In [1]:
```python
import pandas as pd
import numpy as np                    # For mathematical calculations
import seaborn as sns                 # For data visualization
import matplotlib.pyplot as plt
import seaborn as sn                  # For plotting graphs
import io
%matplotlib inline
import warnings                       # To ignore any warnings
warnings.filterwarnings("ignore")
```

In [2]:
```python
filepath2 = r"C:\Users\91623\OneDrive\Desktop\projects\bike prediction\data_bike.csv"
df= pd.read_csv(filepath2)
print(df)
```

```
      Brand                      Model  Selling_Price  Year Seller_Type  \
0       TVS                 TVS XL 100          30000  2017  Individual
1     Bajaj               Bajaj  ct 100          18000  2017  Individual
2        Yo                   Yo Style          20000  2011  Individual
3     Bajaj          Bajaj Discover 100          25000  2010  Individual
4     Bajaj          Bajaj Discover 100          24999  2012  Individual
...     ...                        ...            ...   ...         ...
1056  Royal  Royal Enfield Electra 5 S          90000  2012  Individual
1057   Hero            Hero Honda Hunk          20000  2010  Individual
1058  Bajaj       Bajaj Pulsar 220 DTS-i          60000  2014  Individual
1059   Hero       Hero Honda CBZ extreme          40000  2009  Individual
1060   Hero       Hero Honda CBZ extreme          35000  2012  Individual

          Owner  KM_Driven  Ex_Showroom_Price
0     1st owner       8000            30490.0
1     1st owner      35000            32000.0
2     1st owner      10000            37675.0
3     1st owner      43000            42859.0
4     2nd owner      35000            42859.0
...         ...        ...                ...
1056  1st owner      40000                NaN
1057  1st owner      17000                NaN
1058  1st owner      16000                NaN
1059  1st owner      50000                NaN
1060  1st owner      60000                NaN

[1061 rows x 8 columns]
```

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

Out[3]:

	Brand	Model	Selling_Price	Year	Seller_Type	Owner	KM_Driven	Ex_Showroom_Price
0	TVS	TVS XL 100	30000	2017	Individual	1st owner	8000	30490.0
1	Bajaj	Bajaj ct 100	18000	2017	Individual	1st owner	35000	32000.0
2	Yo	Yo Style	20000	2011	Individual	1st owner	10000	37675.0
3	Bajaj	Bajaj Discover 100	25000	2010	Individual	1st owner	43000	42859.0
4	Bajaj	Bajaj Discover 100	24999	2012	Individual	2nd owner	35000	42859.0

In [4]:
```python
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1061 entries, 0 to 1060
Data columns (total 8 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   Brand              1061 non-null   object
 1   Model              1061 non-null   object
 2   Selling_Price      1061 non-null   int64
 3   Year               1061 non-null   int64
 4   Seller_Type        1061 non-null   object
 5   Owner              1061 non-null   object
 6   KM_Driven          1061 non-null   int64
 7   Ex_Showroom_Price  626 non-null    float64
dtypes: float64(1), int64(3), object(4)
memory usage: 66.4+ KB
```

In [5]:
```python
df= df.dropna()
```

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

Out[6]:

	Selling_Price	Year	KM_Driven	Ex_Showroom_Price
count	626.000000	626.000000	626.000000	6.260000e+02
mean	59445.164537	2014.800319	32671.576677	8.795871e+04
std	59904.350888	3.018885	45479.661039	7.749659e+04
min	6000.000000	2001.000000	380.000000	3.049000e+04
25%	30000.000000	2013.000000	13031.250000	5.485200e+04
50%	45000.000000	2015.000000	25000.000000	7.275250e+04
75%	65000.000000	2017.000000	40000.000000	8.703150e+04
max	760000.000000	2020.000000	585659.000000	1.278000e+06

In [7]:
```python
df.columns = df.columns.str.lower()
```

In [8]:
```python
unique = [feature for feature in df.columns if len(df[feature].unique())>0 and len(df[feature].unique())<100]
for feature in unique:
    print("{} has {} unique values : {} {}".format(feature,len(df[feature].unique()),df[feature].unique(),"\n"))
```

```
brand has 18 unique values : ['TVS' 'Bajaj' 'Yo' 'Honda' 'Mahindra' 'Hero' 'Yamaha' 'Suzuki' 'Activa'
 'Vespa' 'Royal' 'Benelli' 'KTM' 'UM' 'Kawasaki' 'Hyosung' 'BMW' 'Harley']

selling_price has 99 unique values : [ 30000  18000  20000  25000  24999  28000  22000  24000  21000  23000
  26000  42000  32000  15000  27000  45000  70000  50000  40000  26500
  35000  34000  22989  29500  10000  16600   6000  37000  48000  16000
  17000  55000  75000  38000  58000  36000  60000  47999  65000  46000
  47000  69000  62000  12000  17500  56000  14000  51000  74000  57000
  54000  41000  76000  29900  30900  43000  80000  78000  85000  14900
  20100  72000  90000  78500  54786  87000  86000  52000  95000 105000
 100000  31000  98000 110000  77000 120000 130000 150000 145000 115000
 170000 135000 111000 140000 180000 125000 190000 165000 195000 160000
 185000 175000 200000 300000 365000 330000 425000 760000 750000]

year has 18 unique values : [2017 2011 2010 2012 2015 2014 2009 2016 2006 2013 2018 2007 2019 2008
 2001 2004 2005 2020]

seller_type has 2 unique values : ['Individual' 'Dealer']

owner has 4 unique values : ['1st owner' '2nd owner' '3rd owner' '4th owner']
```

In [9]:
```python
df[['brand']].value_counts()
```

Out[9]:
```
brand
Honda       170
Bajaj       143
Hero        108
Yamaha       94
Royal        40
TVS          23
Suzuki       18
KTM           6
Mahindra      6
Kawasaki      4
Activa        3
UM            3
Harley        2
Vespa         2
Hyosung       1
Benelli       1
BMW           1
Yo            1
dtype: int64
```

In [10]:
```python
df[['owner']].value_counts()
```

Out[10]:
```
owner
1st owner    556
2nd owner     66
3rd owner      3
4th owner      1
dtype: int64
```

In [11]:
```python
df.columns
```

Out[11]:
```
Index(['brand', 'model', 'selling_price', 'year', 'seller_type', 'owner',
       'km_driven', 'ex_showroom_price'],
      dtype='object')
```

In [12]:
```python
df.shape
```

Out[12]:
```
(626, 8)
```

In [13]:
```python
df.tail()
```

Out[13]:

	brand	model	selling_price	year	seller_type	owner	km_driven	ex_showroom_price
621	Harley	Harley-Davidson Street 750	330000	2014	Individual	4th owner	6500	534000.0
622	Kawasaki	Kawasaki Ninja 650 [2018-2019]	300000	2011	Individual	1st owner	12000	589000.0
623	Kawasaki	Kawasaki Ninja 650 [2018-2019]	425000	2017	Individual	2nd owner	13600	599000.0
624	Suzuki	Suzuki GSX S750	760000	2019	Individual	1st owner	2800	752020.0
625	Harley	Harley-Davidson Street Bob	750000	2013	Individual	2nd owner	12000	1278000.0

In [14]:
```python
from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
```

In [15]:
```python
df1=df
```

In [16]:
```python
list1=['owner','seller_type']
for i in list1:
    df1[i]=le.fit_transform(df1[i])

df1.head()
```

Out[16]:

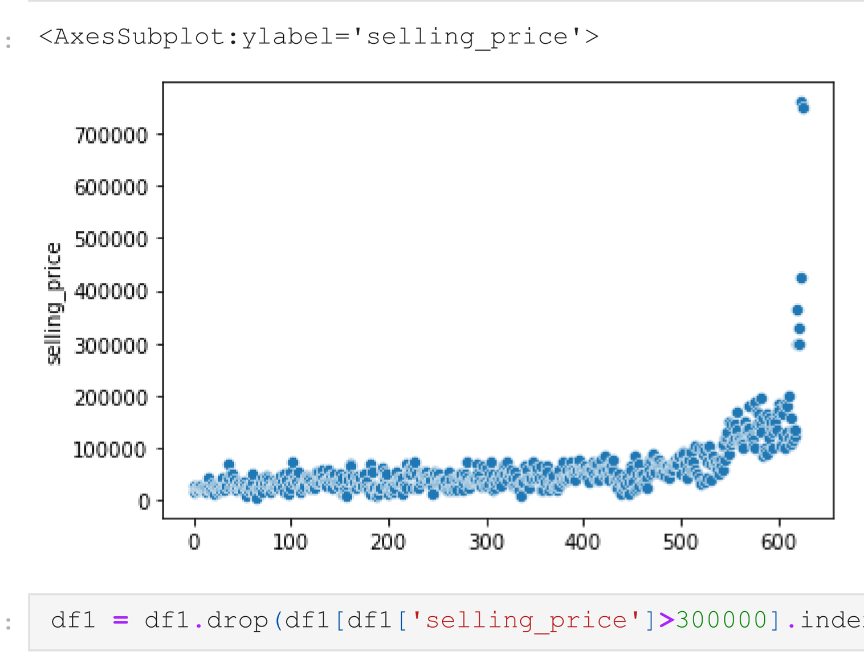
	brand	model	selling_price	year	seller_type	owner	km_driven	ex_showroom_price
0	TVS	TVS XL 100	30000	2017	1	0	8000	30490.0
1	Bajaj	Bajaj ct 100	18000	2017	1	0	35000	32000.0
2	Yo	Yo Style	20000	2011	1	0	10000	37675.0
3	Bajaj	Bajaj Discover 100	25000	2010	1	0	43000	42859.0
4	Bajaj	Bajaj Discover 100	24999	2012	1	1	35000	42859.0

In [17]:
```python
unique = [feature for feature in df1.columns if len(df1[feature].unique())>0 and len(df1[feature].unique())<10(
for feature in unique:
    print("{} has {} unique values : {} {}".format(feature,len(df1[feature].unique()),df1[feature].unique(),"\r
```

```
brand has 18 unique values : ['TVS' 'Bajaj' 'Yo' 'Honda' 'Mahindra' 'Hero' 'Yamaha' 'Suzuki' 'Activa'
 'Vespa' 'Royal' 'Benelli' 'KTM' 'UM' 'Kawasaki' 'Hyosung' 'BMW' 'Harley']

selling_price has 99 unique values : [ 30000  18000  20000  25000  24999  28000  22000  24000  21000  23000
  26000  42000  32000  15000  27000  45000  70000  50000  40000  26500
  35000  34000  22989  29500  10000  16600   6000  37000  48000  16000
  17000  55000  75000  38000  58000  36000  60000  47999  65000  46000
  47000  69000  62000  12000  17500  56000  14000  51000  74000  57000
  54000  41000  76000  29900  30900  43000  80000  78000  85000  14900
  20100  72000  90000  78500  54786  87000  86000  52000  95000 105000
 100000  31000  98000 110000  77000 120000 130000 150000 145000 115000
 170000 135000 111000 140000 180000 125000 190000 165000 195000 160000
 185000 175000 200000 300000 365000 330000 425000 760000 750000]

year has 18 unique values : [2017 2011 2010 2012 2015 2014 2009 2016 2006 2013 2018 2007 2019 2008
 2001 2004 2005 2020]

seller_type has 2 unique values : [1 0]

owner has 4 unique values : [0 1 2 3]
```

In [18]:
```python
sns.scatterplot(data =df1['selling_price'])
```

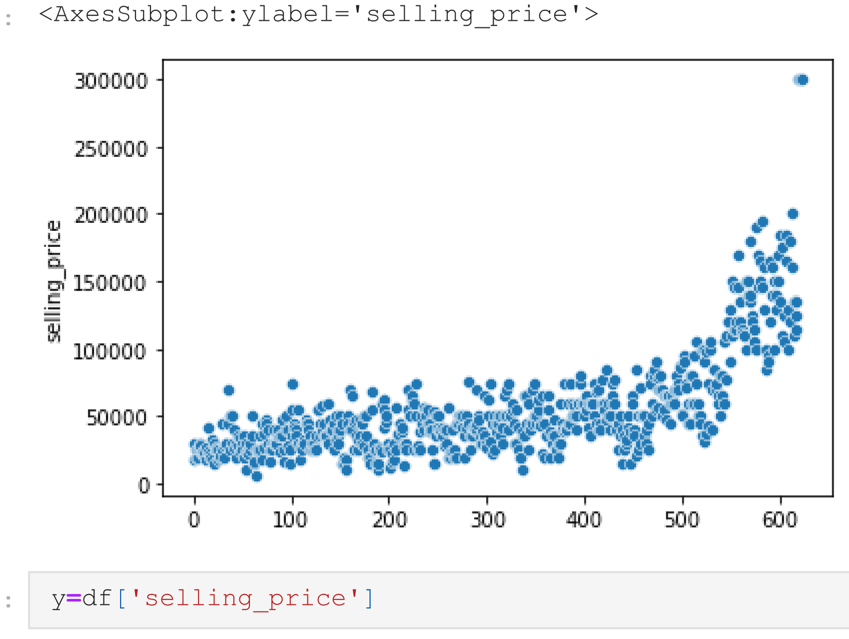
Out[18]:
```
<AxesSubplot:ylabel='selling_price'>
```



In [19]:
```python
df1 = df1.drop(df1[df1['selling_price']>300000].index)
```

In [20]:
```python
sns.scatterplot(data =df1['selling_price'])
```

Out[20]:
```
<AxesSubplot:ylabel='selling_price'>
```



In [21]:
```python
y=df['selling_price']
```

In [22]:
```python
y.shape
```

Out[22]:
```
(626,)
```

In [24]:
```python
df1.head()
```

Out[24]:

	brand	model	selling_price	year	seller_type	owner	km_driven	ex_showroom_price
0	TVS	TVS XL 100	30000	2017	1	0	8000	30490.0
1	Bajaj	Bajaj ct 100	18000	2017	1	0	35000	32000.0
2	Yo	Yo Style	20000	2011	1	0	10000	37675.0
3	Bajaj	Bajaj Discover 100	25000	2010	1	0	43000	42859.0
4	Bajaj	Bajaj Discover 100	24999	2012	1	1	35000	42859.0

In [26]:
```python
x=df1[["year","ex_showroom_price","km_driven","seller_type","owner"]]
```

In [27]:
```python
y=df1['selling_price']
```

In [28]:
```python
from sklearn.model_selection import train_test_split
```

In [29]:
```python
x_train,x_test,y_train,y_test =train_test_split(x,y, test_size=0.3,random_state=2529)
```

In [30]:
```python
x_train.shape,x_test.shape,y_train.shape,y_test.shape
```

Out[30]:
```
((434, 5), (187, 5), (434,), (187,))
```

In [31]:
```python
from sklearn.linear_model import LinearRegression
```

In [32]:
```python
lr=LinearRegression()
```

In [33]:
```python
lr.fit(x_train,y_train)
```

Out[33]:
```
LinearRegression()
```

In [34]:
```python
y_pred = lr.predict(x_test)
```

In [35]:
```python
from sklearn.metrics import mean_squared_error , mean_absolute_error , r2_score
```

In [36]:
```python
lin_reg=r2_score (y_test,y_pred)*100
lin_reg
```

Out[36]:
```
82.36575777575558
```

In [37]:
```python
from sklearn.ensemble import RandomForestRegressor
```

In [38]:
```python
rfr=RandomForestRegressor()
rfr
```

Out[38]:
```
RandomForestRegressor()
```

In [39]:
```python
rfr.fit(x_train,y_train)
```

Out[39]:
```
RandomForestRegressor()
```

In [40]:
```python
rfr_pred=rfr.predict(x_test)
```

In [41]:
```python
rfr_score=r2_score(y_test,rfr_pred)*100
print("Accuracy score for LR :",rfr_score)
```

```
Accuracy score for LR : 87.87762386792129
```

In [42]:
```python
from sklearn.linear_model import Lasso
```

In [43]:
```python
la=Lasso()
la
```

Out[43]:
```
Lasso()
```

In [44]:
```python
la.fit(x_train,y_train)
```

Out[44]:
```
Lasso()
```

In [45]:
```python
la_pred=la.predict(x_test)
```

In [46]:
```python
la_score=r2_score(y_test,la_pred)*100
print("Accuracy score for LR :",la_score)
```

```
Accuracy score for LR : 82.36696078632546
```

In [47]:
```python
from sklearn.svm import SVR
```

In [48]:
```python
svr=SVR()
svr.fit(x_train,y_train)
```

Out[48]:
```
SVR()
```

In [49]:
```python
svr_pred=svr.predict(x_test)
```

In [50]:
```python
svr_score=r2_score(y_test,svr_pred)*100
print("Accuracy score for LR :",svr_score)
```

```
Accuracy score for LR : -8.526105347754598
```

In [51]:
```python
from sklearn.linear_model import Ridge
```

In [52]:
```python
rr=Ridge()
```

Out[52]:
```
Ridge()
```

In [53]:
```python
rr.fit(x_train,y_train)
```

Out[53]:
```
Ridge()
```

In [54]:
```python
rr_pred=rr.predict(x_test)
```

In [55]:
```python
from sklearn.metrics import r2_score
rr_score=r2_score(y_test,rr_pred)*100
print("Accuracy score for RidgeR :",rr_score)
```

```
Accuracy score for RidgeR : 82.36939321600317
```

In [59]:
```python
pd.DataFrame({"Model Names":['Linear Reg','Ridge Reg','Lasso Reg','RandomForest Reg','Support Vector Reg'],
              "Accuracy socre":[lin_reg,rr_score,la_score,rfr_score,svr_score]})
```

Out[59]:

	Model Names	Accuracy socre
0	Linear Reg	82.365758
1	Ridge Reg	82.369393
2	Lasso Reg	82.366961
3	RandomForest Reg	87.877624
4	Support Vector Reg	-8.526105

In [ ]: