In [2]:

```
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 [3]:

```
df=pd.read_csv(r"C:\Users\chait\Downloads\fiat500_VehicleSelection_Dataset.csv")
df
```

Out[3]:

	ID	model	engine_power	age_in_days	km	previous_owners	lat	
0	1	lounge	51	882	25000	1	44.907242	8.611
1	2	pop	51	1186	32500	1	45.666359	12.241
2	3	sport	74	4658	142228	1	45.503300	11.417
3	4	lounge	51	2739	160000	1	40.633171	17.634
4	5	pop	73	3074	106880	1	41.903221	12.495
...	...	...	...	...	...	...	...	
1533	1534	sport	51	3712	115280	1	45.069679	7.704
1534	1535	lounge	74	3835	112000	1	45.845692	8.666
1535	1536	pop	51	2223	60457	1	45.481541	9.413
1536	1537	lounge	51	2557	80750	1	45.000702	7.682
1537	1538	pop	51	1766	54276	1	40.323410	17.568

1538 rows × 9 columns

In [4]:

```
df = df[['engine_power','price']]
df.columns=['Eng','pri']
```

In [5]:

```
df.head()
```

Out[5]:

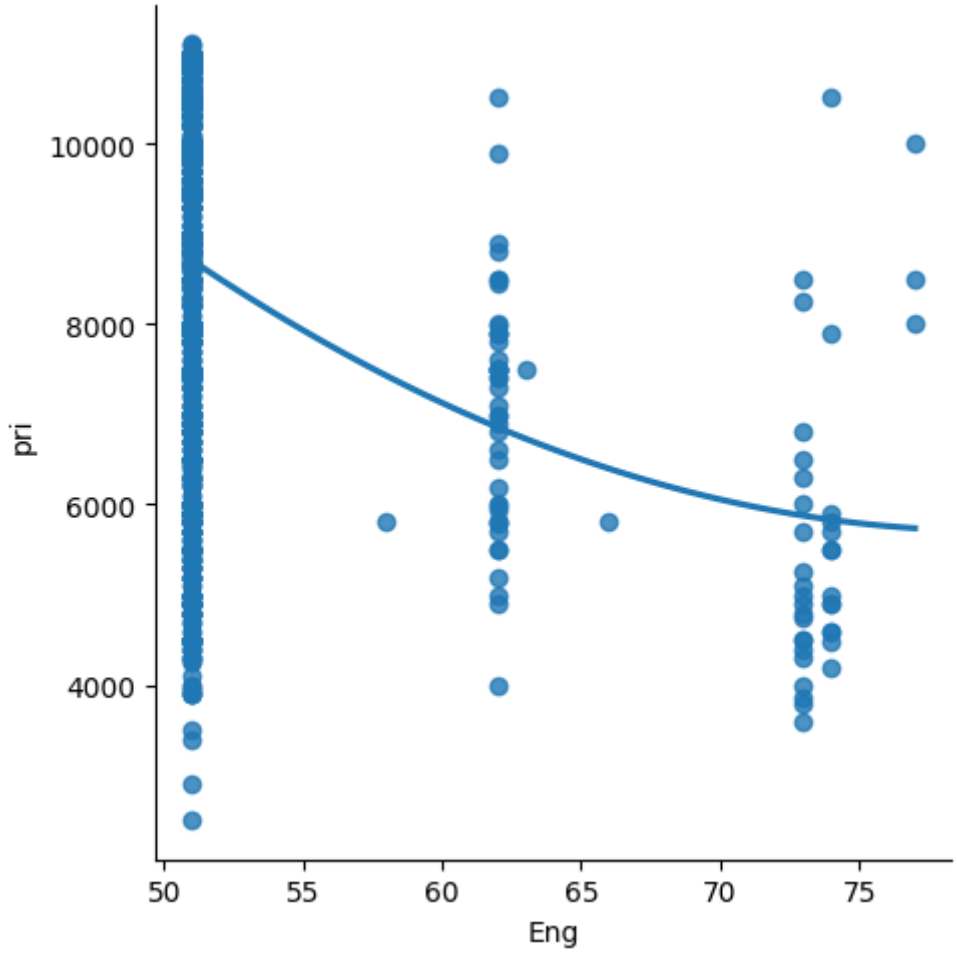
	Eng	pri
0	51	8900.0
1	51	8800.0
2	74	4200.0
3	51	6000.0
4	73	5700.0

In [35]:

```
sns.lmplot(x='Eng',y='pri',data=data,order=2,ci=None)
```

Out[35]:

```
<seaborn.axisgrid.FacetGrid at 0x1b45eb35540>
```



In [6]:

```
df.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     1537 non-null   float64
dtypes: float64(1), int64(1)
memory usage: 24.2 KB
```

In [7]:

```
df.describe()
```

Out[7]:

	Eng	pri
count	1538.000000	1537.000000
mean	51.904421	8577.940143
std	3.988023	1939.102864
min	51.000000	2500.000000
25%	51.000000	7190.000000
50%	51.000000	9000.000000
75%	51.000000	10000.000000
max	77.000000	11100.000000

In [8]:

```
df.fillna(method='ffill')
```

Out[8]:

	Eng	pri
0	51	8900.0
1	51	8800.0
2	74	4200.0
3	51	6000.0
4	73	5700.0
...	...	...
1533	51	5200.0
1534	74	4600.0
1535	51	7500.0
1536	51	5990.0
1537	51	7900.0

1538 rows × 2 columns

In [39]:

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

In [9]:

```
df.dropna(inplace=True)
```

```
C:\Users\chait\AppData\Local\Temp\ipykernel_11644\1379821321.py:1: Settin
gWithCopyWarning:
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-do
cs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (http
s://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returni
ng-a-view-versus-a-copy)
  df.dropna(inplace=True)
```

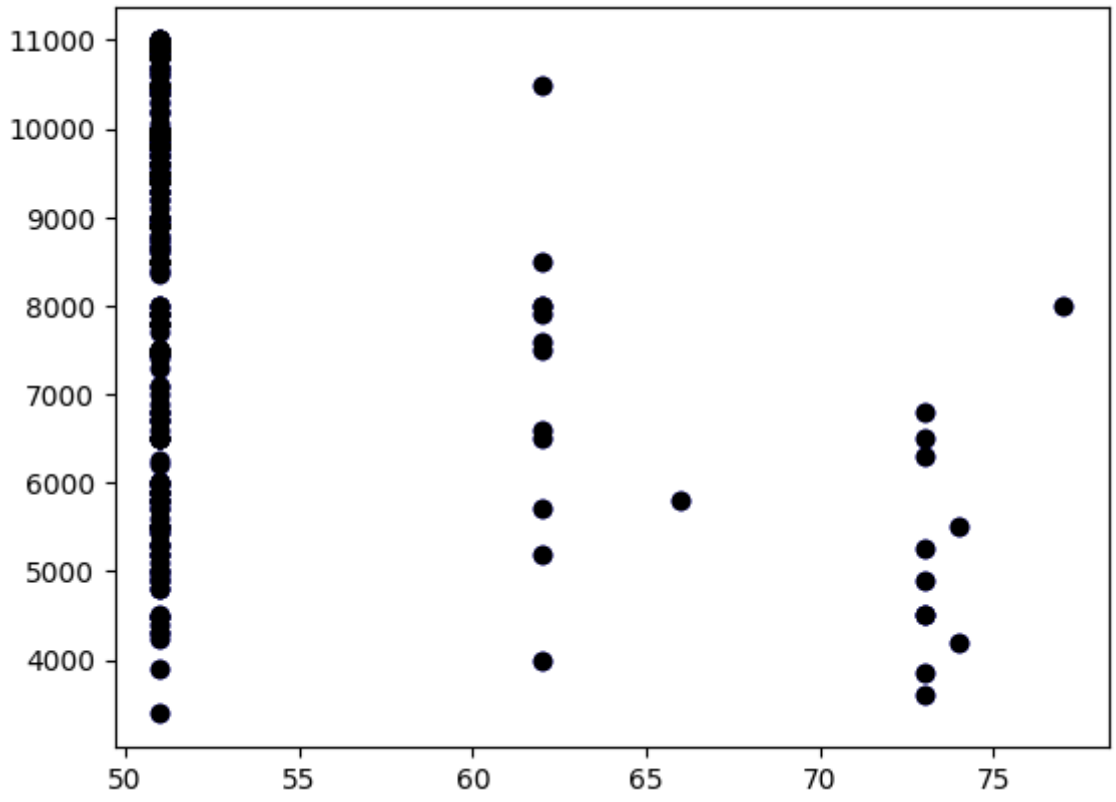
In [43]:

```
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))
```

```
0.10641670955534488
```

In [47]:

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

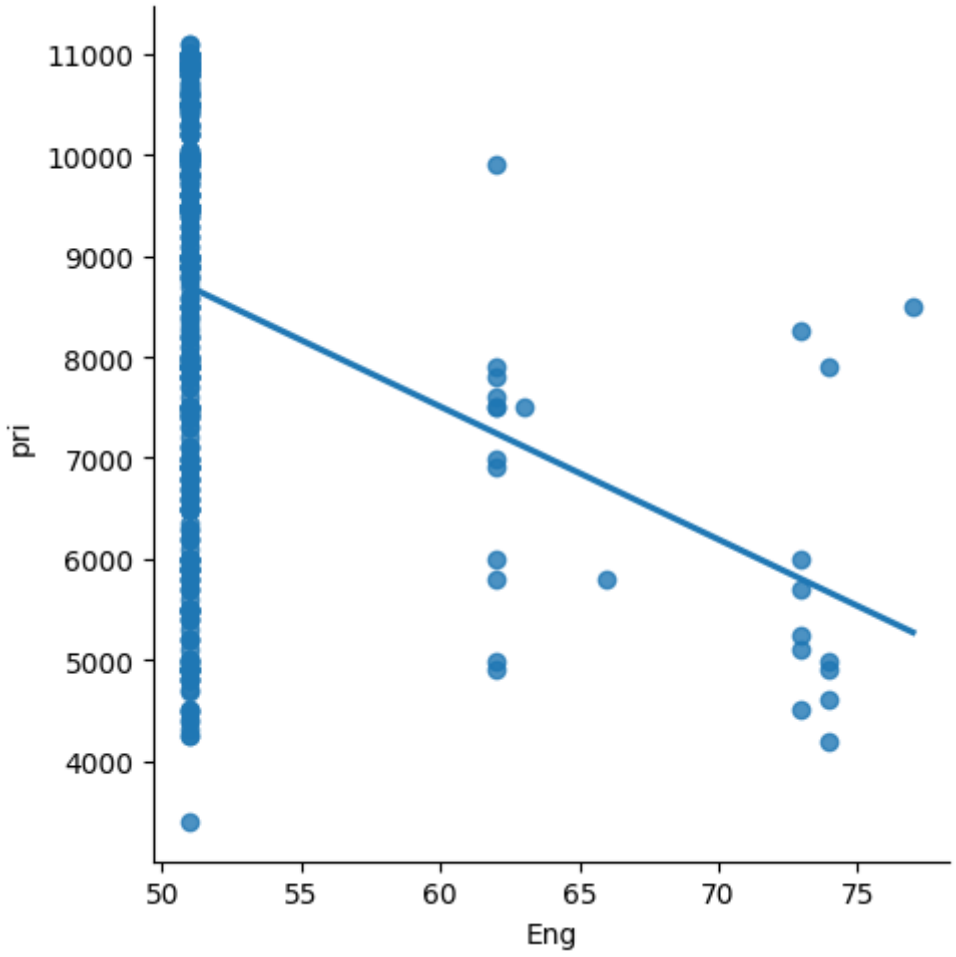


In [12]:

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

Out[12]:

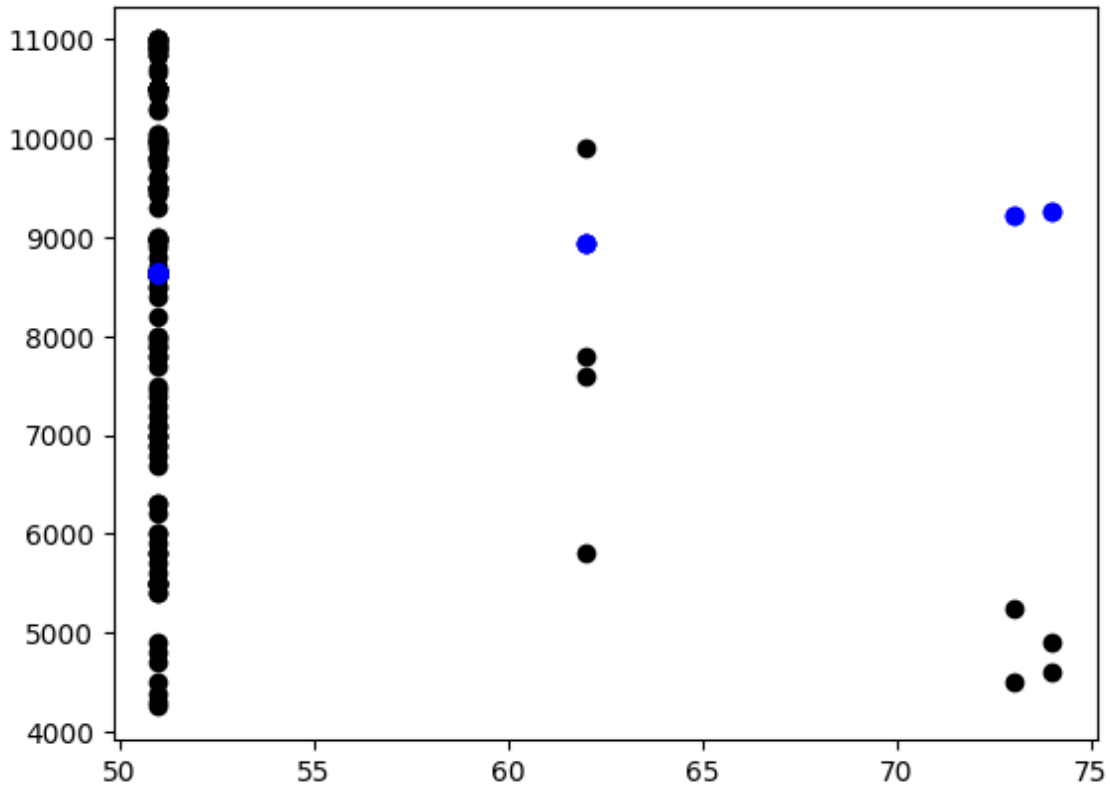
```
<seaborn.axisgrid.FacetGrid at 0x26a99832f50>
```



In [51]:

```
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: -0.06392634929887997
```

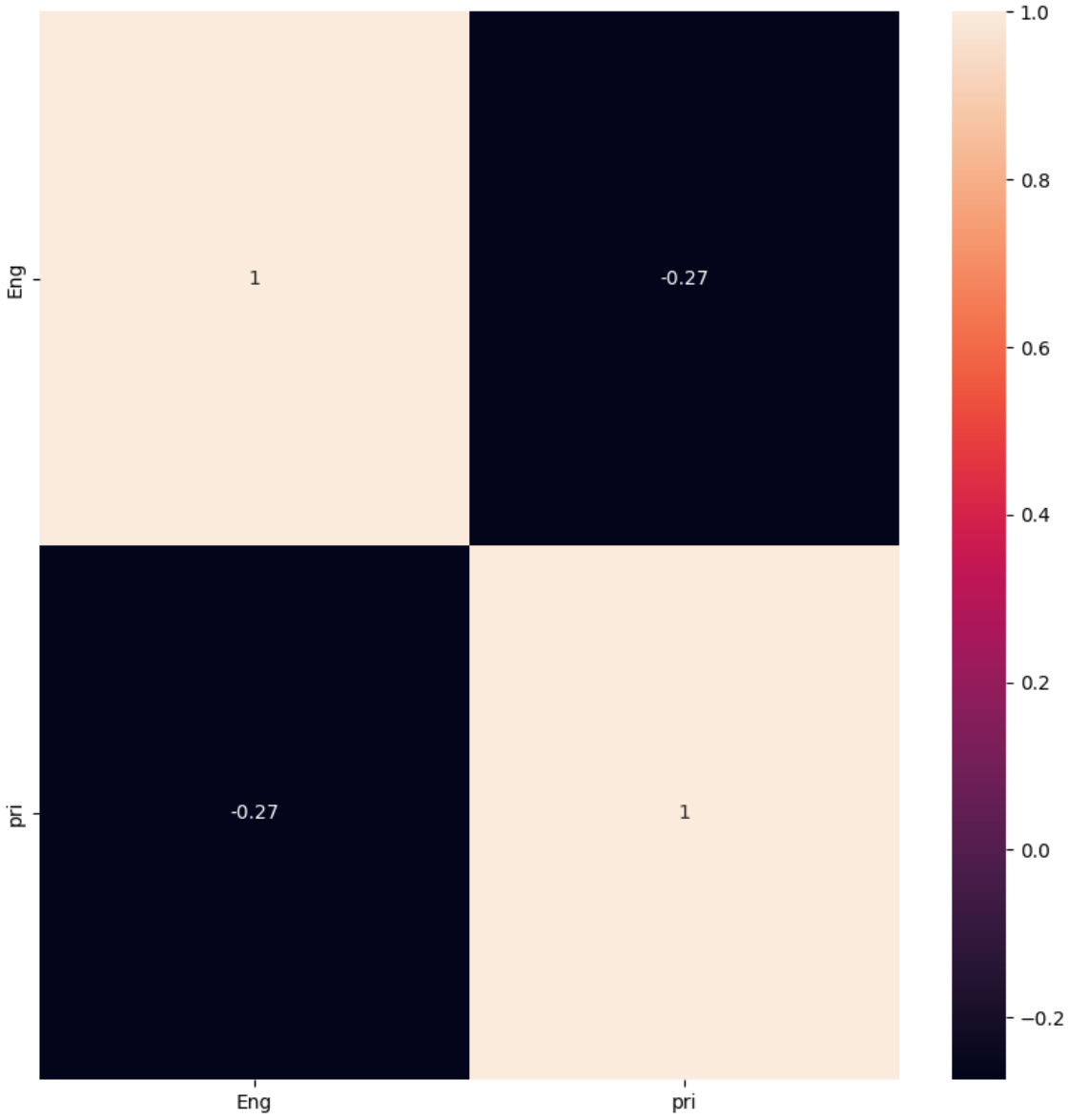


In [52]:

```
plt.figure(figsize=(10,10))
sns.heatmap(data.corr(), annot=True)
```

Out[52]:

<Axes: >



In [54]:

```
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: 0.06820902396944384

In [55]:

```
#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 0.05546607436649442
The test score for lr model is 0.06820902396944384
```

In [56]:

```
#Ridge Regression Model
ridgeReg=Ridge(alpha=10)
ridgeReg.fit(X_train,y_train)
#train and test score 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 0.05546587759100419
The test score for ridge model is 0.06815969807609779
```

In [57]:

```
#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 0.05546428290859384
The test score for ls model is 0.06805871778847472
```

In [59]:

```
#Using the linear CV model
from sklearn.linear_model import LassoCV
#Lasso cross validation
lasso_cv=LassoCV(alphas=[0.0001,0.001,0.01,0.1,1,10],random_state=0).fit(X_train,y_train
#score
print(lasso_cv.score(X_train,y_train))
print(lasso_cv.score(X_test,y_test))
```

```
0.05546428290859384
0.06805871778847472

C:\Users\chait\AppData\Local\Programs\Python\Python310\lib\site-packages
\sklearn\linear_model\_coordinate_descent.py:1568: DataConversionWarning:
A column-vector y was passed when a 1d array was expected. Please change
the shape of y to (n_samples, ), for example using ravel().
  y = column_or_1d(y, warn=True)
```

Elastic Net Regression

In [60]:

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

```
[-127.34873135]
[15183.10260273]
```

In [61]:

```
y_pred_elastic=regr.predict(X_train)
```

In [62]:

```
mean_squared_error=np.mean((y_pred_elastic-y_train)**2)
print("Mean Squared Error on test set",mean_squared_error)
```

```
Mean Squared Error on test set 4184990.9841475063
```

In [ ]:

```

```