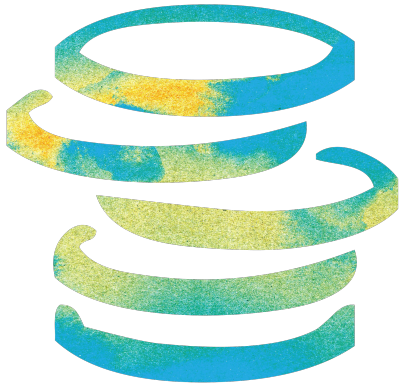
FOREX ANALYSIS

Relationships & Inferences

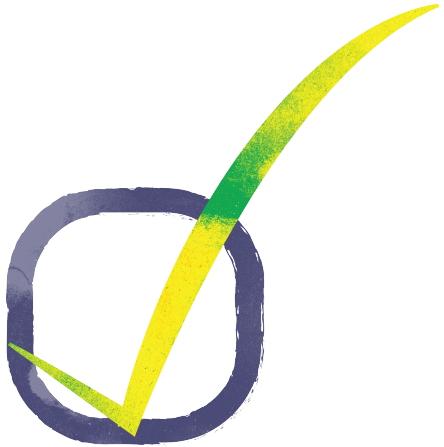
MATH 6359 | October 31, 2017 | Holly Ghaemi, Andre Hochi, and J. Ademar Perez



What are we looking at?

We gathered **weekly quote prices** (or historical exchange rates) from October 15, 2012 to October 2, 2017 for the following currencies:

The currencies were compared to the US dollar as a reference point.



Objectives

What **trend is present** in the QAR index? Is it linear or cubic?

Tools used:

ARIMA Model
Polynomial Regression

Does the MXN index present a **period trend**?

Tools used:

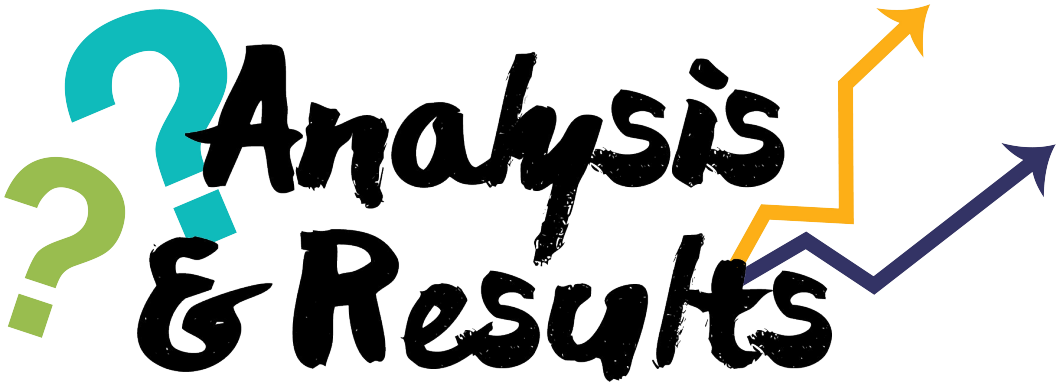
Seasonal ARIMA Model

How far into the **future** can we **forecast** with the JPY data?

Tools used:

ARIMA Model
Forecast function

Can we determine which currency **might yield a high return** if invested in?
Tool used: Annualized Historical Volatility


Analysis
& Results

Analysis & results 1

From the time series plot we notice that there is a **stationary** relationship within the data as the **mean** stays **consistent** throughout.

From ACF plot, we **confirm stationarity** as the values lie within the bands and the variance does not decrease rapidly.

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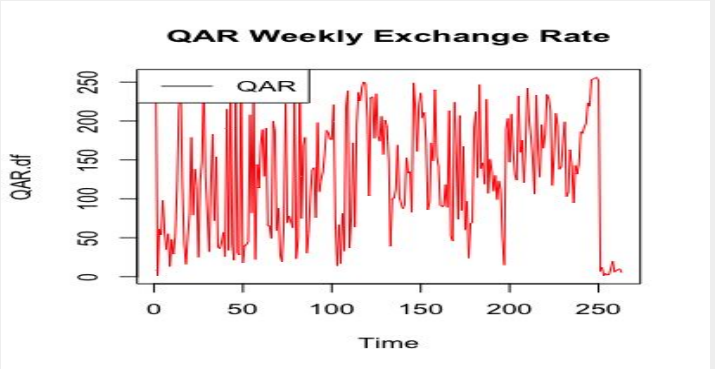
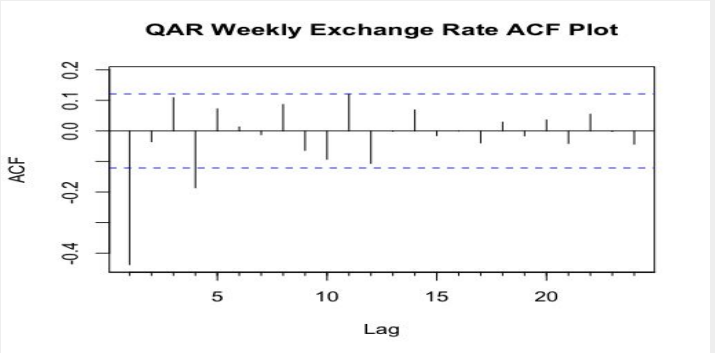
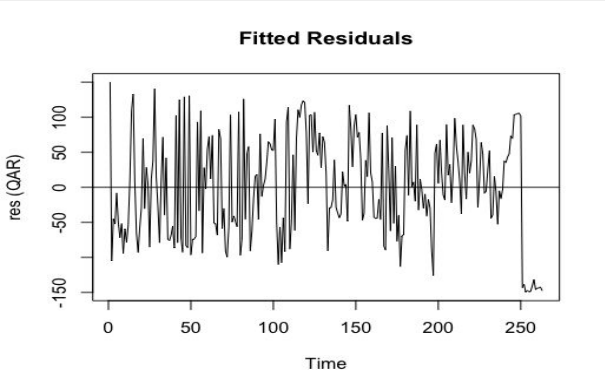




Analysis & results 1

Stationarity is again confirmed with a **residual plot** that exudes **randomness.**



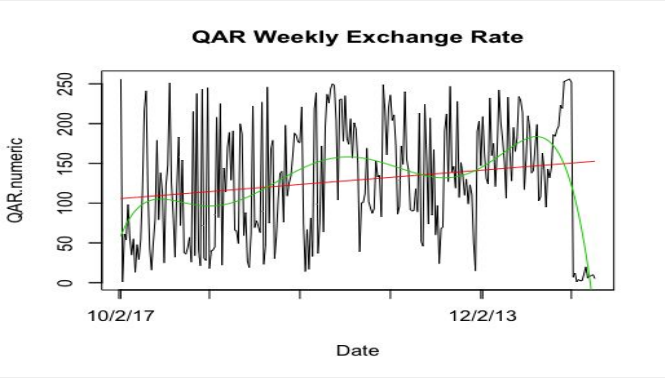
After running a **Dickey-Fuller Stationarity** test, we further confirm stationarity with a p-value of 0.03847 which **rejects the null** hypothesis

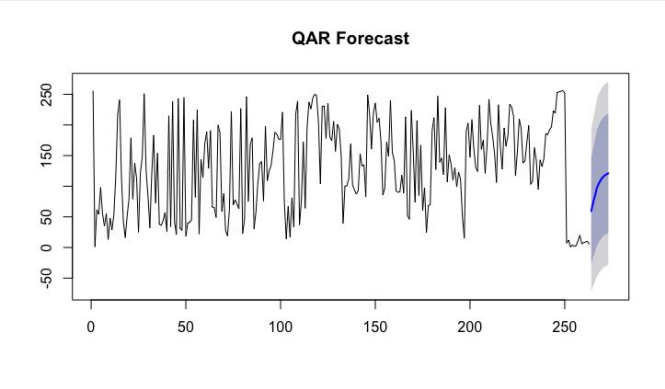
```
> adf.test(diff(log(QAR.numeric),12))

        Augmented Dickey-Fuller Test

data:  diff(log(QAR.numeric), 12)
Dickey-Fuller = -3.5499, Lag order = 6, p-value = 0.03847
alternative hypothesis: stationary
```

Analysis & results 1

After **detrending** for exploratory analysis, neither a linear or cubic fit seem sufficient for the data.

After running the **ARIMA model**, we were able to **forecast** 10 future time points for the following 10 weeks of QAR exchange rates with the USD as a unit.

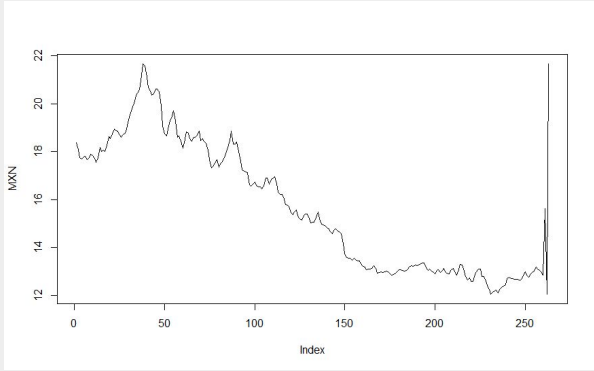


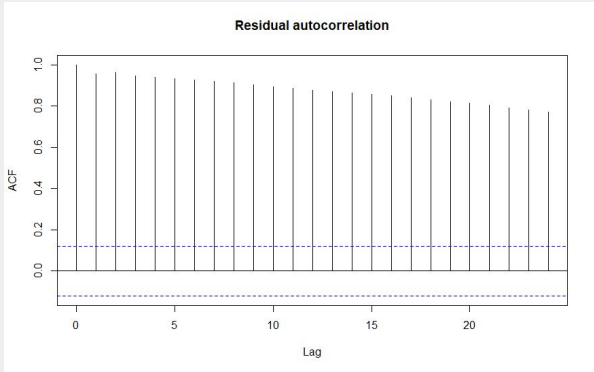


Does the MXN index present a period trend?

It is pretty obvious from the first plot there is no periodic trend.

Looking even more into the residuals using the ACF plot we can see that it's **not periodic**. The very high ACF values show that there is a high correlation between the lag and the error meaning it is **time dependent**. This means it is not stationary



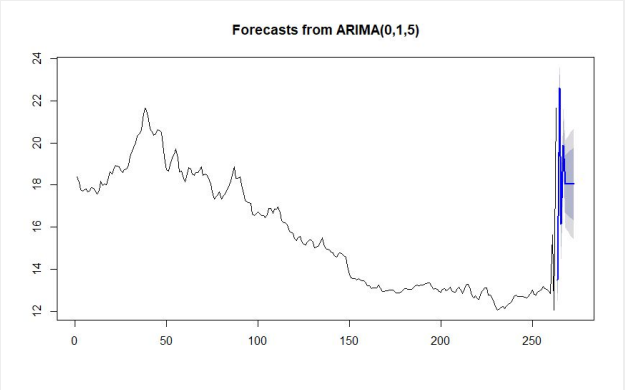


But lets still run the model anyways.

After running auto.arima we find out that the appropriate model is the ARIMA(0,1,5) model.

Forecasting 10 weeks into the future we get the following graph and table.

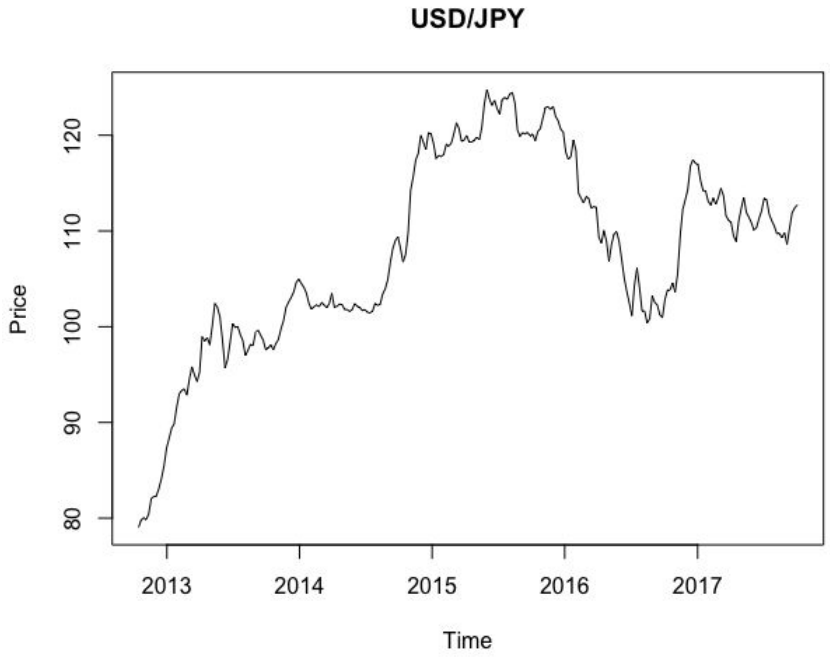
It seems quite obvious that due to the prices having very high variance near the end that the model may not make accurate predictions.

