In [42]:
```
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.preprocessing import StandardScaler
```

In [43]:
```
df=pd.read_csv(r"C:\Users\pucha\Downloads\Advertising.csv")
df
```

Out[43]:

	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 [44]:
```
df.head()
```

Out[44]:

	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 [45]:
```
df.tail()
```

Out[45]:

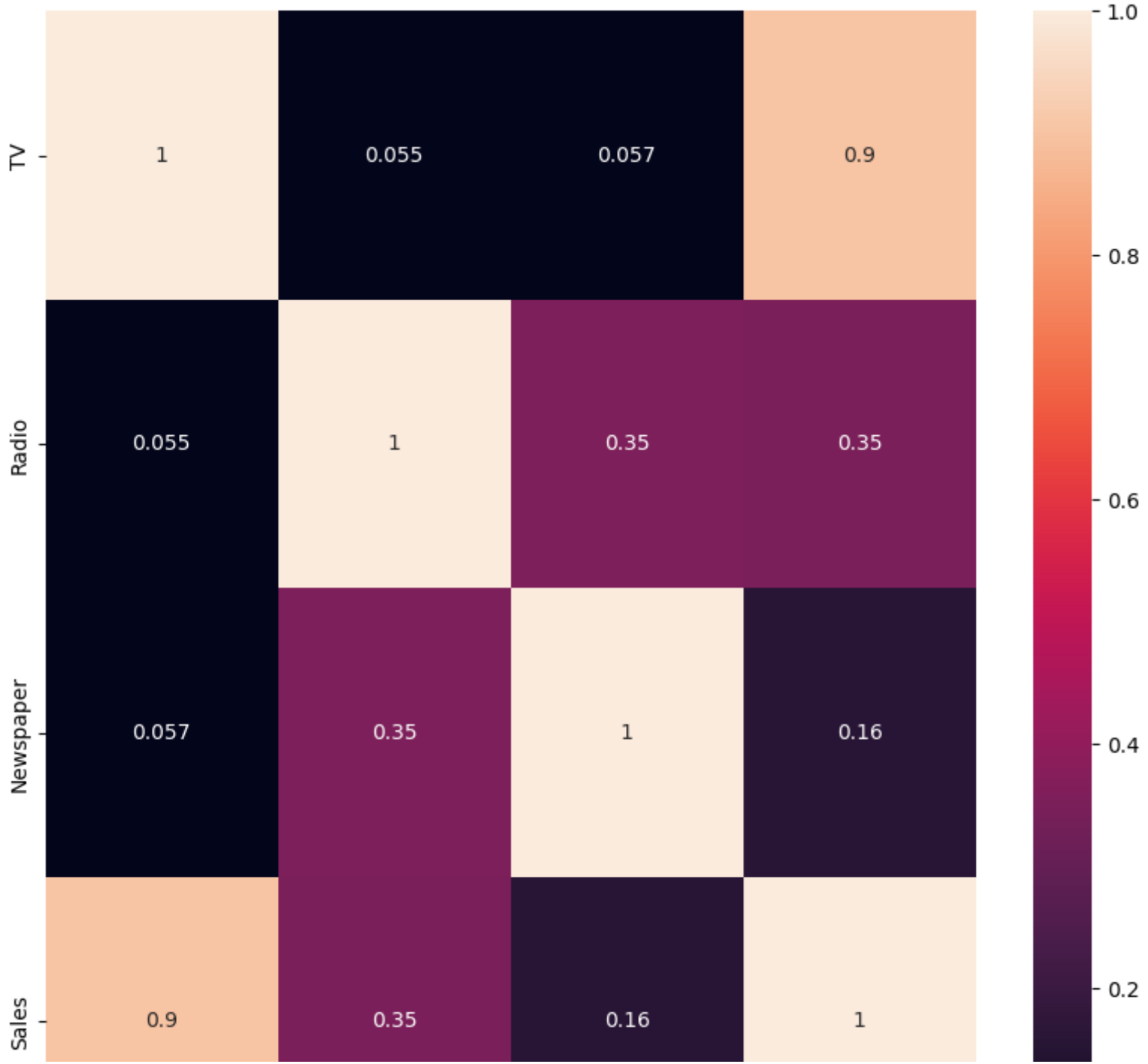
	TV	Radio	Newspaper	Sales
195	38.2	3.7	13.8	7.6
196	94.2	4.9	8.1	14.0
197	177.0	9.3	6.4	14.8
198	283.6	42.0	66.2	25.5
199	232.1	8.6	8.7	18.4

In [46]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 4 columns):
 #   Column     Non-Null Count  Dtype  
---  ------     --------------  -----  
 0   TV         200 non-null    float64
 1   Radio      200 non-null    float64
 2   Newspaper  200 non-null    float64
 3   Sales      200 non-null    float64
dtypes: float64(4)
memory usage: 6.4 KB
```

In [47]:
```
plt.figure(figsize=(10,10))
sns.heatmap(df.corr(),annot=True)
```

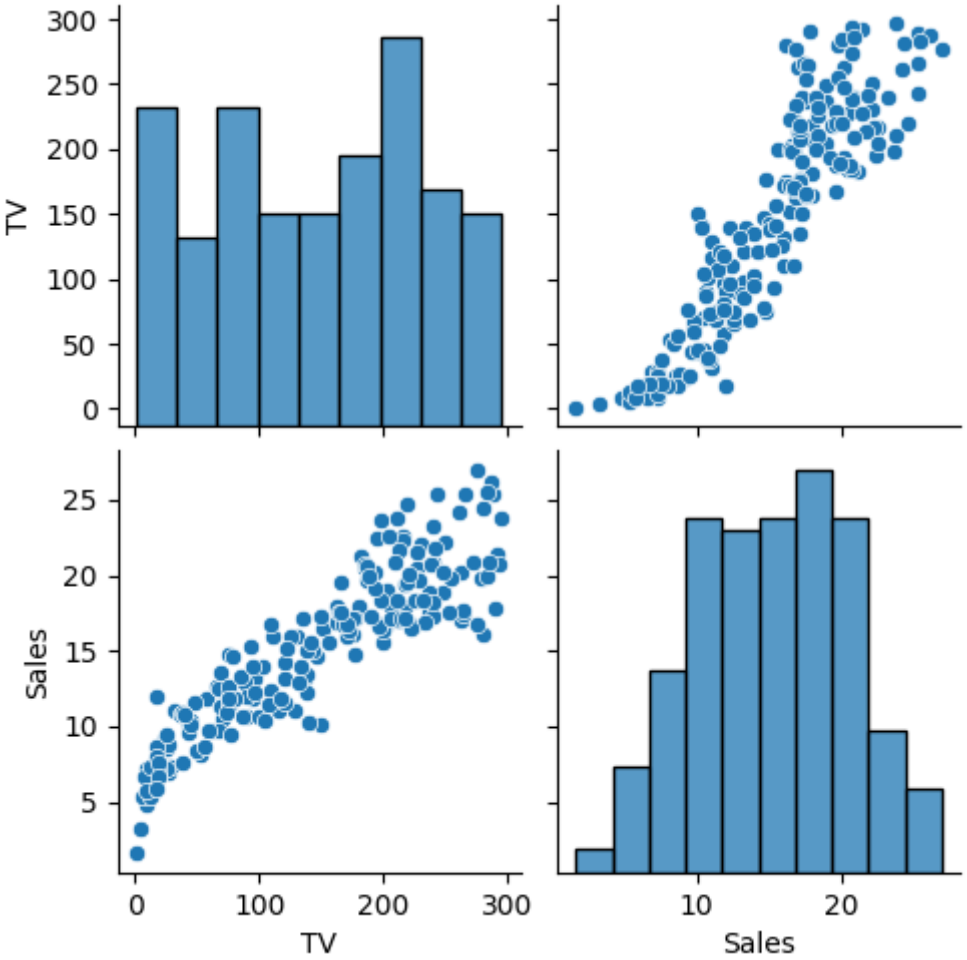
Out[47]: <Axes: >


TV
Radio
Newspaper
Sales
1
0.055
0.057
0.9
0.055
1
0.35
0.35
0.057
0.35
1
0.16
0.9
0.35
0.16
1
1.0
0.8
0.6
0.4
0.2

In [48]:
```
from sklearn.linear_model import Lasso,Ridge
```

In [49]:
```
df.drop(columns=["Radio","Newspaper"],inplace=True)
sns.pairplot(df)
df.sales=np.log(df.Sales)
```

```
C:\Users\pucha\AppData\Local\Temp\ipykernel_9428\1465564857.py:3: UserWarning: Pandas doesn't allow columns to be created via a new attribute name - see https://pandas.pydata.org/pandas-docs/stable/indexing.html#attribute-access (https://pandas.pydata.org/pandas-docs/stable/indexing.html#attribute-access)
  df.sales=np.log(df.Sales)
```



In [50]:
```
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=16)
print("The dimension of X_train is {}".format(X_train.shape))
print("The dimension of X_test is {}".format(X_test.shape))
#Scale features
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 [51]:
```
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 1.0
The test score for lr model is 1.0
```

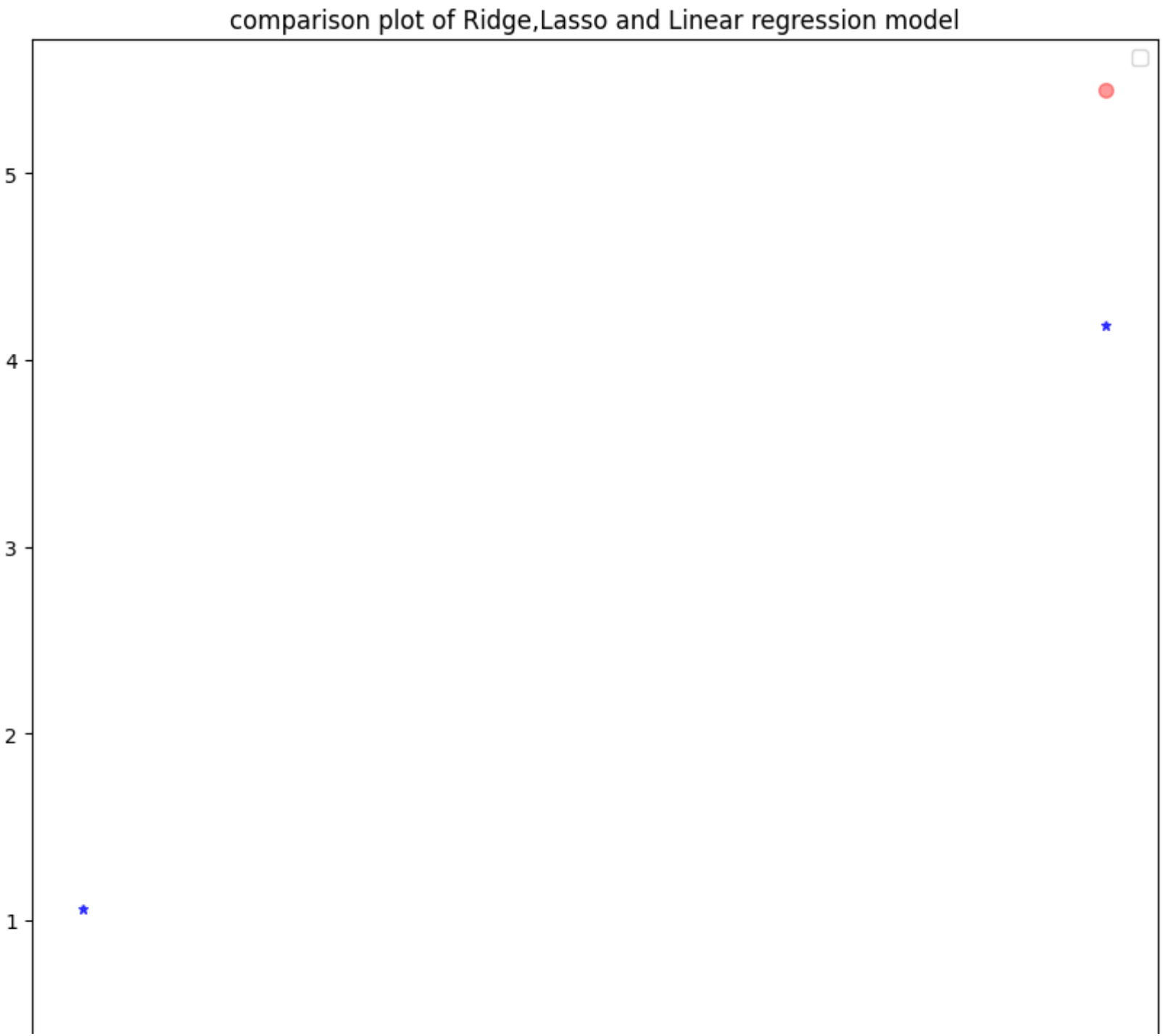
In [52]:
```
#Ridge Regression Model
ridgeReg = Ridge(alpha=10)
ridgeReg.fit(X_train,y_train)
#train and test scorefor ridge regression
train_score_ridge = ridgeReg.score(X_train, y_train)
test_score_ridge = ridgeReg.score(X_test, y_test)
print("\nRidge Model:\n")
print("The train score for ridge model 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 0.9900248472512397
The test score for ridge model is 0.9892754321637042
```

In [53]:
```
plt.figure(figsize=(10,10))
plt.plot(features,ridgeReg.coef_,alpha=0.7,linestyle='none',marker='*',markersize=5,color="blue")
#plt.plot(rr100.coef_,alpha=0.5,linestyle='none',marker='d',markersize=6,color
plt.plot(features,lr.coef_,alpha=0.4,linestyle='none',marker='o',markersize=7,color="red")
plt.xticks(rotation=90)
plt.legend()
plt.title("comparison plot of Ridge,Lasso and Linear regression model")
plt.show()
```

```
No artists with labels found to put in legend.  Note that artists whose label start with an underscore are ignor
ed when legend() is called with no argument.
```


comparison plot of Ridge,Lasso and Linear regression model
5
4
3
2
1

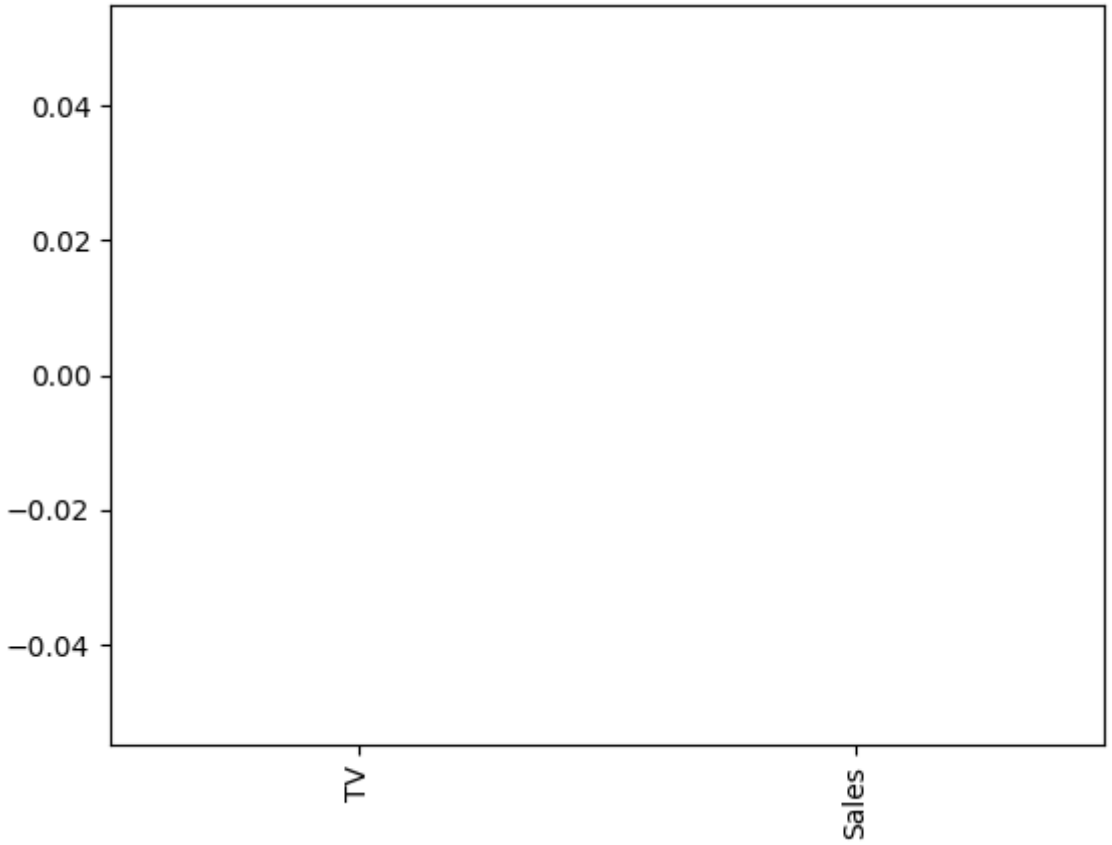
In [54]:
```
print("\nLasso Model: \n")
lasso = Lasso(alpha = 10)
lasso.fit(X_train,y_train)
train_score_ls =lasso.score(X_train,y_train)
test_score_ls =lasso.score(X_test,y_test)
print("The train score for ls model is {}".format(train_score_ls))
print("The test score for ls model is {}".format(test_score_ls))
```

```
Lasso Model:

The train score for ls model is 0.0
The test score for ls model is -0.016493757486486516
```

In [55]:
```
pd.Series(lasso.coef_, features).sort_values(ascending = True).plot(kind = "bar")
```

Out[55]: <Axes: >



In [57]:
```
lasso.fit(X_train,y_train)
```

Out[57]:
```
Lasso(alpha=10)
```
In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

In [59]:
```
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))
```

```
0.9999999708607005
0.9999999656970926
```

In [60]:
```
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 0.9999999999972212
The train score for ridge model is 0.9999999999969249
```

In [61]:
```
from sklearn.linear_model import ElasticNet
regr=ElasticNet()
regr.fit(X,y)
print(regr.coef_)
print(regr.intercept_)
```

```
[0.00938134 0.82969623]
1.197325903826
```

In [62]:
```
y_pred_elastic=regr.predict(X_train)
```

In [63]:
```
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 210.2115240660437
```

In [ ]: