In [2]:

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

In [3]:

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

Out[3]:

	TV	Radio	Newspaper	Sales
0	230.1	37.8	69.2	22.1
1	44.5	39.3	45.1	10.4
2	17.2	45.9	69.3	12.0
3	151.5	41.3	58.5	16.5
4	180.8	10.8	58.4	17.9
...	...	...	...	...
195	38.2	3.7	13.8	7.6
196	94.2	4.9	8.1	14.0
197	177.0	9.3	6.4	14.8
198	283.6	42.0	66.2	25.5
199	232.1	8.6	8.7	18.4

200 rows × 4 columns

In [4]:

```
df.head()
```

Out[4]:

	TV	Radio	Newspaper	Sales
0	230.1	37.8	69.2	22.1
1	44.5	39.3	45.1	10.4
2	17.2	45.9	69.3	12.0
3	151.5	41.3	58.5	16.5
4	180.8	10.8	58.4	17.9

In [5]:

```
df.tail()
```

Out[5]:

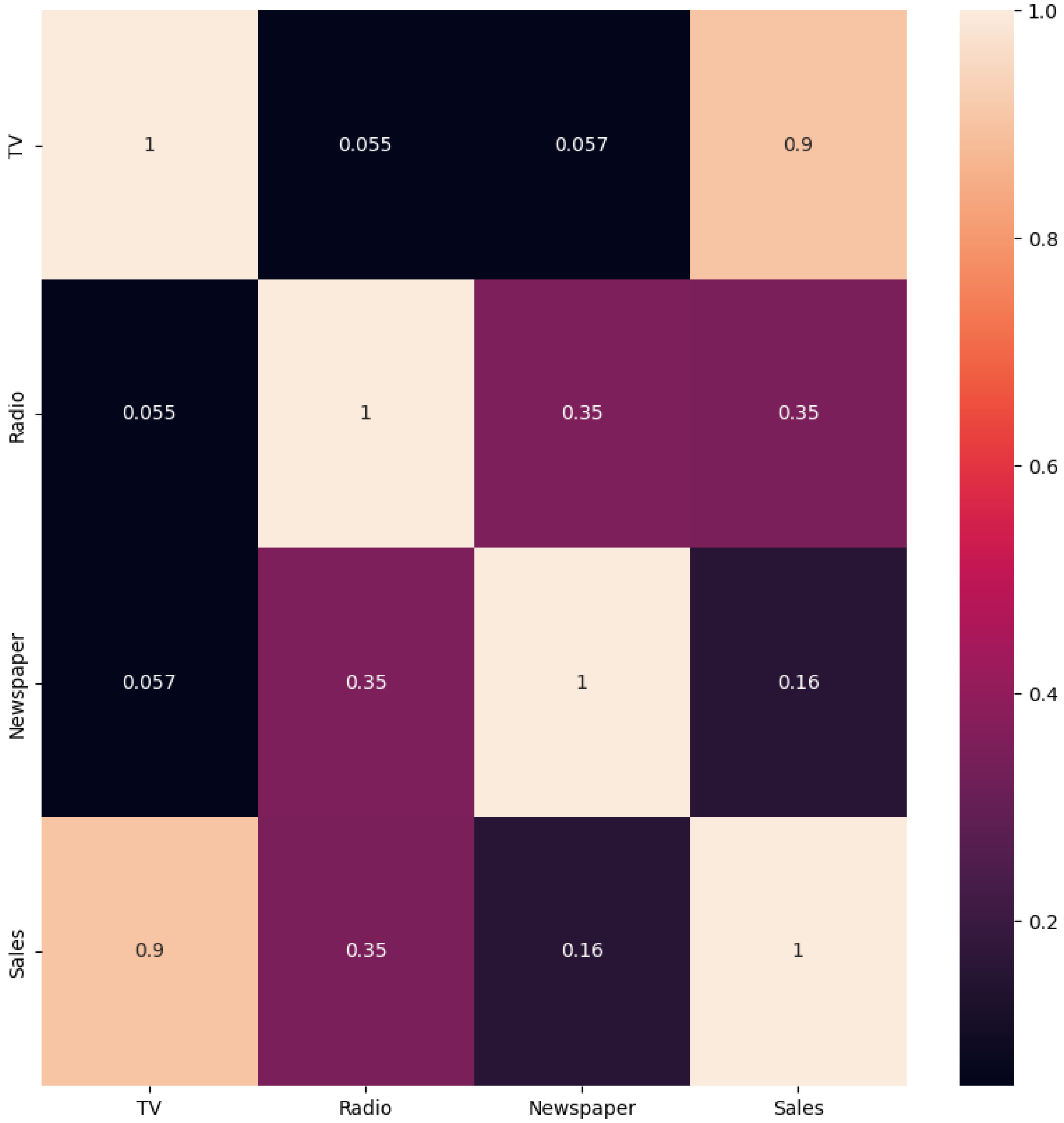
	TV	Radio	Newspaper	Sales
195	38.2	3.7	13.8	7.6
196	94.2	4.9	8.1	14.0
197	177.0	9.3	6.4	14.8
198	283.6	42.0	66.2	25.5
199	232.1	8.6	8.7	18.4

In [6]:

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

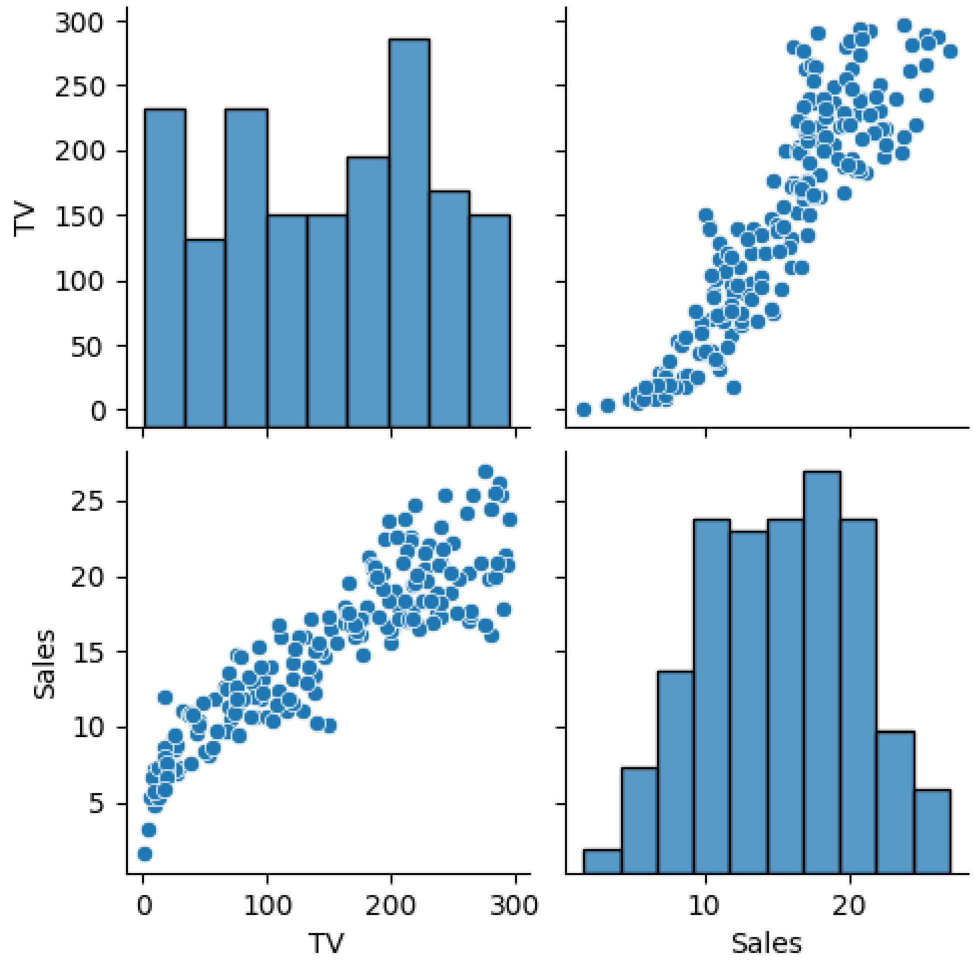
Out[6]:

```
<Axes: >
```



In [7]:

```
df.drop(columns = ["Radio","Newspaper"], inplace=True)
#pairplot
sns.pairplot(df)
df.Sales=np.log(df.Sales)
```



In [8]:

```
features=df.columns[0:2]
target=df.columns[-1]
#x and y values
x=df[features].values
y=df[target].values
#splot
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3,random_state=17)
print("The dimensions of x_train is {}".format(x_train.shape))
print("The dimensions of x_train is {}".format(x_test.shape))
#scale features
scaler=StandardScaler()
x_train=scaler.fit_transform(x_train)
x_test=scaler.transform(x_test)
```

```
The dimensions of x_train is (140, 2)
The dimensions of x_train is (60, 2)
```

