In [1]:

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
df=pd.read_csv(r"C:\Users\P. VIJAY KUMAR\Downloads\fiat500_VehicleSelection_Dataset.csv"
print(df)
```

```
        ID   model  engine_power  age_in_days      km  previous_owners  
0        1  lounge            51          882   25000                1   \
1        2     pop            51         1186   32500                1
2        3   sport            74         4658  142228                1
3        4  lounge            51         2739  160000                1
4        5     pop            73         3074  106880                1
...    ...     ...           ...          ...     ...              ...
1533  1534   sport            51         3712  115280                1
1534  1535  lounge            74         3835  112000                1
1535  1536     pop            51         2223   60457                1
1536  1537  lounge            51         2557   80750                1
1537  1538     pop            51         1766   54276                1

            lat        lon  price
0     44.907242   8.611560   8900
1     45.666359  12.241890   8800
2     45.503300  11.417840   4200
3     40.633171  17.634609   6000
4     41.903221  12.495650   5700
...         ...        ...    ...
1533  45.069679   7.704920   5200
1534  45.845692   8.666870   4600
1535  45.481541   9.413480   7500
1536  45.000702   7.682270   5990
1537  40.323410  17.568270   7900

[1538 rows x 9 columns]
```

In [27]:

```
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn import preprocessing,svm
```

In [28]:

```
df=df[['km','price']]
df.columns=['Km','Price']
```

In [29]:

```
#display top 10 rows
print(df.head(10))
```

```
       Km  Price
0   25000   8900
1   32500   8800
2  142228   4200
3  160000   6000
4  106880   5700
5   70225   7900
6   11600  10750
7   49076   9190
8   76000   5600
9   89000   6000
```

In [30]:

```
df.describe()
```

Out[30]:

	Km	Price
count	1538.000000	1538.000000
mean	53396.011704	8576.003901
std	40046.830723	1939.958641
min	1232.000000	2500.000000
25%	20006.250000	7122.500000
50%	39031.000000	9000.000000
75%	79667.750000	10000.000000
max	235000.000000	11100.000000

In [31]:

```
#check for Null Values
print(df.isna().any())
```

```
Km       False
Price    False
dtype: bool
```

In [32]:

```
df.columns
```

Out[32]:

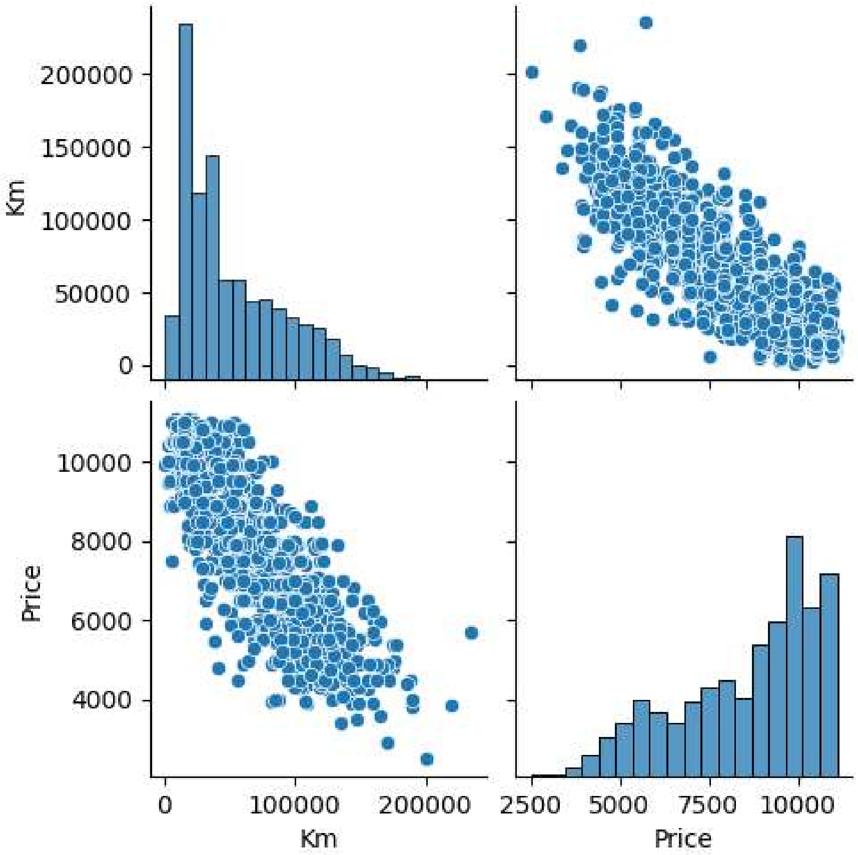
```
Index(['Km', 'Price'], dtype='object')
```

In [33]:

```
sns.pairplot(df)
```

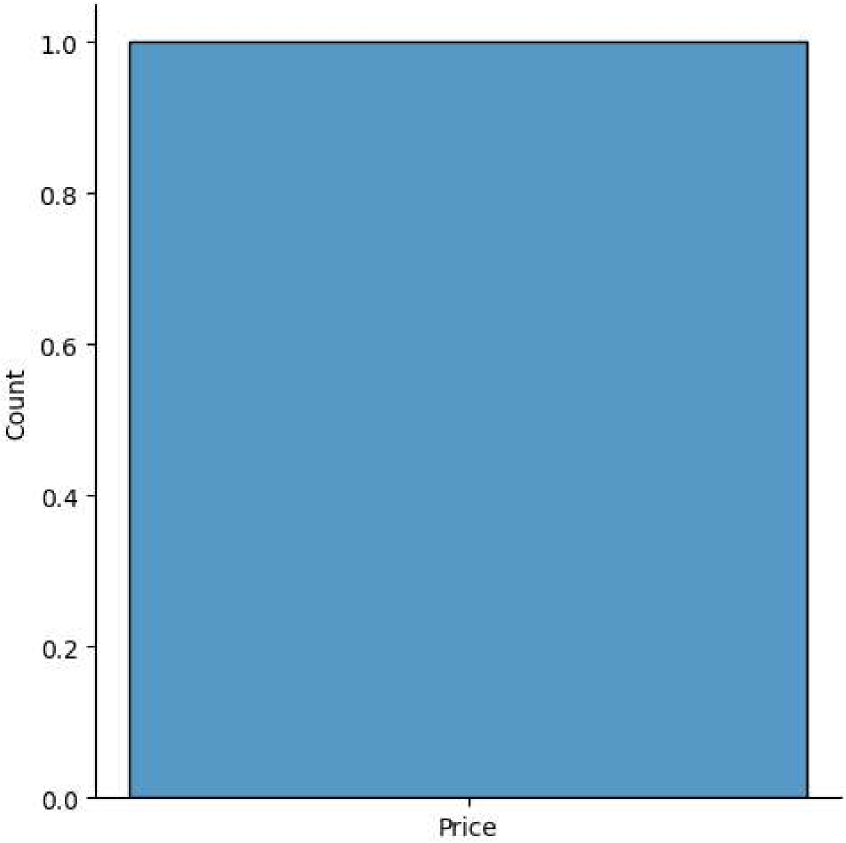
Out[33]:

```
<seaborn.axisgrid.PairGrid at 0x2cb06e7d1b0>
```



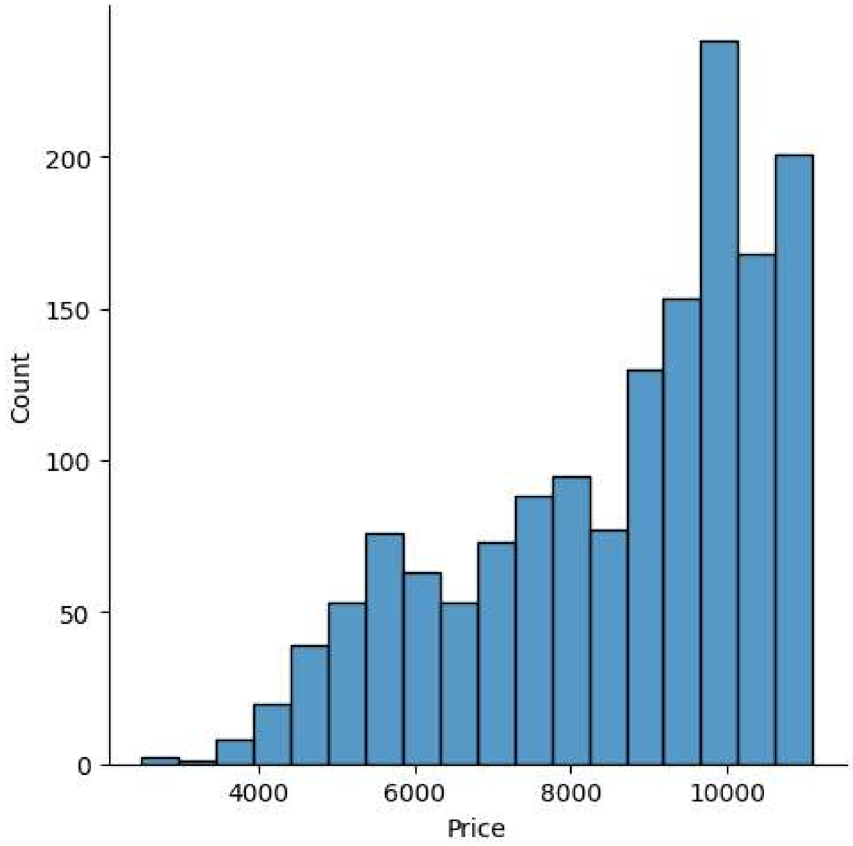
In [34]:
```
sns.displot(["Price"])
```

Out[34]:
```
<seaborn.axisgrid.FacetGrid at 0x2cb09aa3910>
```



In [42]:
```
sns.displot(df["Price"])
```

Out[42]:
```
<seaborn.axisgrid.FacetGrid at 0x2cb09a0f9d0>
```

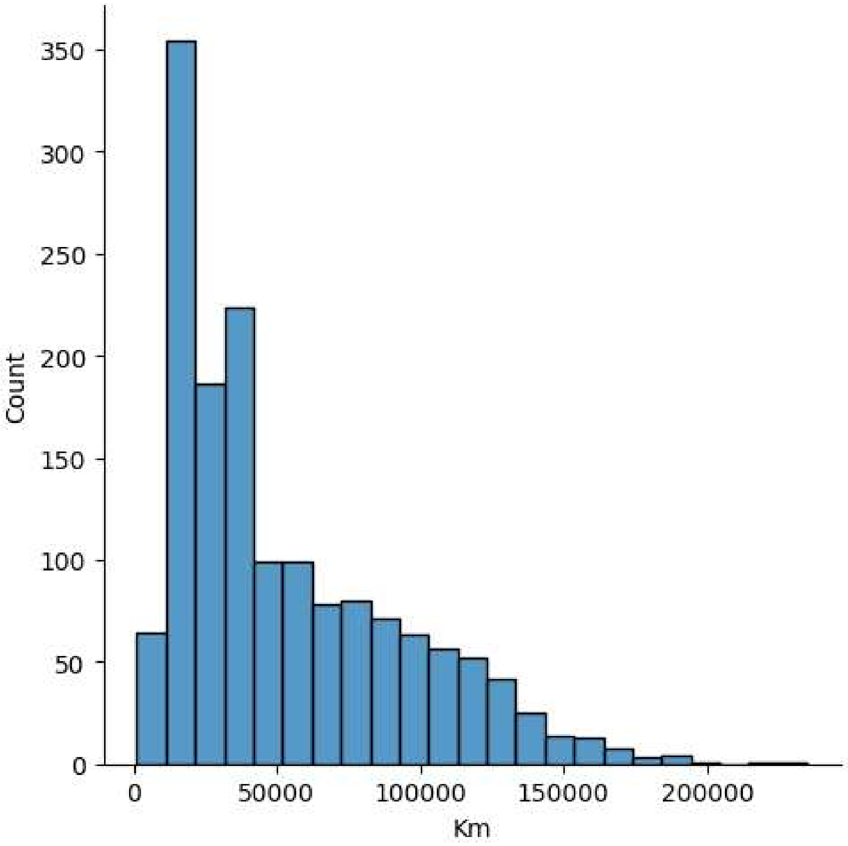


In [44]:

```
sns.displot(df["Km"])
```

Out[44]:

```
<seaborn.axisgrid.FacetGrid at 0x2cb013a0e50>
```



In [45]:

```
x=np.array(df['Km']).reshape(-1,1)
y=np.array(df['Price']).reshape(-1,1)
```

In [46]:

```
df.dropna(inplace=True)
```

```
C:\Users\P. VIJAY KUMAR\AppData\Local\Temp\ipykernel_20624\1379821321.py:1: SettingWithCopy
Warning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_gui
de/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stab
le/user_guide/indexing.html#returning-a-view-versus-a-copy)
  df.dropna(inplace=True)
```

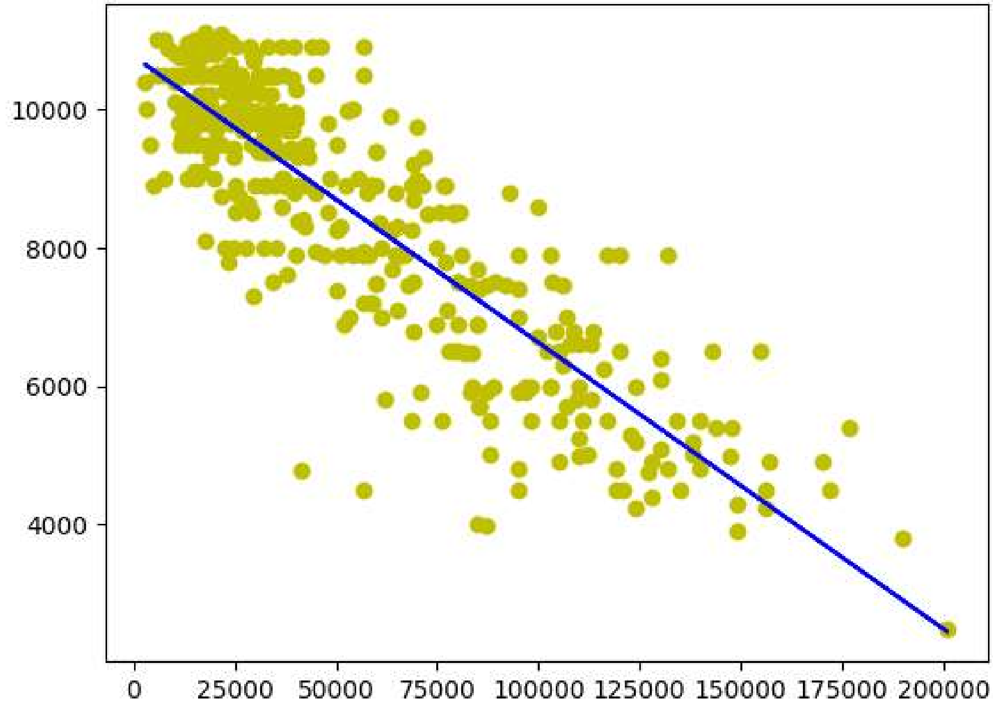
In [47]:

```
X_train,X_test,y_train,y_test=train_test_split(x,y,test_size=0.3)
regr=LinearRegression()
regr.fit(X_train,y_train)
regr.fit(X_train,y_train)
print(regr.score(X_test,y_test))

```

```
0.7595613155117583
```

In [48]:
```
y_pred=regr.predict(X_test)
plt.scatter(X_test,y_test,color='y')
plt.plot(X_test,y_pred,color='b')
plt.show()
```



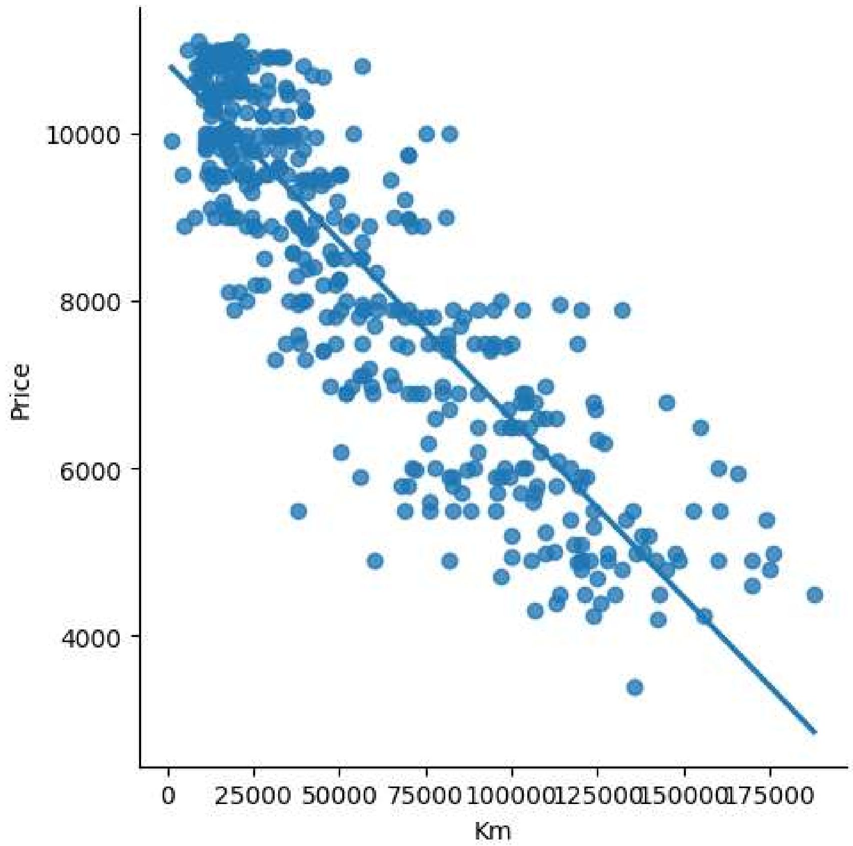
In [49]:

