Armun Shakeri

Defensive Stock Analysis

Business Problem

- During times of uncertainty investors want to protect their assets from loss.
- This project analyzes 3 consumer defensive stocks by performing time series analysis (SARIMA models) and linear regression.
- We will choose the 3 stocks based on highest market caps.

Data

- The data acquired for this project represents broad market data including, S&P 500, stocks within the S&P500, Etherum, PPI (producer price index), Dollar index, and gold rates.
- Columns:
  - Date: Date of close
  - Symbol: Symbol of defensive stock
  - Close: Close price of defensive stock
  - SPClose: Close Price of S&P 500
  - Gold: Gold Price
  - Ether: Ethereum Price
  - USD: US dollar index
  - PPI: Producer Price Index

Methods SARIMA models

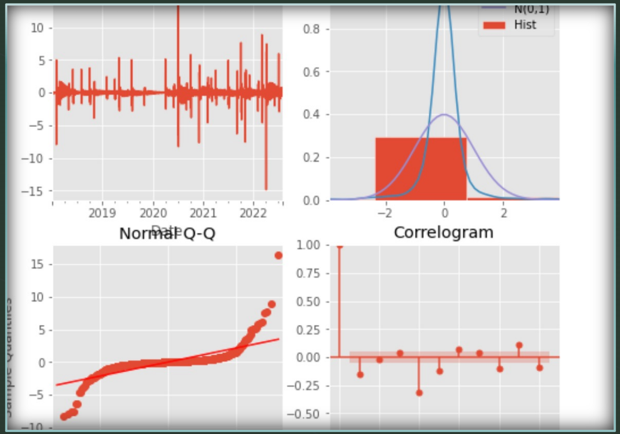
- Begin analysis by defining P, D, and Q
- Modeling steps:
  1. Dropped all columns but date and close price.
  2. Used bfill to fill all missing dates, weekends and holidays.
  3. We then ran a grid pdq and seasonal pdq parameters calculated above and get the best AIC value.
  4. Plug the optimal parameter values into a new SARIMAX model and fit the results.
  5. Call plot_diagnostics() on the results calculated.
  6. Get predictions starting from 01-01-1998 and calculate confidence intervals and Plot real vs predicted values along with confidence interval.
  7. Get the real and predicted values and get the mean squared error.
  8. Plot the dynamic forecast with confidence intervals.

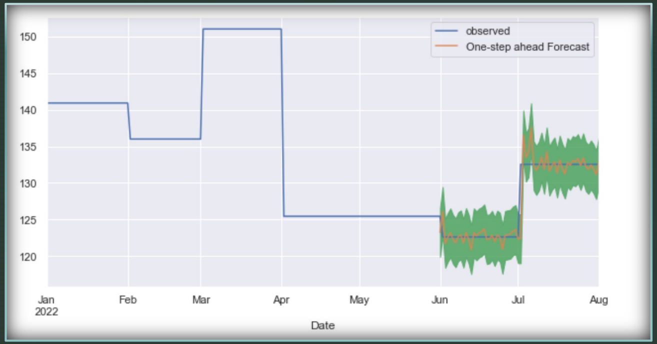
Methods for Linear Regression

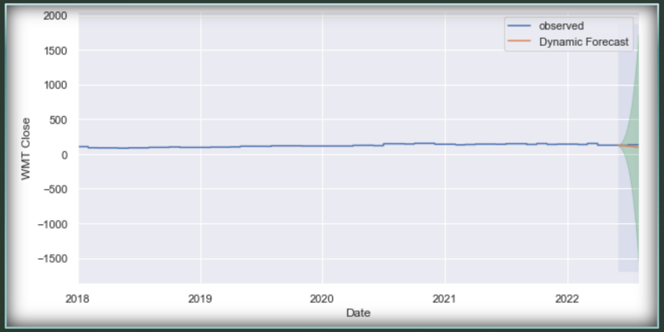
- Steps:
  1. Create initial model and vizualize the terms.
  2. Log transform close price and most correlated feature.
  3. Create final model.
  4. Plot final model on Q-Q plot.
  5. Plot residuals.

SARIMA model WMT

- Mean squared error: 3.12

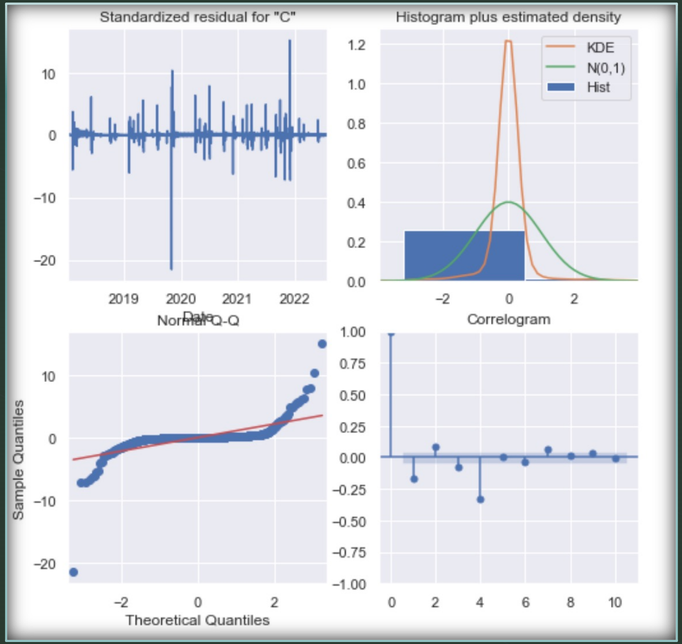






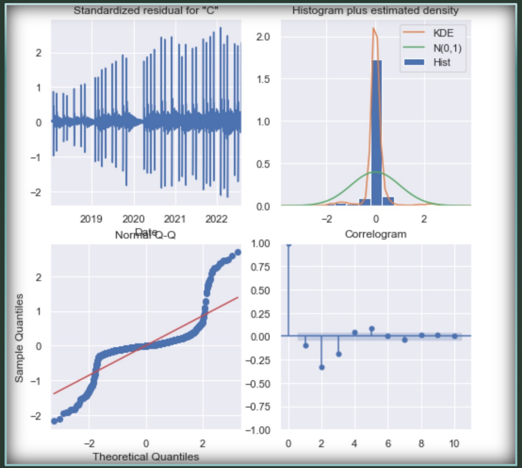
SARIMA model KO

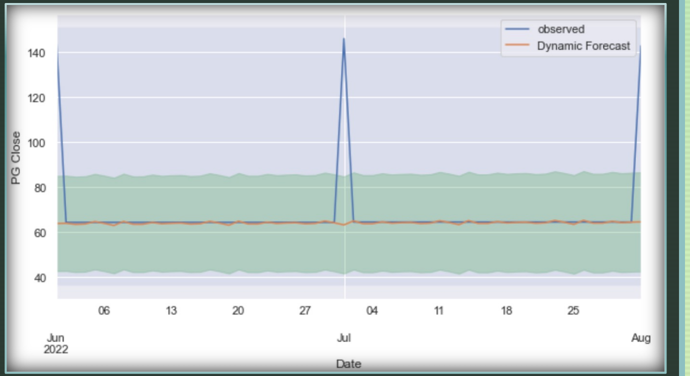
- Mean squared error: .03

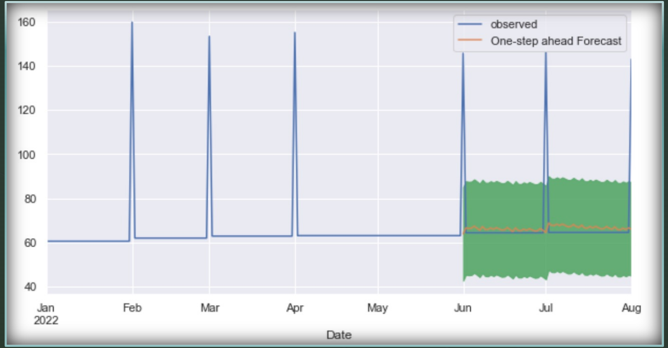


SARIMA model PG

- Mean squared error: 315.37







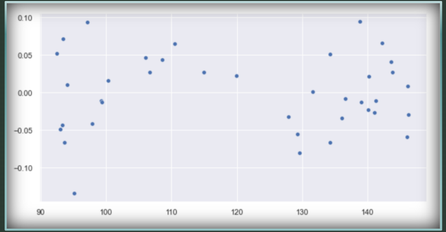
Linear Regression WMT

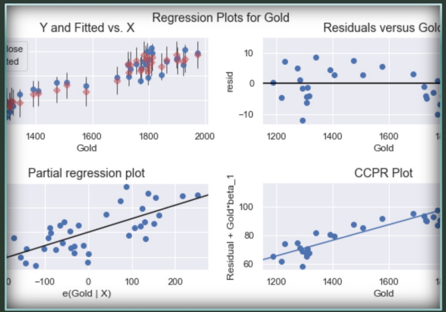
- 'Test Statistic': 17.454007239058875
- 'Test Statistic p-value': 0.6233267123820959
- 'F-Statistic': 0.7220827110094082
- 'F-Test p-value': 0.7589067655725635

Dep. Variable:	log_Close	**R-squared:**	0.920
Model:	OLS	**Adj. R-squared:**	0.908
Method:	Least Squares	**F-statistic:**	73.94
Date:	Tue, 13 Dec 2022	**Prob (F-statistic):**	1.26e-16
Time:	14:22:05	**Log-Likelihood:**	59.517
No. Observations:	38	**AIC:**	-107.0
Df Residuals:	32	**BIC:**	-97.21
Df Model:	5		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	-1.0670	0.650	-1.642	0.110	-2.391	0.257
log_Gold	0.7166	0.113	6.331	0.000	0.486	0.947
Ether	-3.057e-05	1.74e-05	-1.754	0.089	-6.61e-05	4.94e-06
USD	0.0028	0.003	0.912	0.368	-0.003	0.009
PPI	-0.0015	0.000	-3.168	0.003	-0.002	-0.001
SPClose	0.0002	4.75e-05	3.553	0.001	7.21e-05	0.000

Omnibus:	0.350	**Durbin-Watson:**	1.528
Prob(Omnibus):	0.839	**Jarque-Bera (JB):**	0.335
Skew:	-0.203	**Prob(JB):**	0.846
Kurtosis:	2.783	**Cond. No.**	2.83e+05





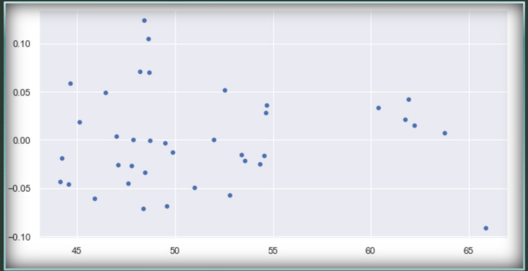
Linear Regression KO

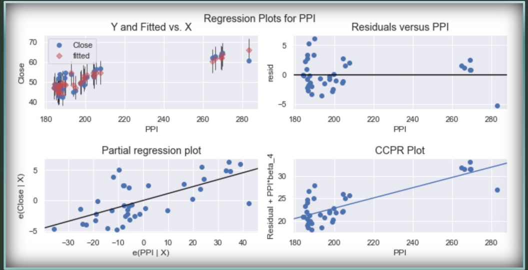
- 'Test Statistic': 23.545451639264005
- 'Test Statistic p-value': 0.2628115007420615 5
- 'F-Statistic': 1.384590745687979
- 'F-Test p-value': 0.2511204642696958 6

Dep. Variable:	log_Close	**R-squared:**	0.834
Model:	OLS	**Adj. R-squared:**	0.808
Method:	Least Squares	**F-statistic:**	32.07
Date:	Tue, 13 Dec 2022	**Prob (F-statistic):**	1.44e-11
Time:	14:22:07	**Log-Likelihood:**	61.071
No. Observations:	38	**AIC:**	-110.1
Df Residuals:	32	**BIC:**	-100.3
Df Model:	5		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	0.9004	0.462	1.949	0.060	-0.041	1.841
Gold	-0.0002	6.99e-05	-2.317	0.027	-0.000	-1.96e-05
Ether	-4.099e-05	1.68e-05	-2.443	0.020	-7.52e-05	-6.82e-06
USD	0.0027	0.003	0.945	0.352	-0.003	0.009
log_PPI	0.4454	0.103	4.340	0.000	0.236	0.654
SPClose	0.0002	4.58e-05	4.180	0.000	9.82e-05	0.000

Omnibus:	1.841	**Durbin-Watson:**	1.323
Prob(Omnibus):	0.398	**Jarque-Bera (JB):**	1.455
Skew:	0.476	**Prob(JB):**	0.483
Kurtosis:	2.884	**Cond. No.**	2.27e+05





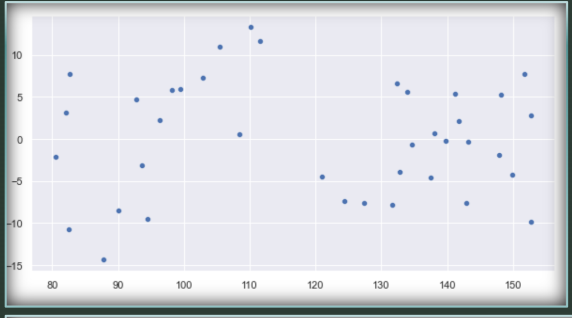
Linear Regression PG

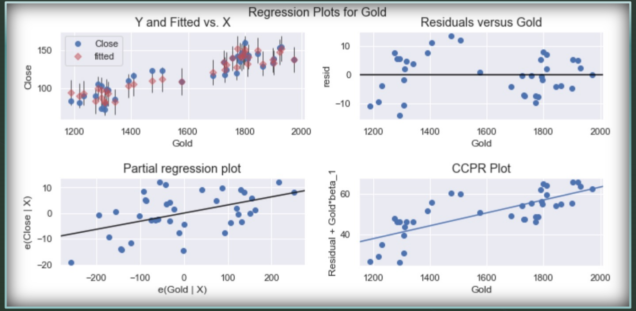
- Test Statistic':
  23.545451639264005
- 'Test Statistic p-value':
  0.26281150074206155
- 'F-Statistic':
  1.384590745687979
- 'F-Test p-value':
  0.25112046426969586

Dep. Variable:	Close	**R-squared:**	0.925
Model:	OLS	**Adj. R-squared:**	0.913
Method:	Least Squares	**F-statistic:**	78.62
Date:	Tue, 13 Dec 2022	**Prob (F-statistic):**	5.13e-17
Time:	14:22:08	**Log-Likelihood:**	-126.86
No. Observations:	38	**AIC:**	265.7
Df Residuals:	32	**BIC:**	275.5
Df Model:	5		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	-508.2905	87.705	-5.795	0.000	-686.939	-329.642
log_Gold	51.1521	15.273	3.349	0.002	20.042	82.262
Ether	-0.0048	0.002	-2.058	0.048	-0.010	-4.99e-05
USD	1.3498	0.412	3.276	0.003	0.511	2.189
PPI	0.0227	0.062	0.366	0.717	-0.104	0.149
SPClose	0.0282	0.006	4.400	0.000	0.015	0.041

Omnibus:	1.909	**Durbin-Watson:**	0.588
Prob(Omnibus):	0.385	**Jarque-Bera (JB):**	1.187
Skew:	-0.072	**Prob(JB):**	0.552
Kurtosis:	2.146	**Cond. No.**	2.83e+05





Conclusions

- Defensive stocks do provide protection against market volatility.
- Recommendations:
    1. 1) Walmart showed to have an downward trend, hold or sell WMT.
    2. KO showed to have an upward trend, buy KO.
    3. PG showed a upward trend, buy PG.

Next Steps

- This project focused mainly on recent market data, beginning in 2017. This created issues when trying to identify an accurate trend. For more accurate results we will gather information about the markets at an earlier date, starting preferably at 2010.
- We will include other indices such as the VIX, NASDAQ, and Dow Jones to provide a wider market perspective to see how defensive stocks hedge against moves in the broader market.

Thank You

- Email: ashakeri62@gmail.com
- LinkedIn: https://www.linkedin.com/in/armun-shakeri/
- Github: https://github.com/ashakeri92