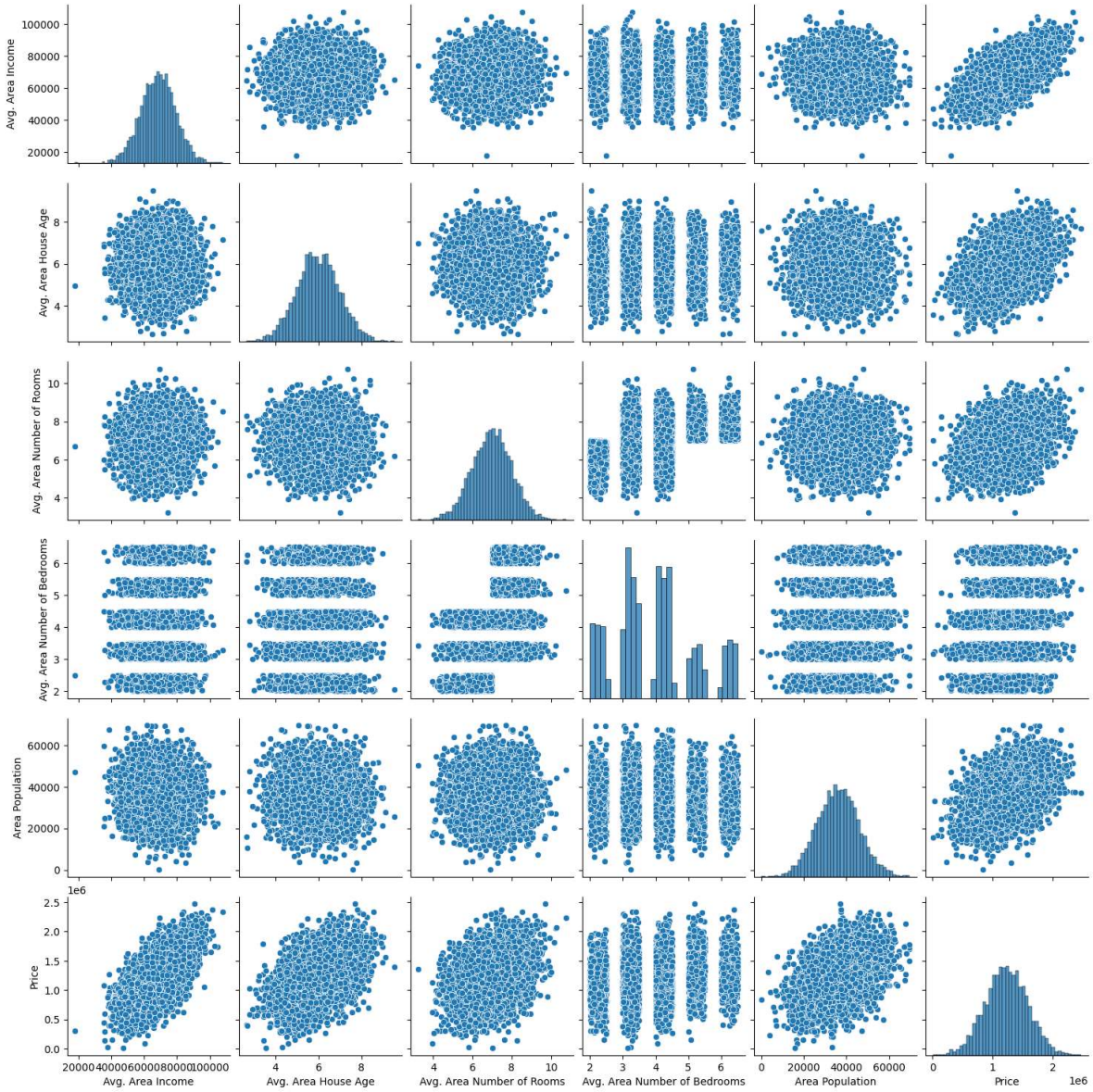
In [34]:
```
df.columns
```

Out[34]:
```
Index(['Avg. Area Income', 'Avg. Area House Age', 'Avg. Area Number of Room
s',
       'Avg. Area Number of Bedrooms', 'Area Population', 'Price', 'Addres
s'],
      dtype='object')
```

Exploratory Data Analysis

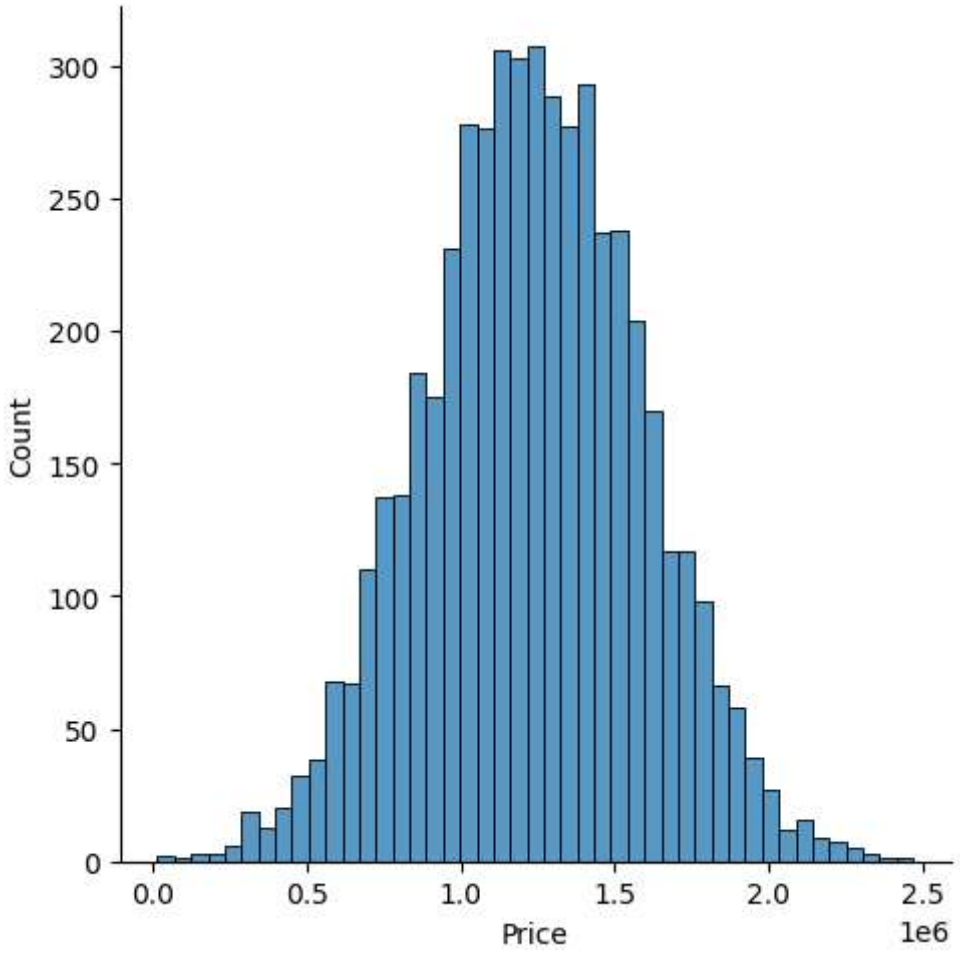
In [35]:
```
sns.pairplot(df)
```

Out[35]: <seaborn.axisgrid.PairGrid at 0x29eddb97e50>



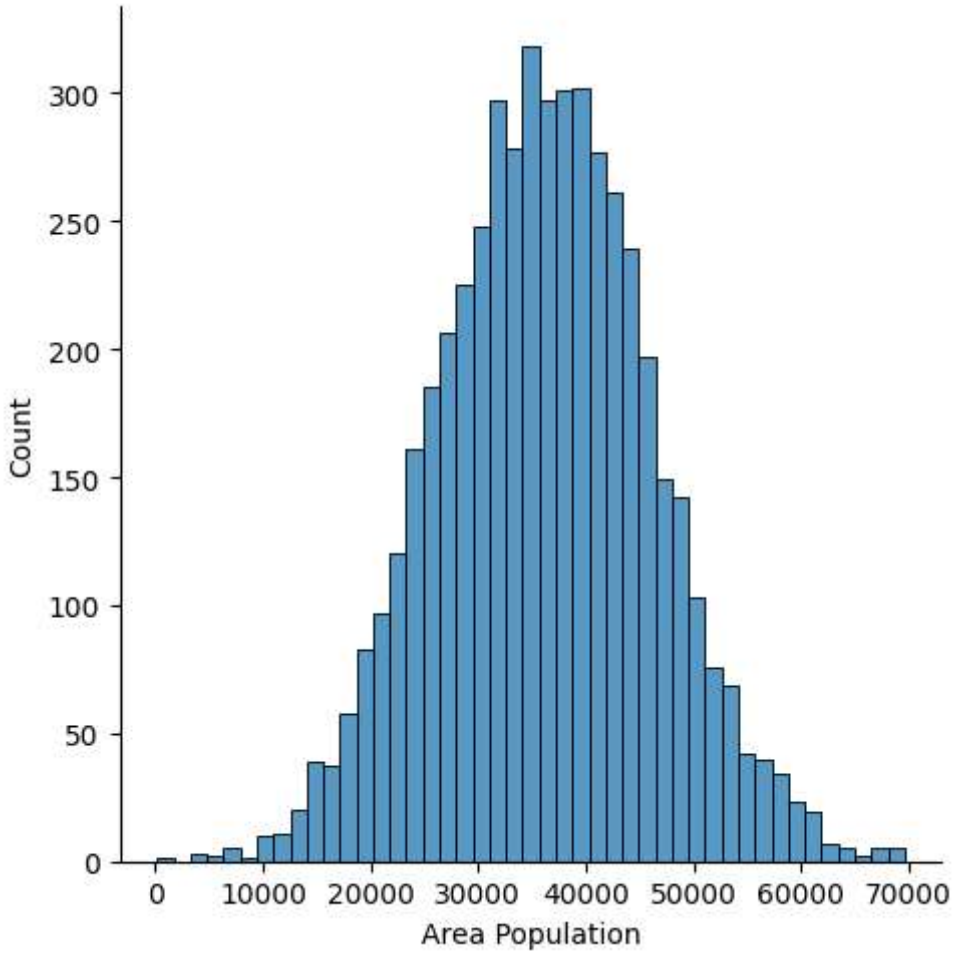
In [36]:
```
sns.displot(df['Price'])
```

