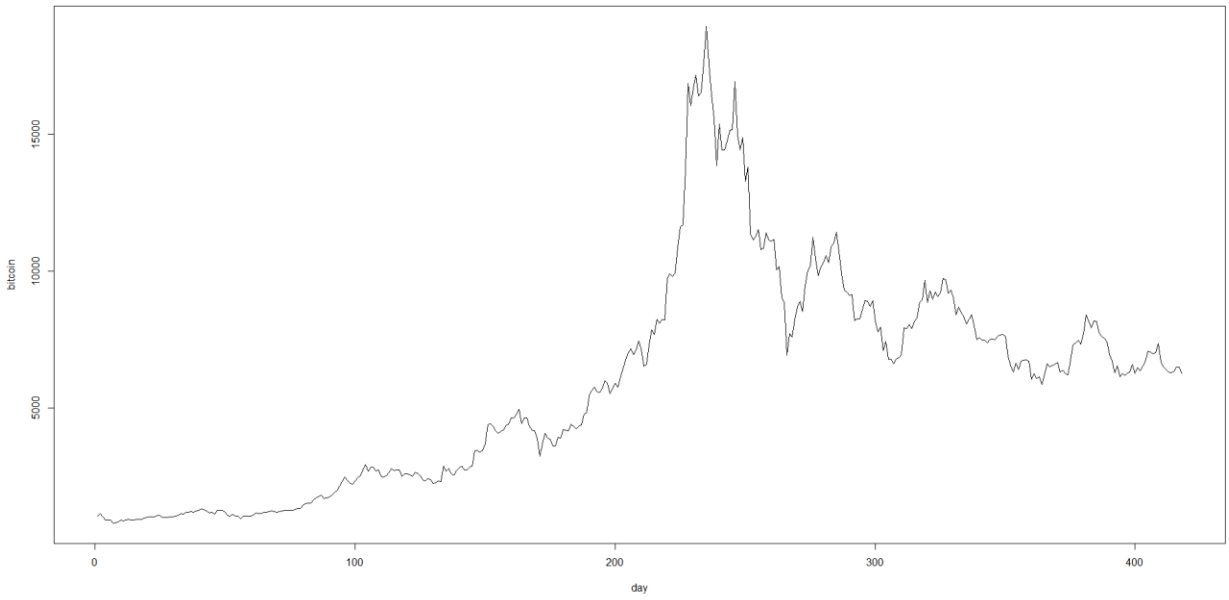
The dataset used in this analysis was collected from the below institutions
St Louis FRED
The S&P500 (SP500),
The London bullion market price for gold in US dollars (GOLDAMGBD228NLBM)
The US/Euro exchange rate (DEXUSEU)
The West Texas Intermediate spot price of oil (DCOILWTICO)

Using a naïve regression to find spurious correlations to the bitcoin price in the data set (e.g., regress the bitcoin price on the other series without any differencing to see if you find any interesting but total bullshit relationships).

Raw daily bitcoin relations

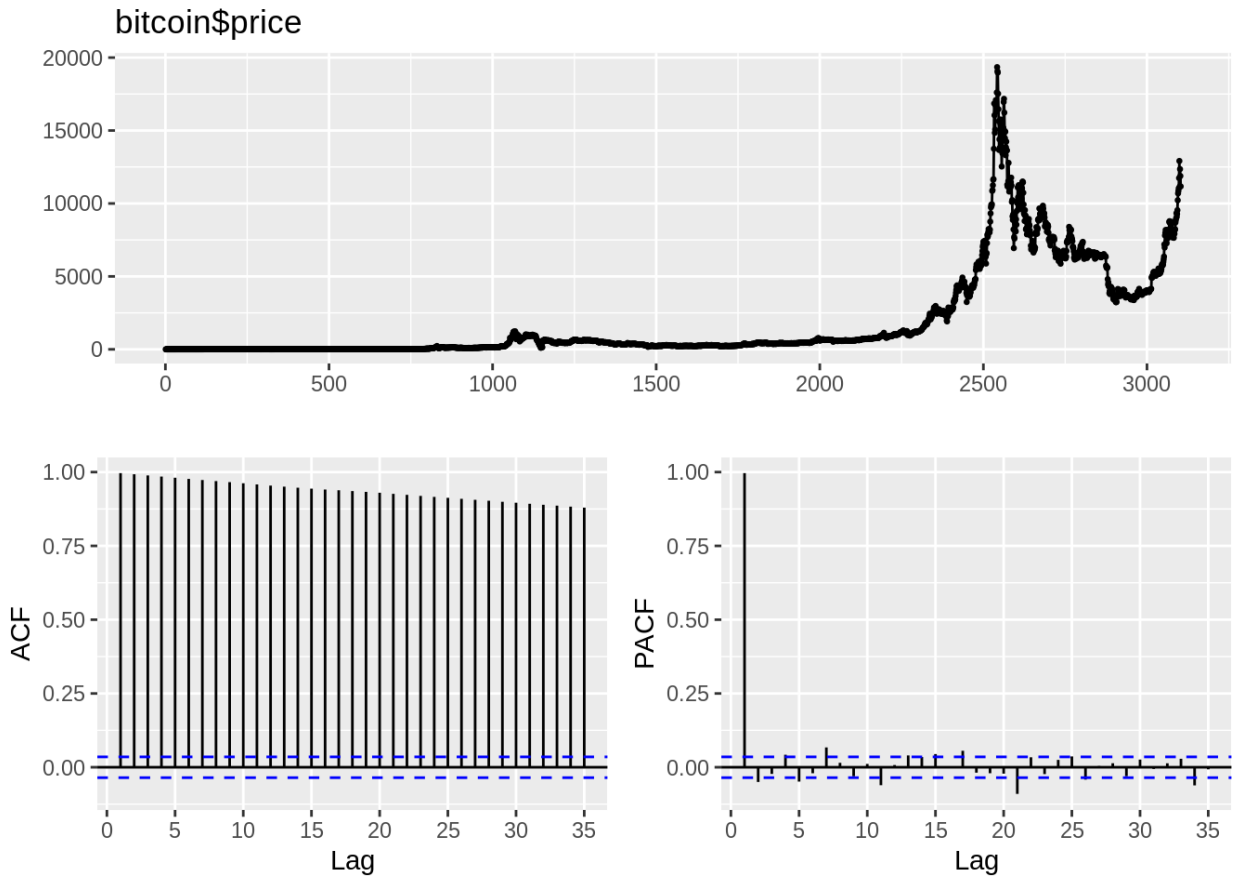


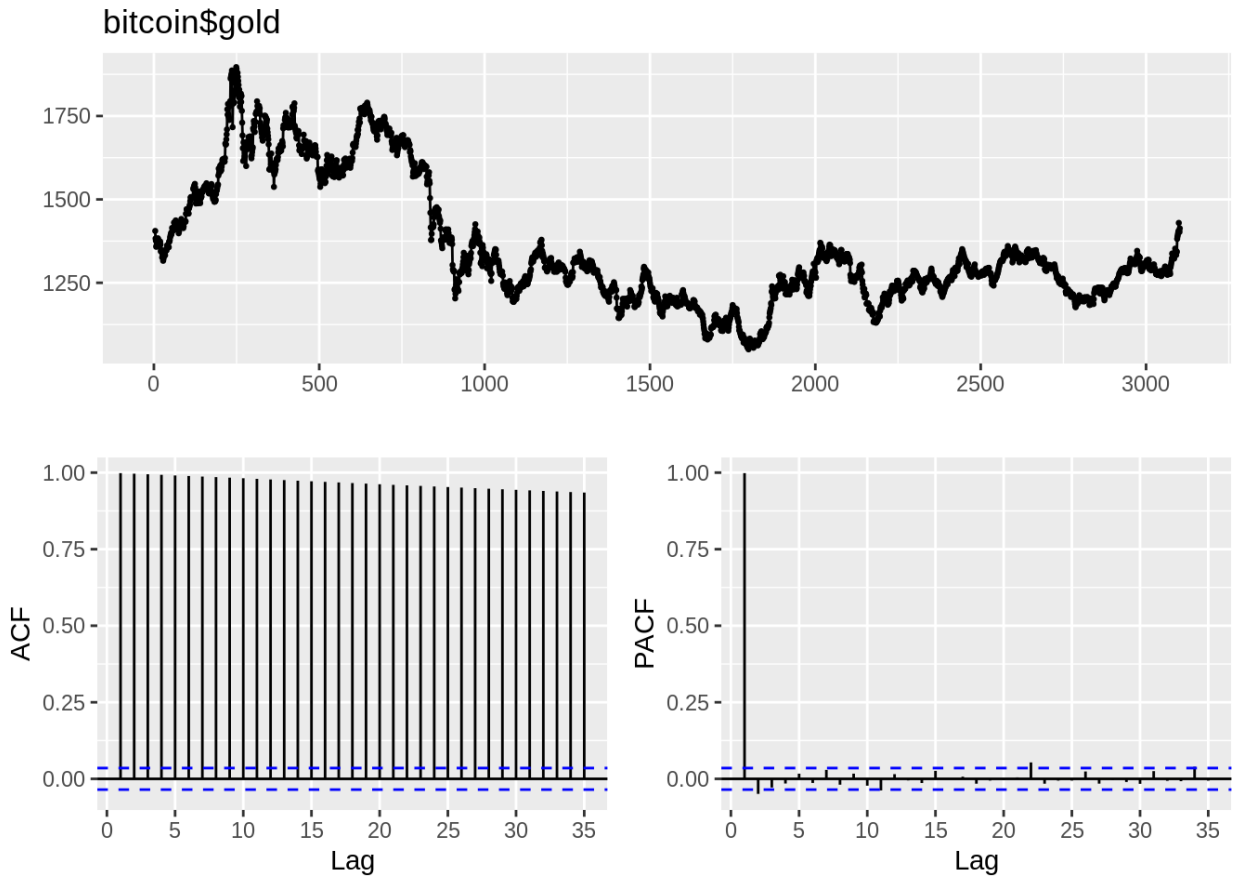
Use the KPSS test to find how many differences each series takes to become stationary.

