Simple Linear Regression Exercise1

July 19, 2024

1 Simple linear regression

Real estate is one of those examples that every regression course goes through as it is extremely easy to understand and there is a (almost always) certain causal relationship to be found.

The data is located in the file: 'real_estate_price_size.csv'.

In this exercise, the dependent variable is 'price', while the independent variable is 'size'.

1.1 Import the relevant libraries

[ ]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import statsmodels.api as sm
import seaborn as sns
sns.set()
```

1.2 Load the data

[ ]:
```
data = pd.read_csv('real_estate_price_size.csv')
```

[ ]:
```
data.head()
```

[ ]:

	price	size
0	234314.144	643.09
1	228581.528	656.22
2	281626.336	487.29
3	401255.608	1504.75
4	458674.256	1275.46

[ ]:
```
data.describe()
```

[ ]:

	price	size
count	100.000000	100.000000
mean	292289.470160	853.024200
std	77051.727525	297.941951
min	154282.128000	479.750000
25%	234280.148000	643.330000

```
50%     280590.716000    696.405000
75%     335723.696000   1029.322500
max     500681.128000   1842.510000
```

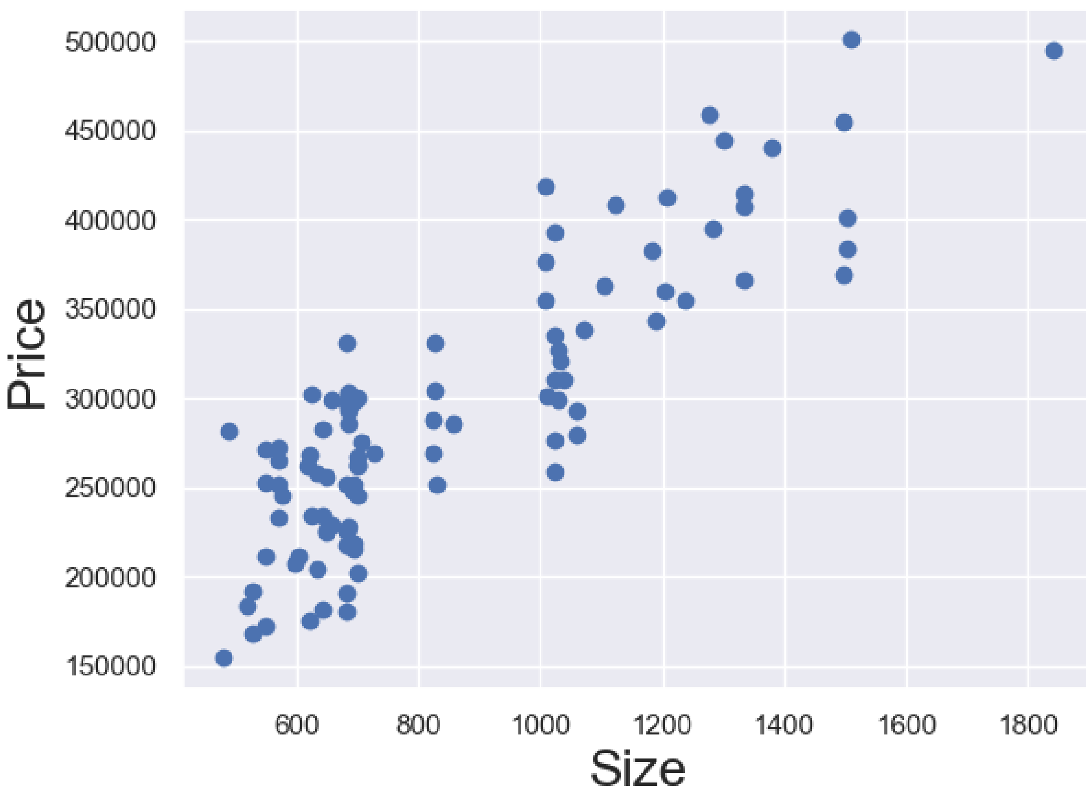
1.3 Create the regression

1.3.1 Declare the dependent and the independent variables

[ ]:
```
y = data['price']
x1 = data['size']
```

1.3.2 Explore the data

[ ]:
```
plt.scatter(x1,y)
plt.xlabel('Size',fontsize=20)
plt.ylabel('Price',fontsize=20)
plt.show()
```



1.3.3 Regression itself

[ ]:
```
x = sm.add_constant(x1)
results = sm.OLS(y,x).fit()
results.summary()
```

[ ]:

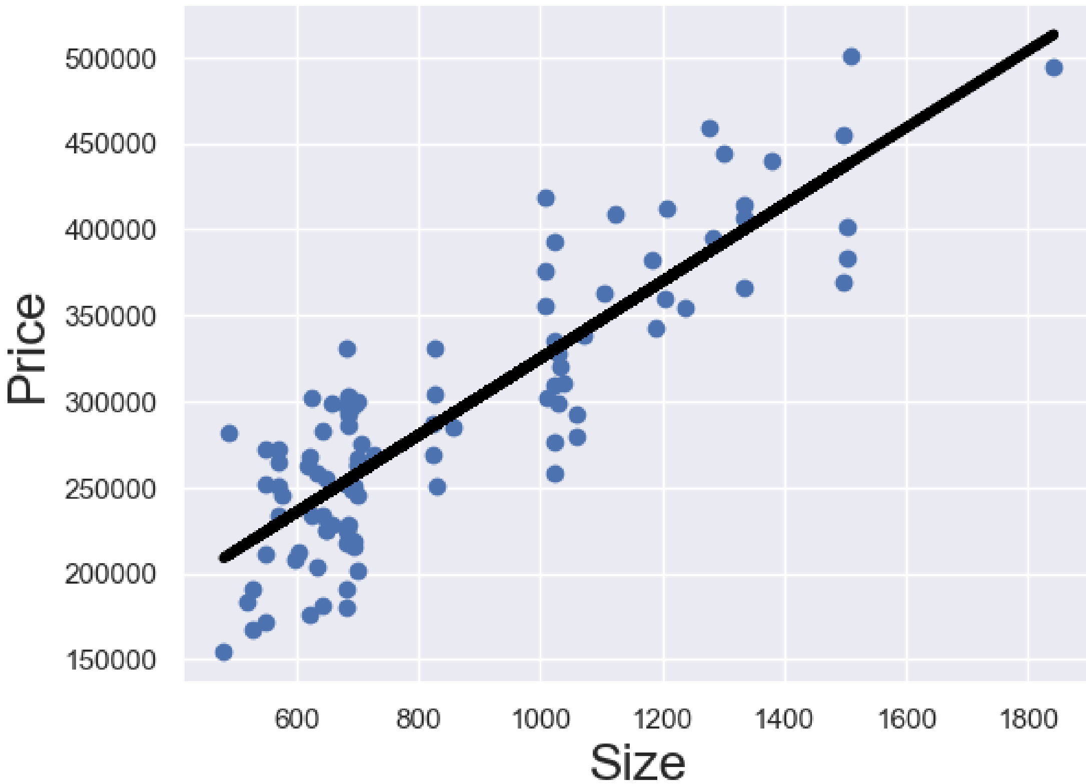
Dep. Variable:	price	**R-squared:**	0.745
Model:	OLS	**Adj. R-squared:**	0.742
Method:	Least Squares	**F-statistic:**	285.9
Date:	Fri, 19 Jul 2024	**Prob (F-statistic):**	8.13e-31
Time:	12:12:29	**Log-Likelihood:**	-1198.3
No. Observations:	100	**AIC:**	2401.
Df Residuals:	98	**BIC:**	2406.
Df Model:	1		
Covariance Type:	nonrobust		

	coef	**std err**	**t**	**P>|t|**	**[0.025**	**0.975]**
const	1.019e+05	1.19e+04	8.550	0.000	7.83e+04	1.26e+05
size	223.1787	13.199	16.909	0.000	196.986	249.371

Omnibus:	6.262	**Durbin-Watson:**	2.267
Prob(Omnibus):	0.044	**Jarque-Bera (JB):**	2.938
Skew:	0.117	**Prob(JB):**	0.230
Kurtosis:	2.194	**Cond. No.**	2.75e+03

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[2] The condition number is large, 2.75e+03. This might indicate that there are
strong multicollinearity or other numerical problems.

[ ]:
```
plt.scatter(x1,y)
yhat = x1*223.1787+101900
fig = plt.plot(x1,yhat, lw=4, c='black', label ='regression line')
plt.xlabel('Size', fontsize = 20)
plt.ylabel('Price', fontsize = 20)
plt.show()
```


500000
450000
400000
350000
300000
250000
200000
150000
Price
600
800
1000
1200
1400
1600
1800
Size