Out[36]: <seaborn.axisgrid.FacetGrid at 0x29edfde1360>



In [37]:
```
sns.displot(df['Area Population'])
```

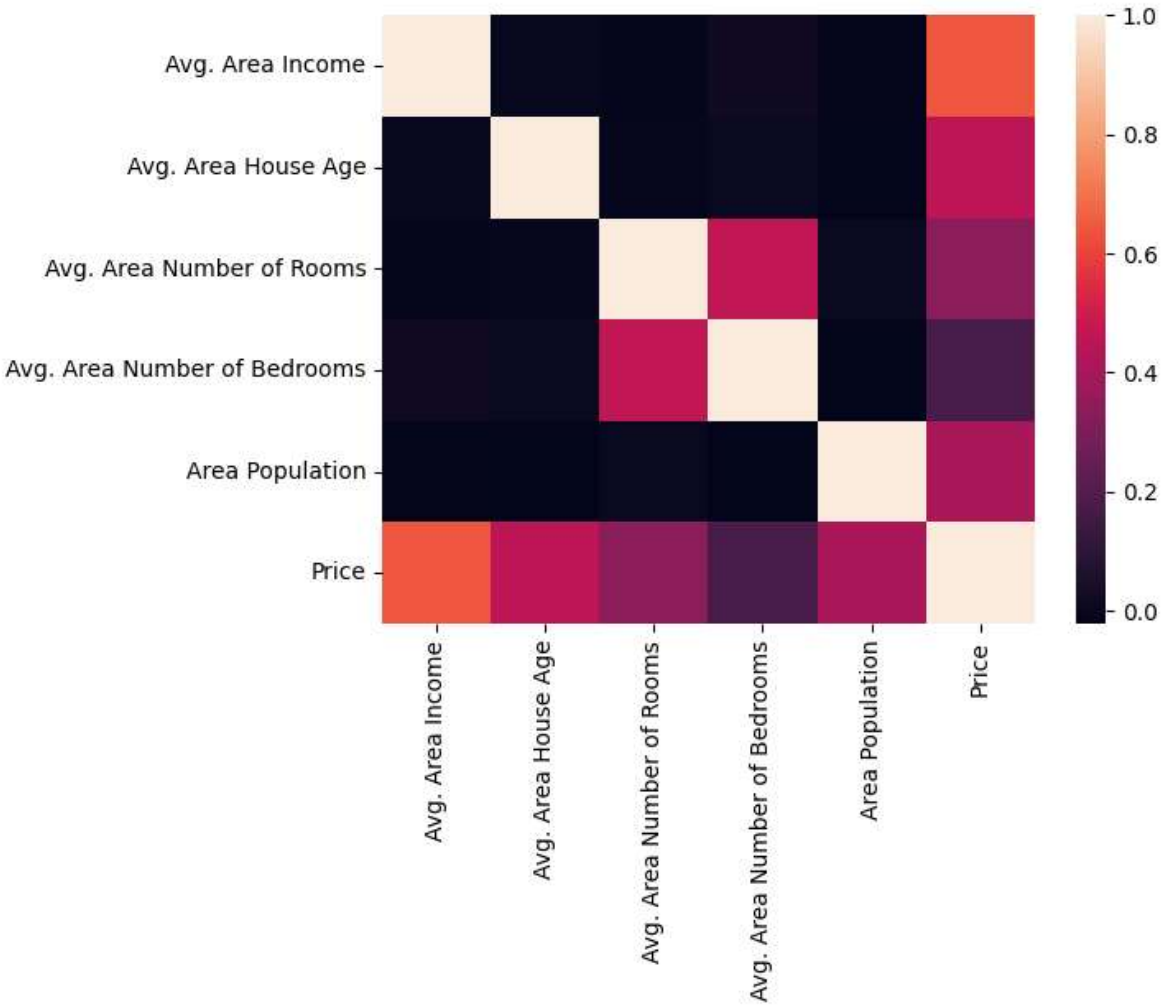
Out[37]: <seaborn.axisgrid.FacetGrid at 0x29f02f615a0>



In [38]:
```
Housedf=df[['Avg. Area Income', 'Avg. Area House Age', 'Avg. Area Number of Rc
       'Avg. Area Number of Bedrooms', 'Area Population', 'Price']]
```

In [39]:
```
sns.heatmap(Housedf.corr())
```

Out[39]: <Axes: >



To train the Model

We are going to train linear regression model.We need to first split up our data into X list that contains the features to train on, and a Y list with the target variable in this case, the price column.We will ignore the address column because it only has text which is not useful for Linear Regression model

In [40]:
```
x=Housedf[['Avg. Area Income', 'Avg. Area House Age', 'Avg. Area Number of Roo
       'Avg. Area Number of Bedrooms', 'Area Population']]
y=df['Price']
```

In [43]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3,random_state=
```

In [46]:
```
from sklearn.linear_model import LinearRegression
lm=LinearRegression()
lm.fit(x_train,y_train)
```

Out[46]:
```
LinearRegression
LinearRegression()
```

In [47]:
```
print(lm.intercept_)
```

```
-2641372.6673013885
```

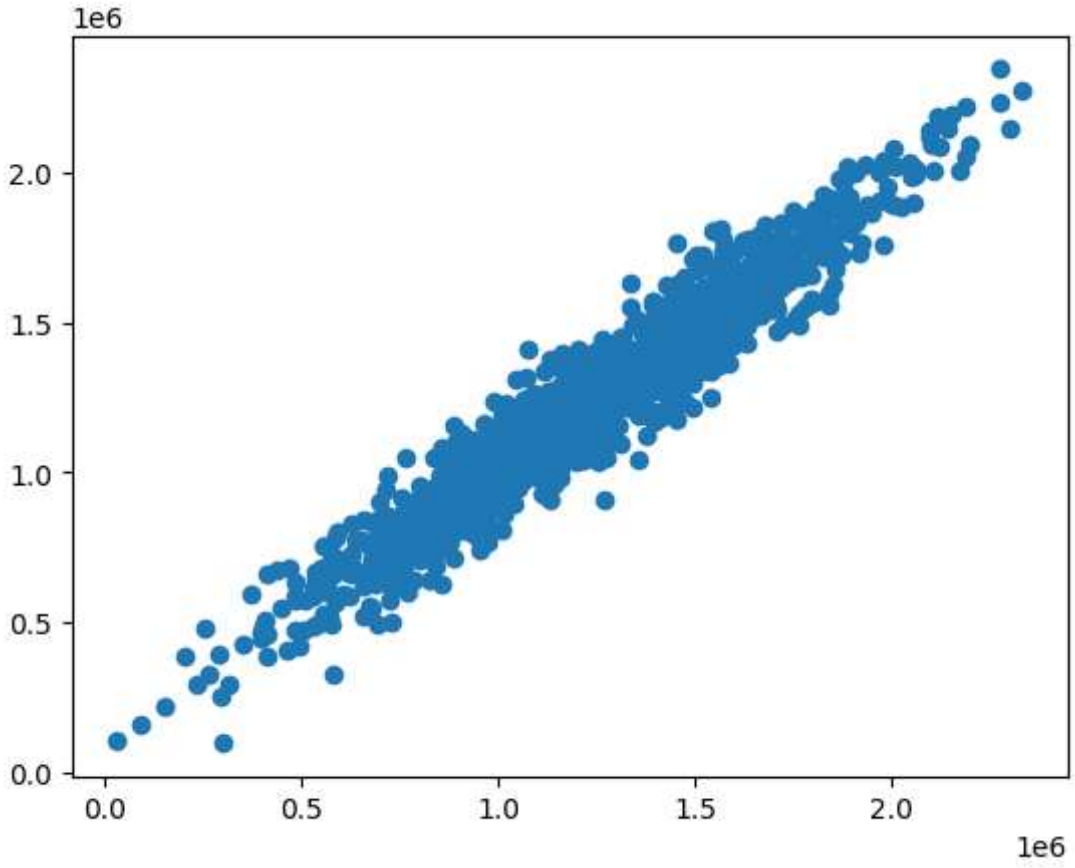
In [52]:
```
coeff_df=pd.DataFrame(lm.coef_,x.columns,columns=['coefficient'])
coeff_df
```

Out[52]:

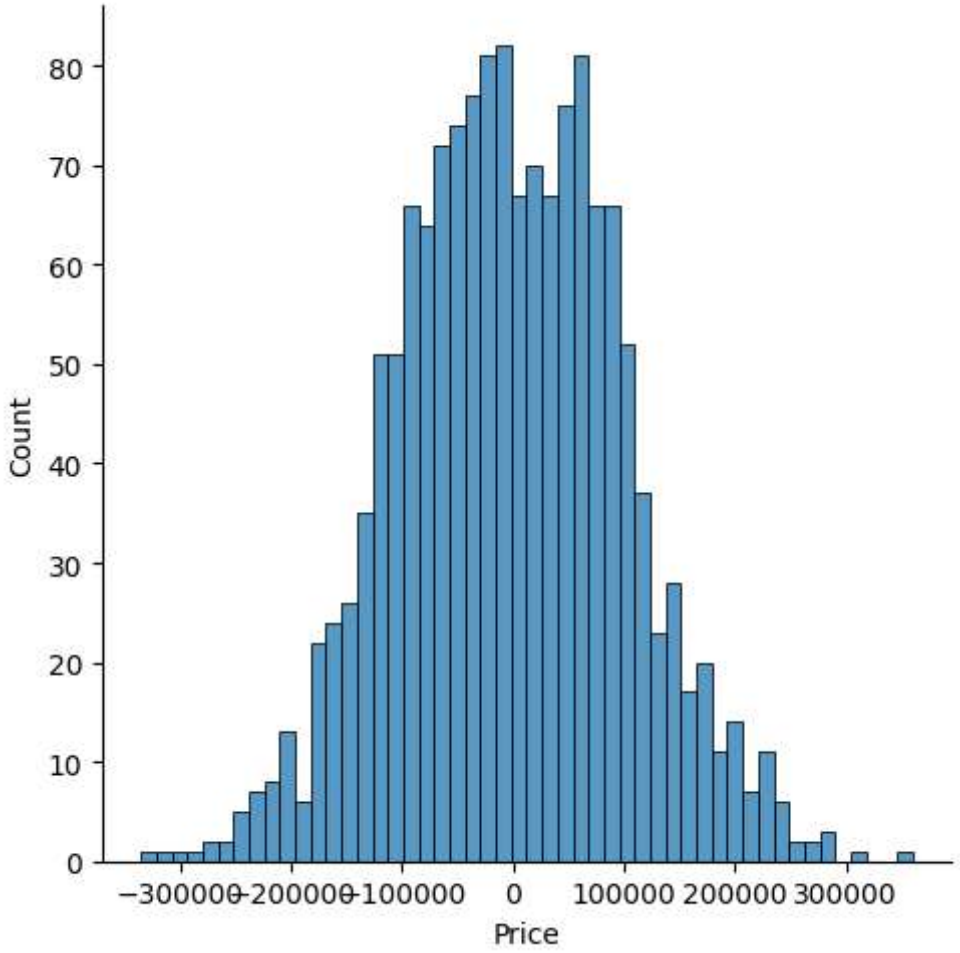
	coefficient
Avg. Area Income	21.617635
Avg. Area House Age	165221.119872
Avg. Area Number of Rooms	121405.376596
Avg. Area Number of Bedrooms	1318.718783
Area Population	15.225196

In [55]:
```
predictions=lm.predict(x_test)
plt.scatter(y_test,predictions)
```

Out[55]:
```
<matplotlib.collections.PathCollection at 0x29f04579090>
```



In [57]:
```
sns.displot((y_test-predictions),bins=50);
```



In [61]:
```
from sklearn import metrics
print('MAE:',metrics.mean_absolute_error(y_test,predictions))
print('MSE:',metrics.mean_squared_error(y_test,predictions))
print('RMSE:',np.sqrt(metrics.mean_squared_error(y_test,predictions)))
```

```
MAE: 81257.55795855928
MSE: 10169125565.897568
RMSE: 100842.0823163503
```

In [ ]:
```

```