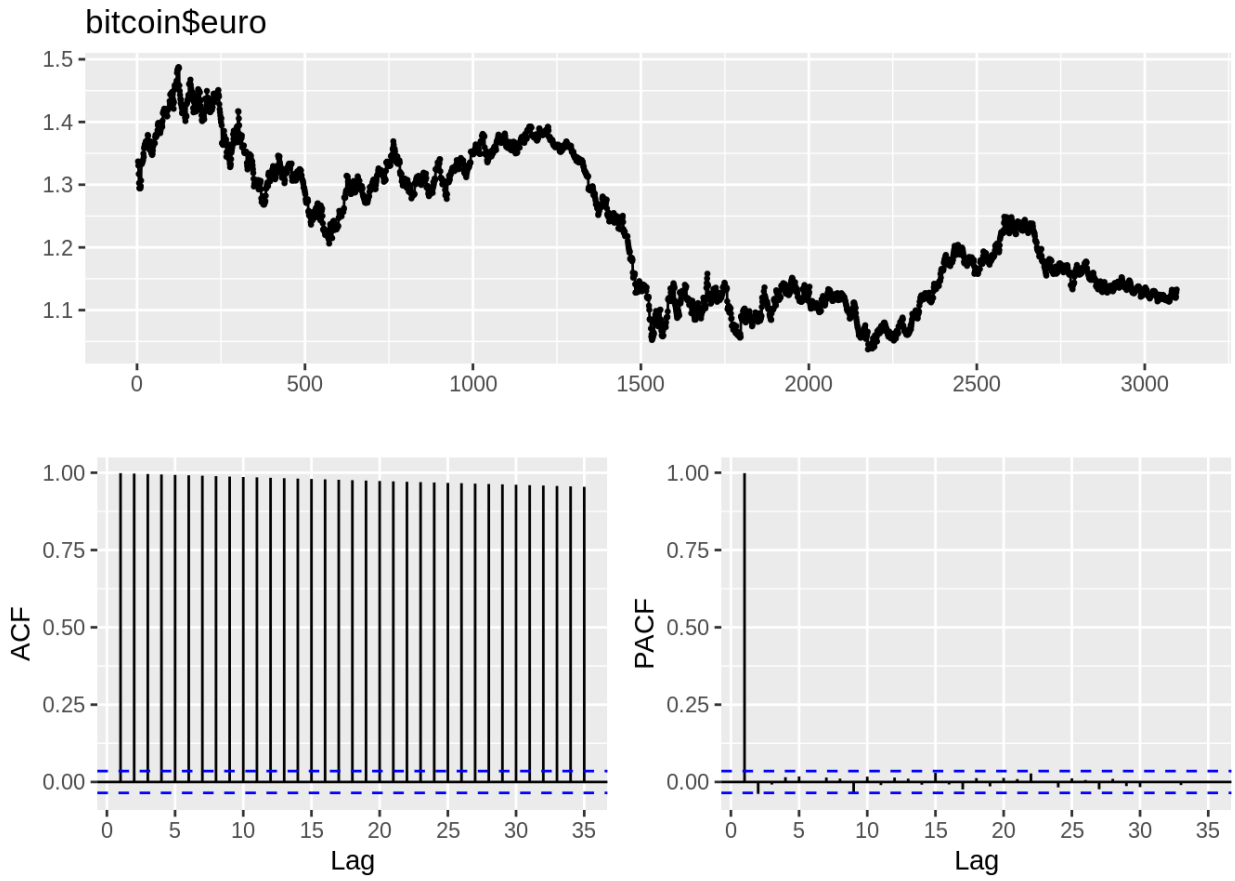
```
 rep.kpss(bitcoinV2$bitcoin)
[1] 1.0 0.0 0.1
 rep.kpss(bitcoinV2$SP500)
[1] 1.0 0.0 0.1
 rep.kpss(bitcoinV2$gold)
[1] 1.00000000 0.00000000 0.07867563
 rep.kpss(bitcoinV2$oil)
[1] 1.0 0.0 0.1
 rep.kpss(bitcoinV2$euro)
[1] 1.00000000 0.00000000 0.08365156
```

