

Forecasting Exchange Rates Using A Neural Network

PRESENTATION

AUGUST 20, 2019



Agenda

August 20, 2019

1

Project Context

2

The Network

3

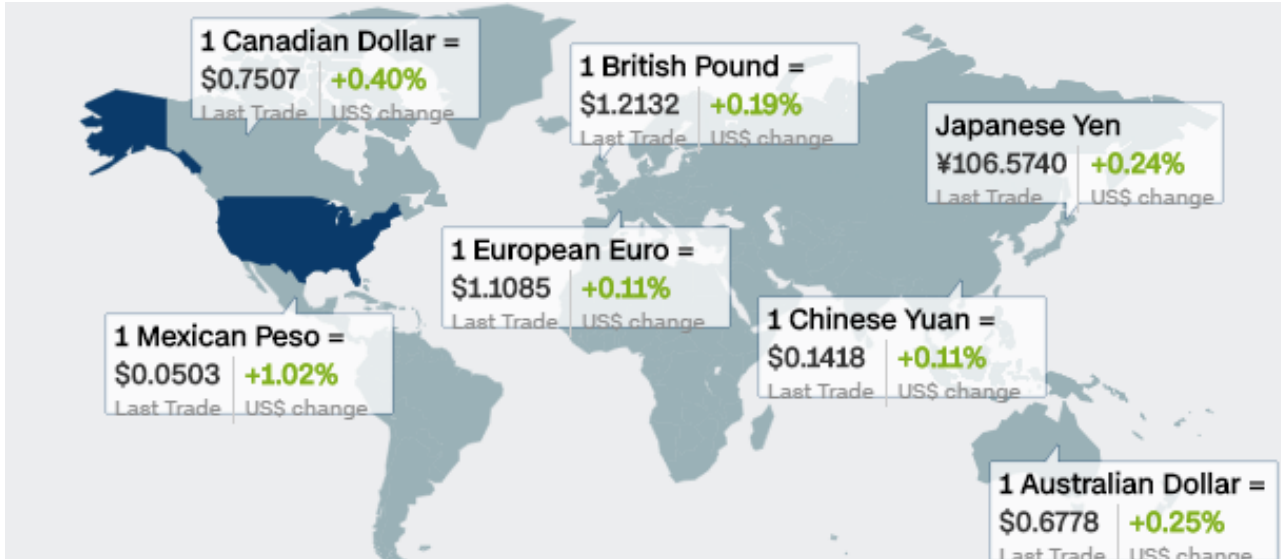
The Model

4

Results

Exchange rates indicate the worldwide demand for a currency





$$ex.r * Price_{U.S.} = Price_{World}$$

$$ex.r = \frac{Price_{World}}{Price_{U.S.}}$$

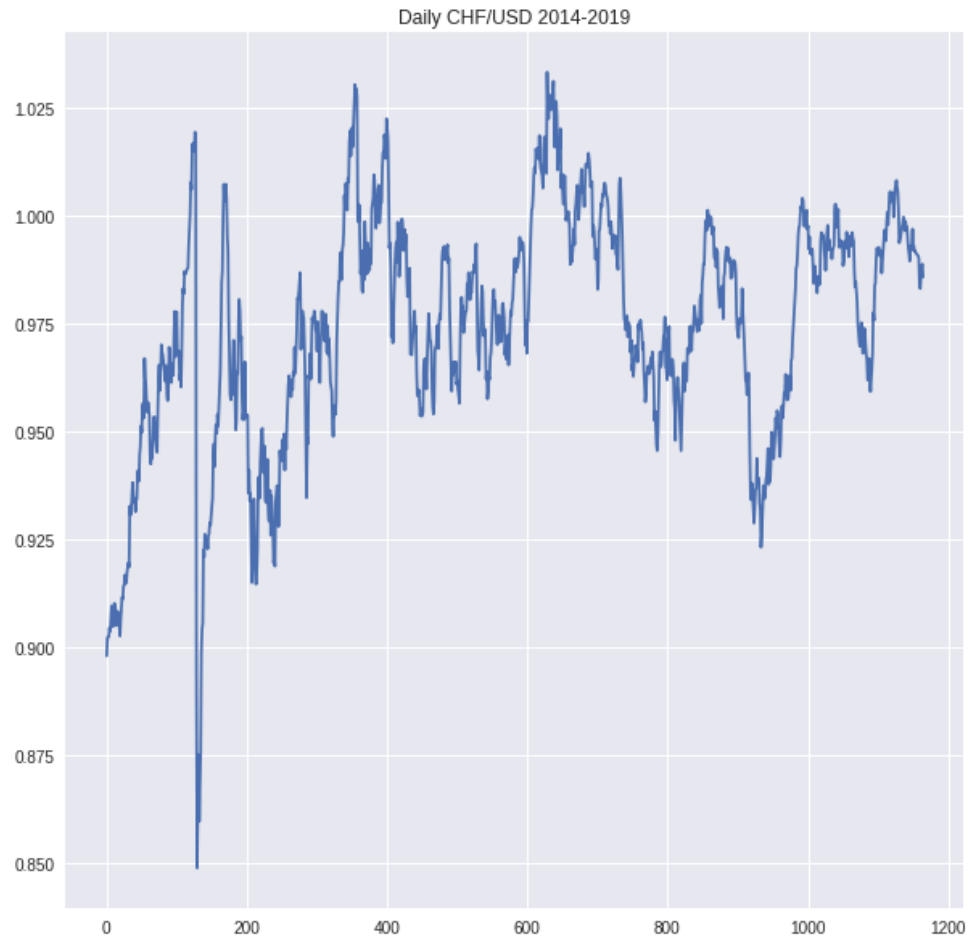
Project Context

EXCHANGE RATES

- › What are exchange rates?
 - Nominal?
 - Real?
- › How are exchange rates determined?
- › Why are exchange rates used?

