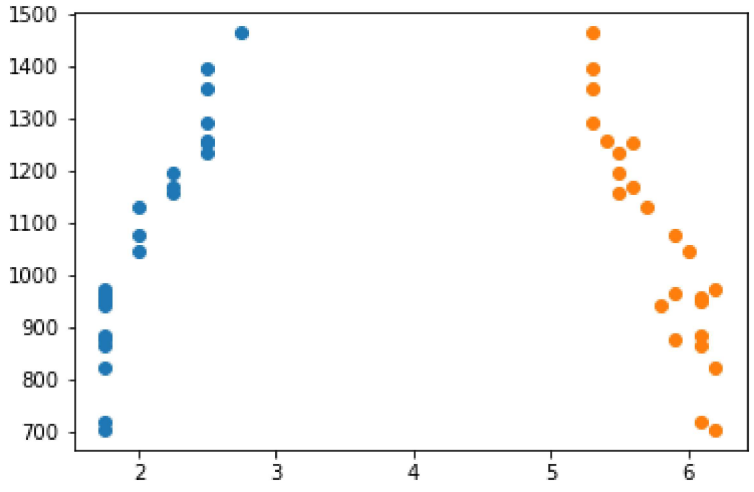
In [3]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt


df = pd.read_csv('OneDrive\Desktop\Stock_Market.csv')
df.head()
```

Out[3]:

	Unnamed: 0	Year	Month	Interest_Rate	Unemployment_Rate	Stock_Index_Price
0	0	2017	12	2.75	5.3	1464
1	1	2017	11	2.50	5.3	1394
2	2	2017	10	2.50	5.3	1357
3	3	2017	9	2.50	5.3	1293
4	4	2017	8	2.50	5.4	1256

In [6]:
```
#2.Scatter Plot.(20 points) Construct a scatter plot of the Stock Index Price(Y )
#Based on your scatter plot, do you think a linear relationship exists between
#Stock Index Price and Interest Rate, Unemployment Rate? Why?

scatterInt = plt.scatter(x=df['Interest_Rate'], y=df['Stock_Index_Price'])
scatterEmp = plt.scatter(x=df['Unemployment_Rate'], y=df['Stock_Index_Price'])

#As the interest rate increases, the stock index price increases.
#This makes sense as interest rates need to compete with inflation and stock mark

#As unemployment decreases, the stock index price increases.
#This also makes sense as a more employed workforce is representative of a strong
```

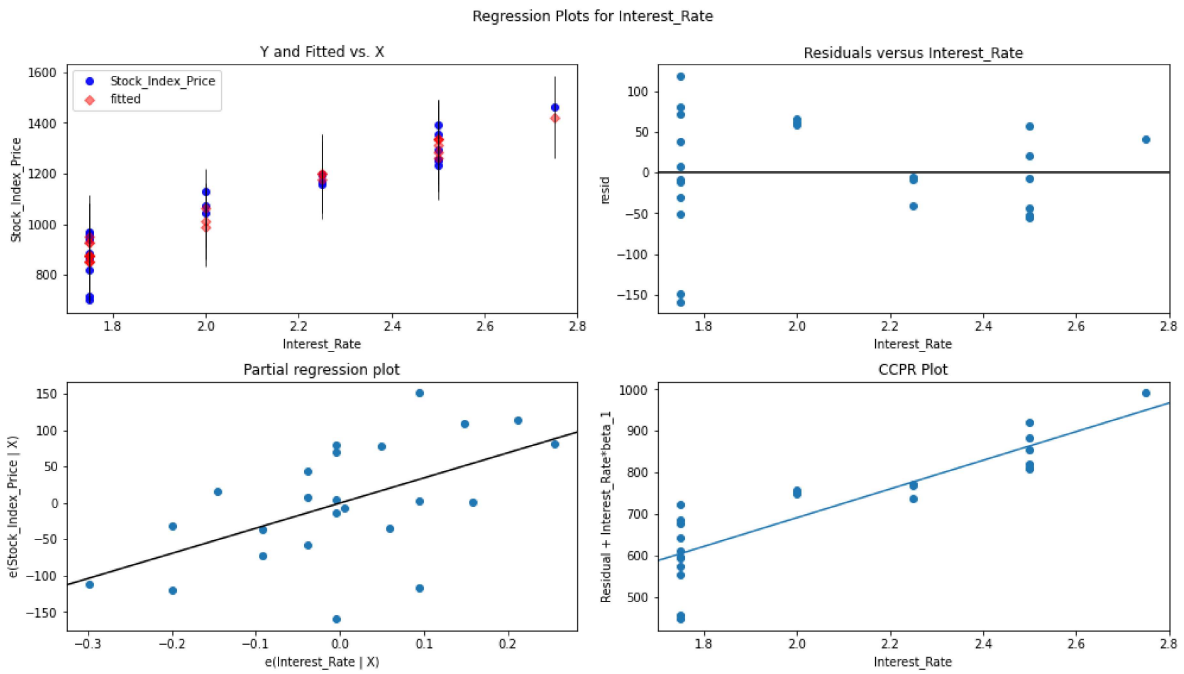


In [10]:
```
# 3.Liner Regression.(40 points) Performing the multiple linear regression based
from sklearn import linear_model