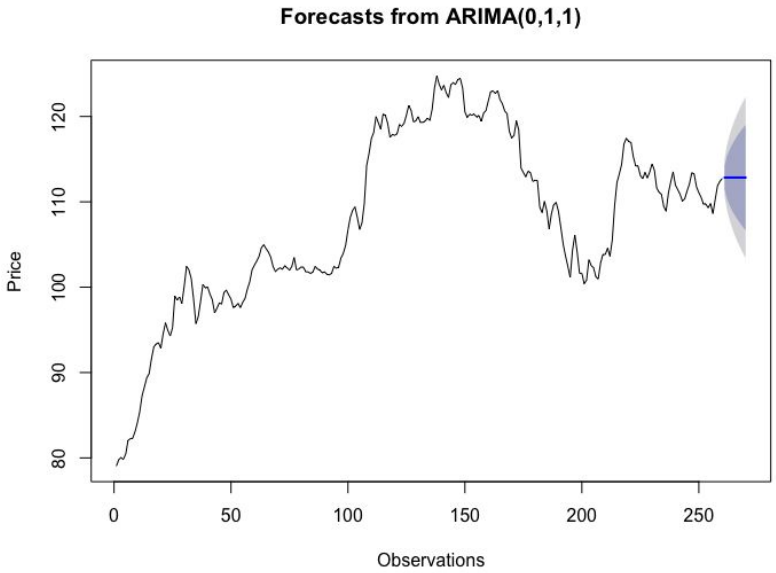


	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95
264	13.47577	12.83636	14.11518	12.49787	14.45366
265	22.60491	21.95203	23.25779	21.60641	23.60341
266	16.13184	15.03546	17.22821	14.45508	17.80860
267	19.88607	18.74393	21.02820	18.13932	21.63281
268	18.04631	16.69861	19.39402	15.98517	20.10746
269	18.04631	16.61123	19.48140	15.85155	20.24108
270	18.04631	16.52888	19.56375	15.72560	20.36703
271	18.04631	16.45078	19.64185	15.60615	20.48648
272	18.04631	16.37632	19.71631	15.49228	20.60035
273	18.04631	16.30504	19.78758	15.38327	20.70936

How far into the **future** can we **forecast** utilizing the USD/JPY data?

From the plot:
No seasonality
and **stable variance**






```
> forecast(japyn.d1.a)
    Point Forecast    Lo 80    Hi 80    Lo 95    Hi 95
261       112.8446 111.4421 114.2472 110.6996 114.9896
262       112.8446 110.3974 115.2919 109.1019 116.5873
263       112.8446 109.6807 116.0086 108.0057 117.6835
264       112.8446 109.0986 116.5906 107.1156 118.5736
265       112.8446 108.5956 117.0937 106.3463 119.3430
266       112.8446 108.1461 117.5432 105.6589 120.0304
267       112.8446 107.7360 117.9532 105.0317 120.6576
268       112.8446 107.3565 118.3328 104.4512 121.2380
269       112.8446 107.0015 118.6877 103.9084 121.7808
270       112.8446 106.6670 119.0223 103.3967 122.2925
```

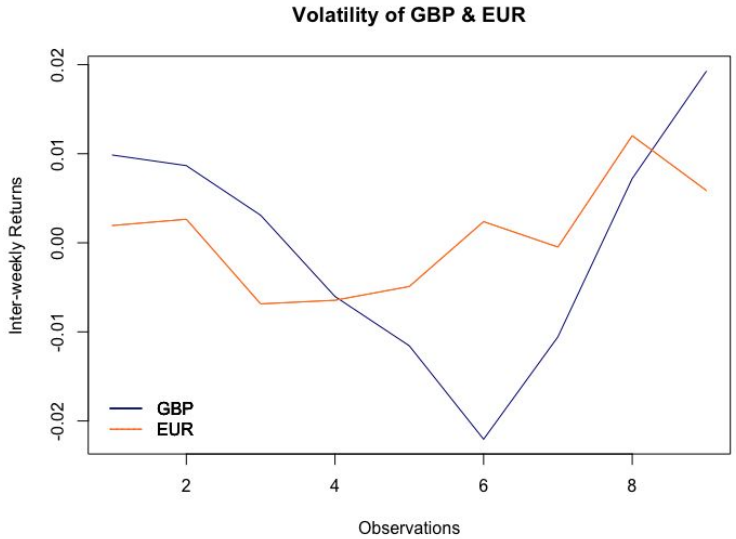
Using the ARIMA model and forecast function, we can forecast 10 points into the future (or **ten weeks**).

Differences:

114.9896 - 110.6996 = **4.29**

122.2925 - 103.3967 = **18.8958**

Using historical volatility, can we determine which currency **might yield a high return** if invested in?



Annualized Historical Volatility

USD/EUR: 0.037

USD/GBP: 0.079

USD/JPY: 0.053

USD/MXN: 0.056

USD/QAR: 0.045

Further Exploration

There are a few things that we could still explore. First of all we still have 2 extra sets of data that we could use. So we could explore the trends and forecast of the euro. Similarly we could explore the trends and forecast of the pound.

Since we now have better understanding of the techniques used in time series analysis we could now explore other sets of time series data like stock prices.