In [9]:

```
#model
lr=LinearRegression()

#fit model
lr.fit(x_train,y_train)
#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("\nLinearRegression 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))
```

```
LinearRegression model:

The train score for lr model is 1.0
The test score for lr model is 1.0
```

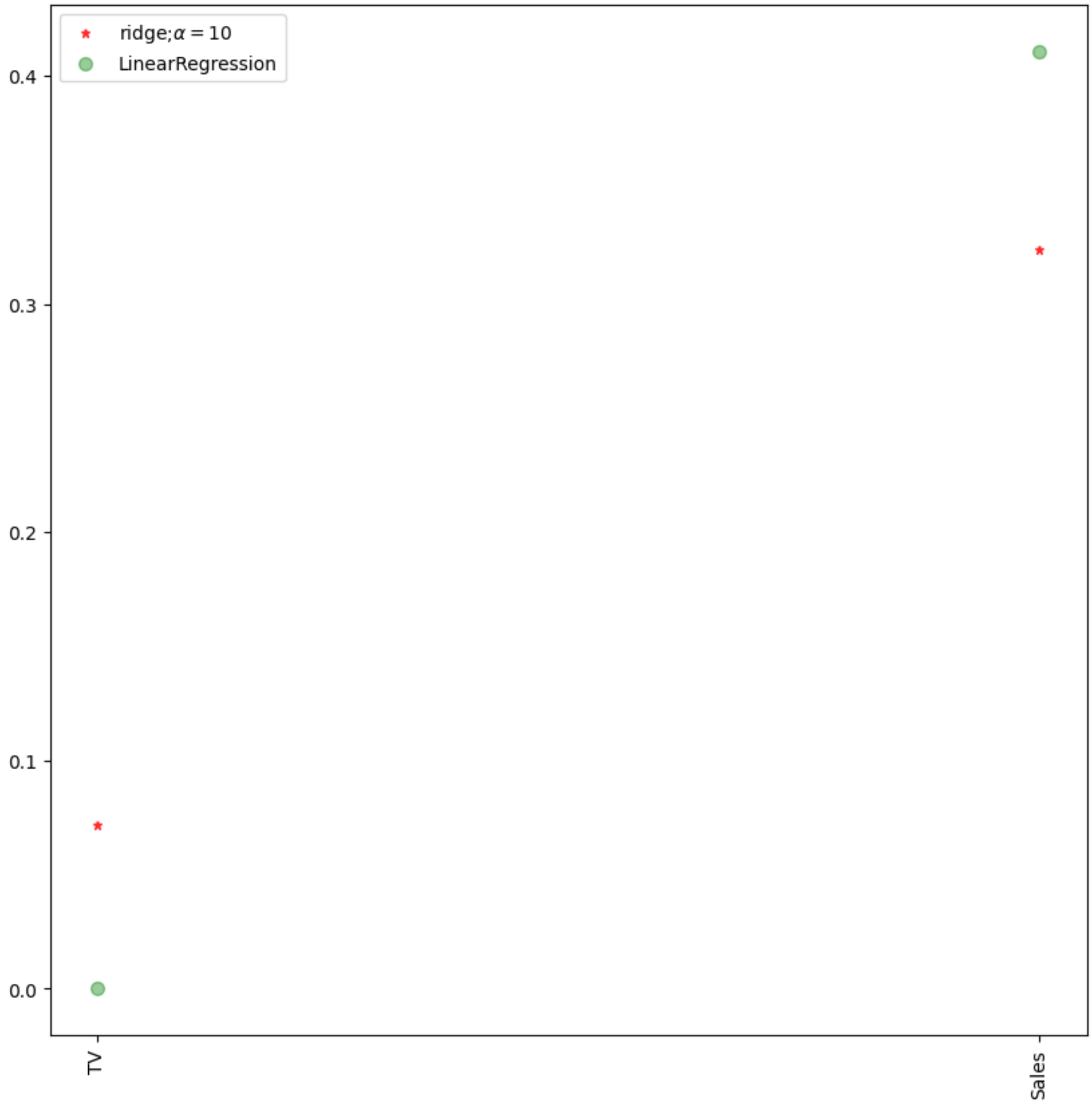
In [10]:

```
#$Ridge Regression model
ridgeReg=Ridge(alpha=10)
ridgeReg.fit(x_train,y_train)
#train and test score for ridge regression
train_score_ridge=ridgeReg.score(x_train,y_train)
test_score_ridge=ridgeReg.score(x_test,y_test)
print("\nRidge Model")
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 0.990287139194161
The test score for ridge model is 0.9844266285141221
```

