In [2]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn import preprocessing,svm
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
```

In [3]:

```
df=pd.read_csv(r"C:\Users\hp\Downloads\data.csv")
df
```

Out[3]:

	date	price	bedrooms	bathrooms	sqft_living	sqft_lot	floors	waterfront
0	2014-05-02 00:00:00	3.130000e+05	3.0	1.50	1340	7912	1.5	0
1	2014-05-02 00:00:00	2.384000e+06	5.0	2.50	3650	9050	2.0	0
2	2014-05-02 00:00:00	3.420000e+05	3.0	2.00	1930	11947	1.0	0
3	2014-05-02 00:00:00	4.200000e+05	3.0	2.25	2000	8030	1.0	0
4	2014-05-02 00:00:00	5.500000e+05	4.0	2.50	1940	10500	1.0	0
...	...	...	...	...	...	...	...	...
4595	2014-07-09 00:00:00	3.081667e+05	3.0	1.75	1510	6360	1.0	0
4596	2014-07-09 00:00:00	5.343333e+05	3.0	2.50	1460	7573	2.0	0
4597	2014-07-09 00:00:00	4.169042e+05	3.0	2.50	3010	7014	2.0	0
4598	2014-07-10 00:00:00	2.034000e+05	4.0	2.00	2090	6630	1.0	0
4599	2014-07-10 00:00:00	2.206000e+05	3.0	2.50	1490	8102	2.0	0

4600 rows × 18 columns

In [4]:

```
df=df[['sqft_living','sqft_lot']]
df.head(10)
```

Out[4]:

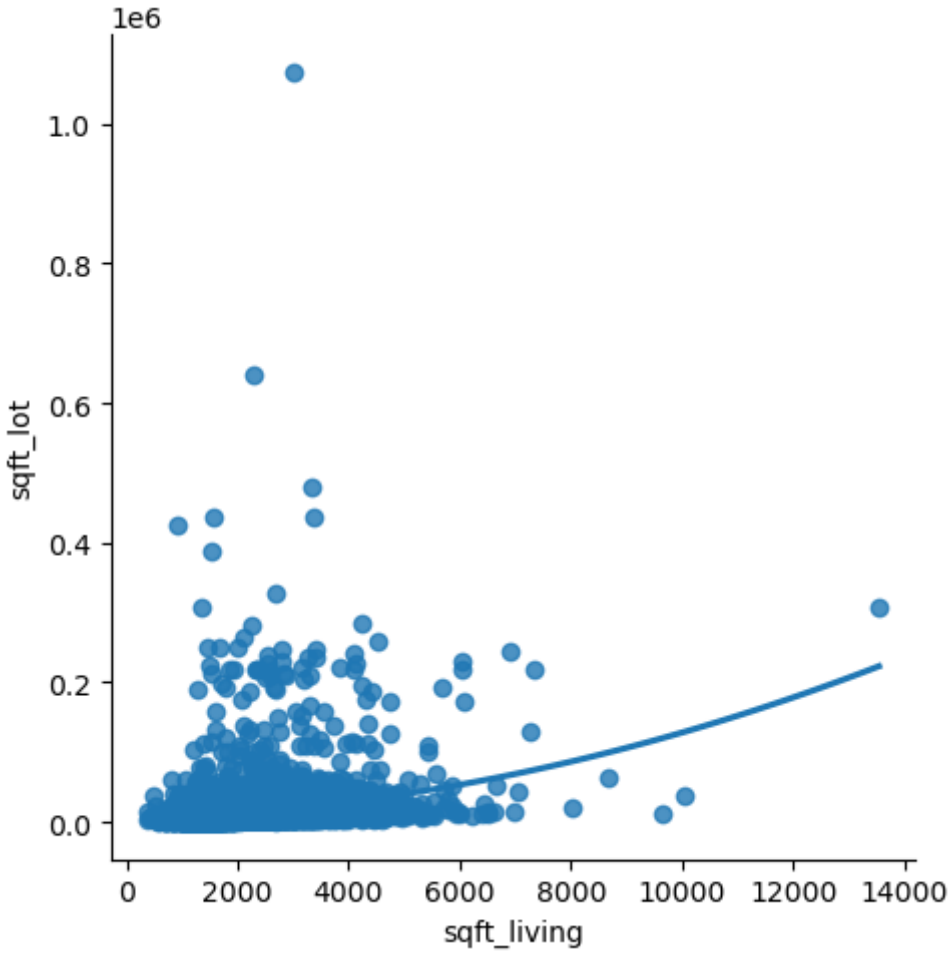
	sqft_living	sqft_lot
0	1340	7912
1	3650	9050
2	1930	11947
3	2000	8030
4	1940	10500
5	880	6380
6	1350	2560
7	2710	35868
8	2430	88426
9	1520	6200

In [5]:

```
sns.lmplot(x='sqft_living',y='sqft_lot',data=df,order=2,ci=None)
```

Out[5]:

```
<seaborn.axisgrid.FacetGrid at 0x2624096dd80>
```



In [6]:

```
df.describe()
```

Out[6]:

	sqft_living	sqft_lot
count	4600.000000	4.600000e+03
mean	2139.346957	1.485252e+04
std	963.206916	3.588444e+04
min	370.000000	6.380000e+02
25%	1460.000000	5.000750e+03
50%	1980.000000	7.683000e+03
75%	2620.000000	1.100125e+04
max	13540.000000	1.074218e+06

In [7]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4600 entries, 0 to 4599
Data columns (total 2 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   sqft_living  4600 non-null   int64
 1   sqft_lot     4600 non-null   int64
dtypes: int64(2)
memory usage: 72.0 KB
```

In [8]:

```
df.fillna(method='ffill',inplace=True)
```

```
C:\Users\hp\AppData\Local\Temp\ipykernel_5804\4116506308.py:1: SettingWith
CopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-doc
s/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://
pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-
view-versus-a-copy)
  df.fillna(method='ffill',inplace=True)
```

In [9]:

```
x=np.array(df['sqft_living']).reshape(-1,1)
y=np.array(df['sqft_lot']).reshape(-1,1)
```

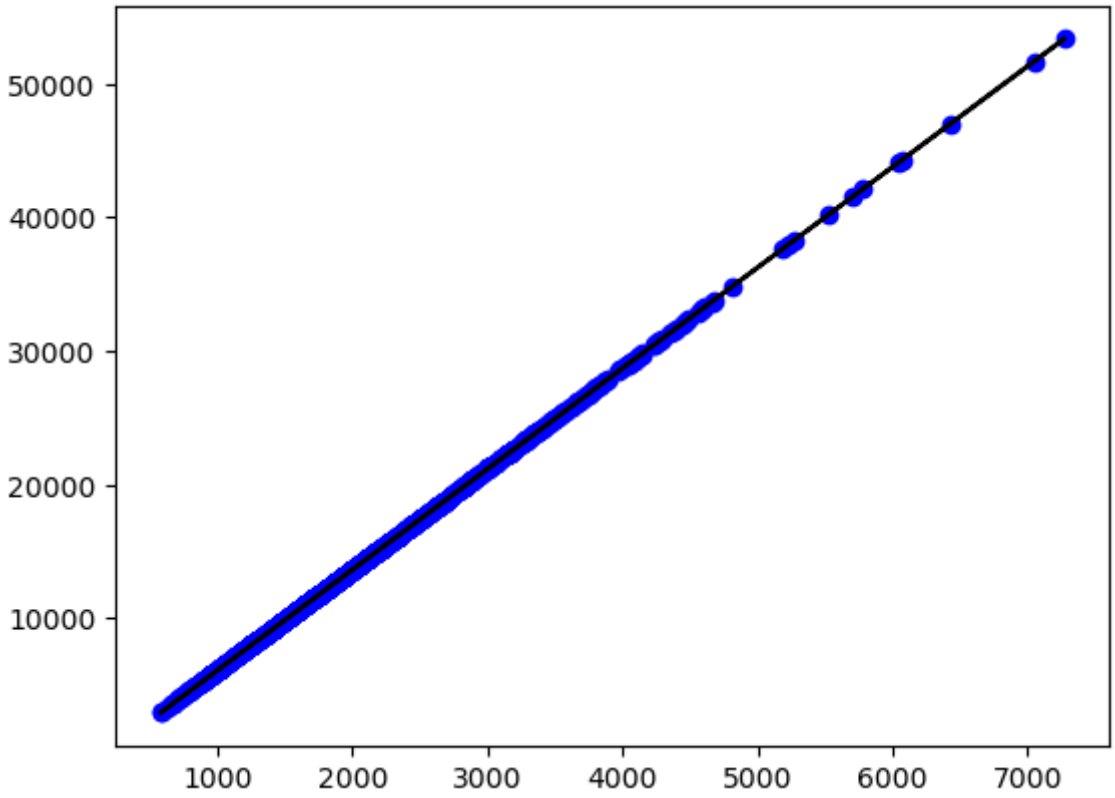
In [10]:

```
df.dropna(inplace=True)
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.25)
regr=LinearRegression()
regr.fit(x_train,y_train)
print(regr.score(x_test,y_test))
```

```
0.06317947171264593

C:\Users\hp\AppData\Local\Temp\ipykernel_5804\693062840.py:1: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-doc
s/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://
pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-
view-versus-a-copy)
  df.dropna(inplace=True)
```

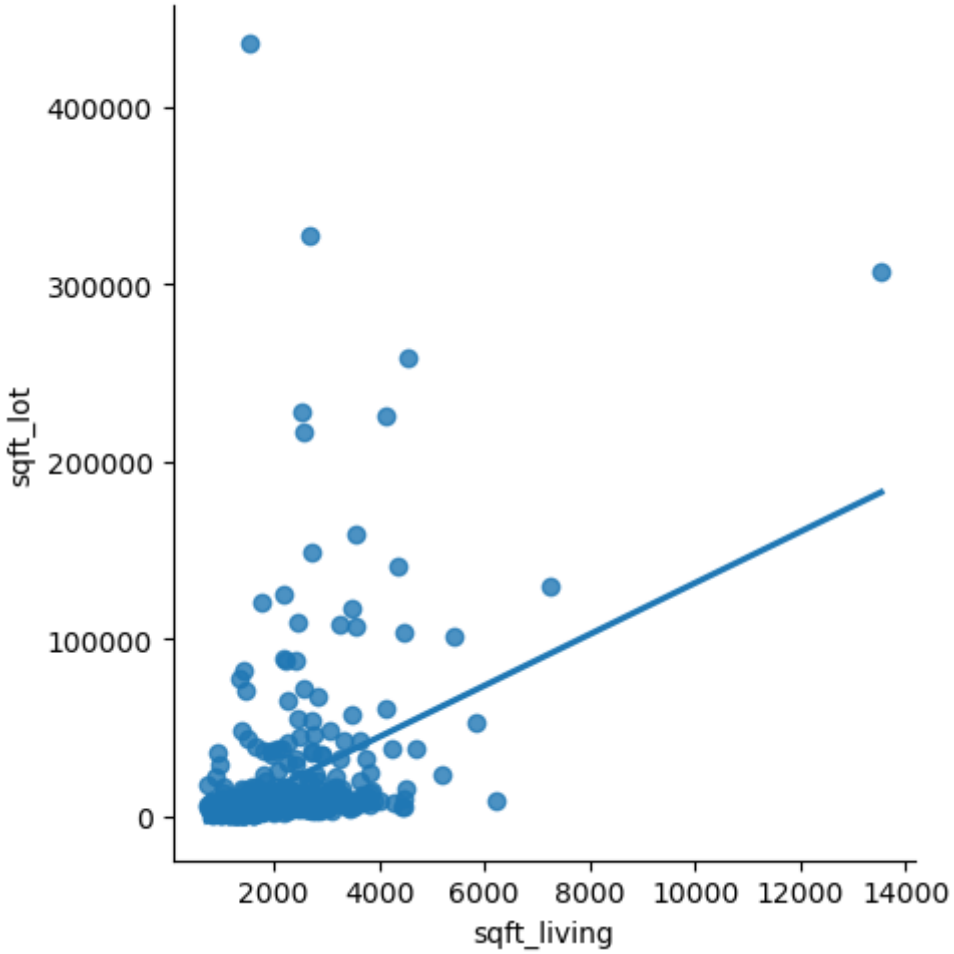
In [11]:

```
y_pred=regr.predict(x_test)
plt.scatter(x_test,y_pred,color='b')
plt.plot(x_test,y_pred,color='k')
plt.show()
```



In [12]:

```
df500=df[:][:500]
sns.lmplot(x="sqft_living",y="sqft_lot",data=df500,order=1,ci=None)
x=np.array(df500['sqft_living']).reshape(-1,1)
y=np.array(df500['sqft_lot']).reshape(-1,1)
df500.dropna(inplace=True)
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.25)
```



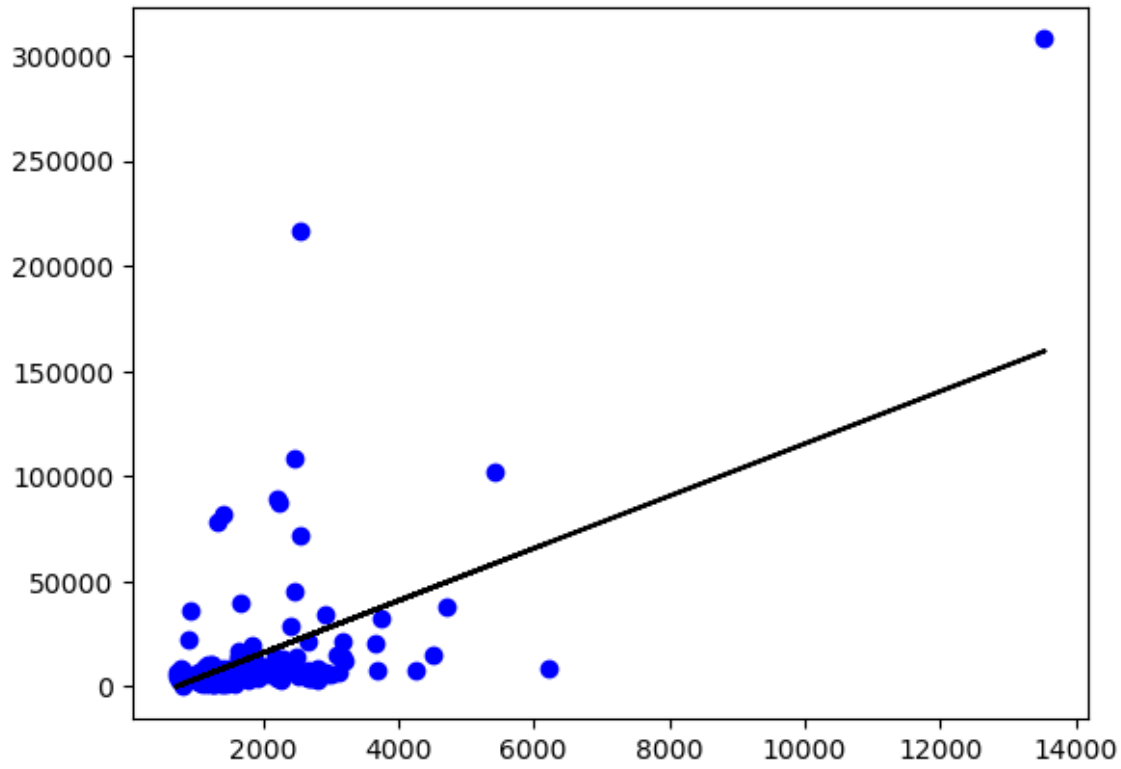
In [13]:

```
regr=LinearRegression()
regr.fit(x_train,y_train)
print("Regression:",regr.score(x_test,y_test))
```

```
Regression: 0.36786468635835523
```