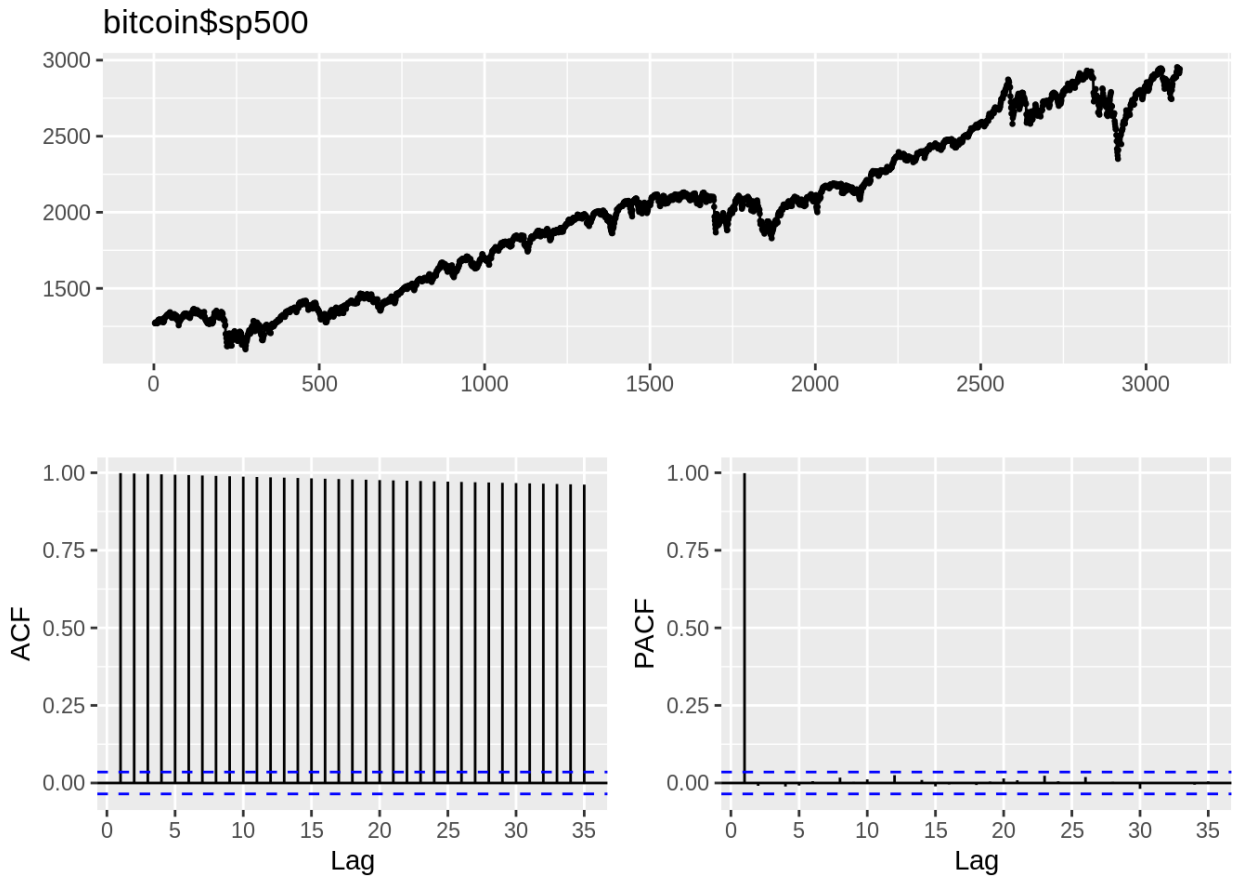
After taking differences, regress the bitcoin price on the other series. We need to now see if there are any changes reflecting in the summary statistics.

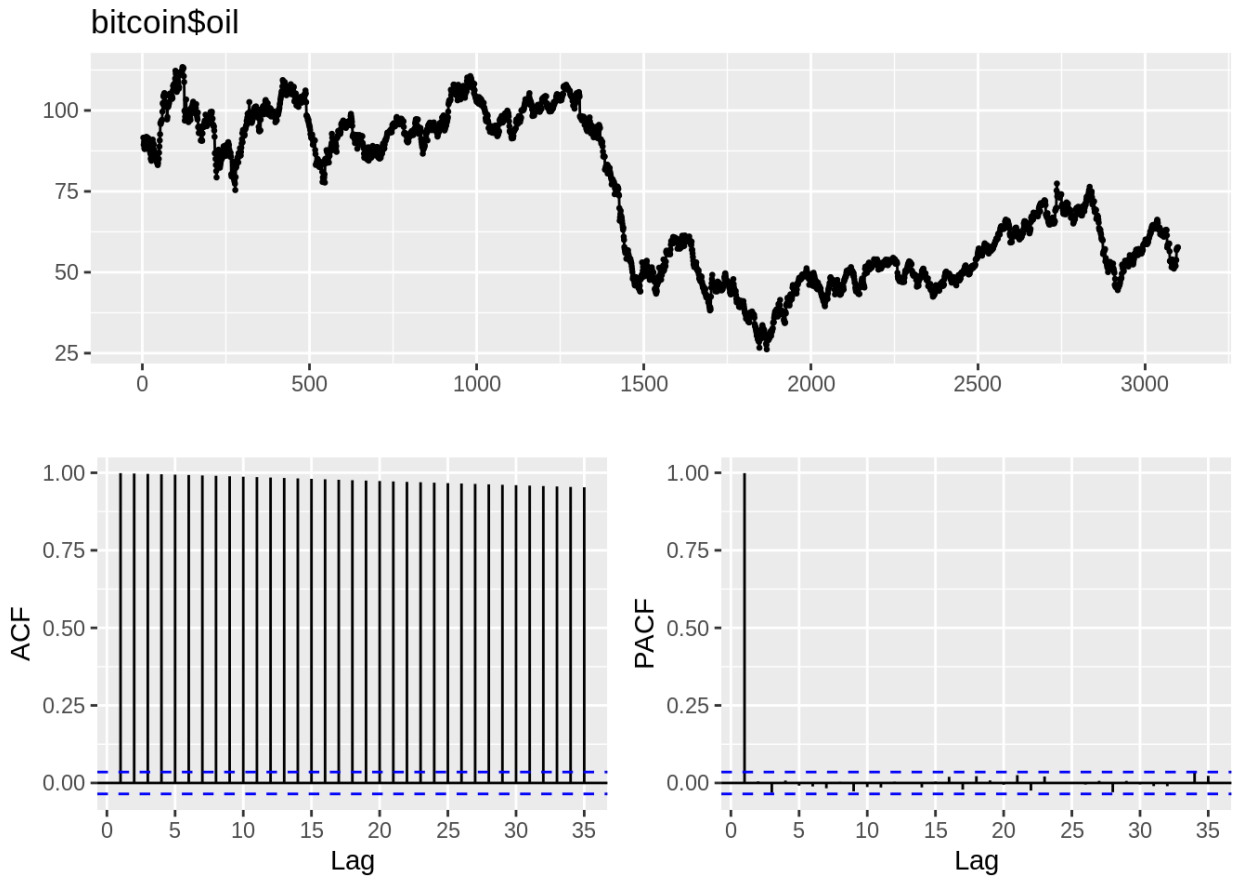
Remove all the data before 2017 where the bitcoin price starts to spike. Plot the new data. This is the data you are to use for the rest of the question.



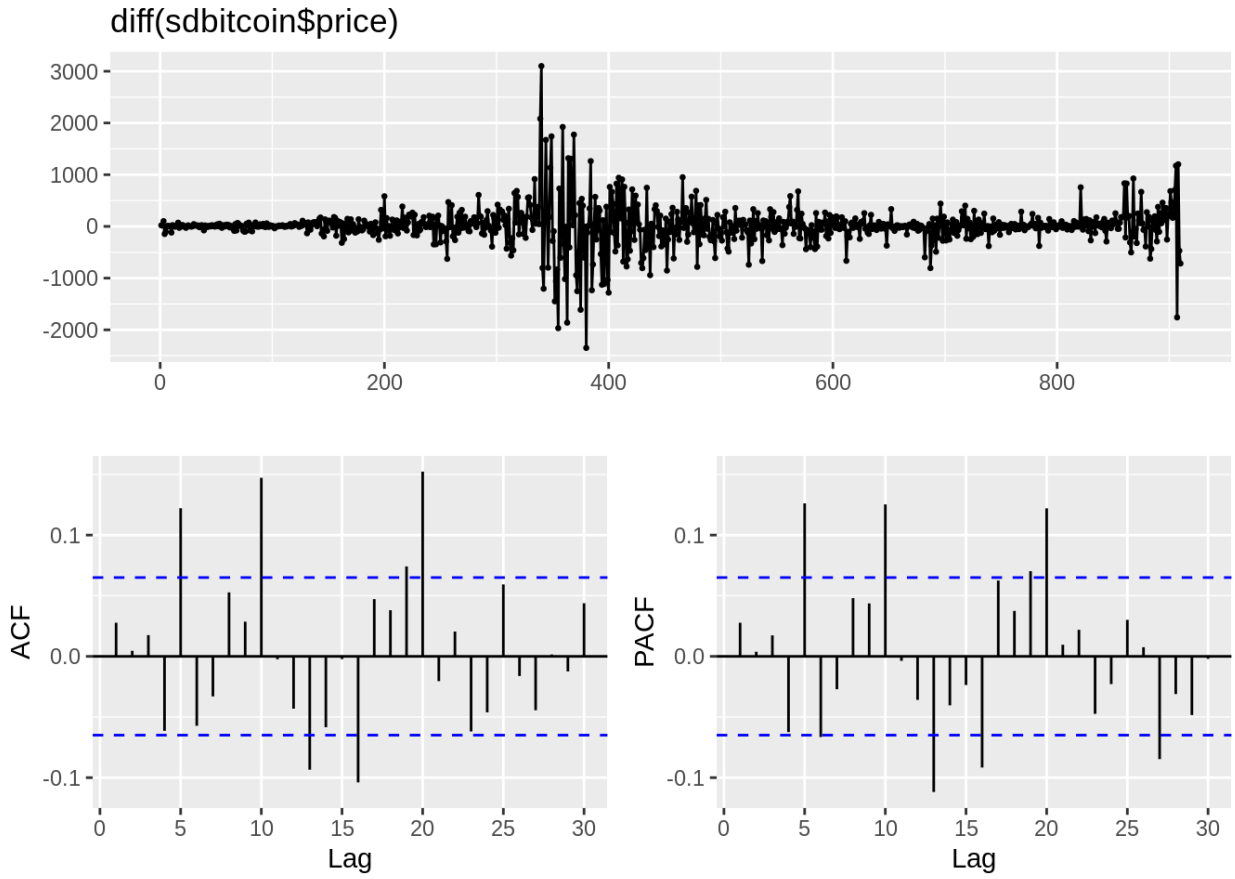

bitcoin$gold
1750
1500
1250
0
500
1000
1500
2000
2500
3000
ACF
1.00
0.75
0.50
0.25
0.00
0
5
10
15
20
25
30
35
Lag
PACF
1.00
0.75
0.50
0.25
0.00
0
5
10
15
20
25
30
35
Lag


bitcoin$euro
1.5
1.4
1.3
1.2
1.1
0
500
1000
1500
2000
2500
3000
ACF
1.00
0.75
0.50
0.25
0.00
0
5
10
15
20
25
30
35
Lag
PACF
1.00
0.75
0.50
0.25
0.00
0
5
10
15
20
25
30
35
Lag


bitcoin$sp500
3000
2500
2000
1500
0
500
1000
1500
2000
2500
3000
ACF
1.00
0.75
0.50
0.25
0.00
0
5
10
15
20
25
30
35
Lag
PACF
1.00
0.75
0.50
0.25
0.00
0
5
10
15
20
25
30
35
Lag

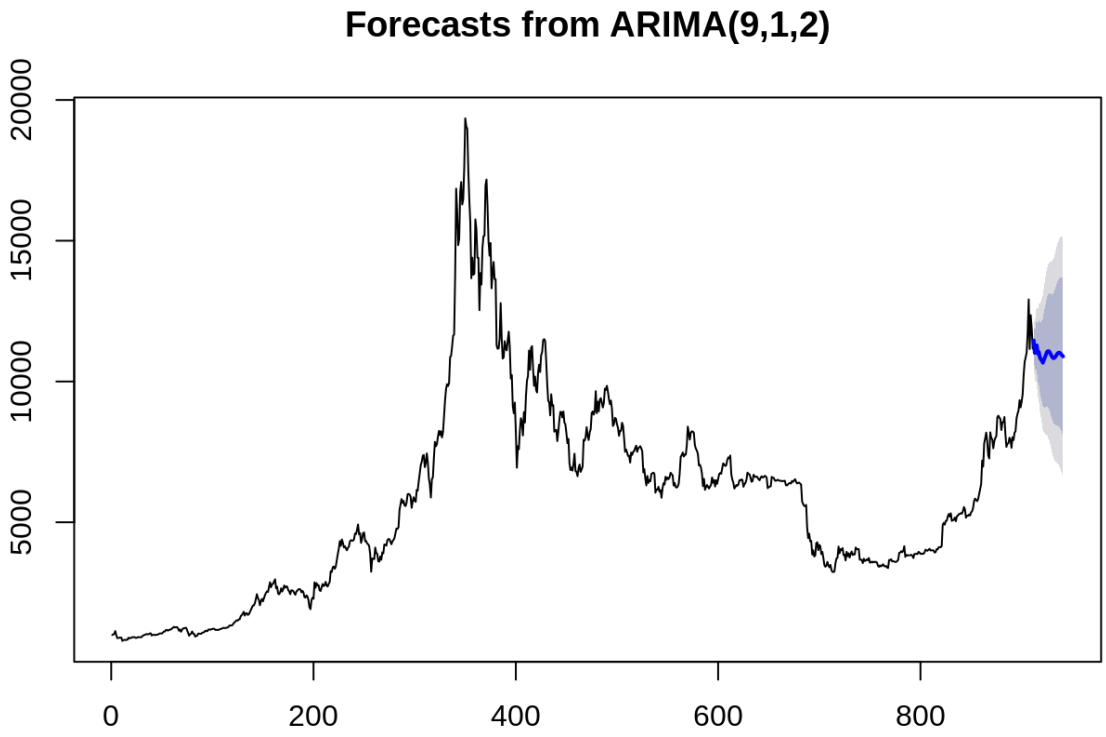

bitcoin$oil
100
75
50
25
0
500
1000
1500
2000
2500
3000
ACF
1.00
0.75
0.50
0.25
0.00
0
5
10
15
20
25
30
35
Lag
PACF
1.00
0.75
0.50
0.25
0.00
0
5
10
15
20
25
30
35
Lag

Plotting the ACF and PACF of the bitcoin price.

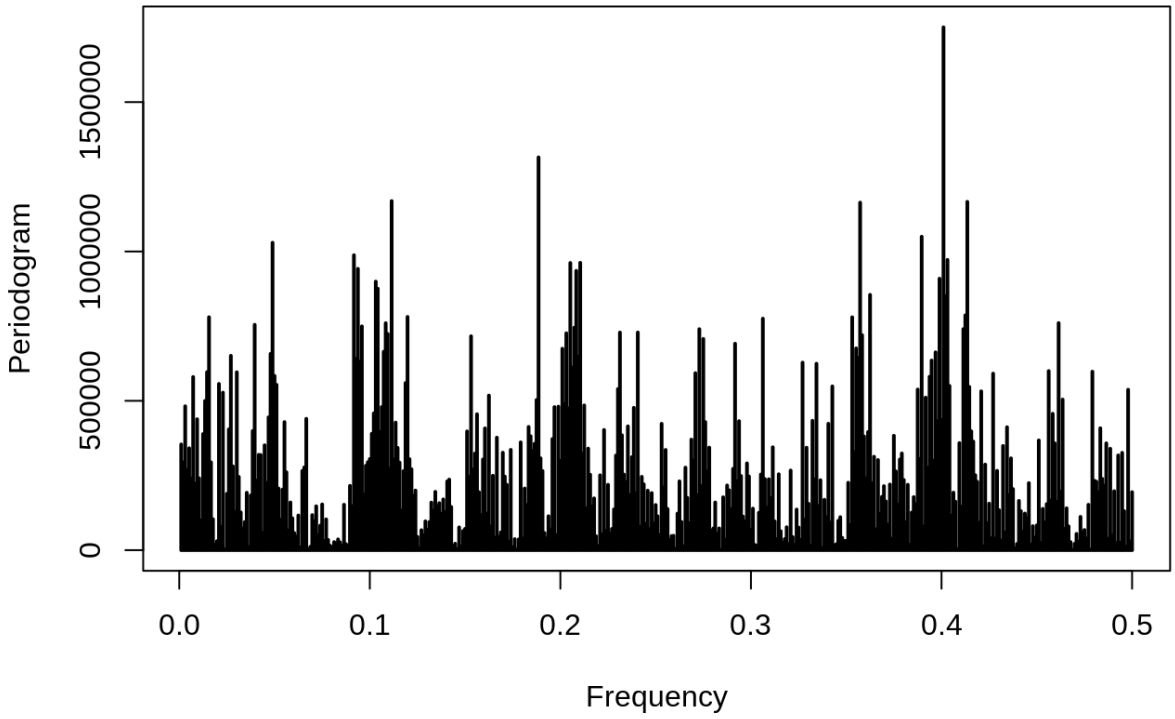


Fit various arima models to the bitcoin price. Which model fits best using the AIC?

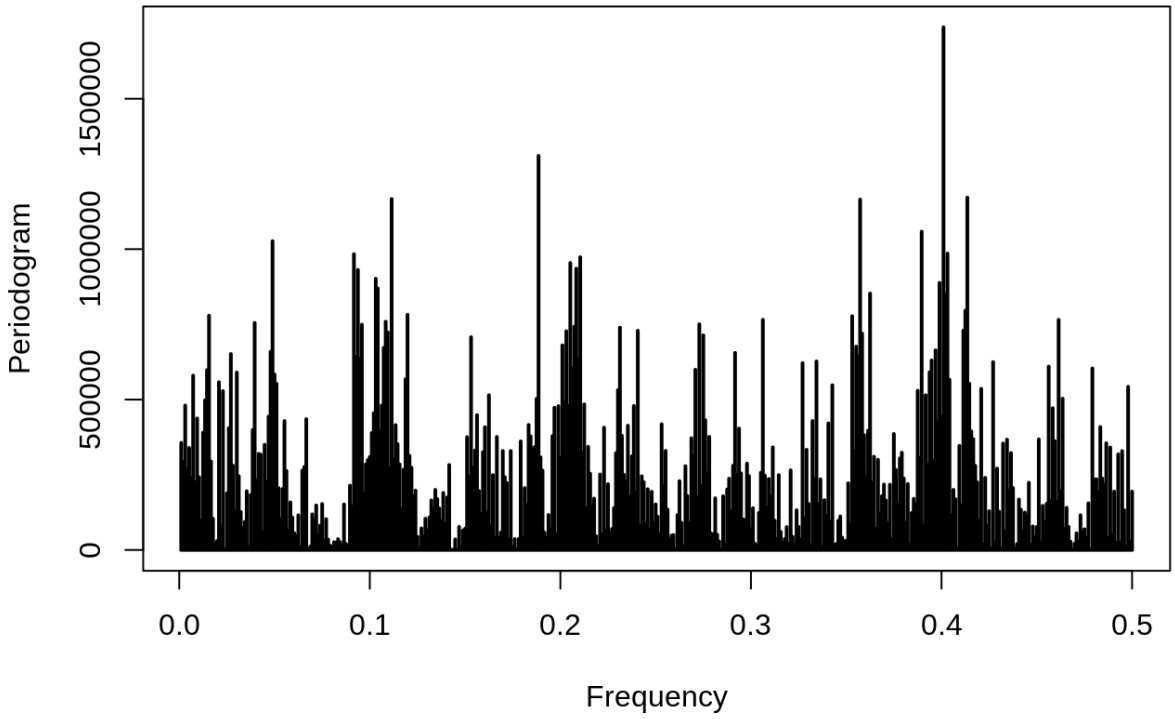
Forecast the next 30 days of the bitcoin price and plot the forecast.



Plot the periodogram of the data. Do you see any seasonality in the data?



Fit a model where you regress the stationarity-transformed price on dummy variables for the different days of the week. Obtain the residuals from the model. Plot the periodogram of these residuals. Has the periodogram changed greatly? Do you think this transformation helps us to capture any seasonality in the data?



Using the AIC, select a VAR model which best captures the relationships between our 5 variables. What Granger causality relationships do you see between our prices?

Forecast the next 30 days of the prices using the VAR model. Compare your forecasts to one from the ARIMA model.