```
udf=df[:][:500]
sns.lmplot(x="Km",y="Price",data=udf,order=1,ci=None)

```

Out[49]:

```
<seaborn.axisgrid.FacetGrid at 0x2cb0b36dea0>
```



In [50]:

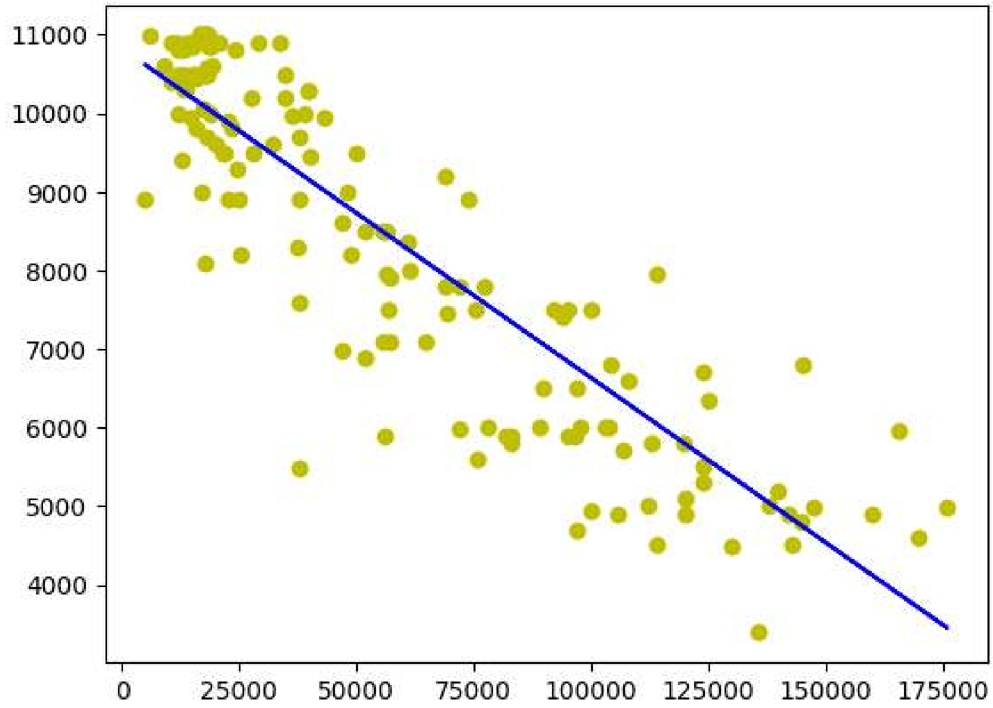
```
udf.fillna(method='ffill',inplace=True)
X=np.array(udf['Km']).reshape(-1,1)
y=np.array(udf['Price']).reshape(-1,1)
udf.dropna(inplace=True)
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.3)
regr.fit(X_train,y_train)
```

Out[50]:

```
▾ LinearRegression
LinearRegression()
```

In [51]:

```
y_pred=regr.predict(X_test)
plt.scatter(X_test,y_test,color='y')
plt.plot(X_test,y_pred,color='b')
plt.show()
```



In [52]:

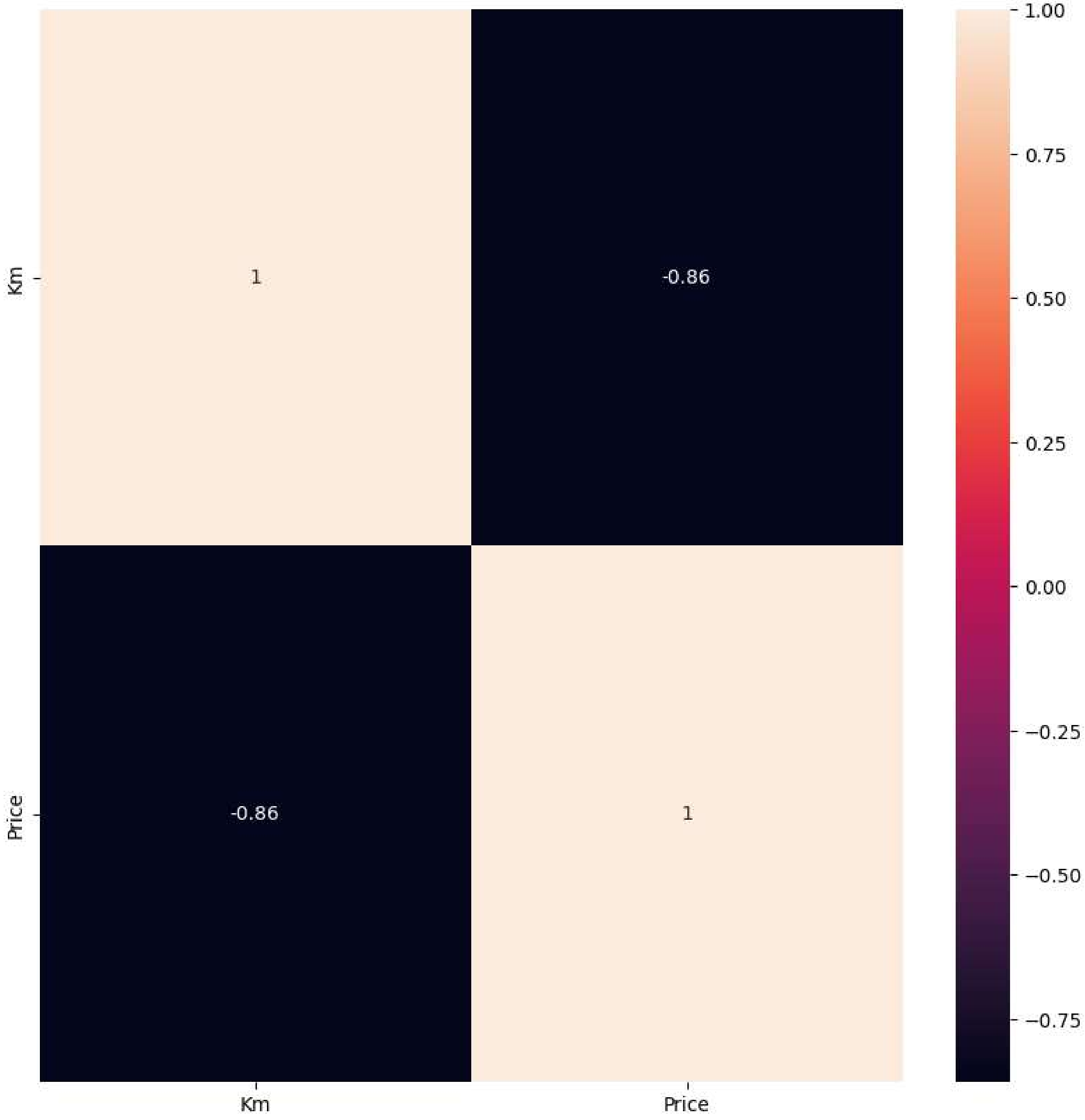
```
from sklearn.linear_model import Ridge,Lasso,RidgeCV,LassoCV
```

In [53]:

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

Out[53]:

```
<Axes: >
```



In [54]:

```python
from sklearn.preprocessing import StandardScaler
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 (1076, 2)
The dimension of X_test is (462, 2)
```

In [55]:

```python
#Linear regression model
regr=LinearRegression()
regr.fit(X_train,y_train)
actual=y_test #actual value
train_score_regr=regr.score(X_train,y_train)
test_score_regr=regr.score(X_test,y_test)
print("\nLinear model:\n")
print("The train score for Linear model is {}".format(train_score_regr))
print("The test score for Linear model is {}".format(test_score_regr))
```

```

Linear model:

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

In [56]:

```python
#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:\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 0.9997095924476732
The test score for ridge model is 0.9997198323998524
```

In [57]:

```python
#using the linear cv model for ridge regression
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(ridge_cv.score(X_train,y_train))
print(ridge_cv.score(X_test,y_test))

```

```
0.9999999999999668
0.999999999999968
```

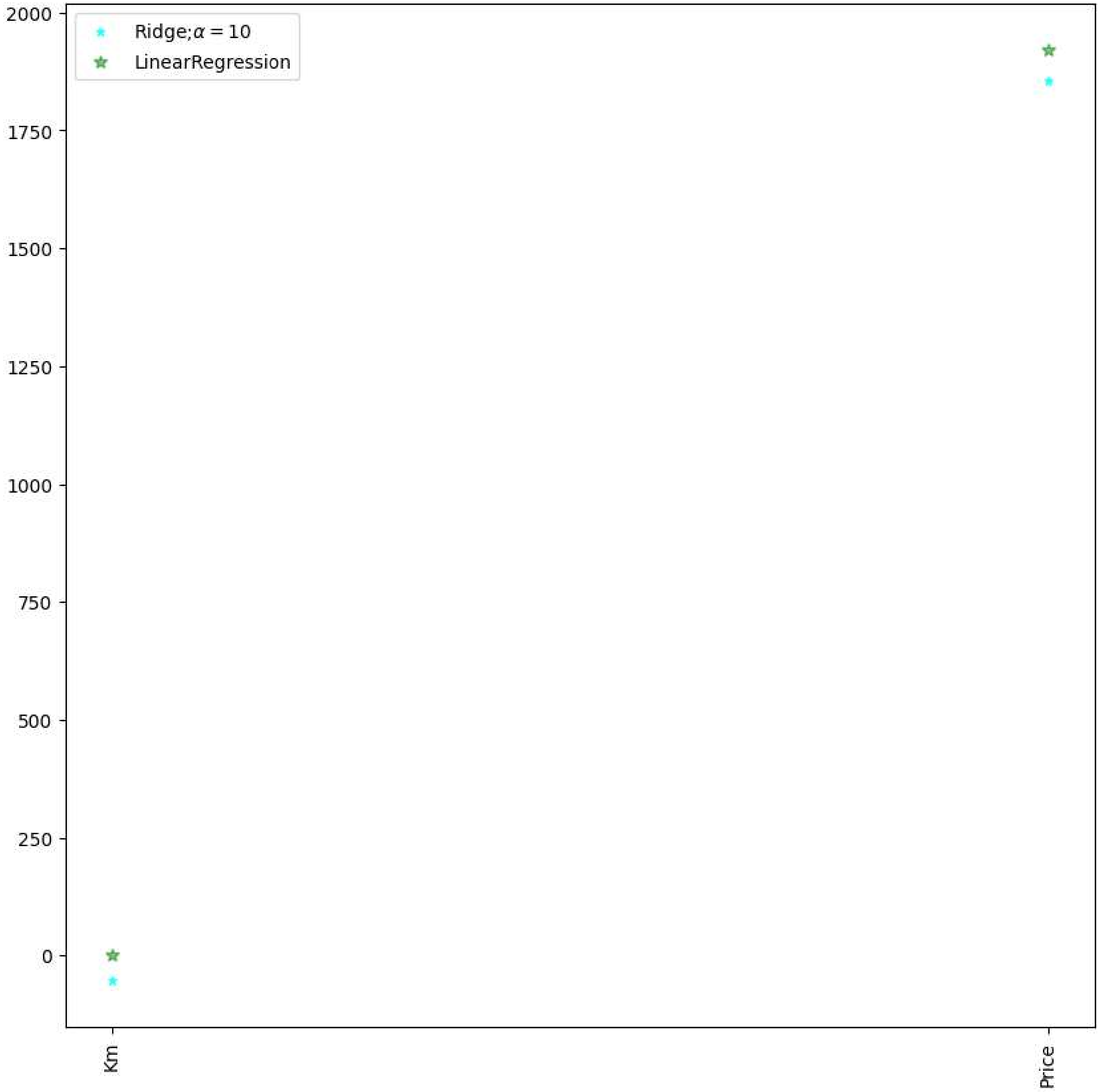
In [59]:

```python
#using the linear cv model for lasso regression
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))
```

```
0.9999999877496772
0.9999999874481674
```

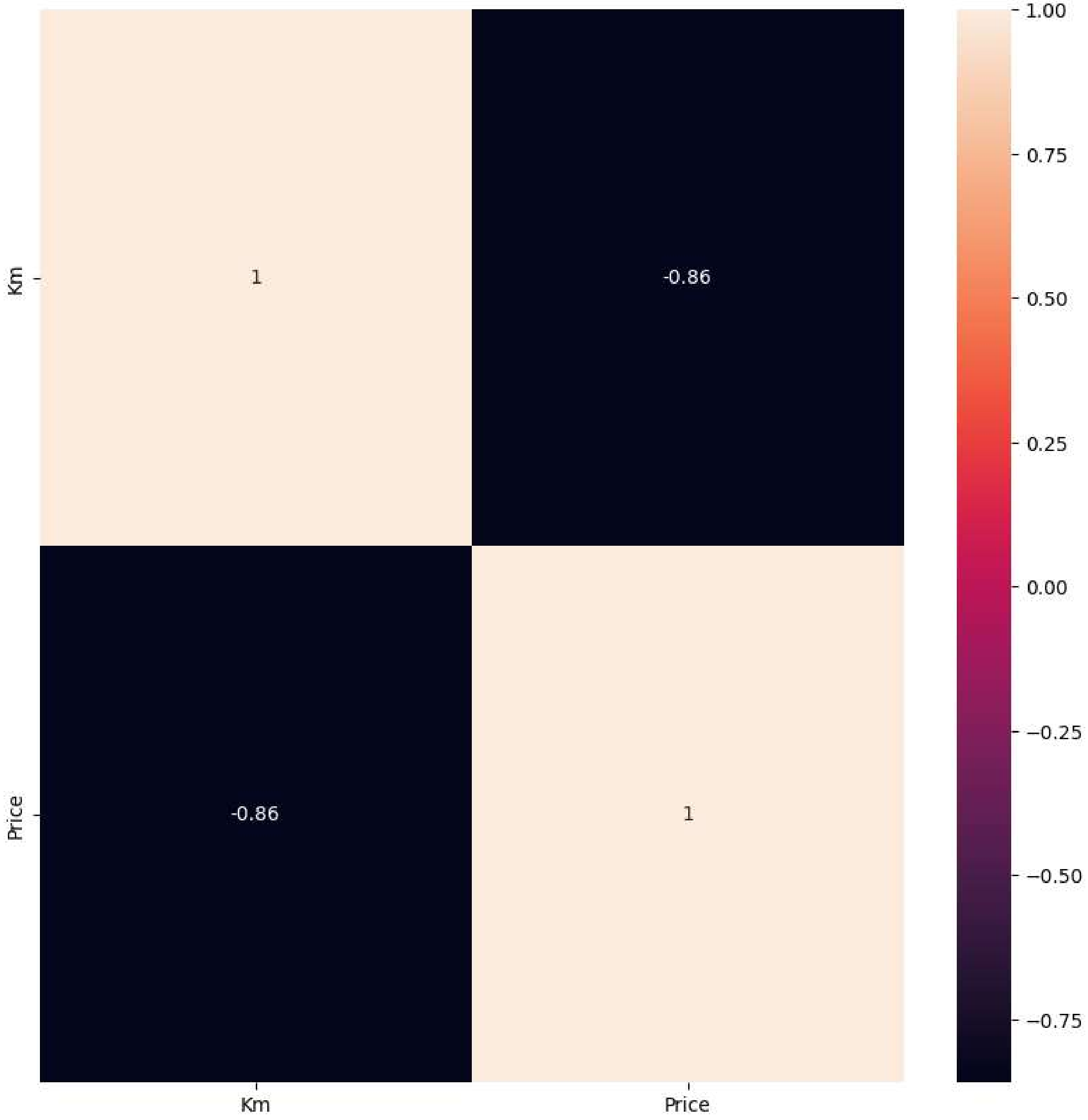
In [63]:

```python
plt.figure(figsize=(10,10))
plt.plot(features,ridgeReg.coef_,alpha=0.7,linestyle='none',marker='*',markersize=5,
         color='cyan',label=r'Ridge;$\alpha=10$',zorder=7)
plt.plot(features,regr.coef_,alpha=0.5,linestyle='none',marker='*',markersize=7,
         color='g',label=r'LinearRegression')
plt.xticks(rotation=90)
plt.legend()
plt.show()
```



In [60]:
```
#ridge regression
plt.figure(figsize=(10,10))
sns.heatmap(df.corr(),annot=True)
```

Out[60]:
```
<Axes: >
```



In [61]:

```
#lasso regression model
lassoReg=Lasso(alpha=10)
lassoReg.fit(X_train,y_train)
#train and test score for ridge regression
train_score_lasso=lassoReg.score(X_train,y_train)
test_score_lasso=lassoReg.score(X_test,y_test)
print("\nLasso model:\n")
print("The train score for lasso model is {}".format(train_score_lasso))
print("The test score for lasso model is {}".format(test_score_lasso))
```