In [14]:

```
y_pred=regr.predict(x_test)
plt.scatter(x_test,y_test,color='b')
plt.plot(x_test,y_pred,color='k')
plt.show()
```



In [15]:

```
from sklearn.linear_model import Lasso,Ridge
from sklearn.preprocessing import StandardScaler
```

In [16]:

```
features= df.columns[0:8]
target= df.columns[-1]
```

In [17]:

```
x= df[features].values
y= df[target].values

x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3,random_state=17)

print("The dimension of x_train is {}")
print("The dimension of x_test is {}")
scaler =StandardScaler()
x_train=scaler.fit_transform(x_train)
x_test=scaler.transform(x_test)
```

```
The dimension of x_train is {}
The dimension of x_test is {}
```

In [18]:

```
ridgeReg=Ridge(alpha=10)
ridgeReg.fit(x_train,y_train)
train_score_ridge=ridgeReg.score(x_train,y_train)
test_score_ridge=ridgeReg.score(x_test,y_test)
```

In [19]:

```
print("\n Ridge Model:\n")
print("the train score for ridge model is{}".format(train_score_ridge))
print("the test score for ridge model is{}".format(test_score_ridge))
```

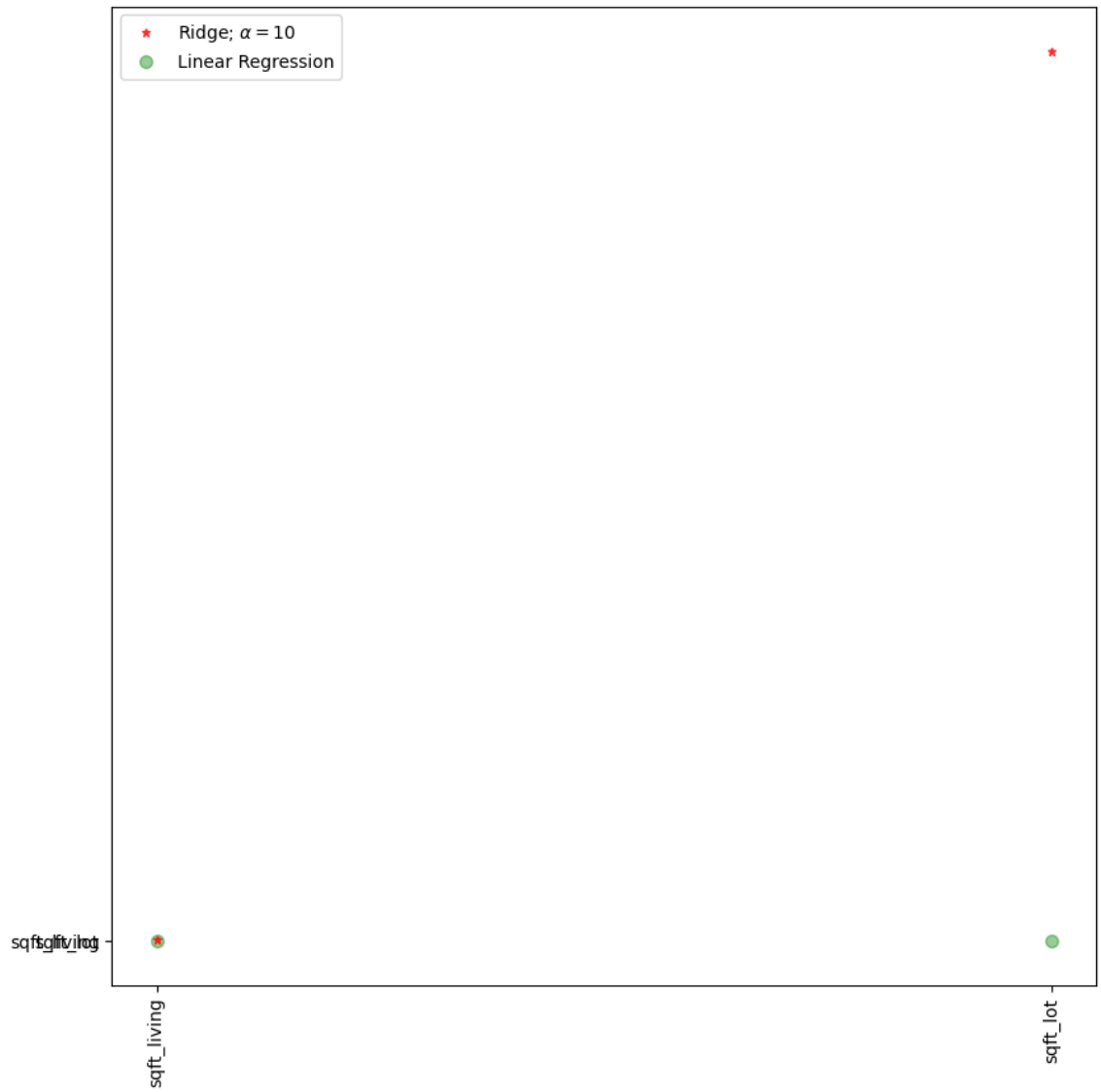
```
 Ridge Model:

the train score for ridge model is0.9999900245012017
the test score for ridge model is0.9999902306741419
```

In [20]:

```
lr=LinearRegression()
```

In [21]:

```
plt.figure(figsize= (10,10))
plt.plot(features,ridgeReg.coef_,alpha=0.7,linestyle='none',marker="*",markersize=5,colo
plt.plot(features,alpha=0.4,linestyle='none',marker='o',markersize=7,color="green",label
plt.xticks(rotation = 90)
plt.legend()
plt.show()
```



In [22]:

```
print("\n Lasso Model:\n")
lasso=Lasso(alpha=10)
lasso.fit(x_train,y_train)
train_score_ls=lasso.score(x_train,y_train)
test_score_ls=lasso.score(x_test,y_test)
print("The train score for ls model is {}".format(train_score_ls))
print("The test score for ls model is{}".format(test_score_ls))
```

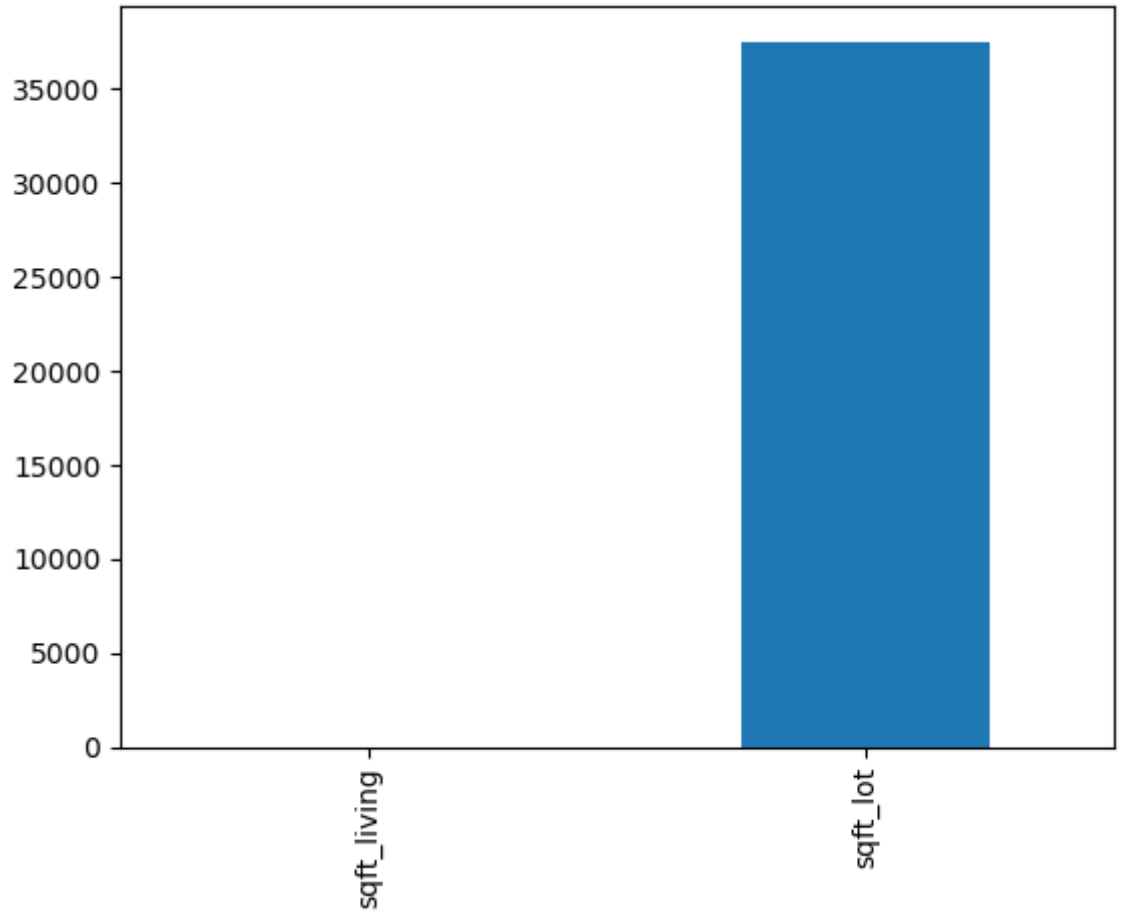
```
 Lasso Model:

The train score for ls model is 0.9999999291360324
The test score for ls model is0.9999999291231869
```

In [23]:

```
pd.Series(lasso.coef_,features).sort_values(ascending=True).plot(kind="bar")
```

Out[23]:

```
<Axes: >
```



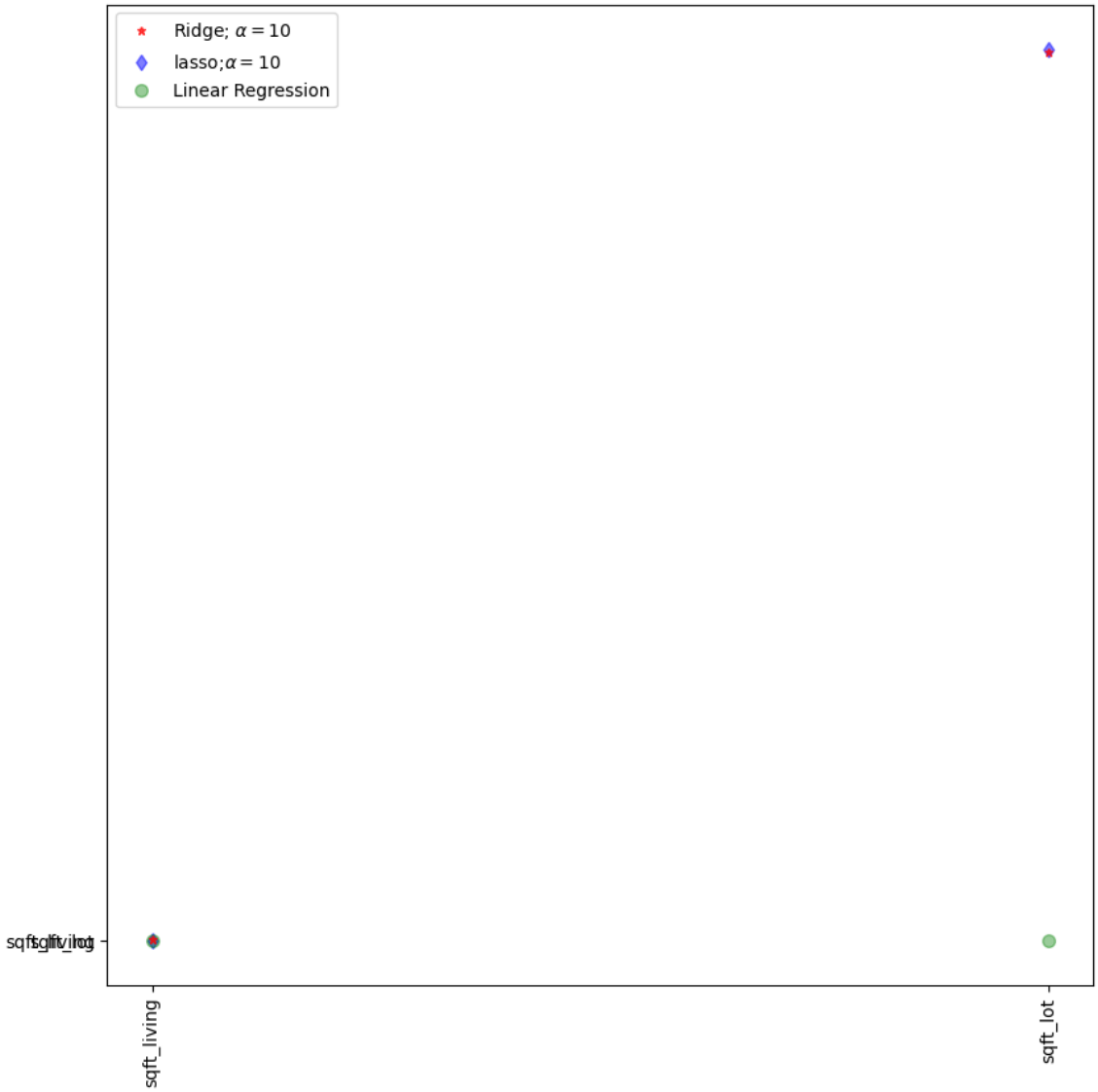
In [24]:

```
from sklearn.linear_model import LassoCV
lasso_cv=LassoCV(alphas=[0.0001,0.001,0.01,1,10],random_state=0).fit(x_train,y_train)
print(lasso_cv.score(x_train,y_train))
print(lasso_cv.score(x_test,y_test))
```

```
0.9999999999997705
0.9999999999996928
```

In [25]:

```
plt.figure(figsize= (10,10))
plt.plot(features,ridgeReg.coef_,alpha=0.7,linestyle='none',marker="*",markersize=5,colo
plt.plot(lasso_cv.coef_,alpha=0.5,linestyle='none',marker='d',markersize=6,color='blue',
plt.plot(features,alpha=0.4,linestyle='none',marker='o',markersize=7,color="green",label
plt.xticks(rotation = 90)
plt.legend()
plt.show()
```



In [26]:

```
from sklearn.linear_model import ElasticNet
regr=ElasticNet()
regr.fit(x,y)
print(regr.coef_)
print(regr.intercept_)
```

```
[7.84570096e-07 9.99999995e-01]
-0.0016010777617339045
```

In [27]:

```
y_pred_elastic = regr.predict(x_train)
mean_squared_error=np.mean((y_pred_elastic - y_train)**2)
print(mean_squared_error)
```

```
1635484254.2408667
```