Project Context

TIME SERIES



- › Autoregressive process
 - AR (p)
- › Stationarity
 - Constant mean and variance over time
- › Non-stationarity
 - Random-walk

Project Context

TIME SERIES

- › Autocorrelation
 - Adjacent observations are related
- › Autocorrelation function (ACF / PCF)
 - Correlation between a series and its lags
- › First Difference
 - The change in output between one period



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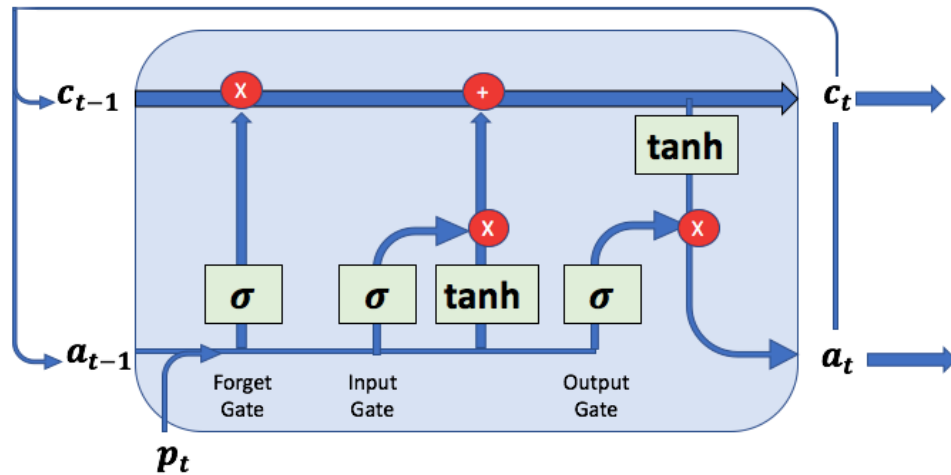
The Model

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Results

The Network

LONG SHORT-TERM MEMORY



```
1 model = Sequential()  
2 model.add(LSTM(cells[i], activation='tanh', input_shape=(lags,1)))  
3 model.add(Dropout(rate = 0.2))  
4 model.add(Dense(1))  
5 model.compile(optimizer='adam', loss='mse')
```


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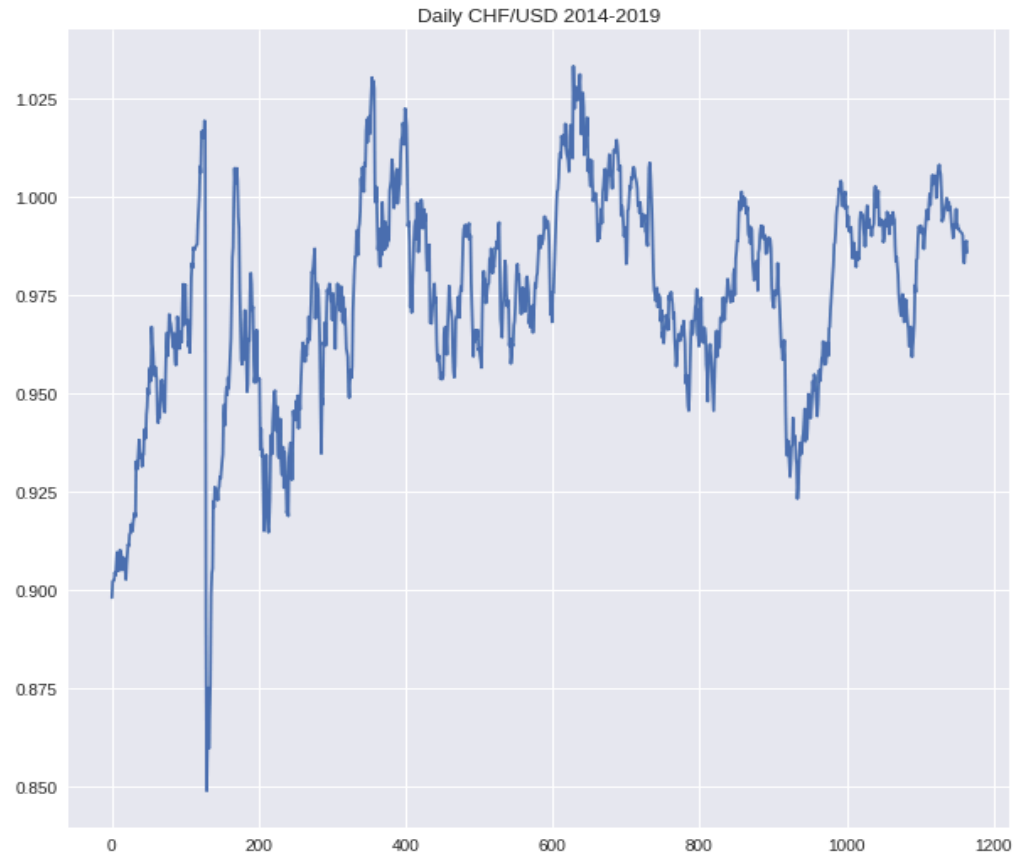
4

Results

The Model

PRETESTING

› Swiss Franc (*July 2014 – January 2019*)



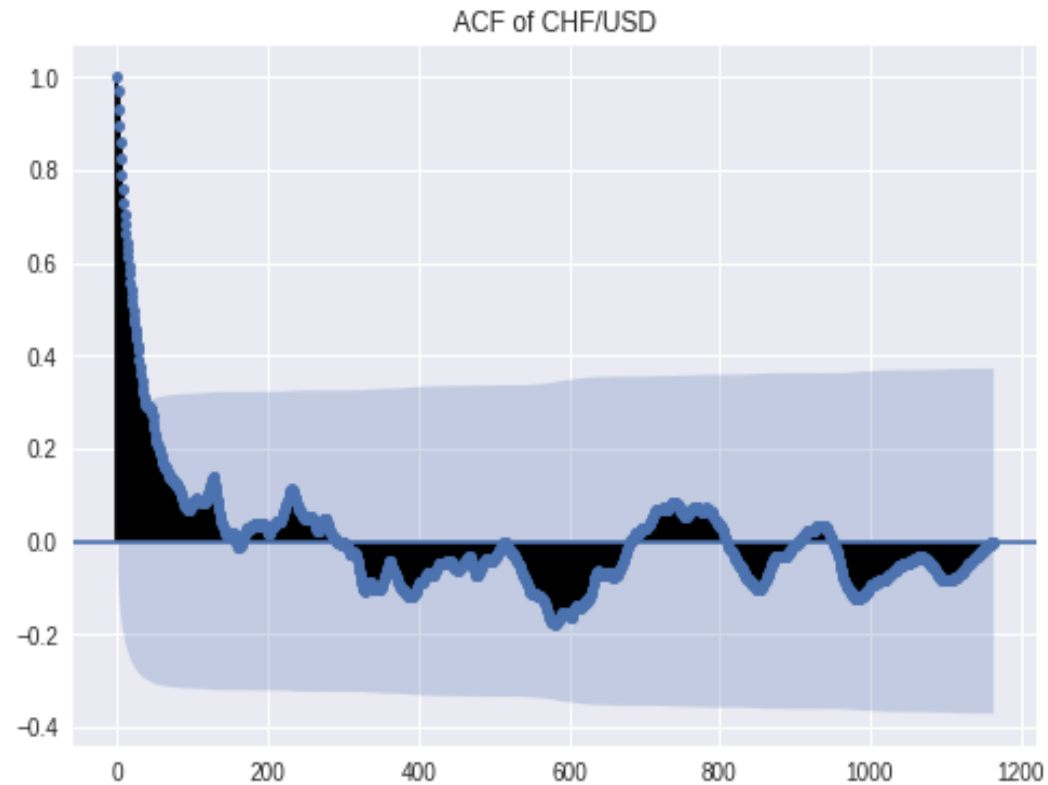
› Brazilian Real (*July 2014 – January 2019*)