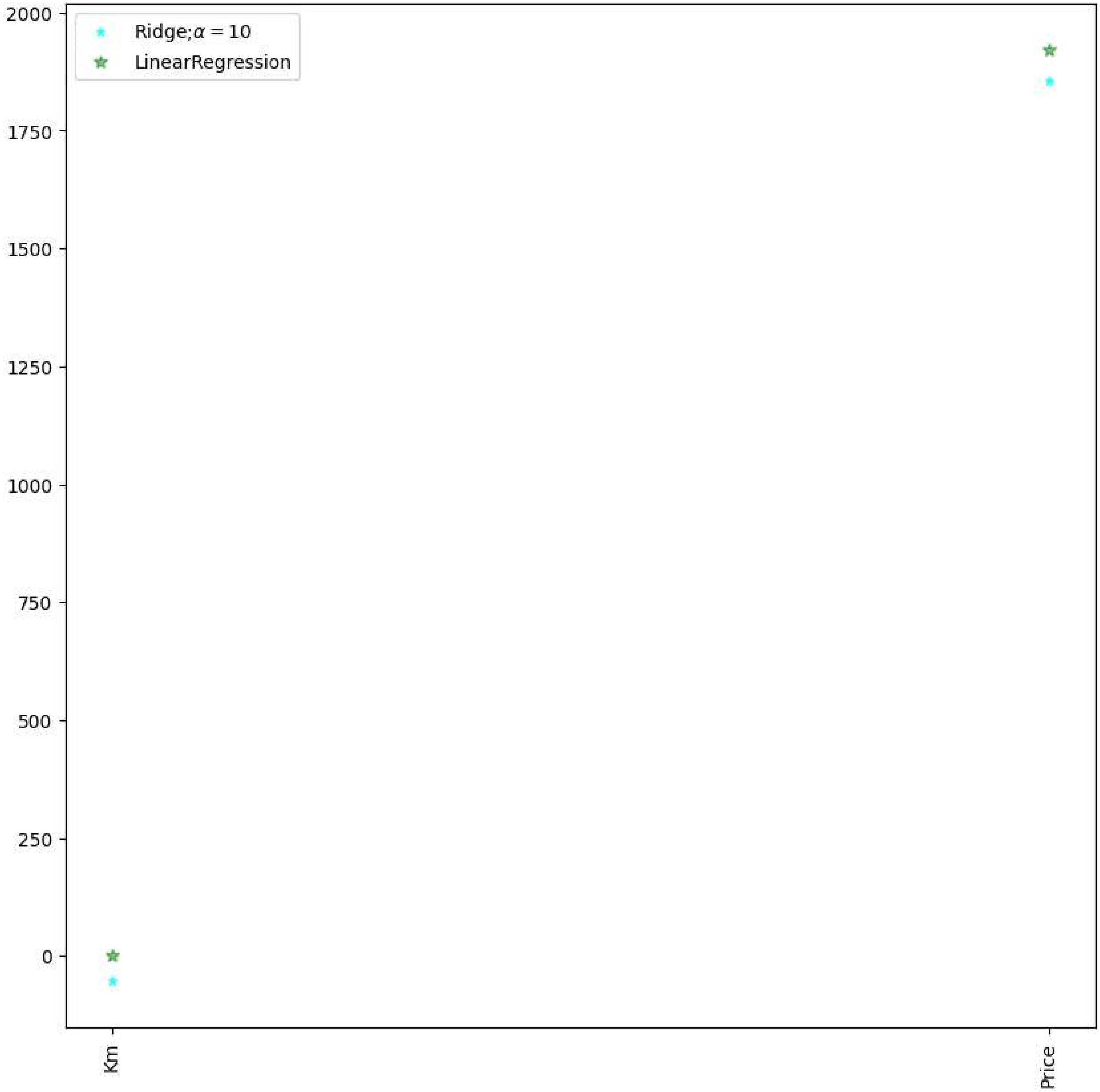
```

Lasso model:

The train score for lasso model is 0.9999728562194999
The test score for lasso model is 0.9999728508562553
```

In [64]:

```
plt.figure(figsize=(10,10))
plt.plot(features,ridgeReg.coef_,alpha=0.7,linestyle='none',marker='*',markersize=5,
         color='cyan',label=r'Ridge;$\alpha=10$',zorder=7)
plt.plot(features,regr.coef_,alpha=0.5,linestyle='none',marker='*',markersize=7,
         color='g',label=r'LinearRegression')
plt.xticks(rotation=90)
plt.legend()
plt.show()
```

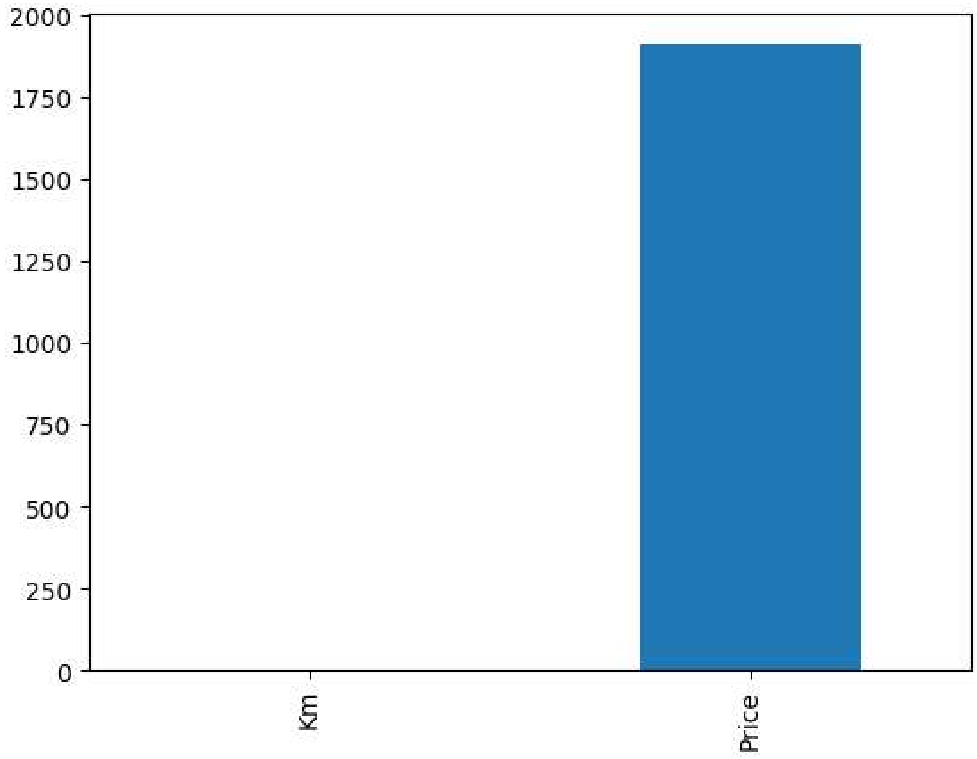


In [62]:

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

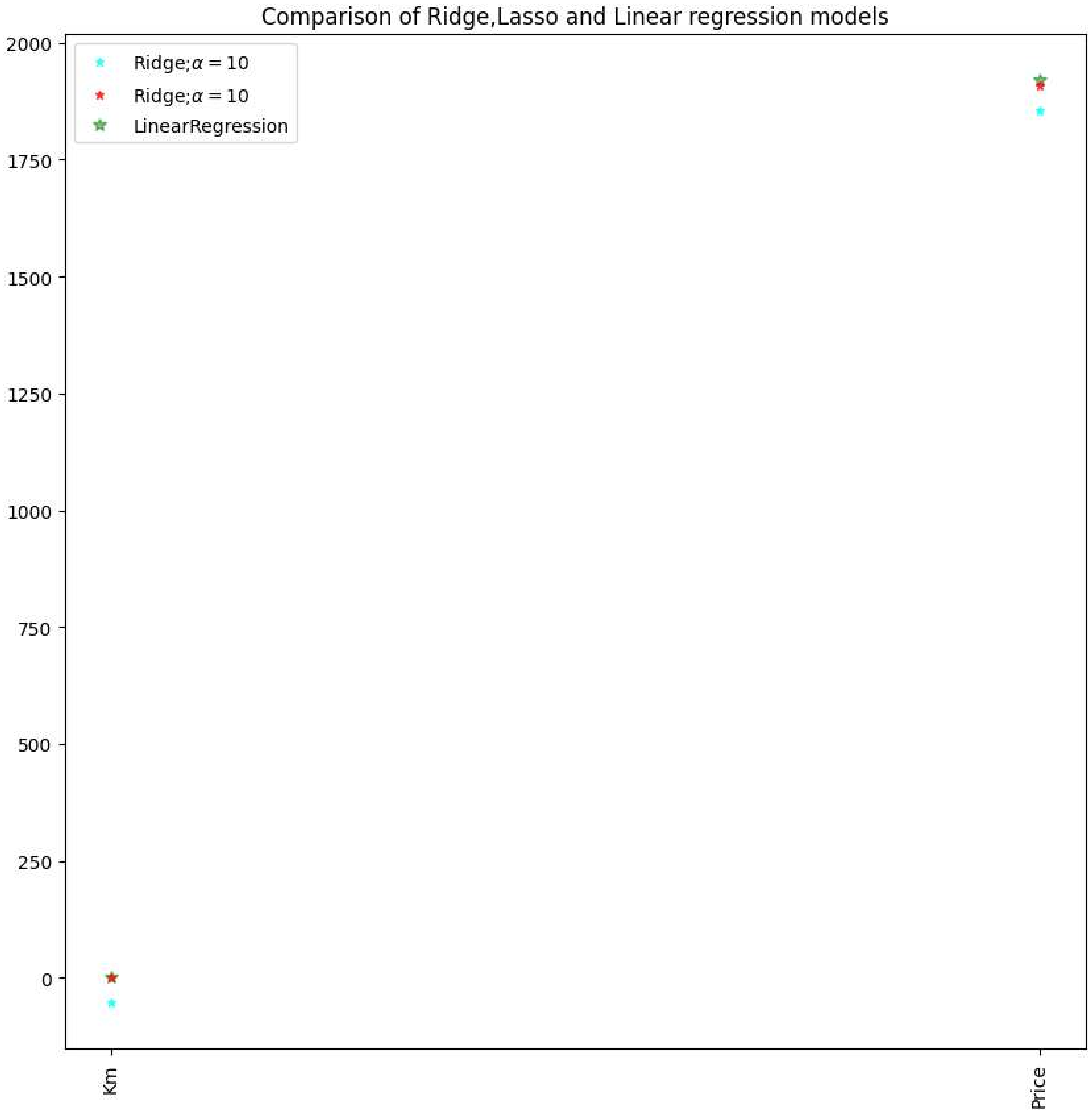
Out[62]:

```
<Axes: >
```



In [66]:

```
#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,
         color='cyan',label=r'Ridge;$\alpha=10$',zorder=7)
#add plot for lasso regression
plt.plot(features,lassoReg.coef_,alpha=0.7,linestyle='none',marker='*',markersize=5,
         color='red',label=r'Ridge;$\alpha=10$',zorder=7)
#add plot for linear model
plt.plot(features,regr.coef_,alpha=0.5,linestyle='none',marker='*',markersize=7,
         color='g',label=r'LinearRegression')
#rotate axis
plt.xticks(rotation=90)
plt.legend()
plt.title("Comparison of Ridge,Lasso and Linear regression models")
plt.show()
```



In [ ]: