In [1]:

```
import numpy as np
import pandas as pd
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]:

```
df=pd.read_csv(r"C:\Users\91950\Downloads\Advertising.csv")
df
```

Out[2]:

	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 [3]:

```
df.head()
```

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

In [4]:

```
df.tail()
```

Out[4]:

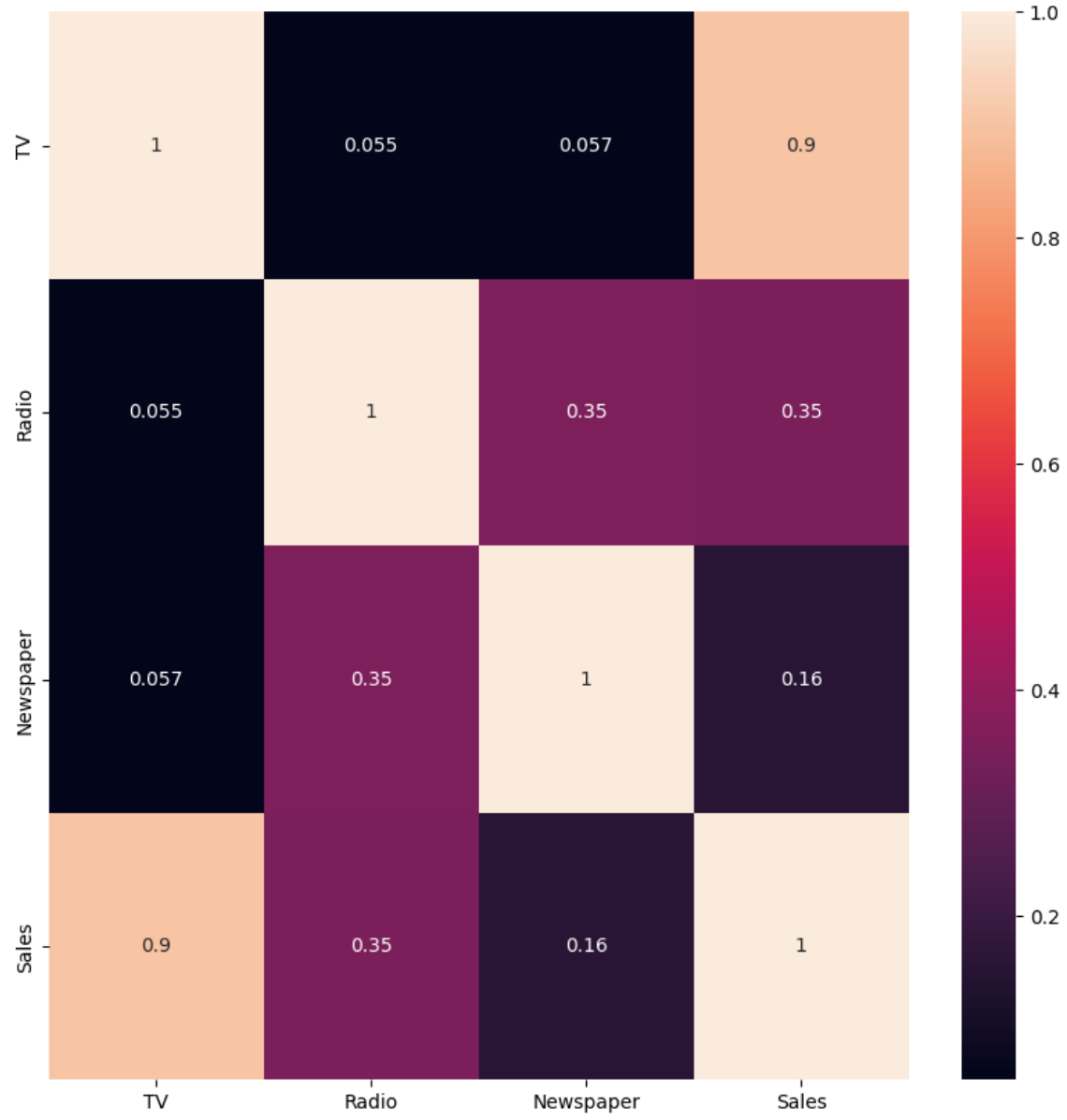
	TV	Radio	Newspaper	Sales
195	38.2	3.7	13.8	7.6
196	94.2	4.9	8.1	14.0
197	177.0	9.3	6.4	14.8
198	283.6	42.0	66.2	25.5
199	232.1	8.6	8.7	18.4

In [5]:

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

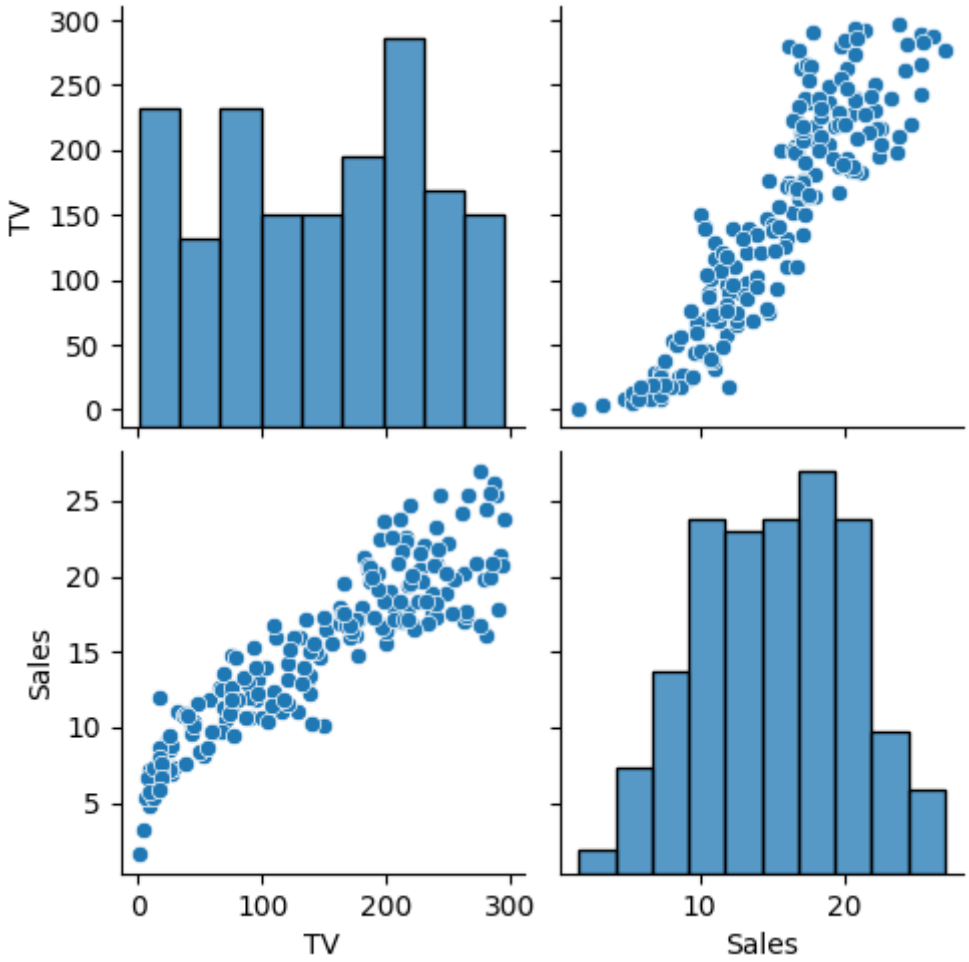
Out[5]:

```
<Axes: >
```



In [6]:

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



In [7]:

```
features=df.columns[0:2]
target=df.columns[-1]

x=df[features].values
y=df[target].values

x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3,random_state=17)

print("The dimension of x_train is {}".format(x_train.shape))
print("The dimension of x_test is {}".format(x_test.shape))

scaler=StandardScaler()
x_train=scaler.fit_transform(x_train)
x_test=scaler.transform(x_test)
```

```
The dimension of x_train is (140, 2)
The dimension of x_test is (60, 2)
```

In [8]:

```
lr = LinearRegression()
lr.fit(x_train, y_train)
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 1.0
The test score for lr model is 1.0
```

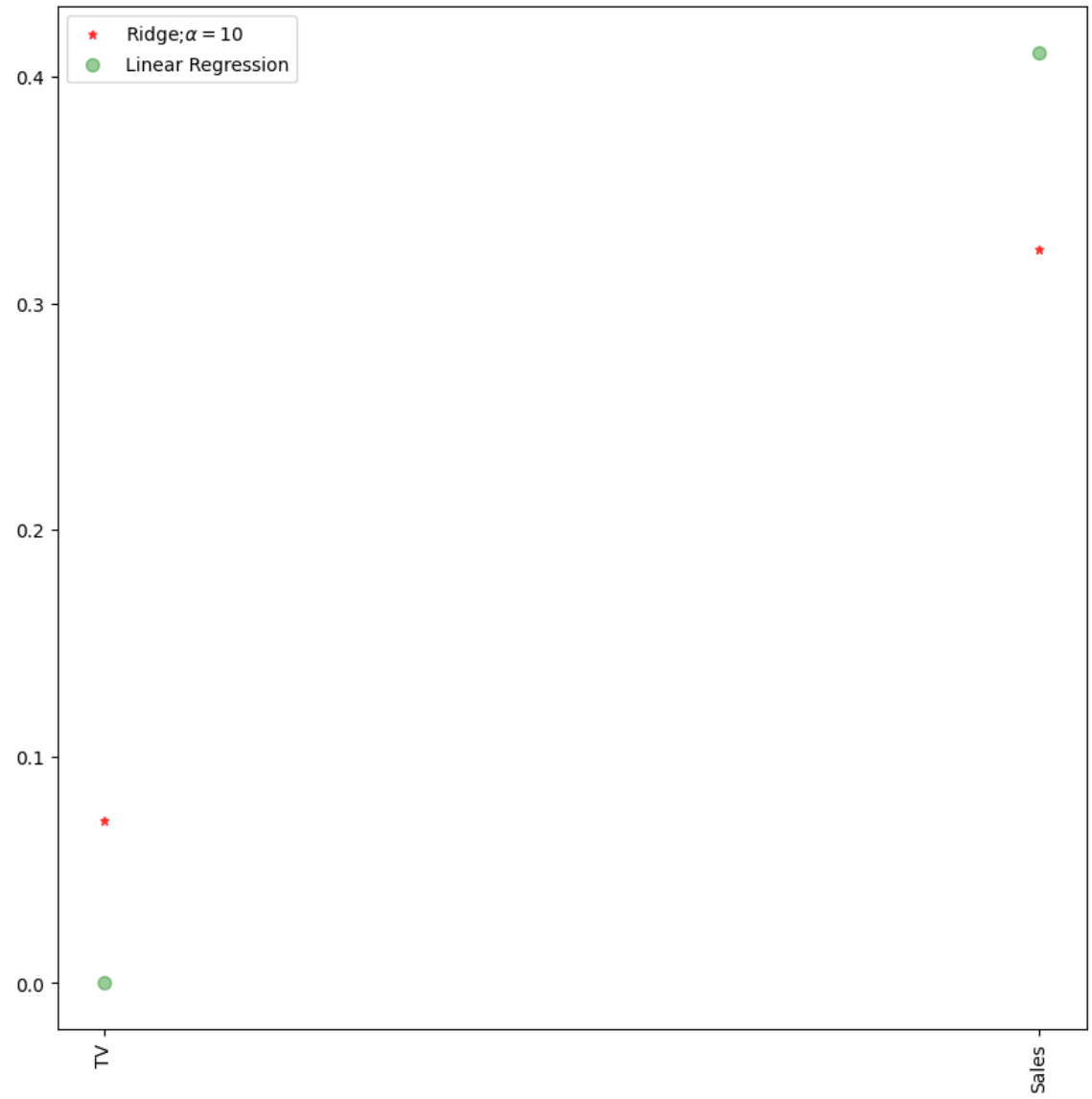
In [9]:

```
ridgeReg = Ridge(alpha=10)
ridgeReg.fit(x_train,y_train)
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 0.9902871391941609
The test score for ridge model is 0.984426628514122
```

In [11]:

```
plt.figure(figsize=(10, 10))
plt.plot(features,ridgeReg.coef_,alpha=0.7,linestyle='none',marker='*',markersize=5,colo
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]:

```
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))
```

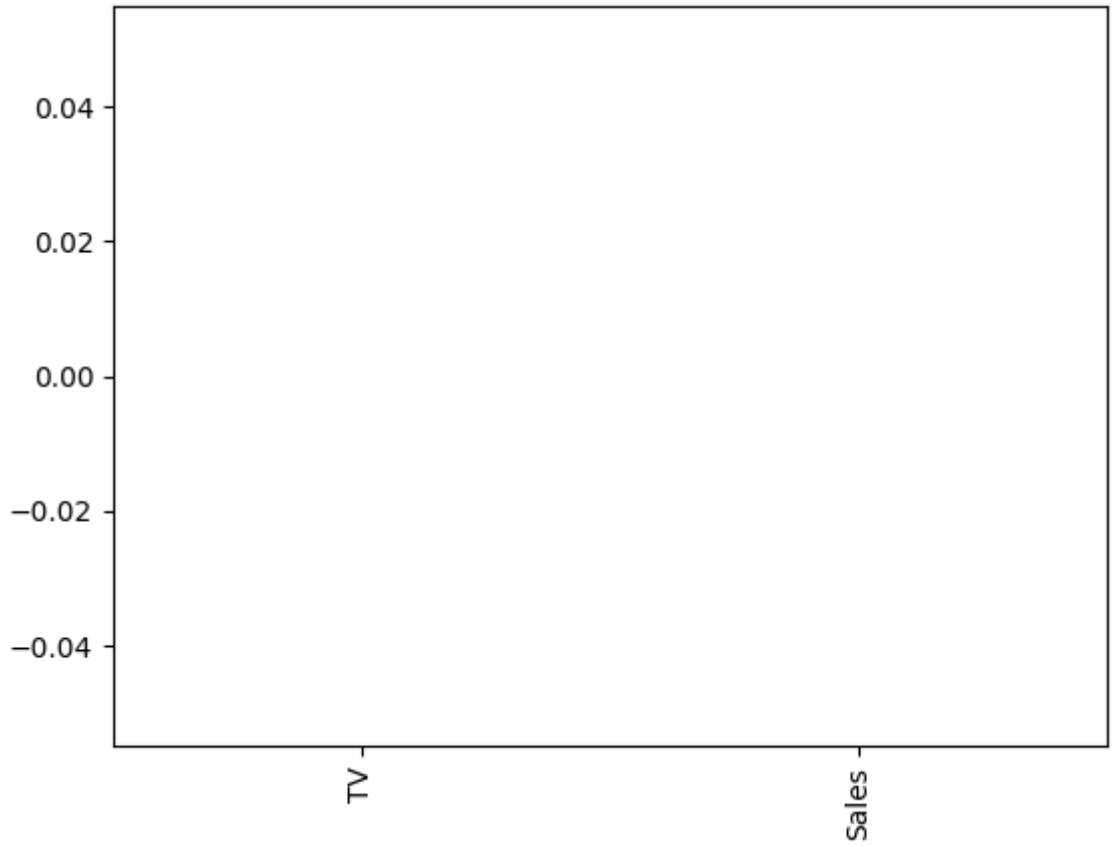
```
Lasso Model:

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

In [14]:

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

Out[14]:

```
<Axes: >
```



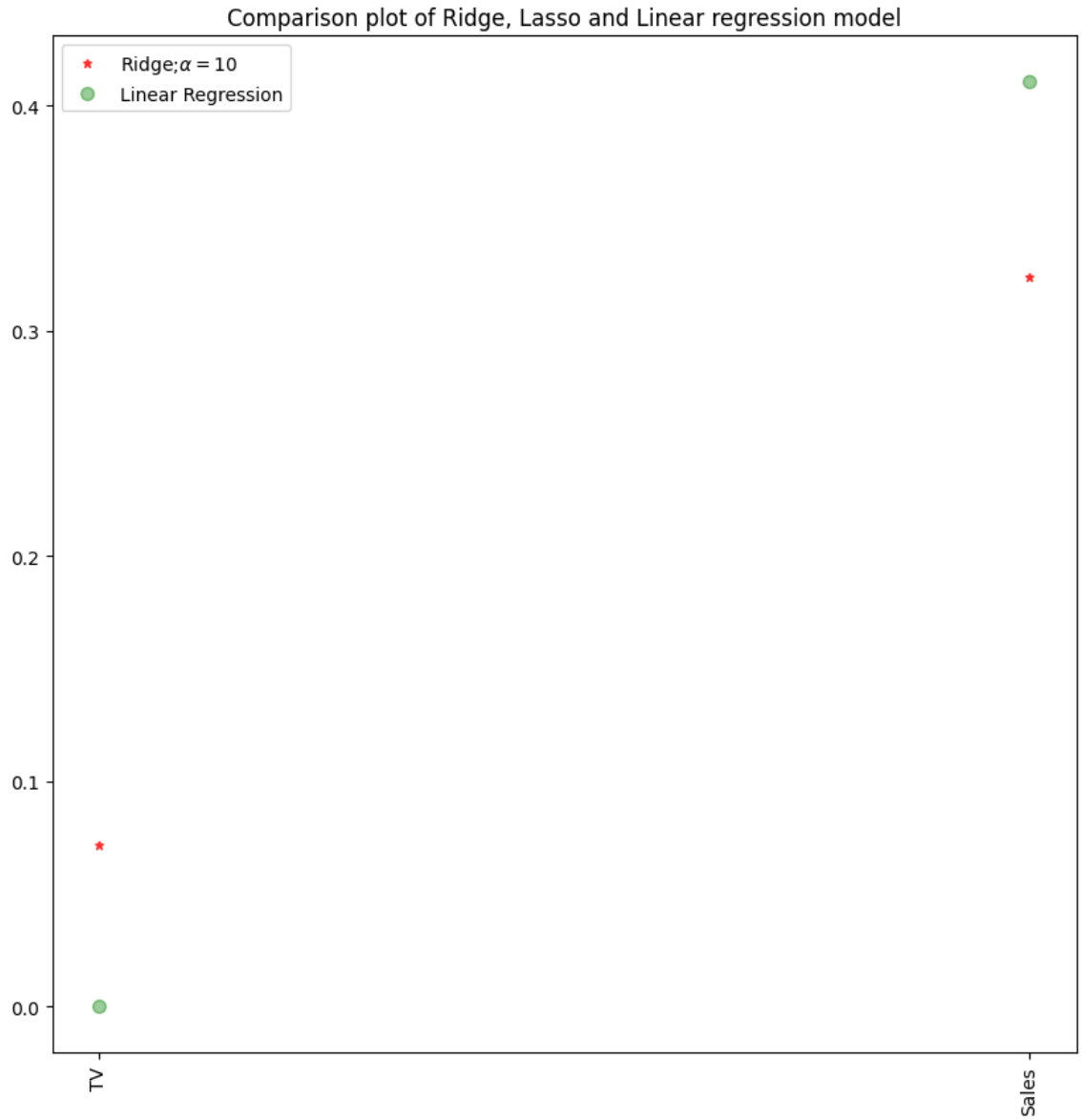
In [17]:

```
from sklearn.linear_model import LassoCV
lasso_cv=LassoCV(alphas = [0.0001, 0.001, 0.01, 0.1, 1, 10], random_state=0).fit(x_train
print(lasso_cv.score(x_train,y_train))
print(lasso_cv.score(x_test,y_test))
```

```
0.9999999343798134
0.9999999152638072
```

In [18]:

```
plt.figure(figsize=(10, 10))
plt.plot(features,ridgeReg.coef_,alpha=0.7,linestyle='none',marker='*',markersize=5,colo
plt.plot(features,lr.coef_,alpha=0.4,linestyle='none',marker='o',markersize=7,color='gre
plt.xticks(rotation=90)
plt.legend()
plt.title("Comparison plot of Ridge, Lasso and Linear regression model")
plt.show()
```



In [20]:

```
from sklearn.linear_model import RidgeCV
ridge_cv=RidgeCV(alphas= [0.0001, 0.001, 0.01, 0.1, 1, 10]).fit(x_train,y_train)
print("The train score for ridge model is {}".format(ridge_cv.score(x_train,y_train)))
print("The test score for ridge model is {}".format(ridge_cv.score(x_test,y_test)))
```

```
The train score for ridge model is 0.999999999997627
The test score for ridge model is 0.9999999999962466
```

In [ ]:

```

```