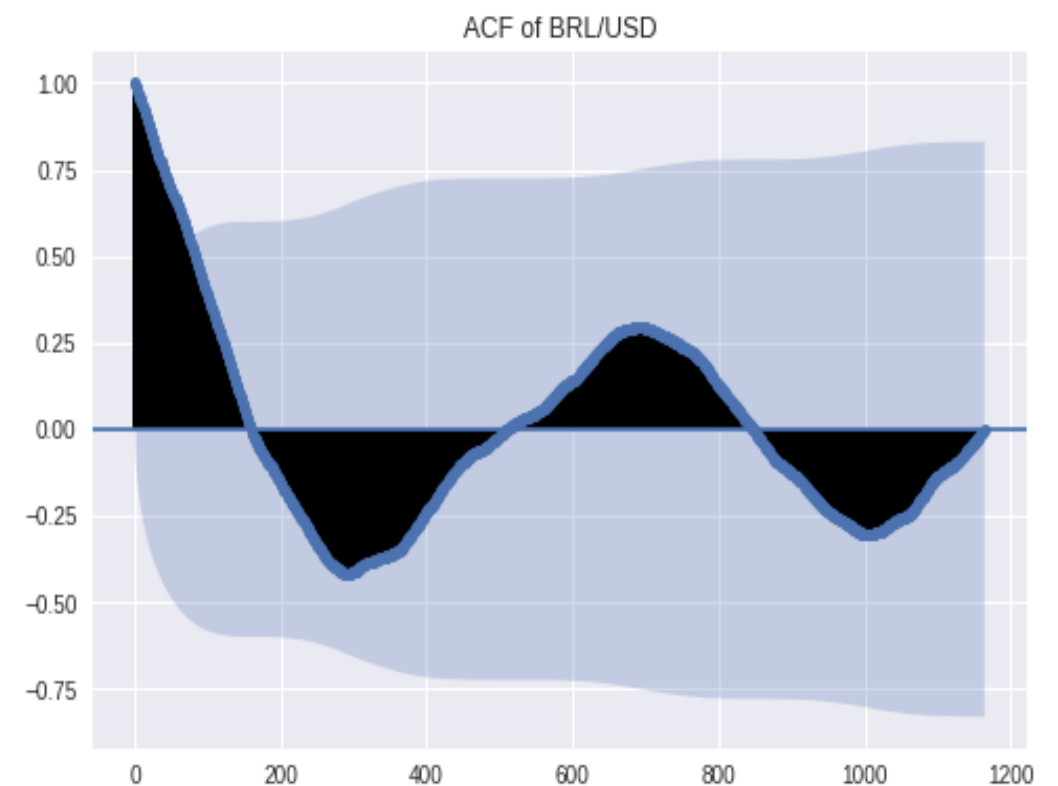
The Model

PRETESTING

› Swiss Franc ACF



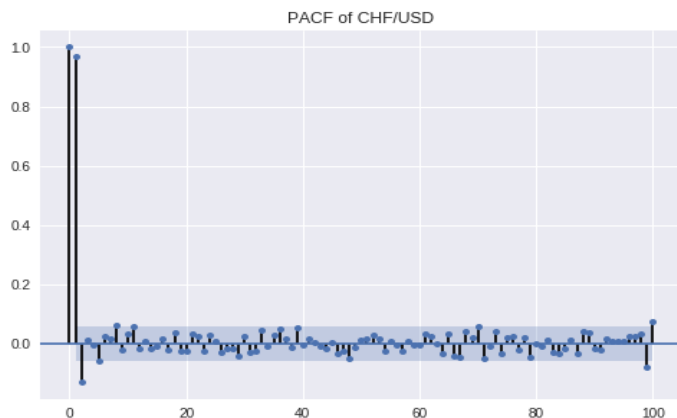
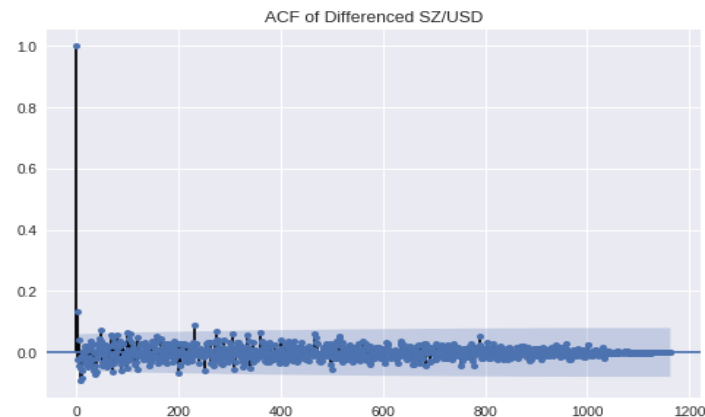
› Brazilian Real ACF



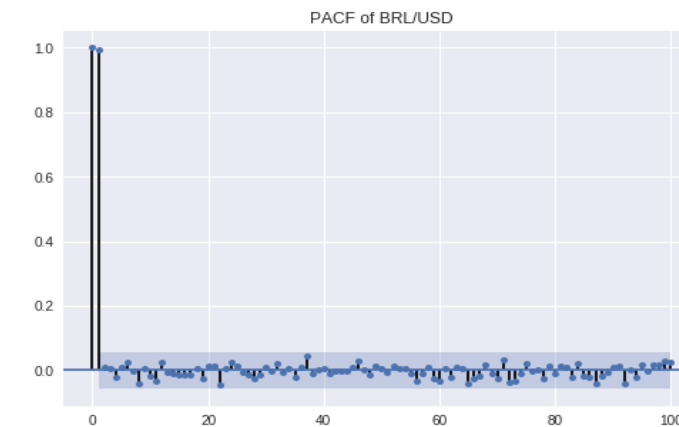
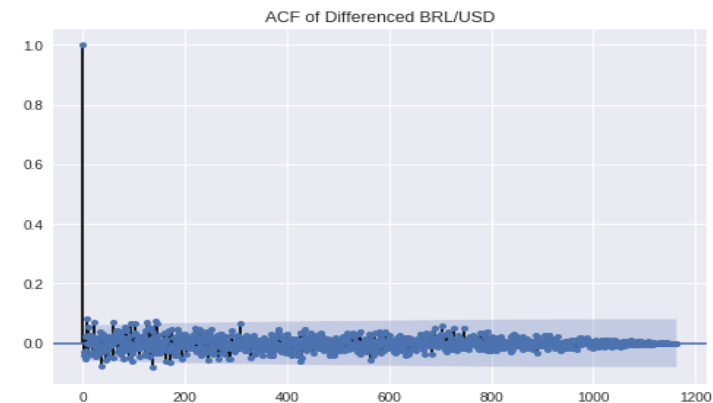
The Model

