Problem Set 3

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Due: 2018-June-27 at 11:59 pm

Question 3.1

Follow the steps as outlined here. These are not meant to be entirely straightforward. This is meant to be a learning experience with time series data. I've basically outlined the approach, but you have to follow the steps to create and model this data. Turn in both your data set and your R code at the end.

1. Go online and search for daily bitcoin prices. Find and download a historical series of bitcoin prices going back to at least 2014

2. Go to St Louis FRED. Find and download the S&P500 (SP500), the London bullion market price for gold in US dollars (GOLDPMGBD228NLBM), the US/Euro exchange rate (DEXUSEU), and the West Texas Intermediate spot price of oil (DCOILWTICO). These should all be available daily as well

3. Merge all the data sets together (you can use either R or Excel or whatever)

4. Plot the series in R

5. Use 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)

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

7. After taking differences, regress the bitcoin price on the other series. What relationships do you find now?

8. 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.

9. Plot the ACF and PACF of the bitcoin price

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

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

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

13. 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?

14. 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?

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