In [1]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.linear_model import Ridge, RidgeCV, Lasso
from sklearn.preprocessing import StandardScaler
```

In [2]:
```
#data
data=pd.read_csv(r"C:\Users\anu\Downloads\fiat500_VehicleSelection_Dataset.csv")
data
```

Out[2]:

	ID	model	engine_power	age_in_days	km	previous_owners	lat	lon	price
0	1	lounge	51	882	25000	1	44.907242	8.611560	8900
1	2	pop	51	1186	32500	1	45.666359	12.241890	8800
2	3	sport	74	4658	142228	1	45.503300	11.417840	4200
3	4	lounge	51	2739	160000	1	40.633171	17.634609	6000
4	5	pop	73	3074	106880	1	41.903221	12.495650	5700
...	...	...	...	...	...	...	...	...	...
1533	1534	sport	51	3712	115280	1	45.069679	7.704920	5200
1534	1535	lounge	74	3835	112000	1	45.845692	8.666870	4600
1535	1536	pop	51	2223	60457	1	45.481541	9.413480	7500
1536	1537	lounge	51	2557	80750	1	45.000702	7.682270	5990
1537	1538	pop	51	1766	54276	1	40.323410	17.568270	7900

1538 rows × 9 columns

In [6]:
```
data = data[['engine_power','price']]
data.columns=['Eng','pri']
```

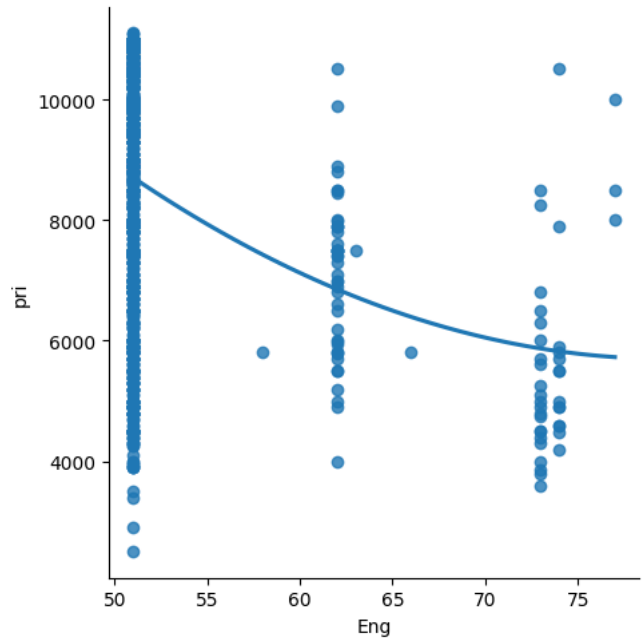
In [7]:
```
data.head()
```

Out[7]:

	Eng	pri
0	51	8900
1	51	8800
2	74	4200
3	51	6000
4	73	5700

In [8]:
```
sns.lmplot(x='Eng',y='pri',data=data,order=2,ci=None)
```

Out[8]:
```
<seaborn.axisgrid.FacetGrid at 0xd0779fb210>
```



In [9]:
```
data.tail()
```

Out[9]:

	Eng	pri
1533	51	5200
1534	74	4600
1535	51	7500
1536	51	5990
1537	51	7900

In [10]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1538 entries, 0 to 1537
Data columns (total 2 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   Eng     1538 non-null   int64
 1   pri     1538 non-null   int64
dtypes: int64(2)
memory usage: 24.2 KB
```

In [11]:
```
data.describe()
```

Out[11]:

	Eng	pri
count	1538.000000	1538.000000
mean	51.904421	8576.003901
std	3.988023	1939.958641
min	51.000000	2500.000000
25%	51.000000	7122.500000
50%	51.000000	9000.000000
75%	51.000000	10000.000000
max	77.000000	11100.000000

In [12]:
```
data.fillna(method='ffill')
```

Out[12]:

	Eng	pri
0	51	8900
1	51	8800
2	74	4200
3	51	6000
4	73	5700
...	...	...
1533	51	5200
1534	74	4600
1535	51	7500
1536	51	5990
1537	51	7900

1538 rows × 2 columns

In [13]:
```
x=np.array(data['Eng']).reshape(-1,1)
y=np.array(data['pri']).reshape(-1,1)
```

In [14]:
```
data.dropna(inplace=True)
```

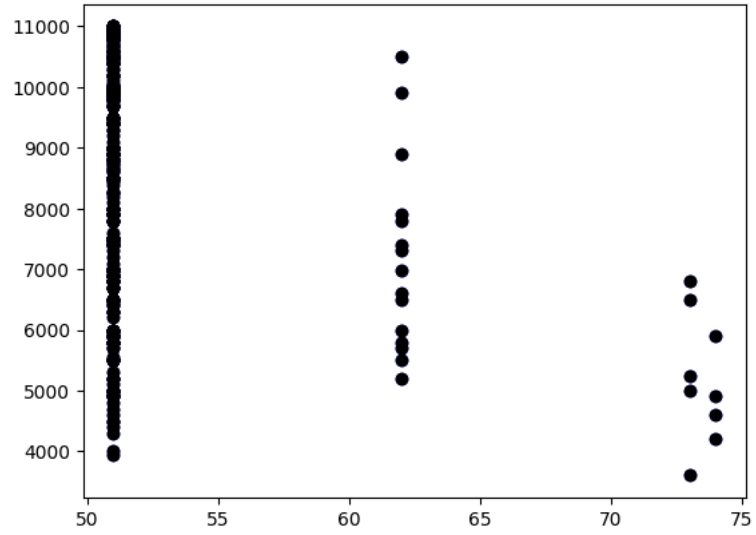
```
C:\Users\anu\AppData\Local\Temp\ipykernel_10712\1368182302.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/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)
  data.dropna(inplace=True)
```

In [15]:
```
X_train,X_test,y_train,y_test = train_test_split(x, y, test_size = 0.25)
# Splitting the data into training data and test data
regr = LinearRegression()
regr.fit(X_train, y_train)
print(regr.score(X_test, y_test))
```

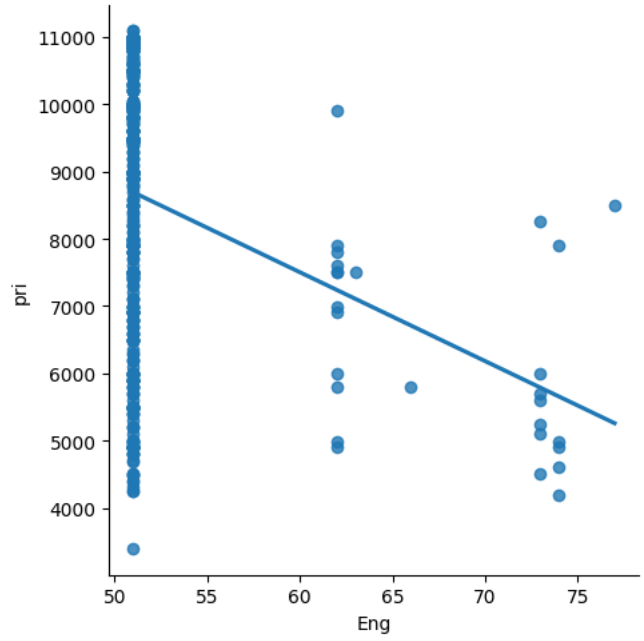
```
0.09139659405015021
```

In [18]:
```
y_pred = regr.predict(X_test)
plt.scatter(X_test, y_test, color = 'b')
plt.scatter(X_test, y_test, color = 'k')
plt.show()
```



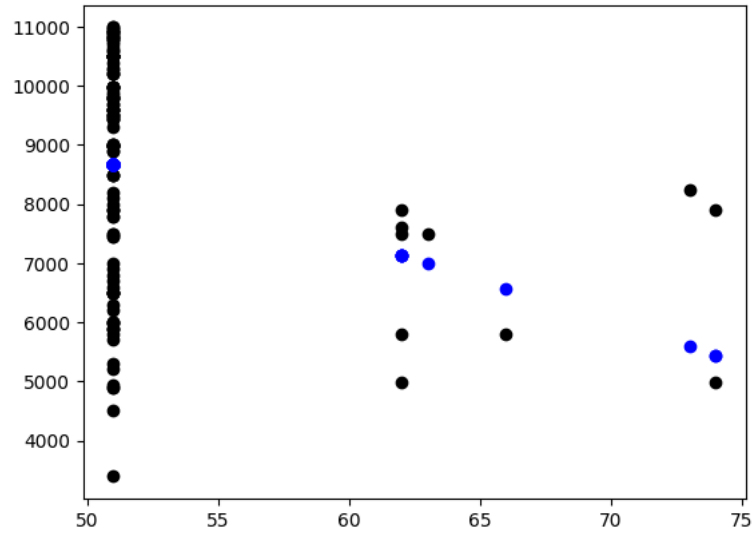
In [19]:
```
df500 = data[:][:500]
# Selecting the 1st 500 rows of teh data
sns.lmplot(x = "Eng", y = "pri", data = df500, order = 1, ci = None)
```

Out[19]: <seaborn.axisgrid.FacetGrid at 0xd079a6e690>



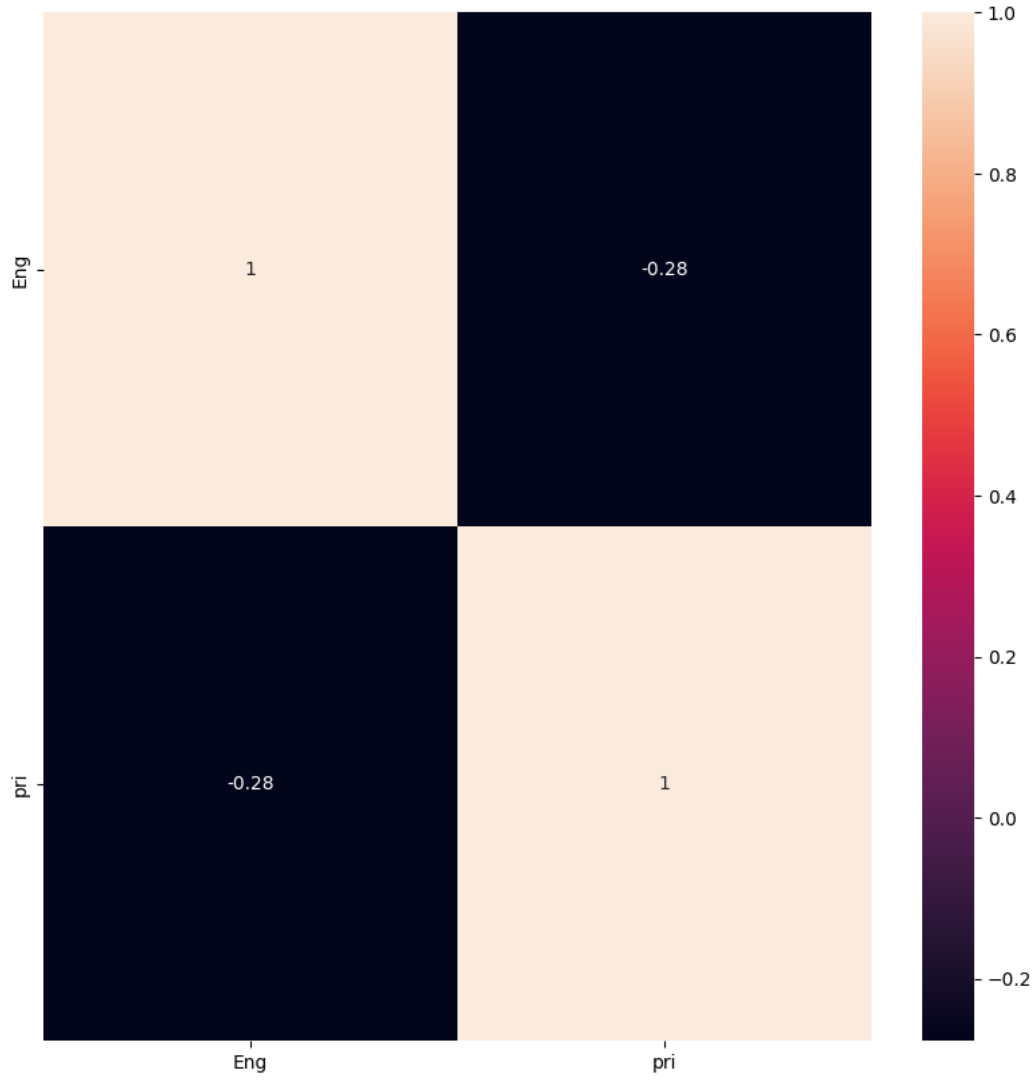
In [20]:
```
df500.fillna(method = 'ffill', inplace = True)
x = np.array(df500['Eng']).reshape(-1, 1)
y = np.array(df500['pri']).reshape(-1, 1)
df500.dropna(inplace = True)
X_train, X_test, y_train, y_test = train_test_split(x, y, test_size = 0.25)
regr = LinearRegression()
regr.fit(X_train, y_train)
print("Regression:",regr.score(X_test, y_test))
y_pred = regr.predict(X_test)
plt.scatter(X_test, y_test, color = 'k')
plt.scatter(X_test, y_pred, color = 'b')
plt.show()
```

```
Regression: 0.05889693200959778
```



In [21]:
```
plt.figure(figsize = (10, 10))
sns.heatmap(data.corr(), annot = True)
```

Out[21]: <Axes: >



In [22]:
```
from sklearn.linear_model import LinearRegression
from sklearn.metrics import r2_score
#Train the model
model = LinearRegression()
model.fit(X_train, y_train)
#Evaluating the model on the test set
y_pred = model.predict(X_test)
r2 = r2_score(y_test, y_pred)
print("R2 score:",r2)
```

```
R2 score: 0.05889693200959778
```

In [23]:
```
#Model
lr = LinearRegression()
#Fit model
lr.fit(X_train, y_train)
#predict
#prediction = lr.predict(X_test)
#actual
actual = y_test
train_score_lr = lr.score(X_train, y_train)
test_score_lr = lr.score(X_test, y_test)
print("\nLinear Regression Model:\n")
print("The train score for lr model is {}".format(train_score_lr))
print("The test score for lr model is {}".format(test_score_lr))
```

```
Linear Regression Model:

The train score for lr model is 0.07173702583107355
The test score for lr model is 0.05889693200959778
```

In [24]:
```
#Ridge Regression Model
ridgeReg = Ridge(alpha=10)
ridgeReg.fit(X_train,y_train)
#train and test scorefor ridge regression
train_score_ridge = ridgeReg.score(X_train, y_train)
test_score_ridge = ridgeReg.score(X_test, y_test)
print("\nRidge 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 is 0.07173681092195672
The test score for ridge model is 0.05896933621054745
```

In [25]:
```
#Lasso regression model
print("\nLasso 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 0.0717354853716482
The test score for ls model is 0.05908941499687659
```

In [26]:
```
#Using the linear CV model
from sklearn.linear_model import RidgeCV
#Ridge Cross validation
ridge_cv = RidgeCV(alphas = [0.0001, 0.001,0.01, 0.1, 1, 10]).fit(X_train, y_train)
#score
print("The train score for ridge model is {}".format(ridge_cv.score(X_train, y_train)))
print("The train score for ridge model is {}".format(ridge_cv.score(X_test, y_test)))
```

```
The train score for ridge model is 0.07173681092195705
The train score for ridge model is 0.05896933621050371
```

ELASTICNET REGRESSION

In [27]:
```
from sklearn.linear_model import ElasticNet
regr=ElasticNet()
regr.fit(x,y)
print(regr.coef_)
print(regr.intercept_)
```

```
[-128.05913739]
[15219.18170389]
```

In [28]:
```
y_predict_elastic = regr.predict(X_train)
```

In [29]:
```
mean_squared_error=np.mean((y_predict_elastic-y_train)**2)
print("mean squared error on test set",mean_squared_error)
```

```
mean squared error on test set 4473533.8762751445
```

In [ ]:
```

```