PRETESTING

› Swiss Franc



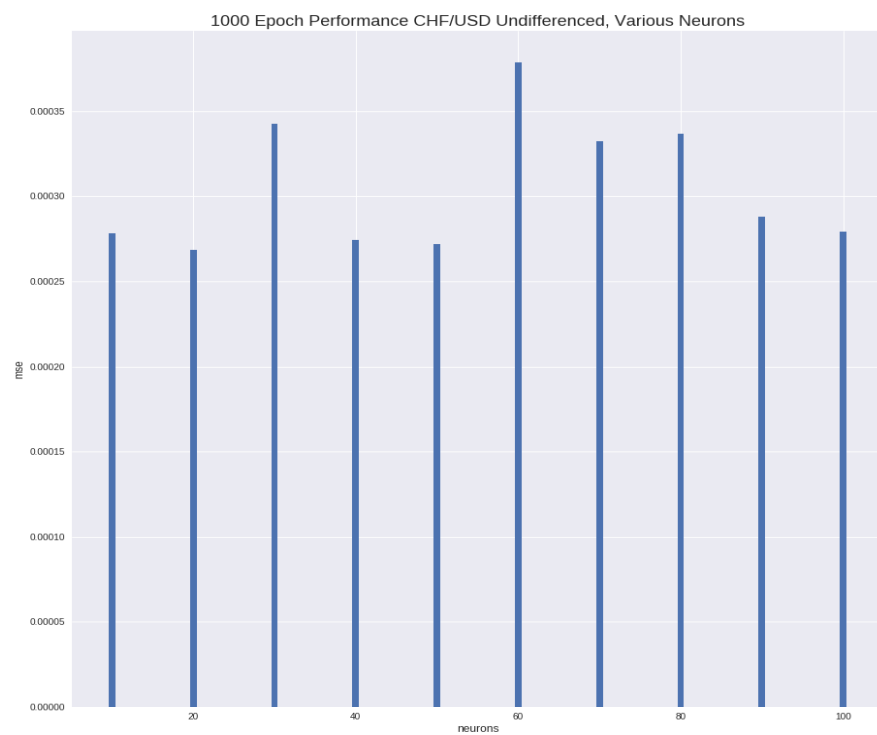
› Brazilian Real



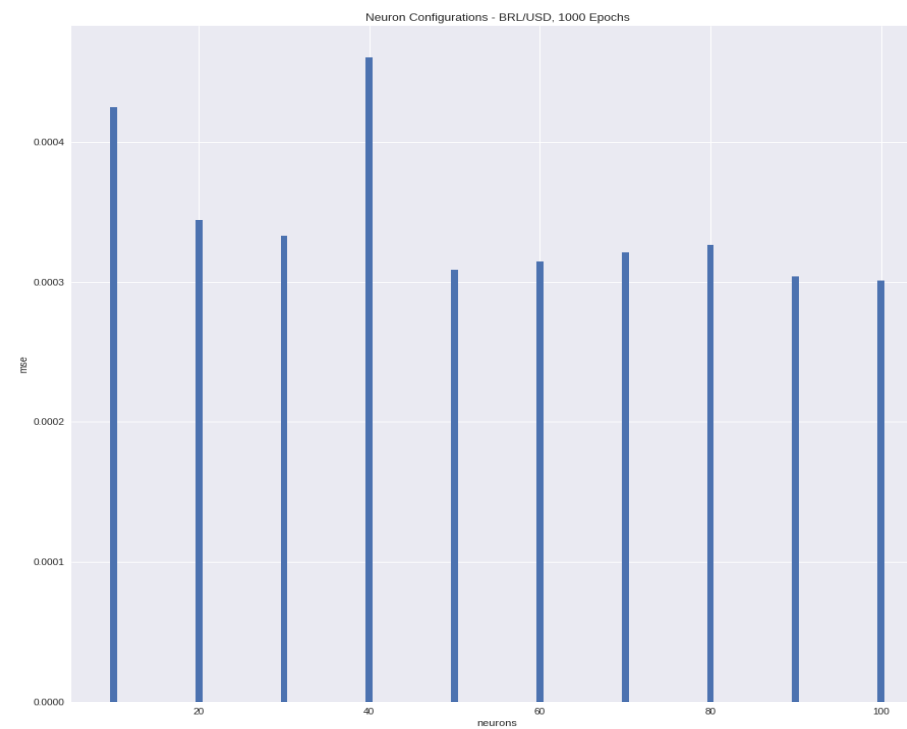
The Model

PRETESTING – OPTIMAL NEURONS

› Swiss Franc



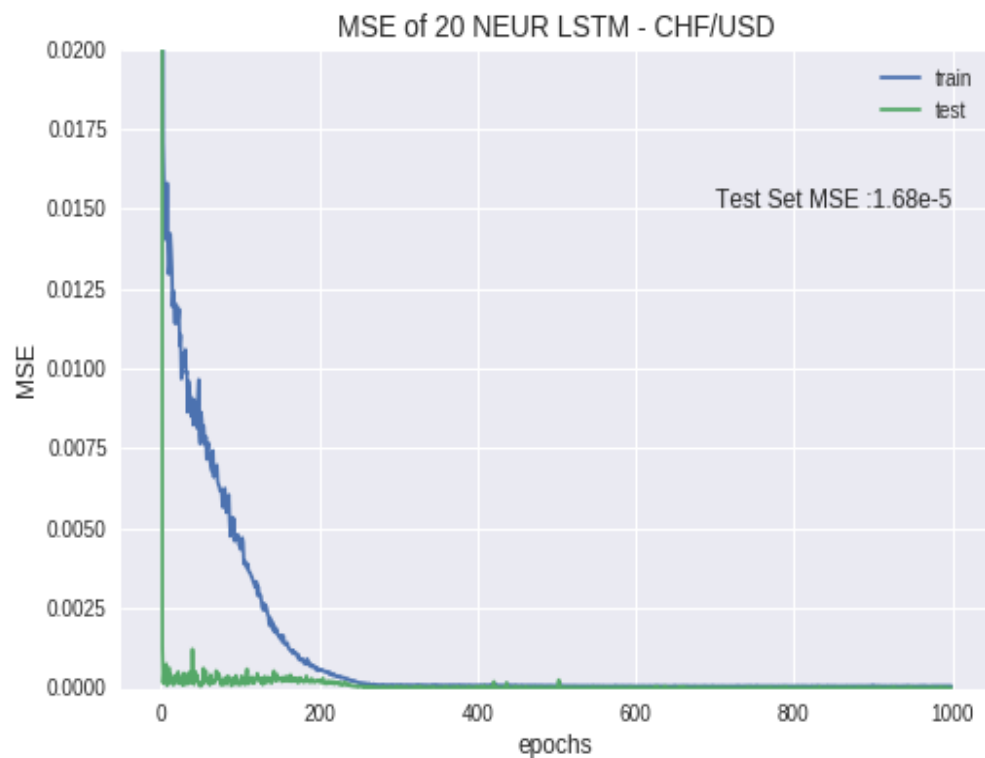
› Brazilian Real



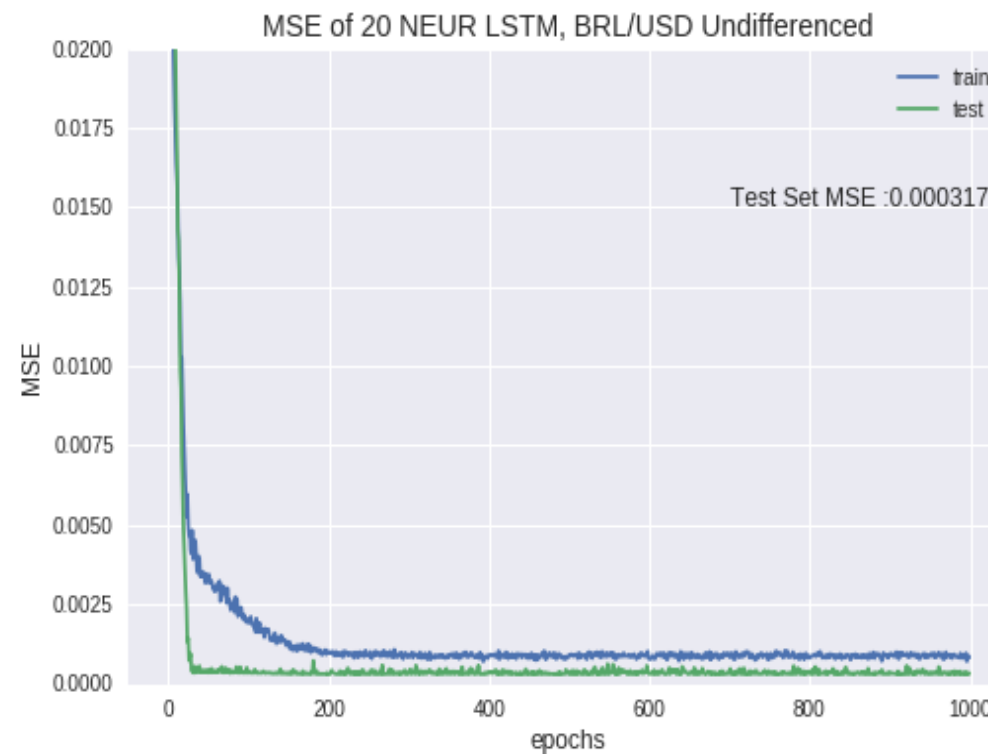
The Model

TRAIN & TEST

› Swiss Franc



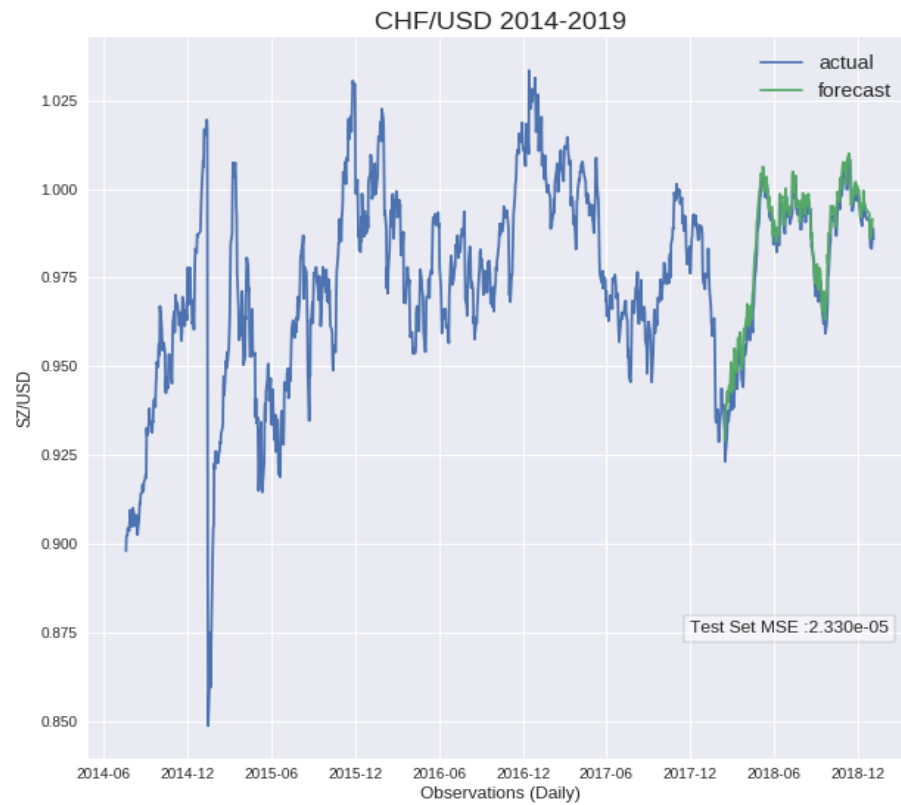
› Brazilian Real



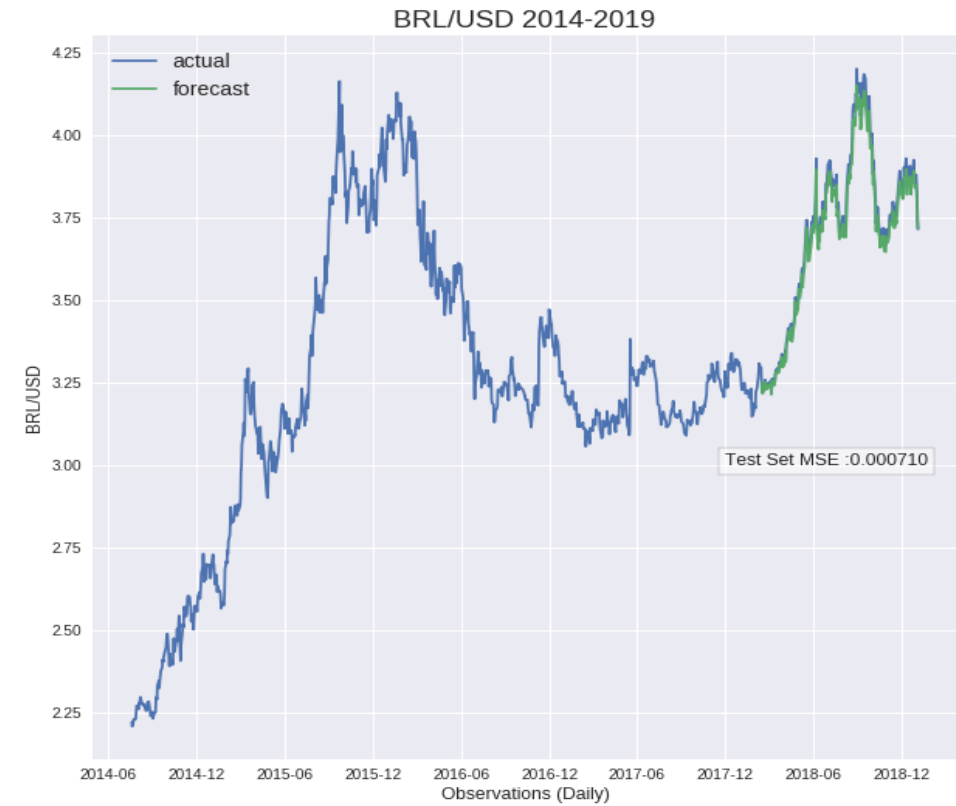
The Model

FORECAST

› Swiss Franc



› Brazilian Real



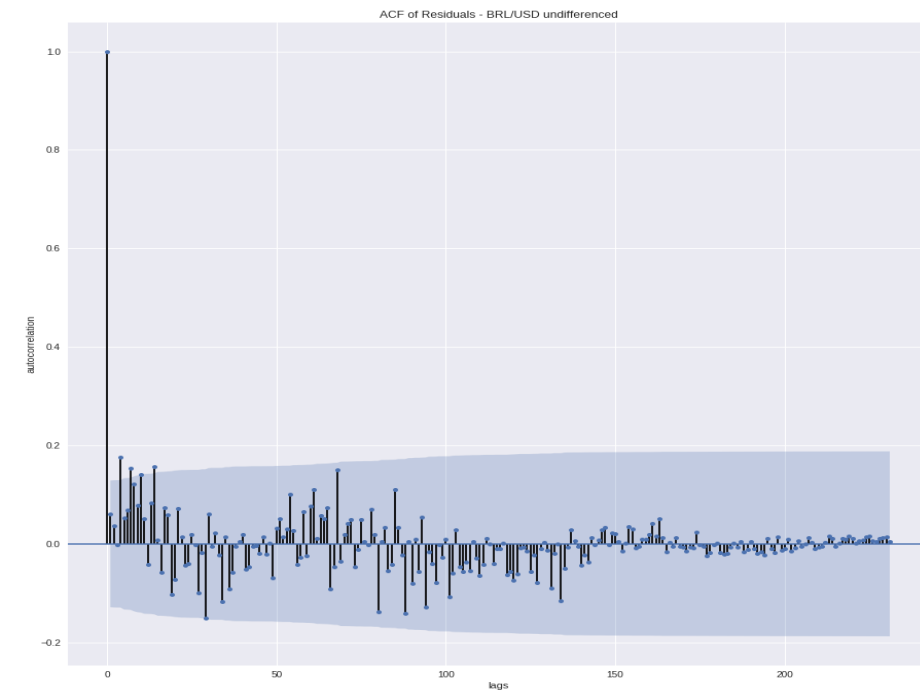
The Model

PERFORMANCE

› Swiss Franc



› Brazilian Real



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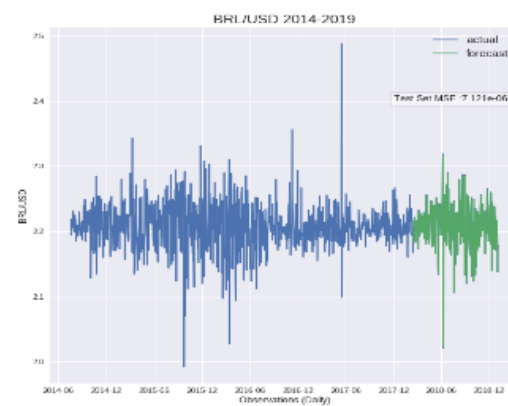
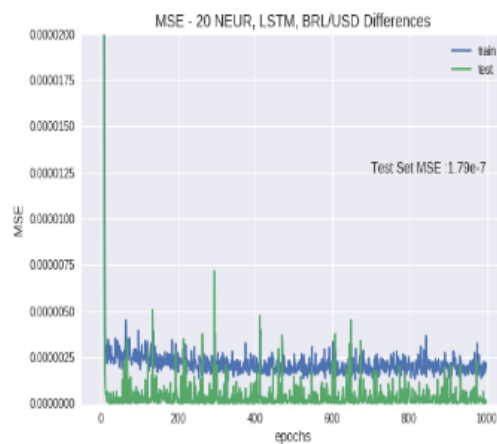
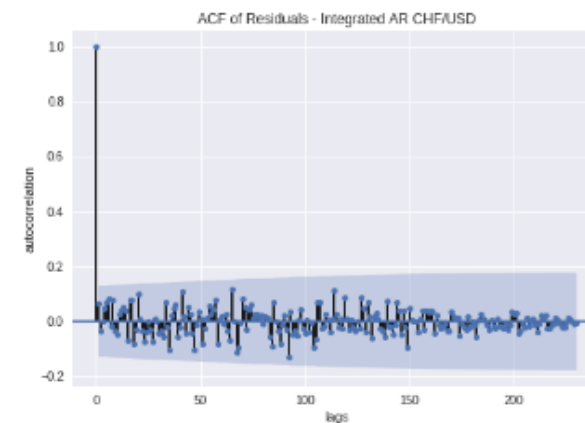
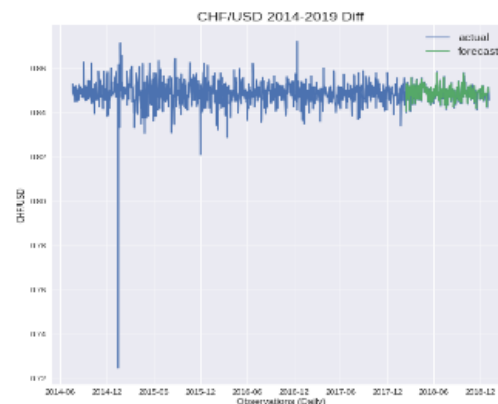
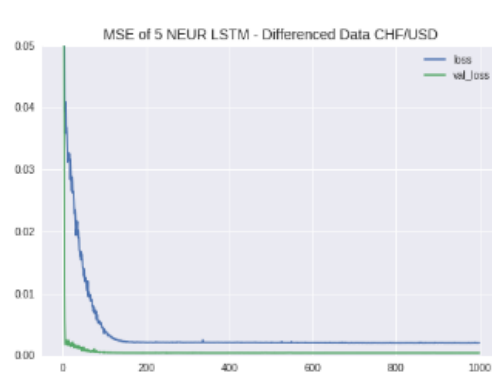
The Model

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Results

Results

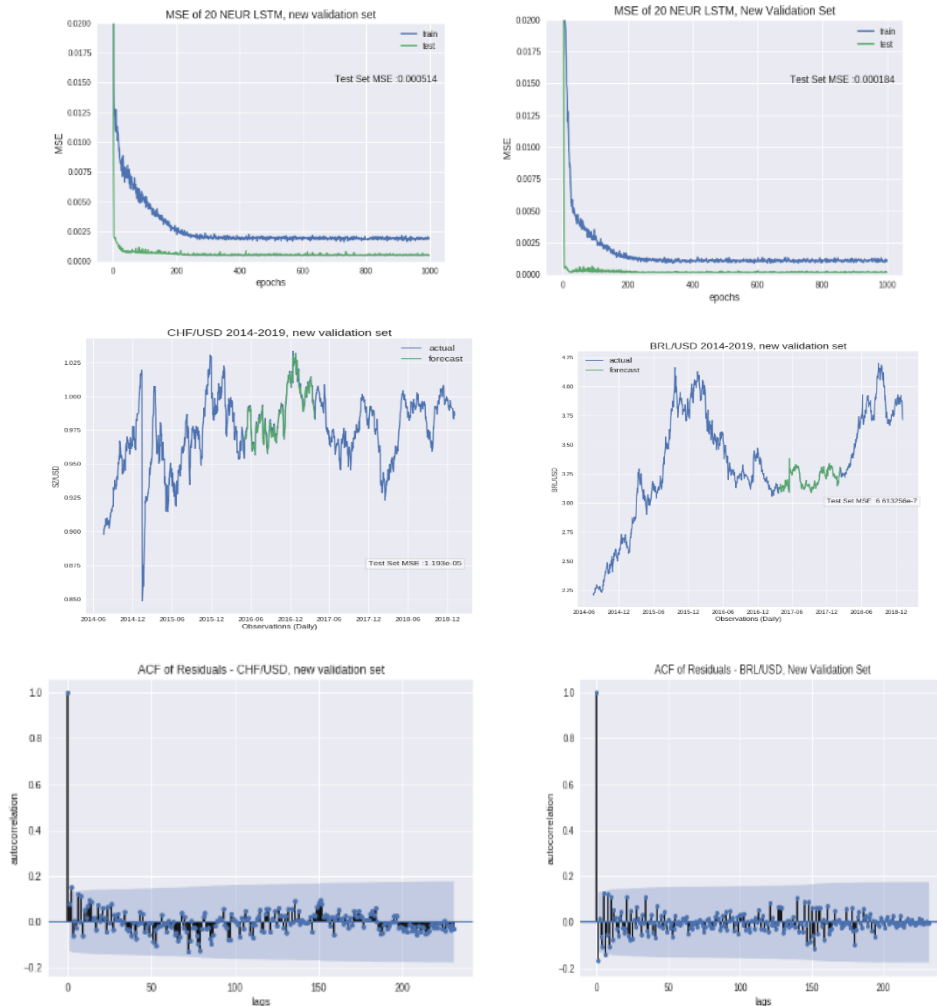
TESTING WITH DIFFERENCED DATA



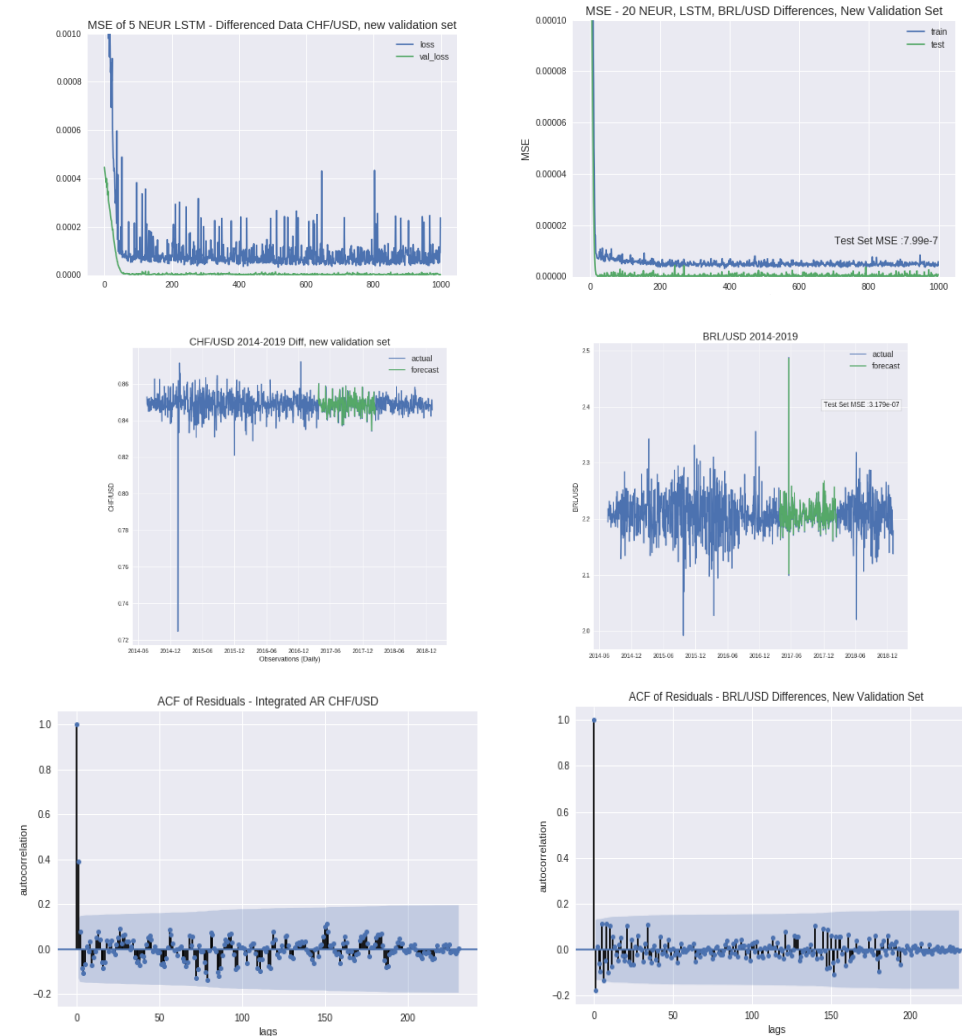
Results

VALIDATION – TRAINING ON YEARS 1 AND 2 | TESTING ON YEAR 3

Levels



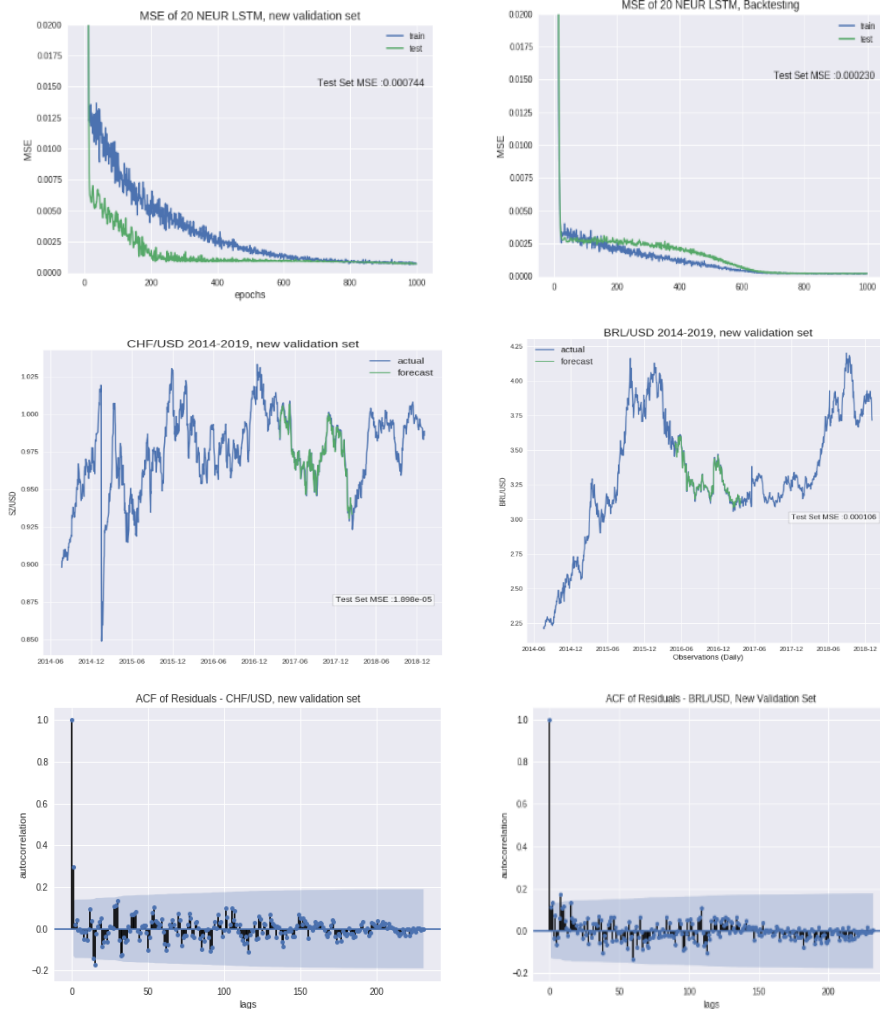
First Differences



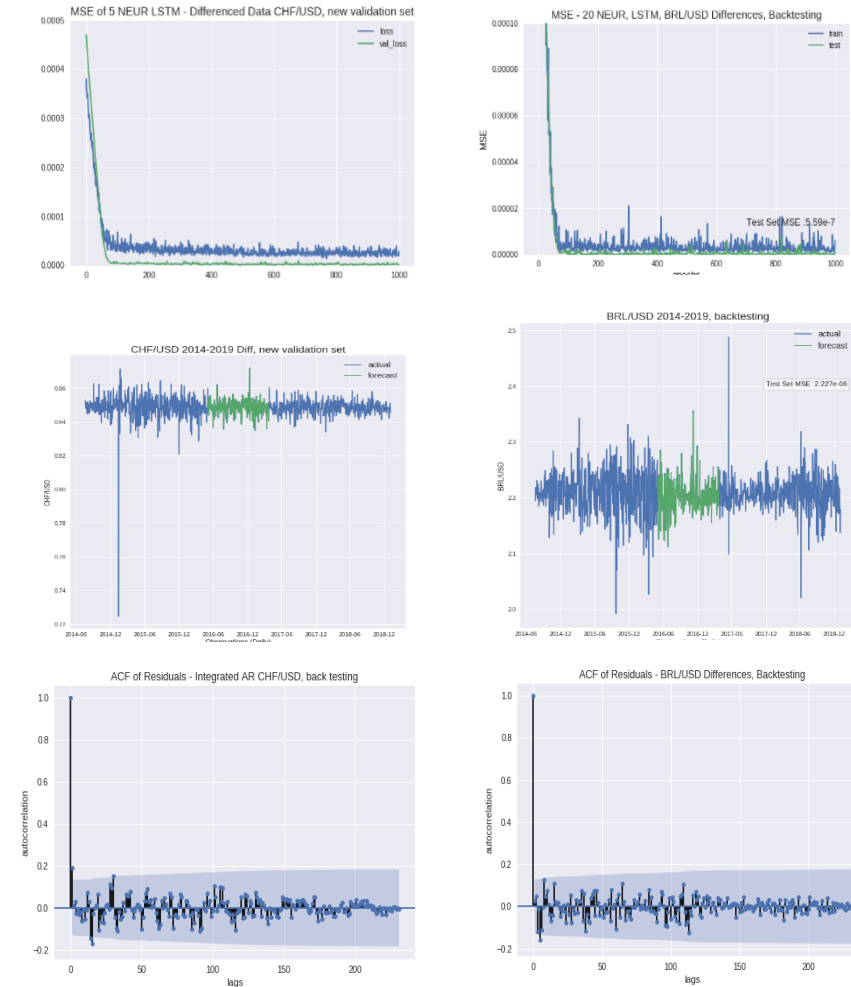
Results

BACK TESTING – TRAINING ON YEAR 3 | TESTING ON YEAR 2

Levels



First Differences





Conclusion

FORECASTING USING LSTM

- › Accurate
- › Unbiased estimates
- › Not economically significant

Future Considerations:

- › Modify the learning rate
- › Use a different optimizer
- › Utilize additional layers

Thank you.