In [11]:

```
plt.figure(figsize=(10,10))
plt.plot(features,ridgeReg.coef_,alpha=0.7,linestyle='none',marker='*',markersize=5,colo
        label=r'ridge;$\alpha=10$',zorder=7)
plt.plot(features,lr.coef_,alpha=0.4,linestyle='none',marker='o',markersize=7,color='gre
plt.xticks(rotation=90)
plt.legend()
plt.show()
```



In [12]:

```
# 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))
```

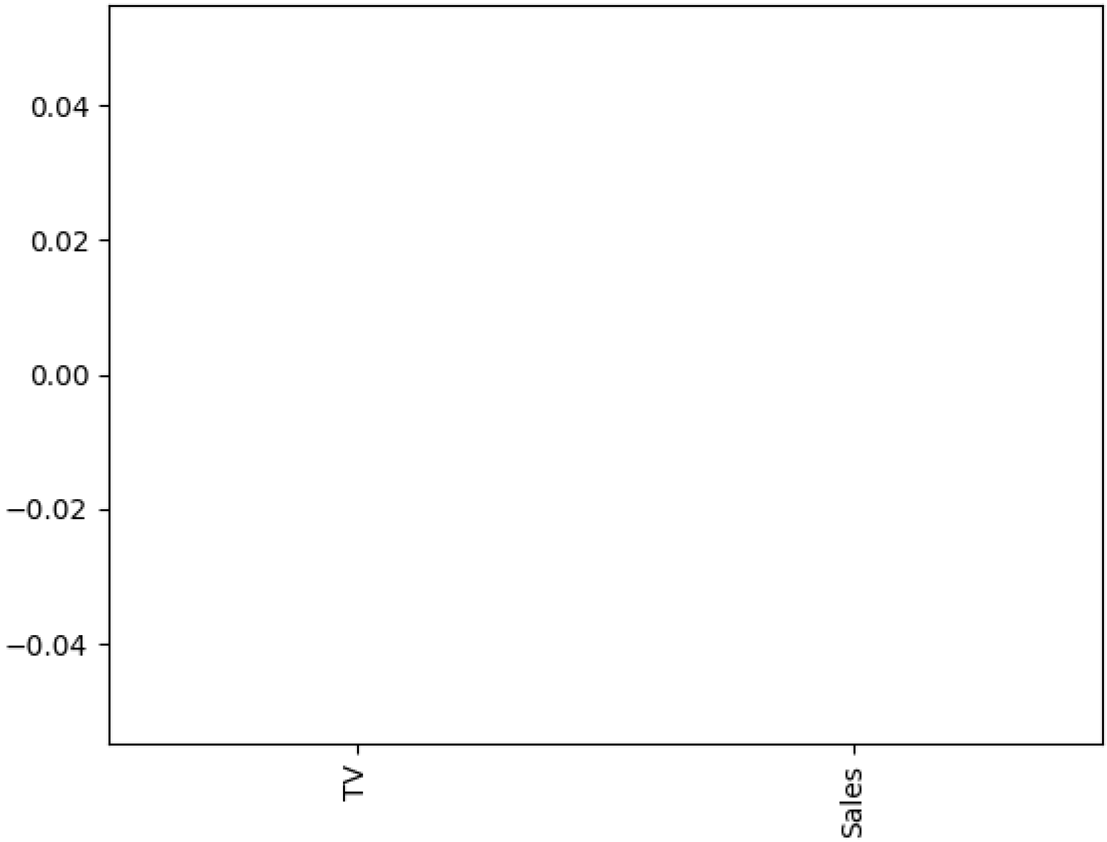
```
Lasso Model:

The train score for ls model is 0.0
The test score for ls model is -0.0042092253233847465
```

In [13]:

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

Out[13]:

```
<Axes: >
```



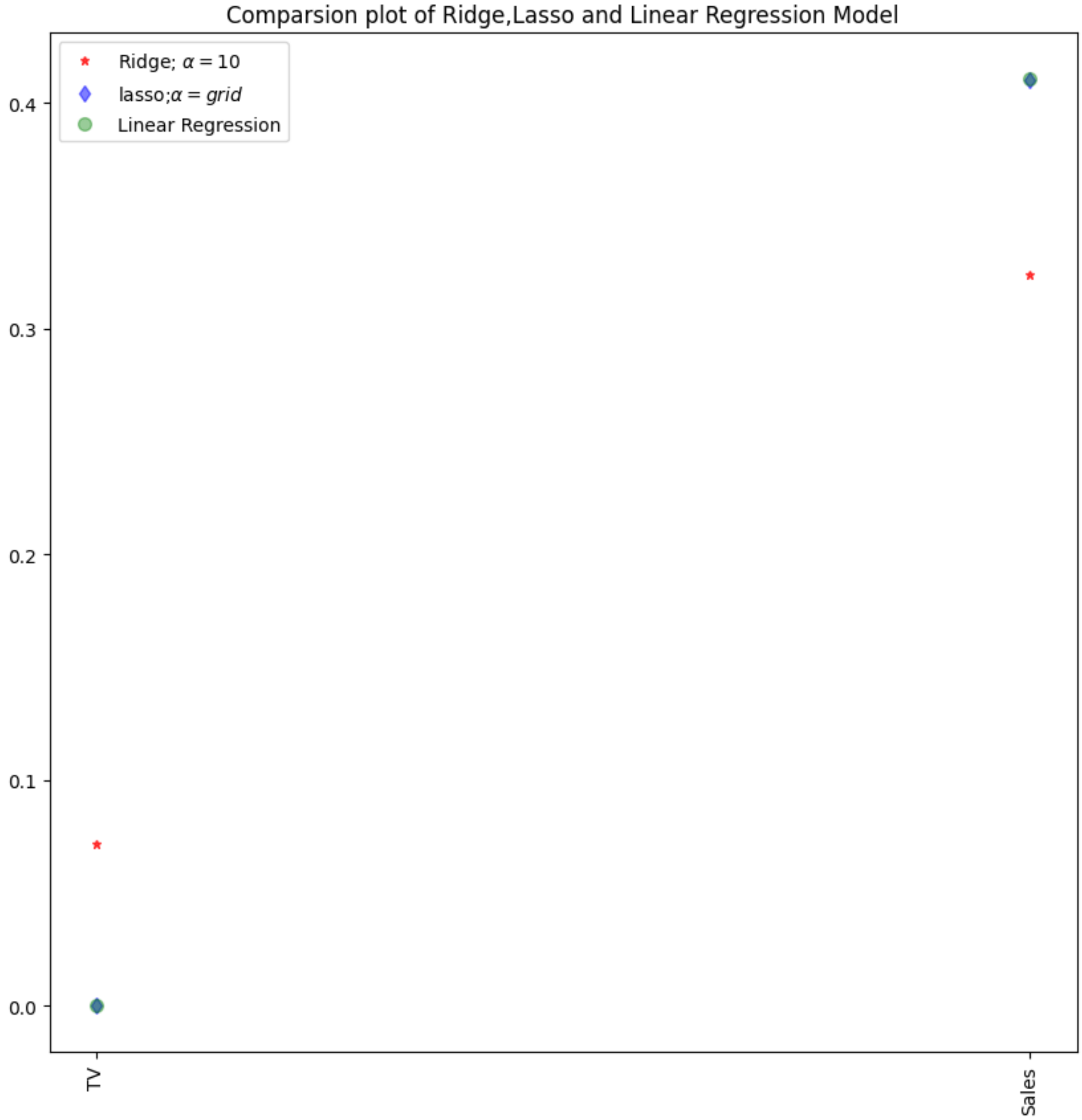
In [14]:

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

```
0.9999999343798134
0.9999999152638072
```

In [15]:

```
#plot size
plt.figure(figsize = (10, 10))
#add plot for ridge regression
plt.plot(features,ridgeReg.coef_,alpha=0.7,linestyle='none',marker='*',markersize=5,colo
#add plot for lasso regression
plt.plot(lasso_cv.coef_,alpha=0.5,linestyle='none',marker='d',markersize=6,color='blue',
#add plot for linear model
plt.plot(features,lr.coef_,alpha=0.4,linestyle='none',marker='o',markersize=7,color='gre
#rotate axis
plt.xticks(rotation = 90)
plt.legend()
plt.title("Comparsion plot of Ridge,Lasso and Linear Regression Model")
plt.show()
```



In [16]:

```
# using the linear CV model
from sklearn.linear_model import RidgeCV

#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 0.999999999997627
The train score for ridge model is 0.9999999999962467
```

ELASTICNET

In [18]:

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

```
[0.00417976 0.        ]
2.026383919311004
```

In [24]:

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

In [25]:

```
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 0.5538818050142158
```

In [ ]:

```

```