x = df[['Interest_Rate', 'Unemployment_Rate']]
y = df['Stock_Index_Price']

regr = linear_model.LinearRegression()
regr.fit(x, y)

print(regr.coef_)

#The coefficients back up the conclusion reached in #2. As the interest rates inc
#Similarly, as unemployment increases, stock index price decreases by 250.
```

```
[ 345.54008701 -250.14657137]
```

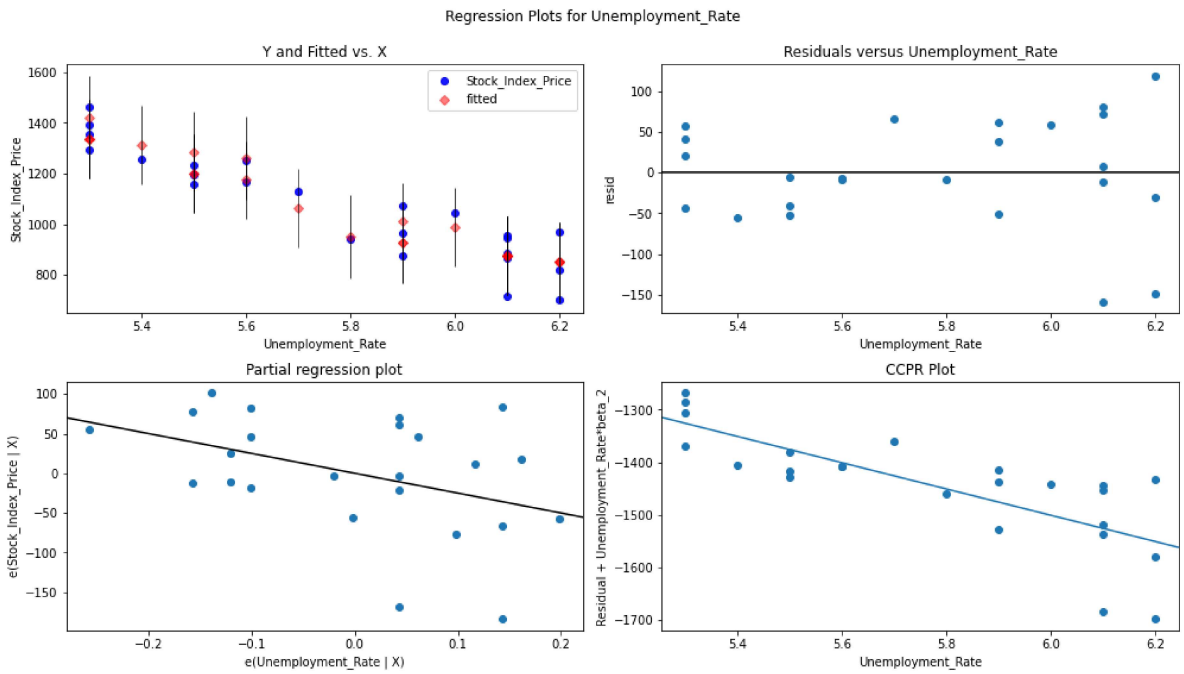
In [23]:
```
#4.Residual Plot.(10 points) Draw a residual plot and interpret your result.
import statsmodels.api as sm
from statsmodels.formula.api import ols

multi_model = ols('Stock_Index_Price ~ Interest_Rate + Unemployment_Rate', data=d

# display model summary
print(multi_model.summary())

# modify figure size
fig = plt.figure(figsize=(14, 8))

# creating regression plots
interestRateFig = sm.graphics.plot_regress_exog(multi_model, 'Interest_Rate', fig
#There is no indication of heteroskedacity
```

```
                            OLS Regression Results
==============================================================================
Dep. Variable:      Stock_Index_Price   R-squared:                       0.898
Model:                            OLS   Adj. R-squared:                  0.888
Method:                 Least Squares   F-statistic:                     92.07
Date:                Wed, 06 Jul 2022   Prob (F-statistic):           4.04e-11
Time:                        08:50:51   Log-Likelihood:                -134.61
No. Observations:                  24   AIC:                             275.2
Df Residuals:                      21   BIC:                             278.8
Df Model:                           2
Covariance Type:            nonrobust
================================================================================
======
                     coef    std err          t      P>|t|      [0.025
0.975]
--------------------------------------------------------------------------------
------
Intercept          1798.4040    899.248      2.000      0.059     -71.685    36
68.493
Interest_Rate       345.5401    111.367      3.103      0.005     113.940     5
77.140
Unemployment_Rate  -250.1466    117.950     -2.121      0.046    -495.437
-4.856
==============================================================================
Omnibus:                        2.691   Durbin-Watson:                   0.530
Prob(Omnibus):                  0.260   Jarque-Bera (JB):                1.551
Skew:                          -0.612   Prob(JB):                        0.461
Kurtosis:                       3.226   Cond. No.                         394.
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctl
y specified.
eval_env: 1
```


Regression Plots for Interest_Rate
Y and Fitted vs. X
Stock_Index_Price
fitted
Stock_Index_Price
Interest_Rate
Residuals versus Interest_Rate
resid
Interest_Rate
Partial regression plot
e(Stock_Index_Price | X)
e(Interest_Rate | X)
CCPR Plot
Residual + Interest_Rate*beta_1
Interest_Rate

In [22]:
```
import statsmodels.api as sm
from statsmodels.formula.api import ols

multi_model = ols('Stock_Index_Price ~ Interest_Rate + Unemployment_Rate', data=d

# display model summary
print(multi_model.summary())

# modify figure size
fig = plt.figure(figsize=(14, 8))

unemploymentRateFig = sm.graphics.plot_regress_exog(multi_model, 'Unemployment_Ra
#There is no indication of heteroskedacity
```

```
                            OLS Regression Results
==============================================================================
Dep. Variable:      Stock_Index_Price   R-squared:                       0.898
Model:                            OLS   Adj. R-squared:                  0.888
Method:                 Least Squares   F-statistic:                     92.07
Date:                Wed, 06 Jul 2022   Prob (F-statistic):           4.04e-11
Time:                        08:50:41   Log-Likelihood:                -134.61
No. Observations:                  24   AIC:                             275.2
Df Residuals:                      21   BIC:                             278.8
Df Model:                           2
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
Intercept       1798.4040    899.248      2.000      0.059     -71.685    3668.493
Interest_Rate    345.5401    111.367      3.103      0.005     113.940     577.140
Unemployment_Rate -250.1466    117.950     -2.121      0.046    -495.437      -4.856
==============================================================================
Omnibus:                        2.691   Durbin-Watson:                   0.530
Prob(Omnibus):                  0.260   Jarque-Bera (JB):                1.551
Skew:                          -0.612   Prob(JB):                        0.461
Kurtosis:                       3.226   Cond. No.                         394.
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
eval_env: 1
```



In [24]:
```
# 5.Prediction.(20 points) Please predict the Stock Index Price when the Interest
predicted = regr.predict([[2.75, 5.3]])
print(predicted)
```

```
[1422.86238865]

C:\Users\andre\anaconda3\lib\site-packages\sklearn\base.py:450: UserWarning: X
does not have valid feature names, but LinearRegression was fitted with feature
names
  warnings.warn(
```

In [ ]: