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

In [2]:
```python
df=pd.read_csv(r"C:\Users\Welcome\Downloads\used_cars_data.csv")
df
```

Out[2]:

	S.No.	Name	Location	Year	Kilometers_Driven	Fuel_Type	Transmission	Owner_T
0	0	Maruti Wagon R LXI CNG	Mumbai	2010	72000	CNG	Manual	F
1	1	Hyundai Creta 1.6 CRDi SX Option	Pune	2015	41000	Diesel	Manual	F
2	2	Honda Jazz V	Chennai	2011	46000	Petrol	Manual	F
3	3	Maruti Ertiga VDI	Chennai	2012	87000	Diesel	Manual	F
4	4	Audi A4 New 2.0 TDI Multitronic	Coimbatore	2013	40670	Diesel	Automatic	Sec
...	...	...	...	...	...	...	...	
7248	7248	Volkswagen Vento Diesel Trendline	Hyderabad	2011	89411	Diesel	Manual	F
7249	7249	Volkswagen Polo GT TSI	Mumbai	2015	59000	Petrol	Automatic	F
7250	7250	Nissan Micra Diesel XV	Kolkata	2012	28000	Diesel	Manual	F
7251	7251	Volkswagen Polo GT TSI	Pune	2013	52262	Petrol	Automatic	T
7252	7252	Mercedes-Benz E-Class 2009-2013 E 220 CDI Avan...	Kochi	2014	72443	Diesel	Automatic	F

7253 rows × 14 columns

In [3]:
```
df.head()
```

Out[3]:

	S.No.	Name	Location	Year	Kilometers_Driven	Fuel_Type	Transmission	Owner_Type
0	0	Maruti Wagon R LXI CNG	Mumbai	2010	72000	CNG	Manual	First
1	1	Hyundai Creta 1.6 CRDi SX Option	Pune	2015	41000	Diesel	Manual	First
2	2	Honda Jazz V	Chennai	2011	46000	Petrol	Manual	First
3	3	Maruti Ertiga VDI	Chennai	2012	87000	Diesel	Manual	First
4	4	Audi A4 New 2.0 TDI Multitronic	Coimbatore	2013	40670	Diesel	Automatic	Second

In [4]:
```
df.tail()
```

Out[4]:

	S.No.	Name	Location	Year	Kilometers_Driven	Fuel_Type	Transmission	Owner_Ty
7248	7248	Volkswagen Vento Diesel Trendline	Hyderabad	2011	89411	Diesel	Manual	F
7249	7249	Volkswagen Polo GT TSI	Mumbai	2015	59000	Petrol	Automatic	F
7250	7250	Nissan Micra Diesel XV	Kolkata	2012	28000	Diesel	Manual	F
7251	7251	Volkswagen Polo GT TSI	Pune	2013	52262	Petrol	Automatic	Tl
7252	7252	Mercedes-Benz E-Class 2009-2013 E 220 CDI Avan...	Kochi	2014	72443	Diesel	Automatic	F

In [5]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7253 entries, 0 to 7252
Data columns (total 14 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   S.No.              7253 non-null   int64  
 1   Name               7253 non-null   object 
 2   Location           7253 non-null   object 
 3   Year               7253 non-null   int64  
 4   Kilometers_Driven  7253 non-null   int64  
 5   Fuel_Type          7253 non-null   object 
 6   Transmission       7253 non-null   object 
 7   Owner_Type         7253 non-null   object 
 8   Mileage            7251 non-null   object 
 9   Engine             7207 non-null   object 
 10  Power              7207 non-null   object 
 11  Seats              7200 non-null   float64
 12  New_Price          1006 non-null   object 
 13  Price              6019 non-null   float64
dtypes: float64(2), int64(3), object(9)
memory usage: 793.4+ KB
```

In [6]:
```
df.describe()
```

Out[6]:

	S.No.	Year	Kilometers_Driven	Seats	Price
count	7253.000000	7253.000000	7.253000e+03	7200.000000	6019.000000
mean	3626.000000	2013.365366	5.869906e+04	5.279722	9.479468
std	2093.905084	3.254421	8.442772e+04	0.811660	11.187917
min	0.000000	1996.000000	1.710000e+02	0.000000	0.440000
25%	1813.000000	2011.000000	3.400000e+04	5.000000	3.500000
50%	3626.000000	2014.000000	5.341600e+04	5.000000	5.640000
75%	5439.000000	2016.000000	7.300000e+04	5.000000	9.950000
max	7252.000000	2019.000000	6.500000e+06	10.000000	160.000000

In [7]:
```
df.shape
```

Out[7]:
```
(7253, 14)
```

In [8]:
```
df.isna().any()
```

Out[8]:
```
S.No.                False
Name                 False
Location             False
Year                 False
Kilometers_Driven    False
Fuel_Type            False
Transmission         False
Owner_Type           False
Mileage               True
Engine                True
Power                 True
Seats                 True
New_Price             True
Price                 True
dtype: bool
```

In [9]:
```
df.isnull().sum()
```

Out[9]:
```
S.No.                   0
Name                    0
Location                0
Year                    0
Kilometers_Driven       0
Fuel_Type               0
Transmission            0
Owner_Type              0
Mileage                 2
Engine                 46
Power                  46
Seats                  53
New_Price            6247
Price                1234
dtype: int64
```

In [11]:
```
df.fillna(value=0,inplace=True)
```

In [12]:
```
df.isnull().sum()
```

Out[12]:
```
S.No.                0
Name                 0
Location             0
Year                 0
Kilometers_Driven    0
Fuel_Type            0
Transmission         0
Owner_Type           0
Mileage              0
Engine               0
Power                0
Seats                0
New_Price            0
Price                0
dtype: int64
```

In [13]:
```
df=df[['Year','Price']]
df.columns=['Yr','Pr']
```

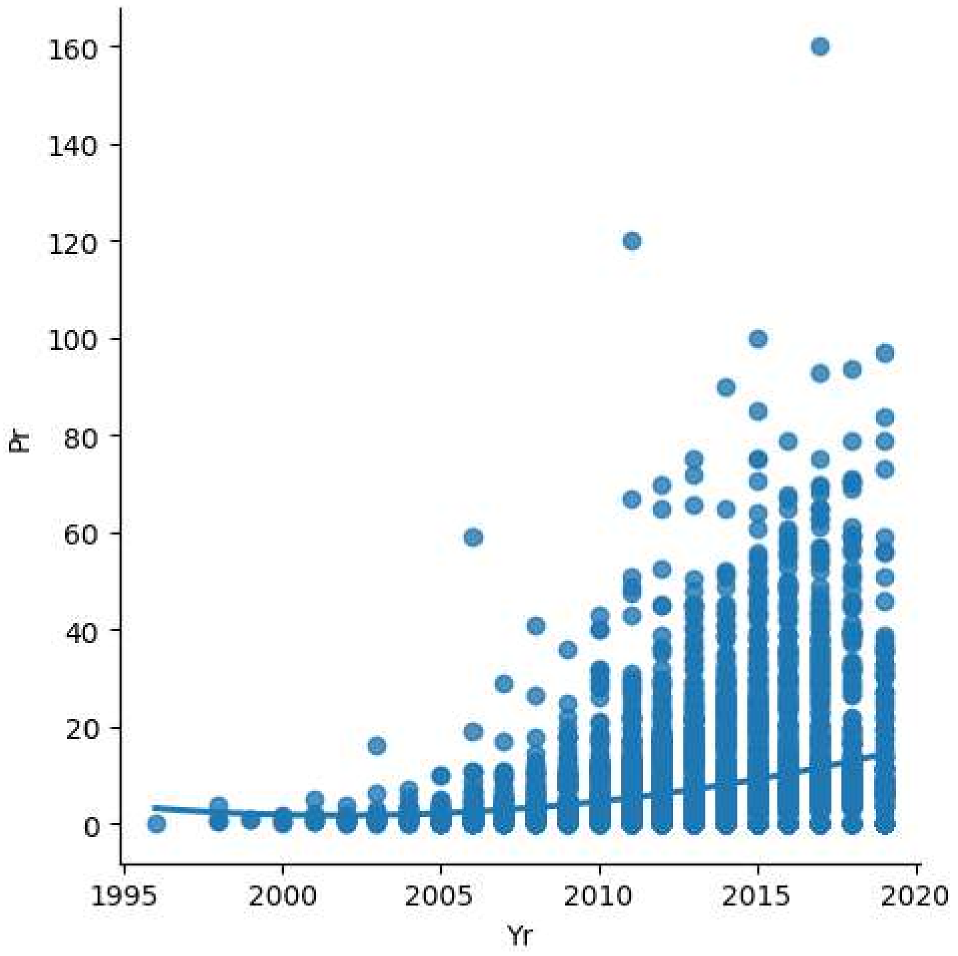
In [15]:
```
df.head(10)
```

Out[15]:

	Yr	Pr
0	2010	1.75
1	2015	12.50
2	2011	4.50
3	2012	6.00
4	2013	17.74
5	2012	2.35
6	2013	3.50
7	2016	17.50
8	2013	5.20
9	2012	1.95

In [17]:
```
sns.lmplot(x="Yr",y="Pr",data=df,order=2,ci=None)
```

Out[17]:
```
<seaborn.axisgrid.FacetGrid at 0x20afd13ccd0>
```



In [18]:
```
df.describe()
```

Out[18]:

	Yr	Pr
count	7253.000000	7253.000000
mean	2013.365366	7.866665
std	3.254421	10.796286
min	1996.000000	0.000000
25%	2011.000000	2.290000
50%	2014.000000	4.650000
75%	2016.000000	8.400000
max	2019.000000	160.000000

In [19]:
```
df.fillna(method='ffill',inplace=True)
```

```
C:\Users\Welcome\AppData\Local\Temp\ipykernel_15892\4116506308.py:1: SettingW
ithCopyWarning:
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/s
table/user_guide/indexing.html#returning-a-view-versus-a-copy (https://panda
s.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-ver
sus-a-copy)
  df.fillna(method='ffill',inplace=True)
```

In [20]:
```
x=np.array(df['Yr']).reshape(-1,1)
y=np.array(df['Pr']).reshape(-1,1)

```

In [21]:
```
df.dropna(inplace=True)
```

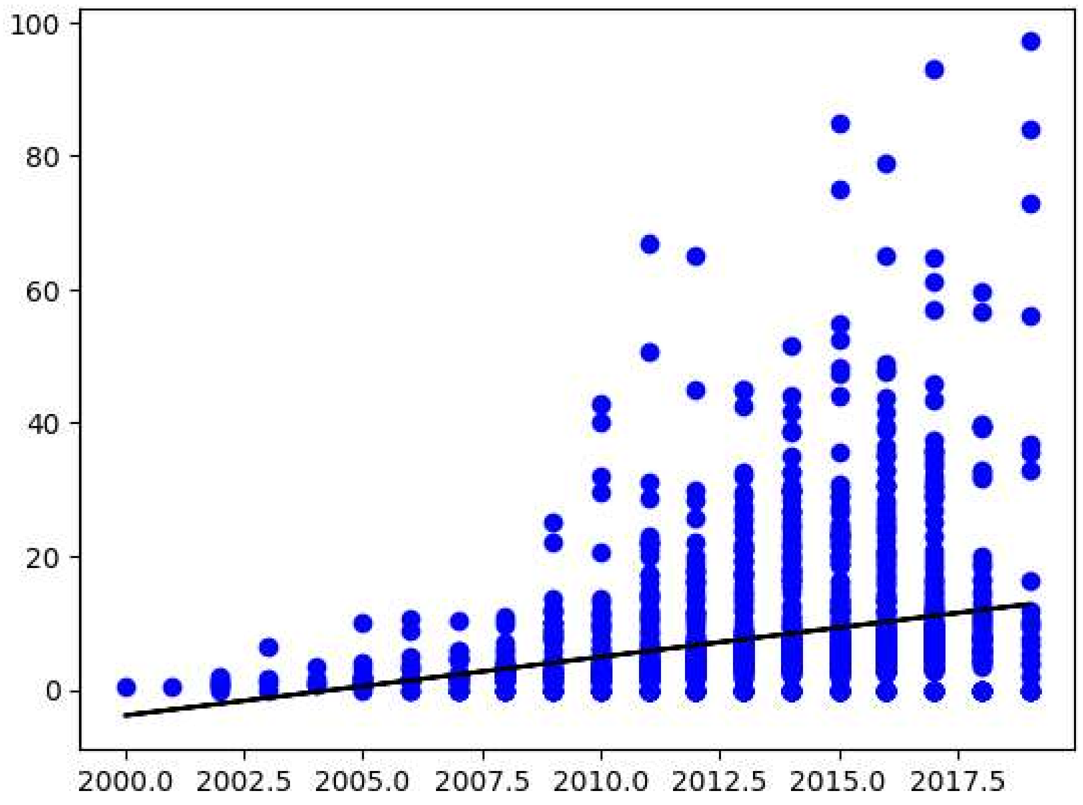
```
C:\Users\Welcome\AppData\Local\Temp\ipykernel_15892\1379821321.py:1: SettingW
ithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

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

In [22]:
```
X_train,X_test,y_train,y_test=train_test_split(x,y,test_size=0.25)
reg=LinearRegression()
reg.fit(X_train,y_train)
print(reg.score(X_test,y_test))
```

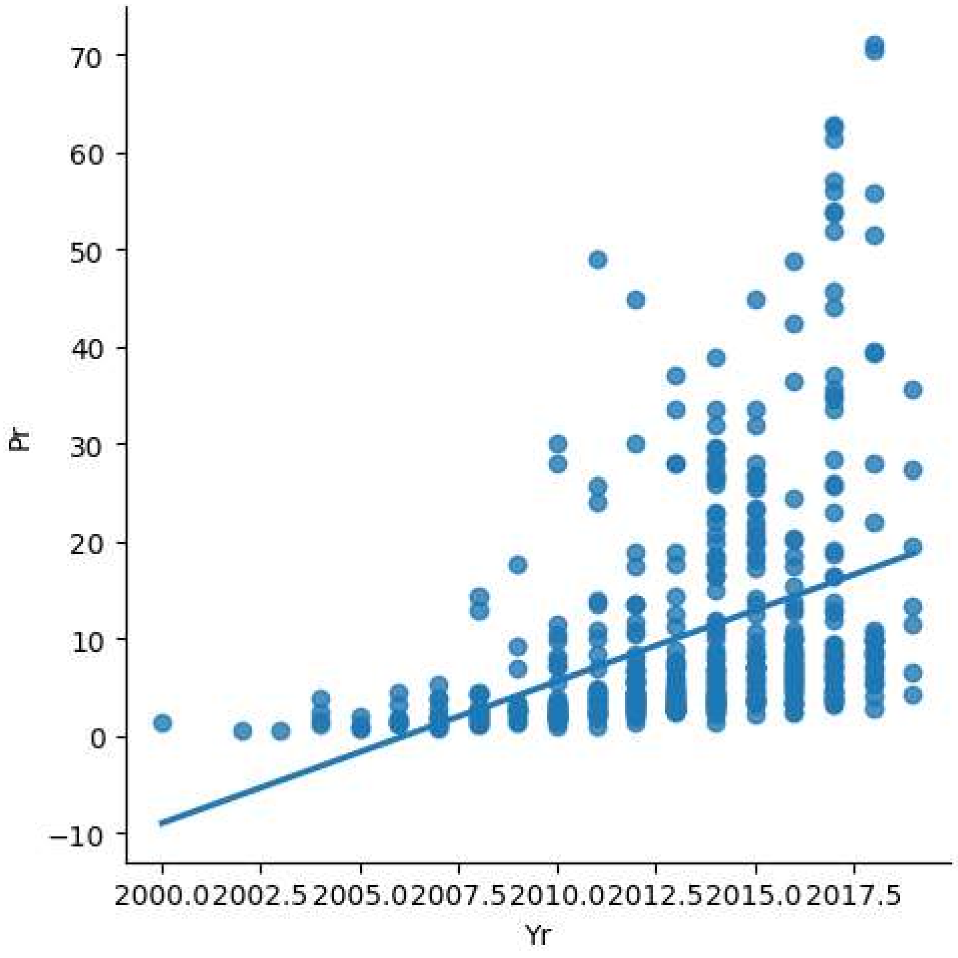
```
0.060339820443730874
```

In [23]:
```
y_pred=reg.predict(X_test)
plt.scatter(X_test,y_test,color='b')
plt.plot(X_test,y_pred,color='k')
plt.show()
```



In [24]:
```
df500=df[:][:500]
sns.lmplot(x="Yr",y="Pr",data=df500,order=1,ci=None)
```

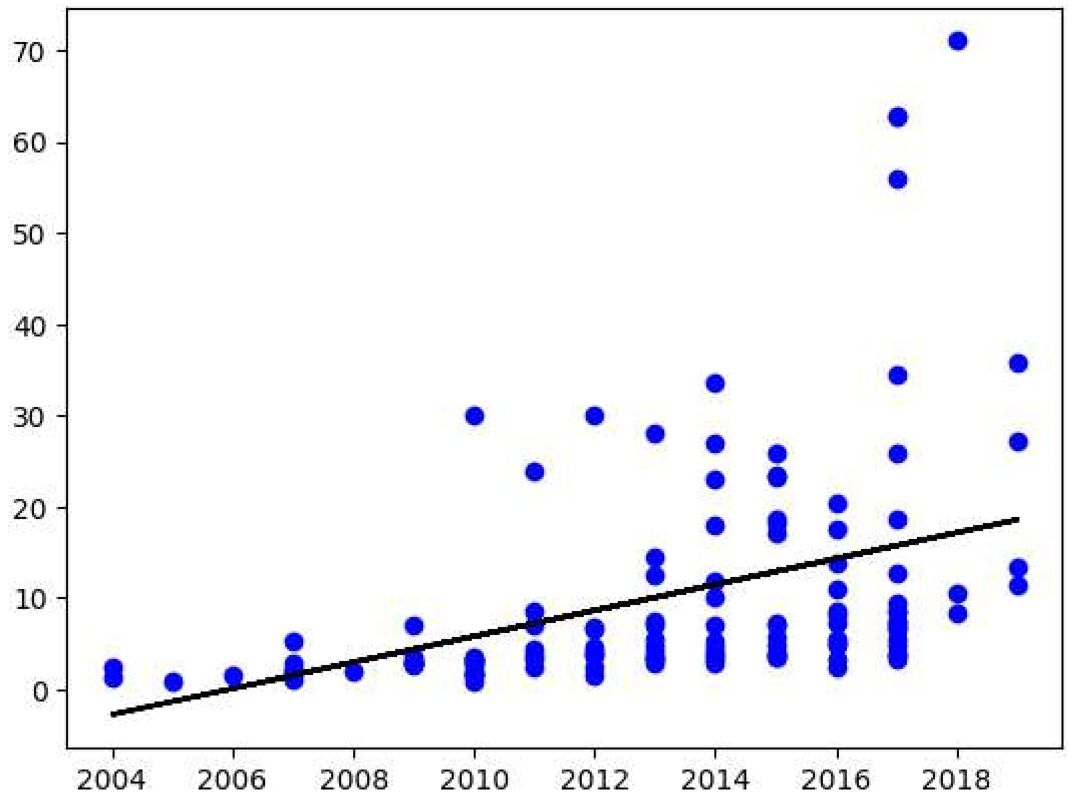
Out[24]:
```
<seaborn.axisgrid.FacetGrid at 0x20aff25e230>
```



In [25]:
```
df500.fillna(method='ffill',inplace=True)
X=np.array(df500['Yr']).reshape(-1,1)
y=np.array(df500['Pr']).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='b')
plt.plot(X_test,y_pred,color='k')
plt.show()

```

```
Regression: 0.179288978213473
```



In [26]:
```
from sklearn.linear_model import LinearRegression
from sklearn.metrics import r2_score
mode1=LinearRegression()
mode1.fit(X_train,y_train)
y_pred=mode1.predict(X_test)
r2=r2_score(y_test,y_pred)
print("R2 score:",r2)
```

```
R2 score: 0.179288978213473
```