In [352]:
```
import pandas as pd
import numpy as np
```

In [353]:
```
df=pd.read_csv(r"C:\Users\SASIDHAR ROYAL\Downloads\Advertising.csv")
df
```

Out[353]:

	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 [354]:
```
df.head()
```

Out[354]:

	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 [355]:
```
df.tail()
```

Out[355]:

	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 [356]:
```
df.describe()
```

Out[356]:

	TV	Radio	Newspaper	Sales
count	200.000000	200.000000	200.000000	200.000000
mean	147.042500	23.264000	30.554000	15.130500
std	85.854236	14.846809	21.778621	5.283892
min	0.700000	0.000000	0.300000	1.600000
25%	74.375000	9.975000	12.750000	11.000000
50%	149.750000	22.900000	25.750000	16.000000
75%	218.825000	36.525000	45.100000	19.050000
max	296.400000	49.600000	114.000000	27.000000

In [357]:
```
df.columns
```

Out[357]:
```
Index(['TV', 'Radio', 'Newspaper', 'Sales'], dtype='object')
```

In [358]:
```
df.shape
```

Out[358]:
```
(200, 4)
```

In [359]:
```
import seaborn as sns
import matplotlib.pyplot as plt
```

In [360]:
```
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 [361]:
```
df=df[['TV','Radio','Newspaper','Sales']]
```

In [362]:
```
df.columns=['TV','Radio','Newspaper','Sales']
```

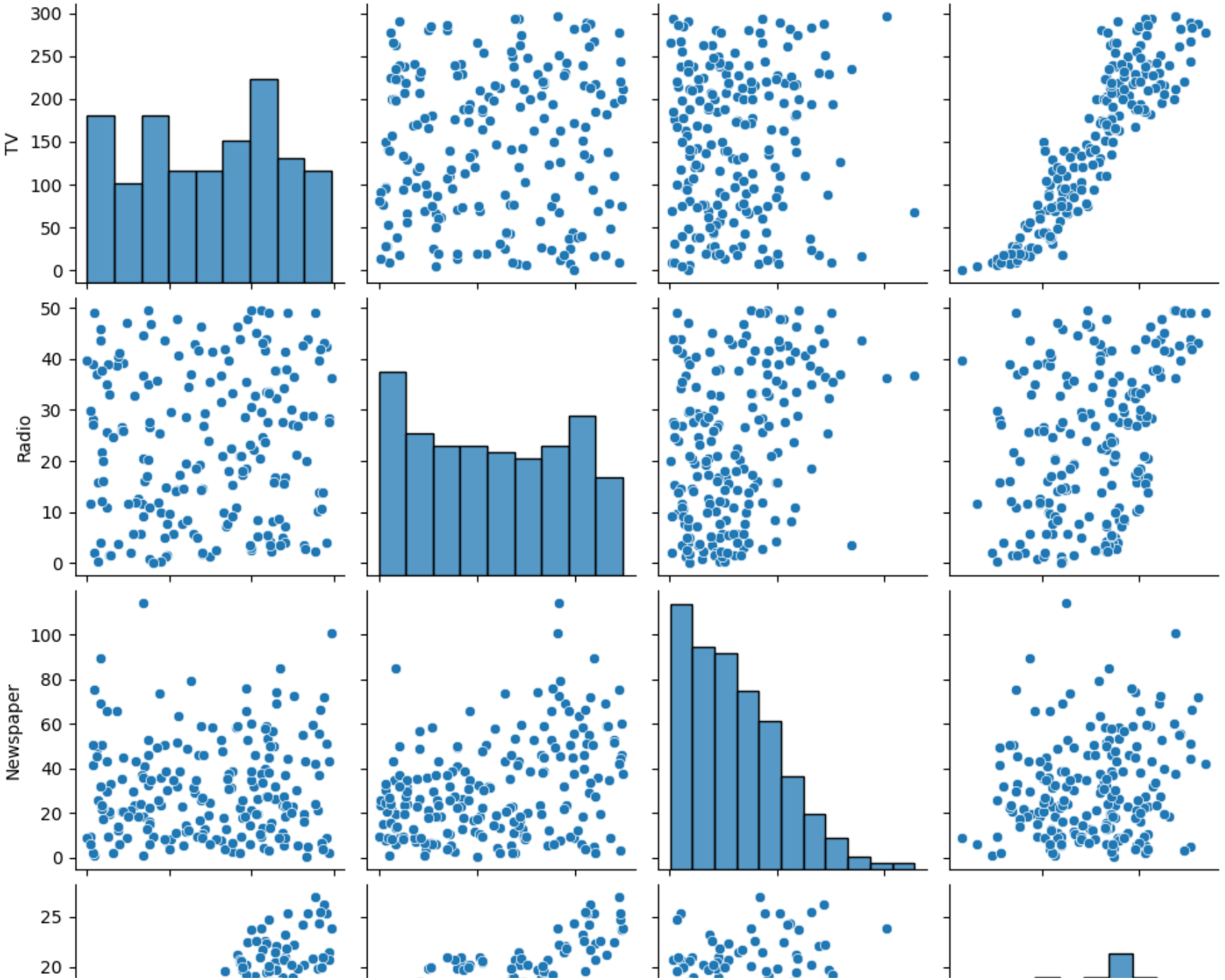
In [363]:
```
df.head(10)
```

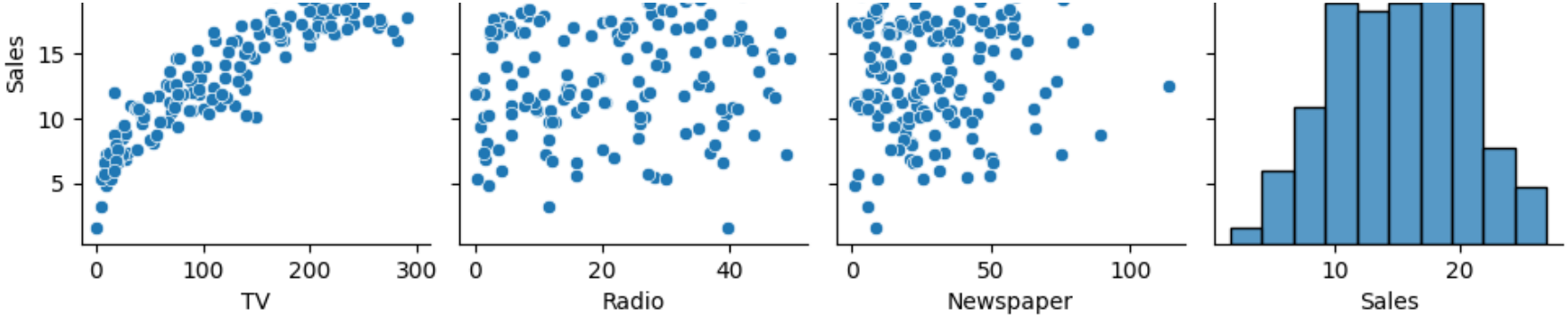
Out[363]:

	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
5	8.7	48.9	75.0	7.2
6	57.5	32.8	23.5	11.8
7	120.2	19.6	11.6	13.2
8	8.6	2.1	1.0	4.8
9	199.8	2.6	21.2	15.6

In [364]:
```
sns.pairplot(df)
```

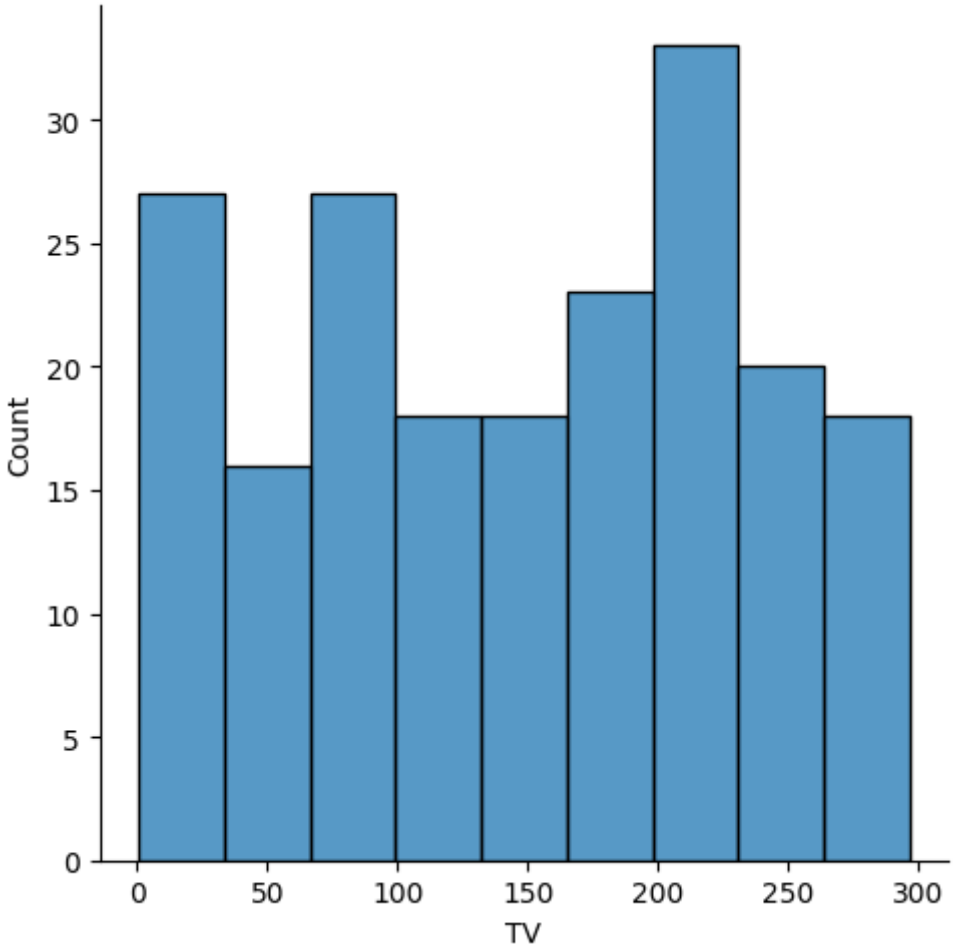
Out[364]:
```
<seaborn.axisgrid.PairGrid at 0x1785153e010>
```


TV
Radio
Newspaper
300
250
200
150
100
50
0
50
40
30
20
10
0
100
80
60
40
20
0
25
20


Sales
15
10
5
0
100
200
300
TV
0
20
40
Radio
0
50
100
Newspaper
10
20
Sales

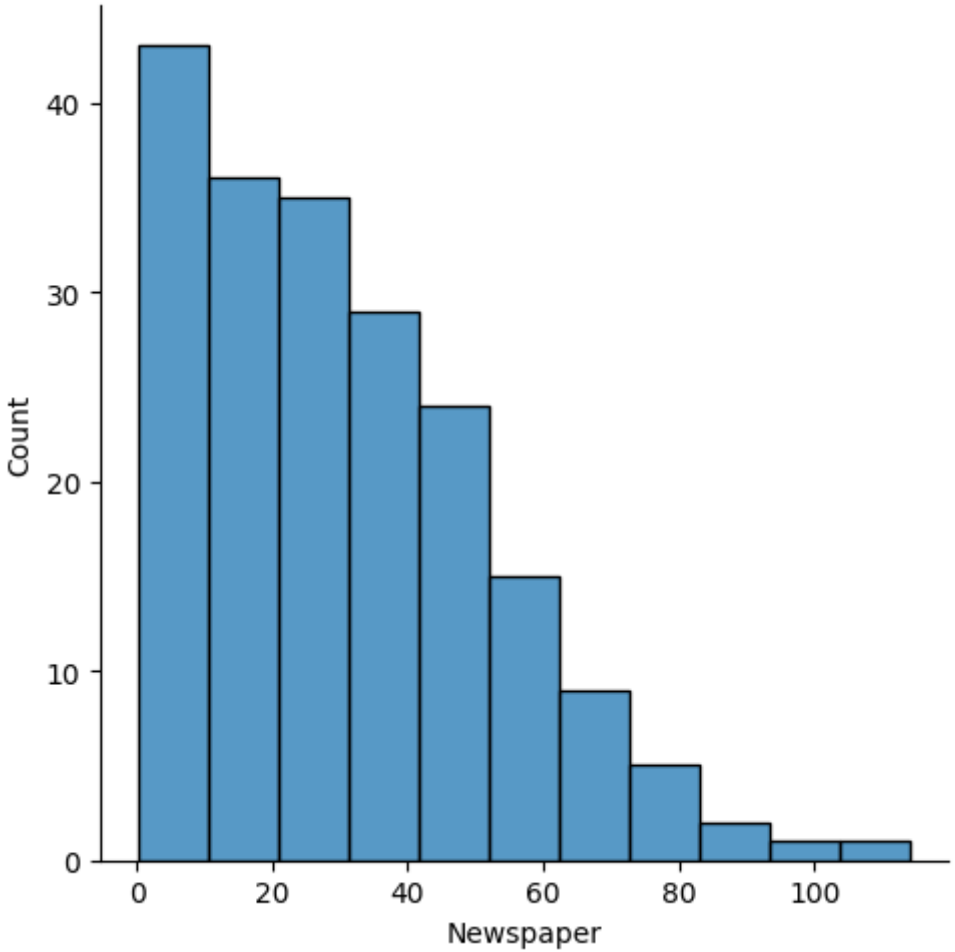
In [365]:
```
sns.displot(df['TV'])
```

Out[365]:
```
<seaborn.axisgrid.FacetGrid at 0x17850aca450>
```



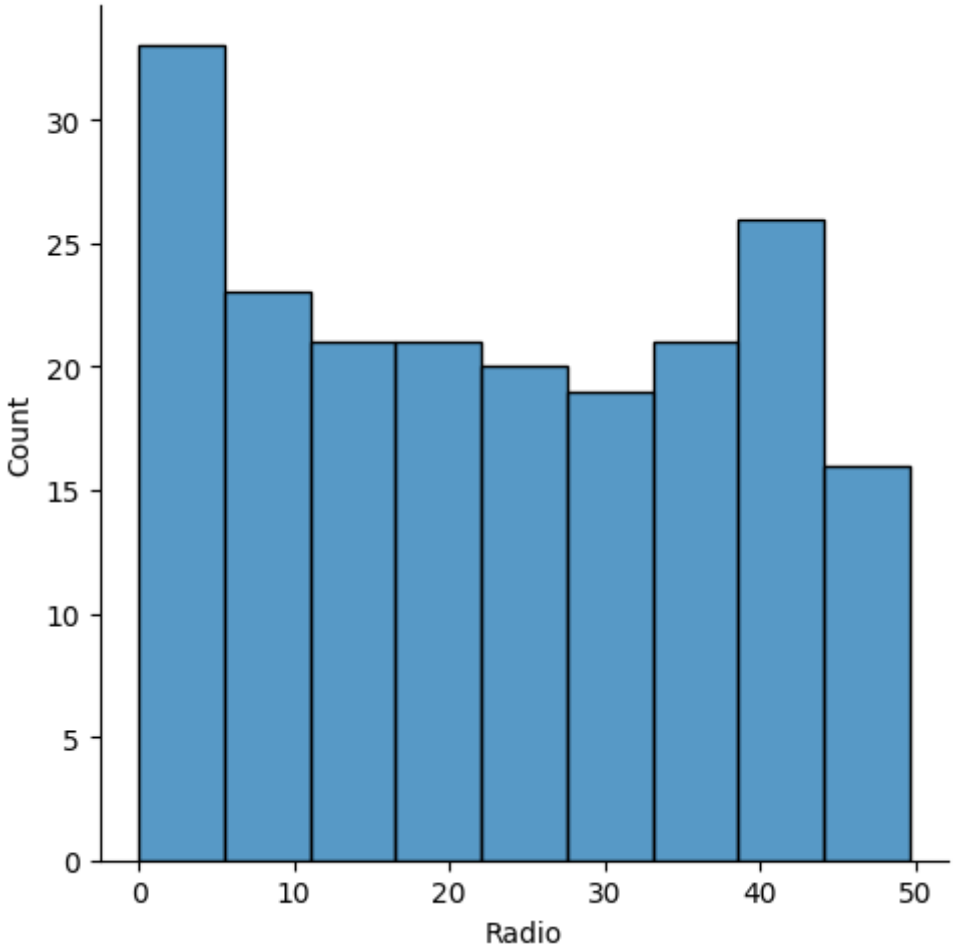
In [366]:
```
sns.displot(df['Newspaper'])
```

Out[366]:
```
<seaborn.axisgrid.FacetGrid at 0x17852dd4590>
```



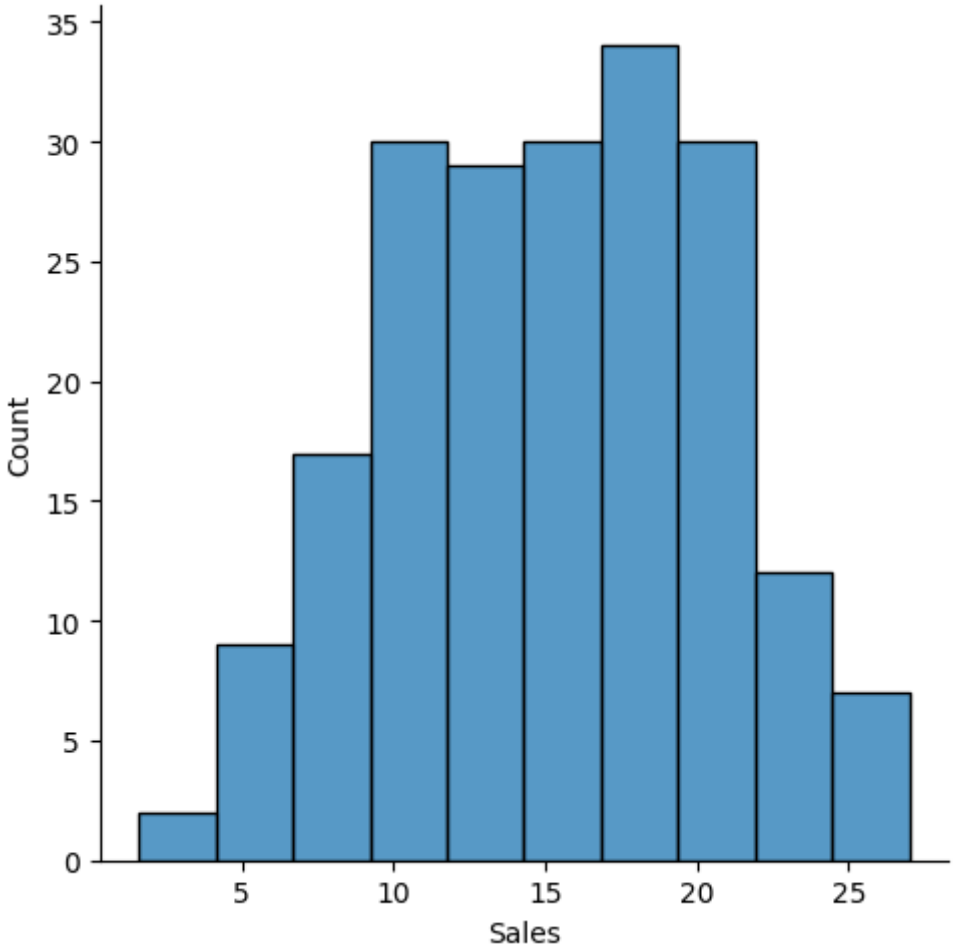
In [367]:
```
sns.displot(df['Radio'])
```

Out[367]:
```
<seaborn.axisgrid.FacetGrid at 0x17852de5e10>
```



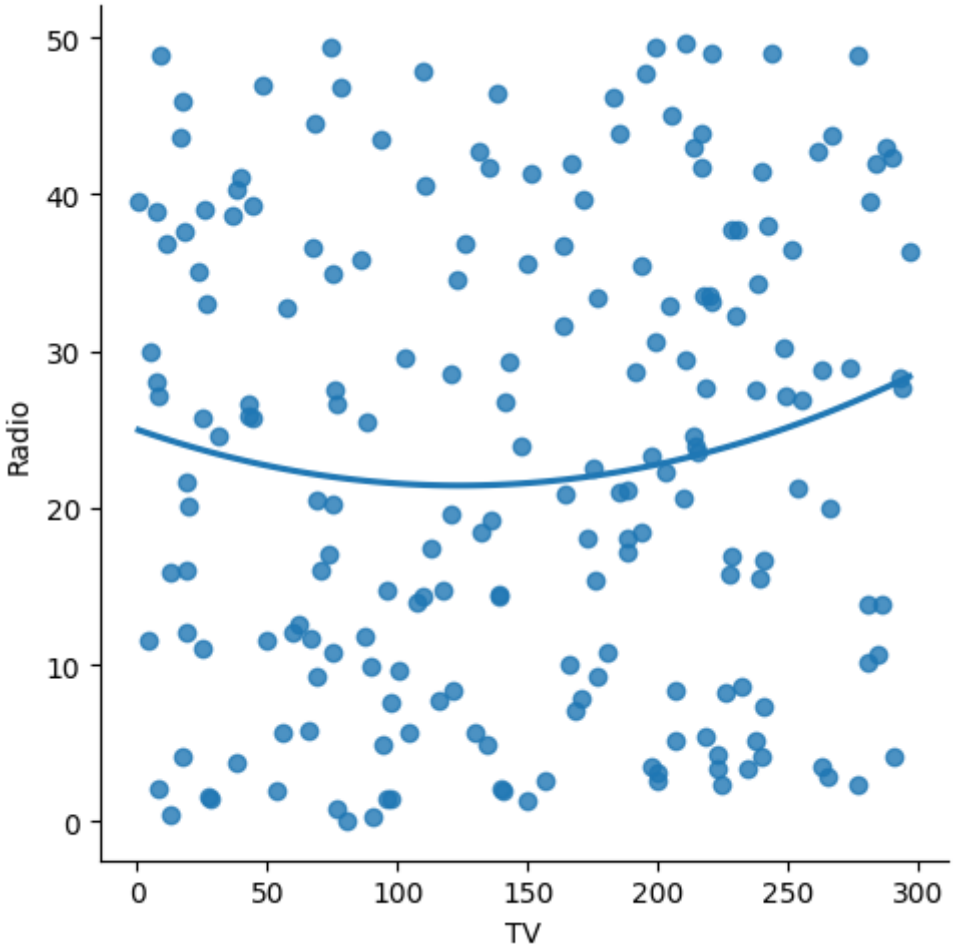
In [368]:
```
sns.displot(df['Sales'])
```

Out[368]:
```
<seaborn.axisgrid.FacetGrid at 0x17852eb4ad0>
```



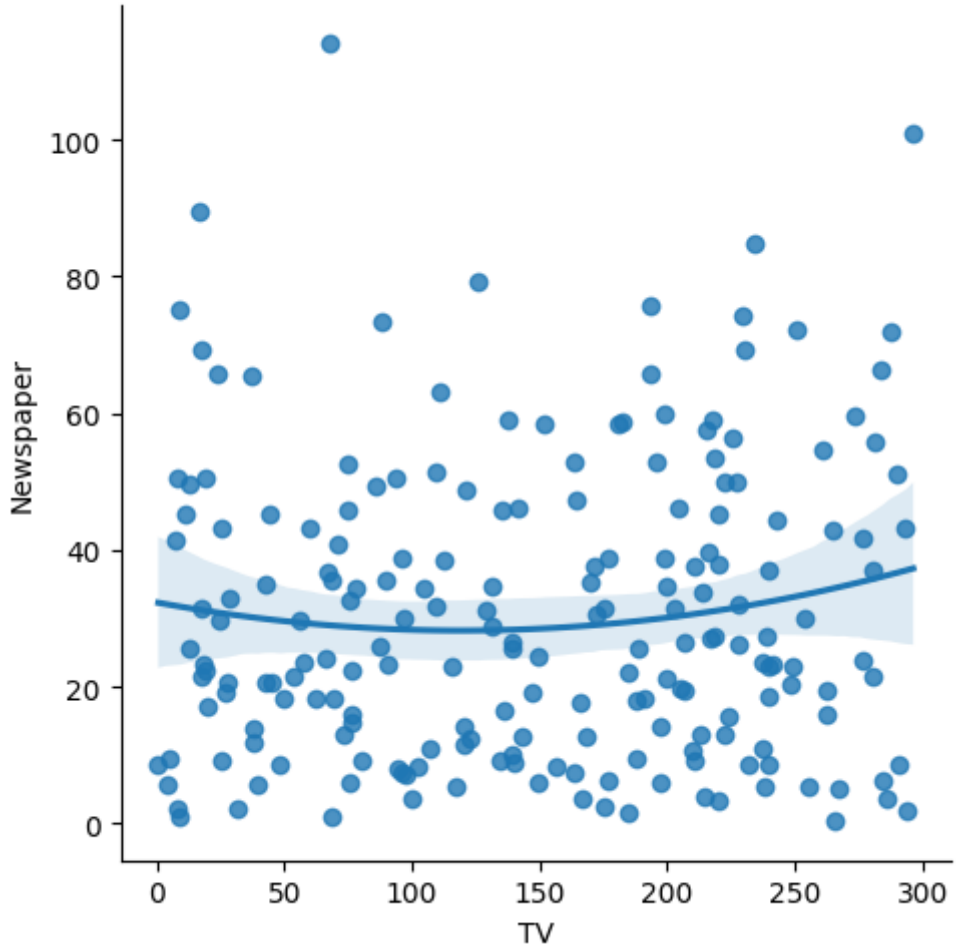
In [369]:
```
sns.lmplot(x="TV",y="Radio",data=df,order=2,ci=None)
```

Out[369]:
```
<seaborn.axisgrid.FacetGrid at 0x178529bc090>
```



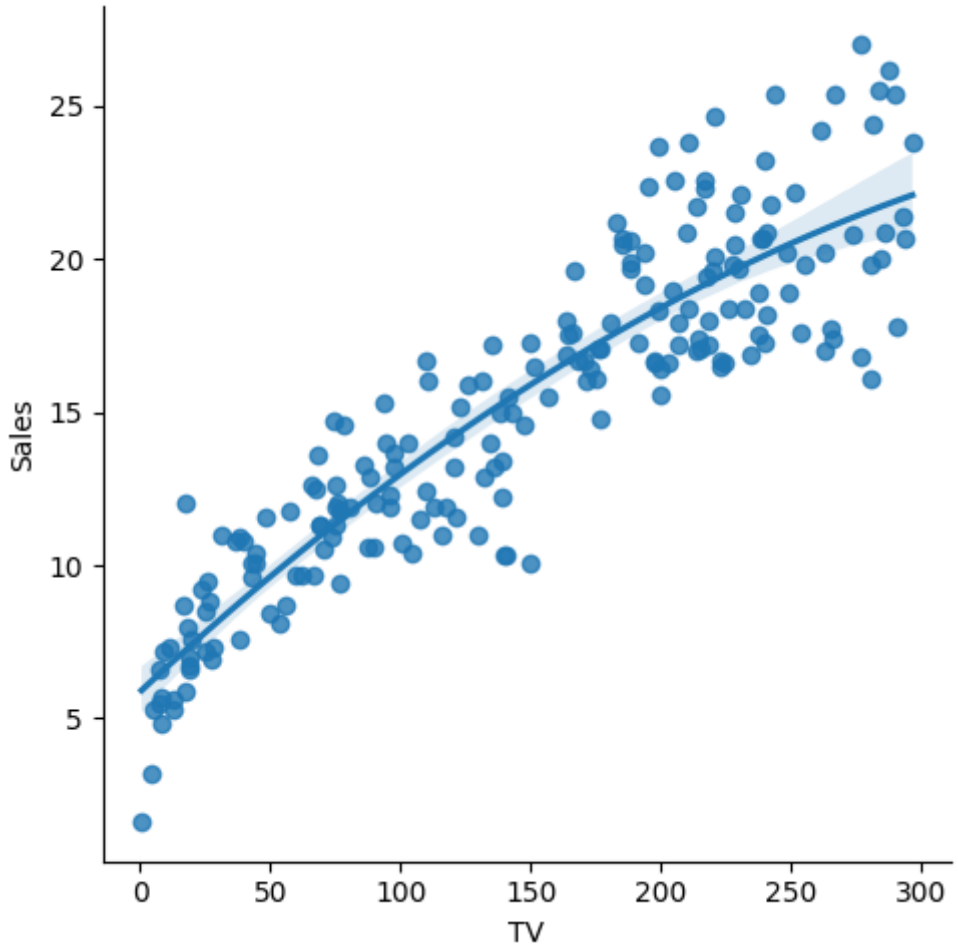
In [370]:
```
sns.lmplot(x="TV",y="Newspaper",data=df,order=2)
```

Out[370]:
```
<seaborn.axisgrid.FacetGrid at 0x17852e141d0>
```



In [371]:
```
sns.lmplot(x="TV",y="Sales",data=df,order=2)
```

Out[371]:
```
<seaborn.axisgrid.FacetGrid at 0x1785295af50>
```



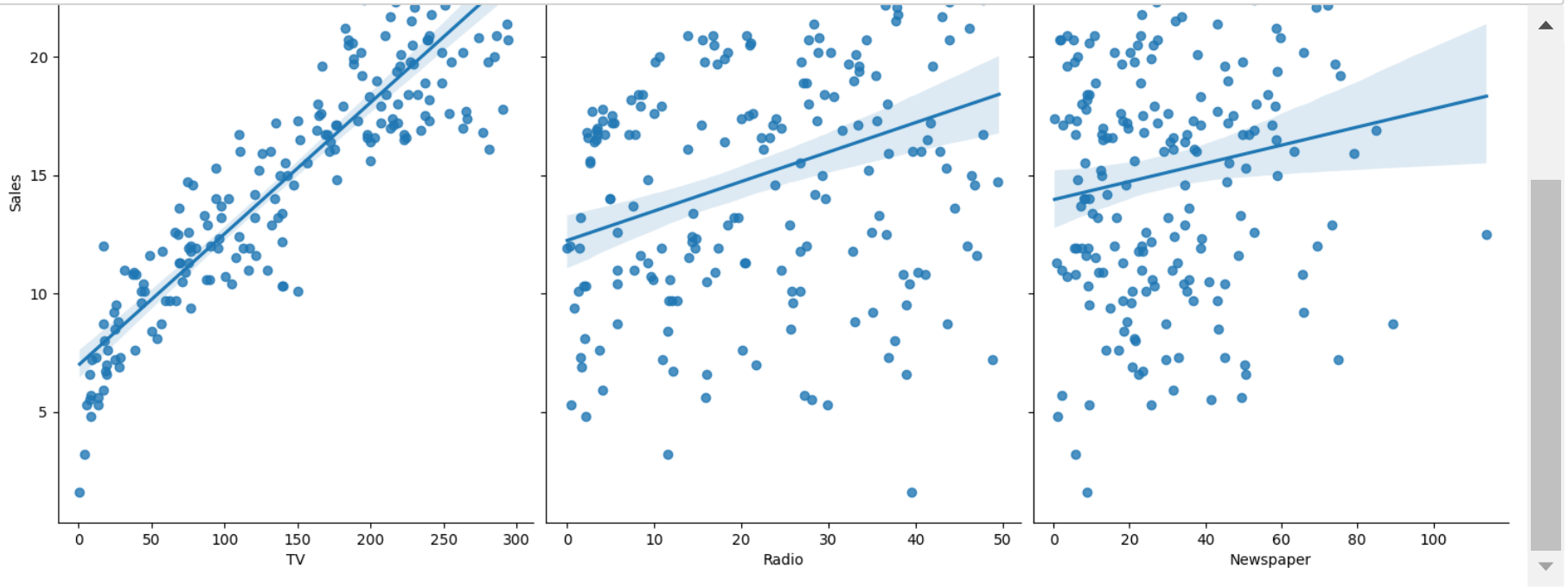
In [372]:
```
df.fillna(method='ffill',inplace=True)
```

In [373]:
```
x=np.array(df['TV']).reshape(-1,1)
y=np.array(df['Radio']).reshape(-1,1)
```

In [374]:
```
df.dropna(inplace=True)
X_train,X_test,y_train,y_test=train_test_split(x,y,test_size=0.3)
regr.fit(X_train,y_train)
regr.fit(X_train,y_train)
```

Out[374]:
```
LinearRegression
LinearRegression()
```

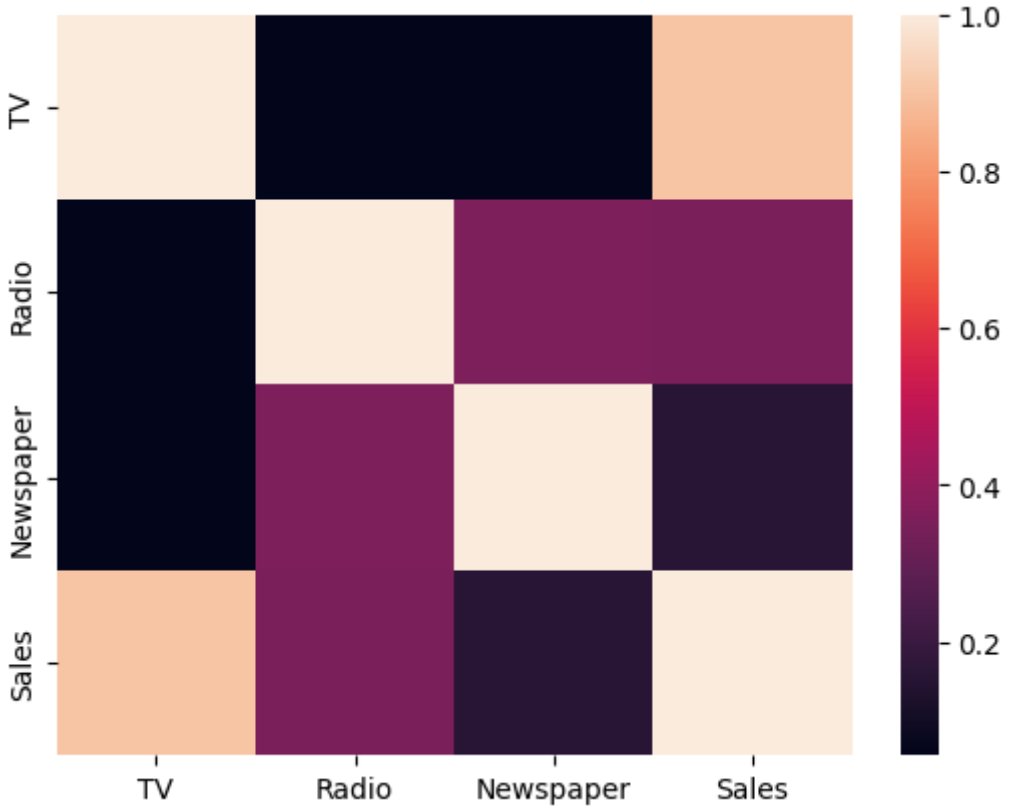
In [375]:
```
sns.pairplot(df,x_vars=['TV','Radio','Newspaper'],y_vars='Sales',height=7,aspect=0.7,kind='reg')
```



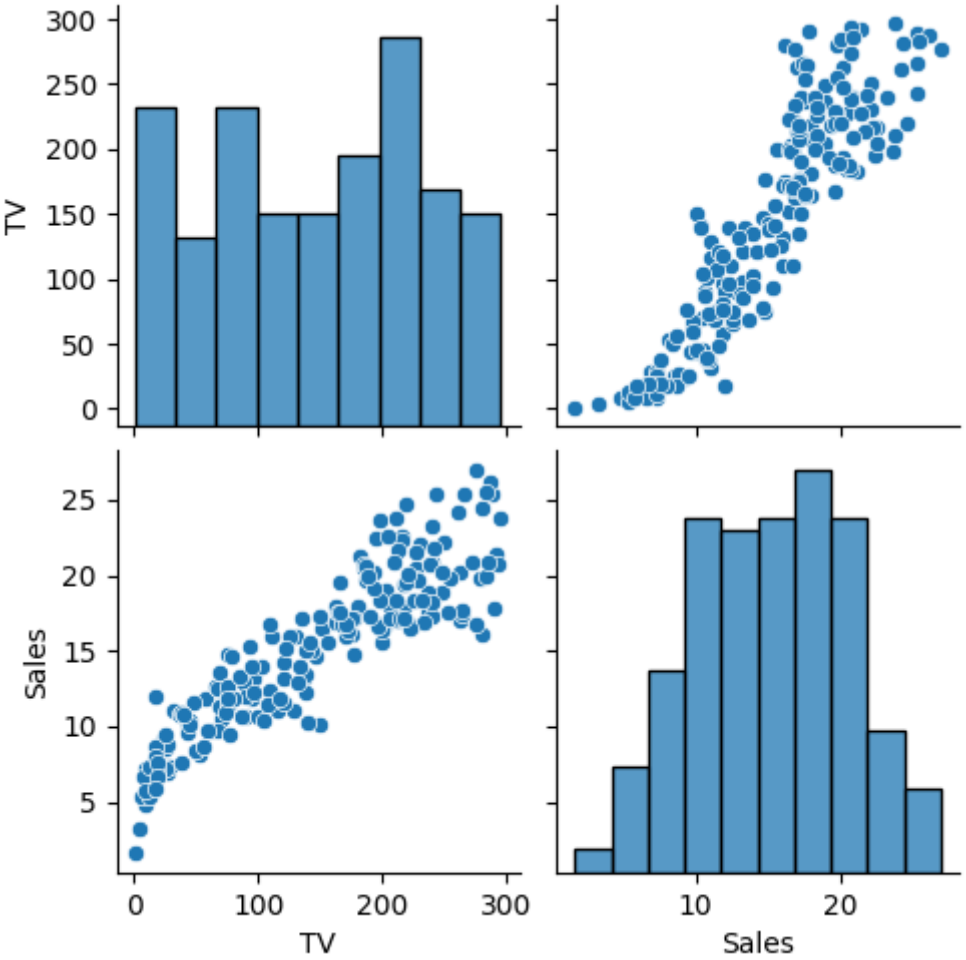
In [376]:
```
hk=df[['TV','Radio','Newspaper','Sales']]
```

In [377]:
```
sns.heatmap(hk.corr())
```

Out[377]: <Axes: >



In [378]:
```
df.drop(columns=['Radio','Newspaper'],inplace=True)
sns.pairplot(df)
df.Sales=np.log(df.Sales)
```



In [379]:
```
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 [380]:
```
from sklearn.linear_model import Lasso,Ridge
```

In [381]:
```
'''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)))'''
```

Out[381]:
```
'from sklearn.linear_model import RidgeCV\nridge_cv=RidgeCV(alphas=[0.0001,0.001,0.01,0.1,1,10]).fit(x_train,y_trai
n)\nprint("The train score for ridge model is{}".format(ridge_cv.score(x_train,y_train)))\nprint("The test score for
ridge model is{}".format(ridge_cv.score(x_test,y_test)))'
```

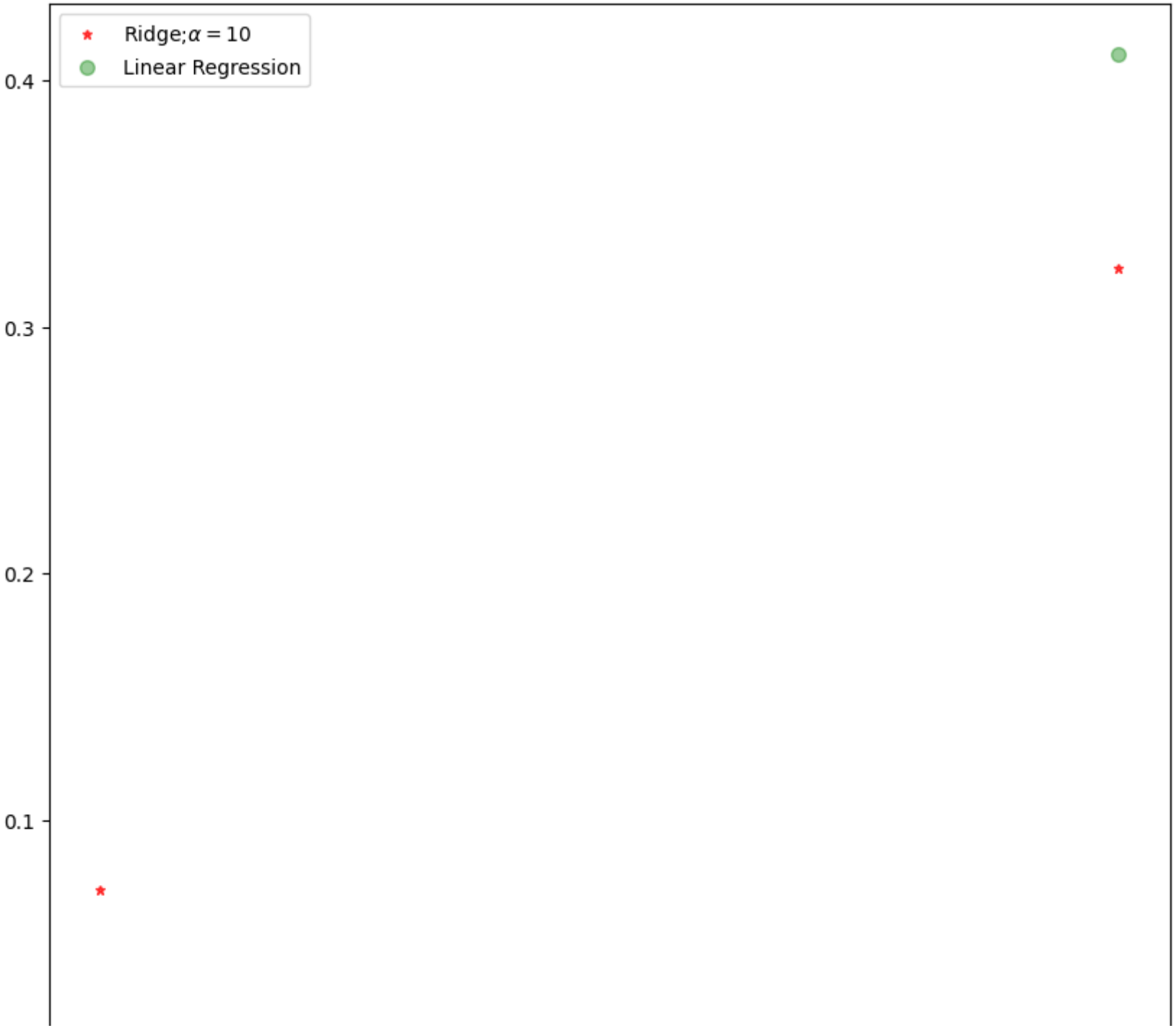
In [382]:
```
lr=LinearRegression()
lr.fit(X_train,y_train)
actual=y_test
train_score_lr=lr.score(X_train,y_train)
test_score_lr=lr.score(X_test,y_test)
print("\nLinear Regression Model:\n" )
print("The train score for lr model is {}".format(train_score_lr))
print("The train score lr model is {}".format(test_score_lr))
```

```
Linear Regression Model:

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

In [383]:
```
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 train score for ridge model is {}".format(test_score_ridge))
```

```
Ridge model\:

The train score for ridge model is 0.990287139194161
The train score for ridge model is 0.9844266285141221
```

In [384]:
```
plt.figure(figsize=(10,10))
plt.plot(features,ridgeReg.coef_,alpha=0.7,linestyle='none',marker='*',markersize=5,color='red',label=r'Ridge;$\alpha=
plt.plot(features,lr.coef_,alpha=0.4,linestyle='none',marker='o',markersize=7,color='green',label='Linear Regression')
plt.xticks(rotation=90)
plt.legend()
plt.show()
```

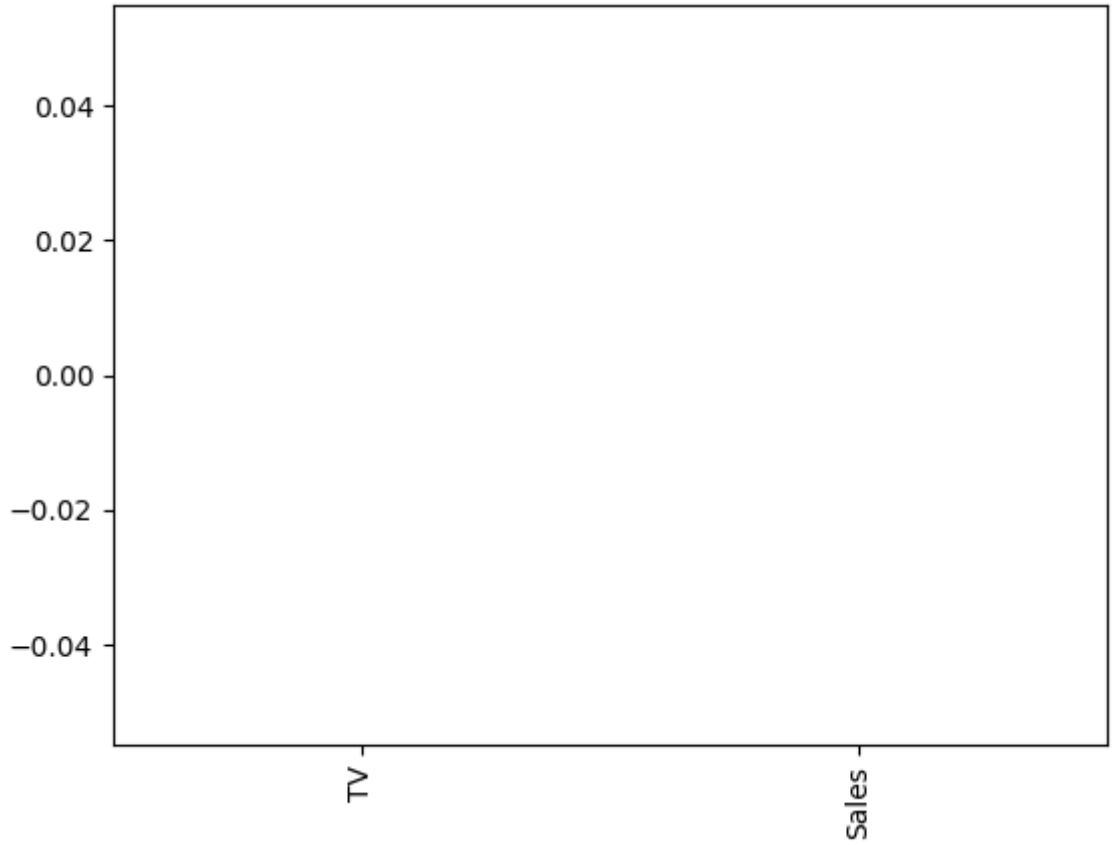

Ridge;$\alpha = 10$
Linear Regression
0.4
0.3
0.2
0.1

In [385]:
```
lassoReg=Lasso(alpha=10)
lassoReg.fit(X_train,y_train)
train_score_lasso=lassoReg.score(X_train,y_train)
test_score_lasso=lassoReg.score(X_test,y_test)
print("\nRidge model\:\n")
print("The train score for lasso model is {}".format(train_score_ridge))
print("The train score for lasso model is {}".format(test_score_ridge))
```

```
Ridge model\:

The train score for lasso model is 0.990287139194161
The train score for lasso model is 0.9844266285141221
```

In [386]:
```
pd.Series(lassoReg.coef_,features).sort_values(ascending=True).plot(kind="bar")
```

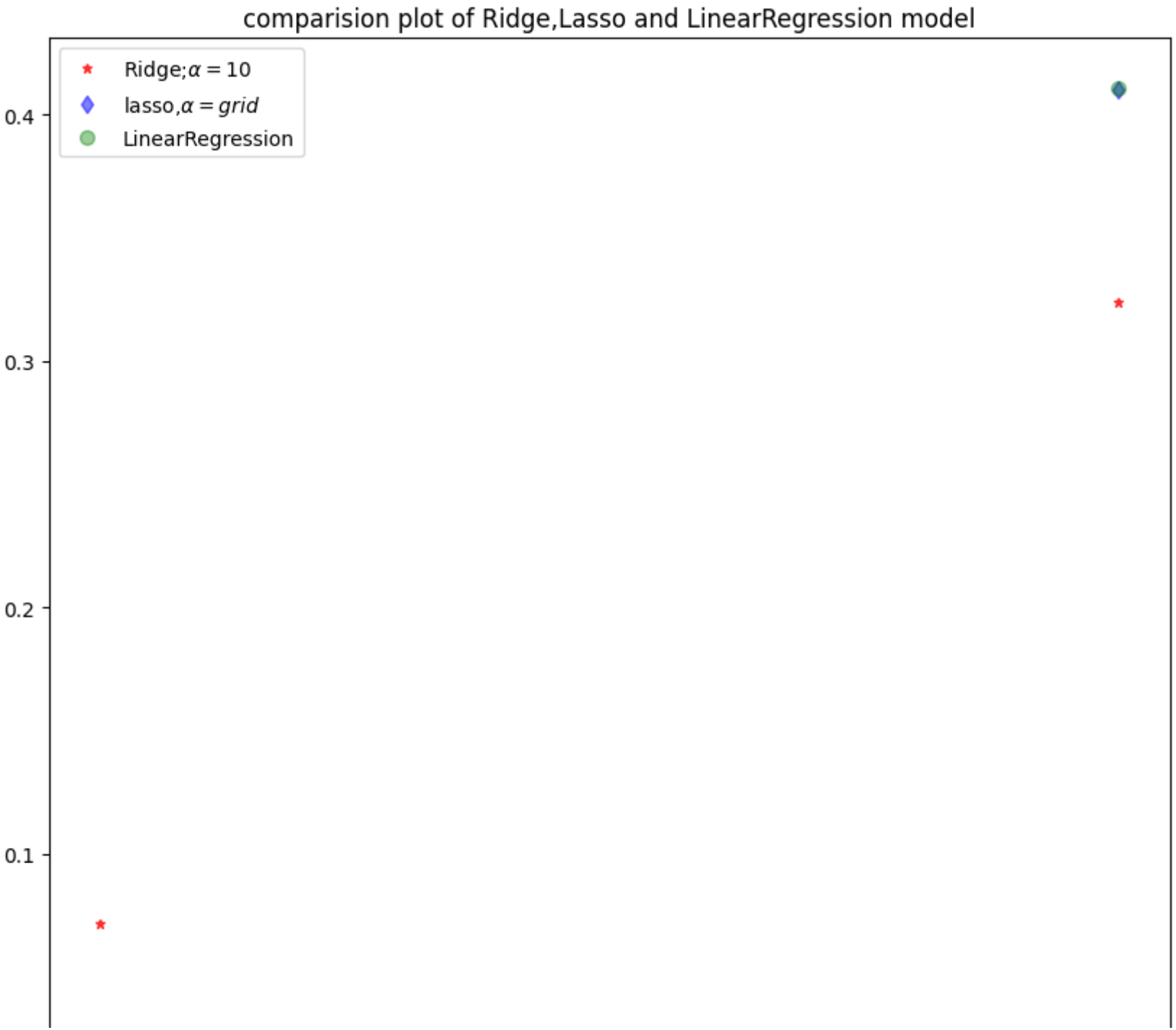
Out[386]: <Axes: >



In [387]:
```
from sklearn.linear_model import LassoCV
lasso_CV=LassoCV(alphas=[0.0001,0.001,0.01,0.1,1,10]).fit(X_train,y_train)
print("The train score for lasso model is{}".format(lasso_CV.score(X_train,y_train)))
print("The test score for lasso model is{}".format(lasso_CV.score(X_test,y_test)))
```

```
The train score for lasso model is0.9999999343798134
The test score for lasso model is0.9999999152638072
```

In [388]:
```
plt.figure(figsize=(10,10))
plt.plot(features,ridgeReg.coef_,alpha=0.7,linestyle='none',marker='*',markersize=5,color='red',label=r'Ridge;$\alpha=
plt.plot(features,lasso_CV.coef_,alpha=0.5,linestyle='none',marker='d',markersize=6,color='blue',label=r'lasso,$\alpha
plt.plot(features,lr.coef_,alpha=0.4,linestyle='none',marker='o',markersize=7,color='green',label='LinearRegression')
plt.xticks(rotation=90)
plt.legend()
plt.title("comparision plot of Ridge,Lasso and LinearRegression model")
plt.show()
```


comparision plot of Ridge,Lasso and LinearRegression model
Ridge;$\alpha = 10$
lasso,$\alpha = grid$
LinearRegression
0.4
0.3
0.2
0.1

In [389]:
```
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 is0.9999999999976281
The test score for ridge model is0.9999999999962489
```

In [ ]: