FORECASTING FOREIGN EXCHANGE RATE

A time series analysis

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AGENDA

Introduction & Background

Objective

Dataset Description/Preparation

Data Analysis & Forecasting Approach

Challenges

Conclusion

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INTRODUCTION & BACKGROUND

- In our project we have explored foreign exchange data. We analyse monthly returns for the four major currencies, Brazilian Real (BRL.USD), Russian Ruble (RUB.USD), Indian rupees (INR.USD) and Chinese Yuan (YUAN.USD)

- We consider the fluctuation in foreign exchange rates. Unlike stock prices, foreign exchange rates are strongly influenced by policies of countries or currency unions.

- Foreign exchange markets are considered to be the most liquid market of all. Given the large amount of research dedicated to equity markets, findings about foreign exchange markets can be used to crosscheck findings about stock prices.

OBJECTIVE

- The ability to predict enhance the accuracy of financial projections and help businesses budget with greater confidence.
- Using a currency exchange rate forecast can help brokers and businesses make informed decisions to help minimize risks and maximize returns.
- The forecast also helps the government to take decisions on their country’s GDP and other factors.

DATASET

217
OBSERVATIONS

17 years time series data on 4 currency w.r.t USD

BRL | RUB | INR | YUAN

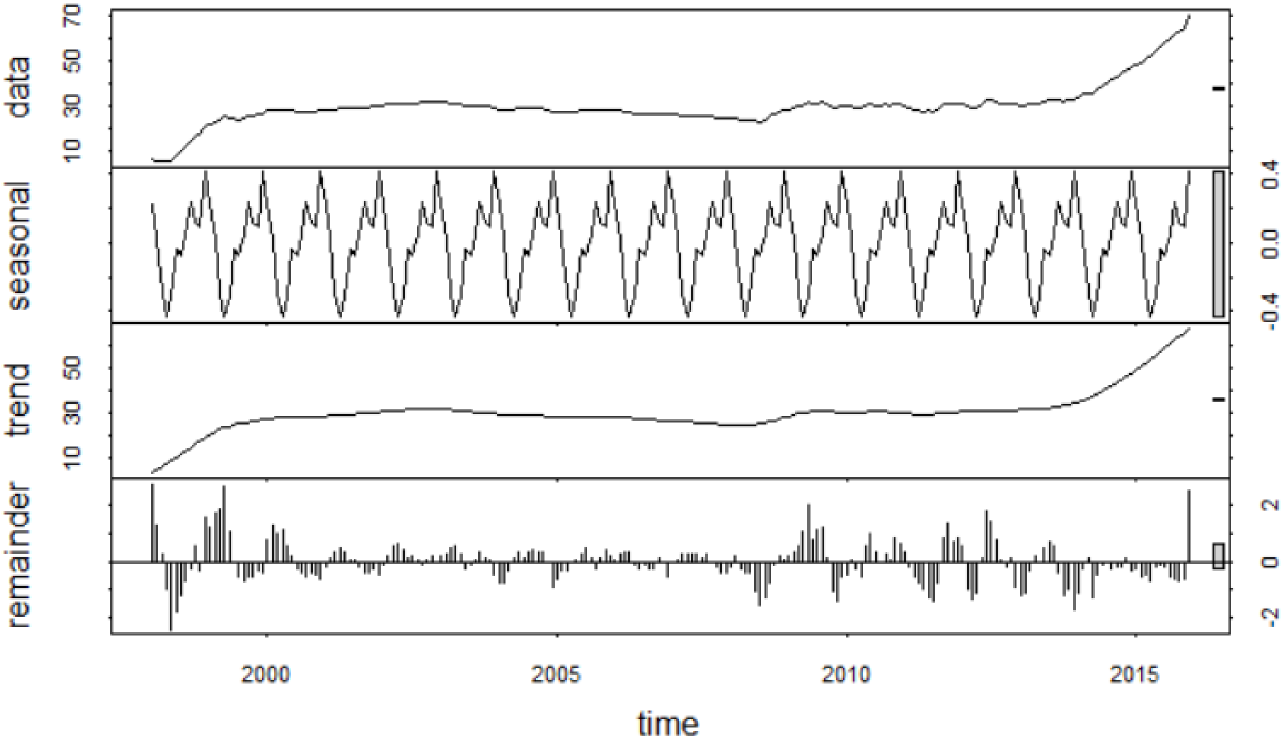
i..DATE <fctr>	BRL.USD <dbl>	RUB.USD <dbl>	INR.USD <dbl>	YUAN.USD <dbl>
01-01-1998	1.1218	6.0100	39.5402	8.2940
01-02-1998	1.1264	5.9983	38.7942	8.2780
01-03-1998	1.1322	6.0100	39.4955	8.2771
01-04-1998	1.1359	6.0449	39.4695	8.2514
01-05-1998	1.1441	6.1356	40.1854	8.2621

DATA ANALYSIS & FORECASTING APPROACH

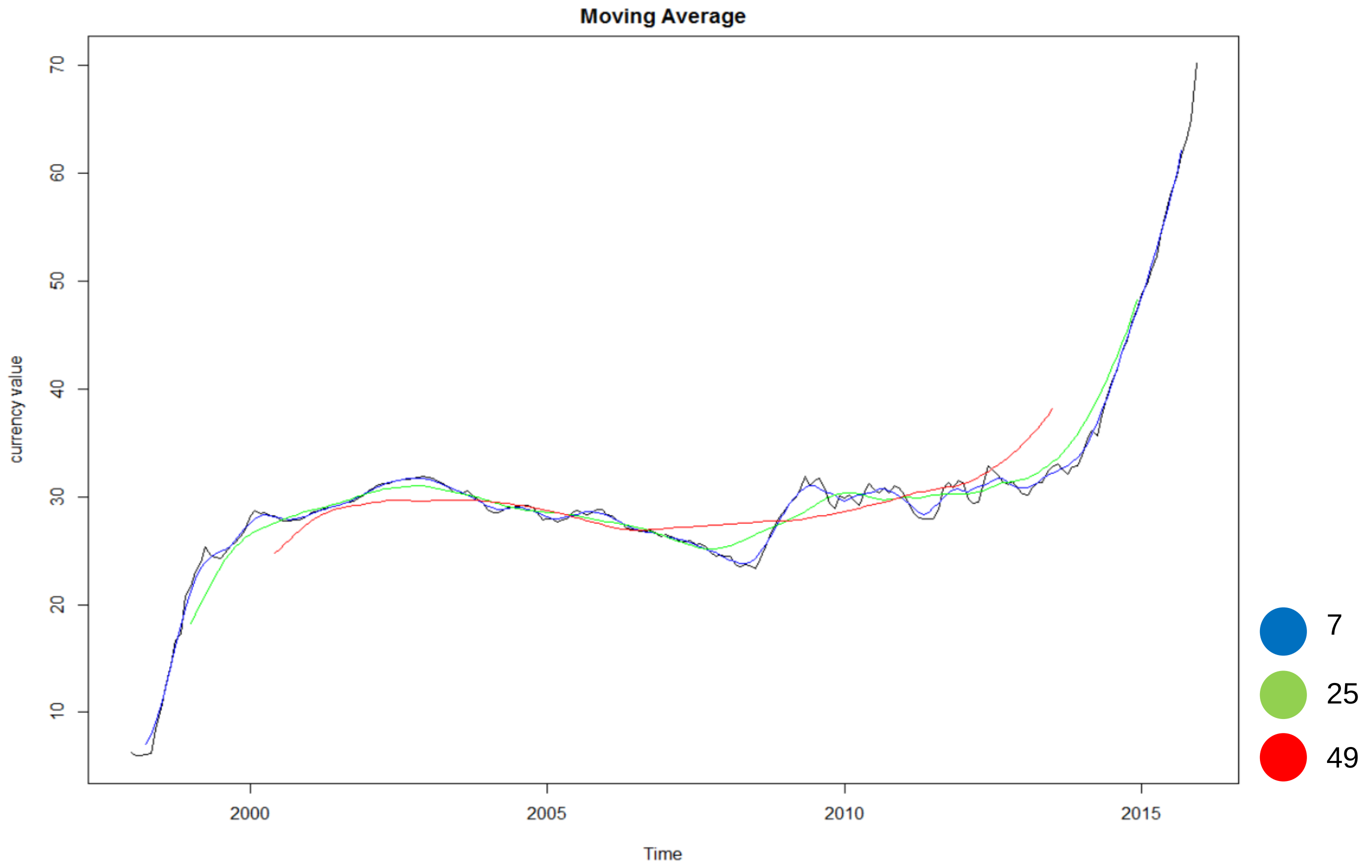
FORECASTING METHODS

- Moving Average Method
- Simple Forecasting Methods
  - Average Method
  - Naïve Method
  - Seasonal Naïve Method
- Holt Winters Method
- ARIMA Model

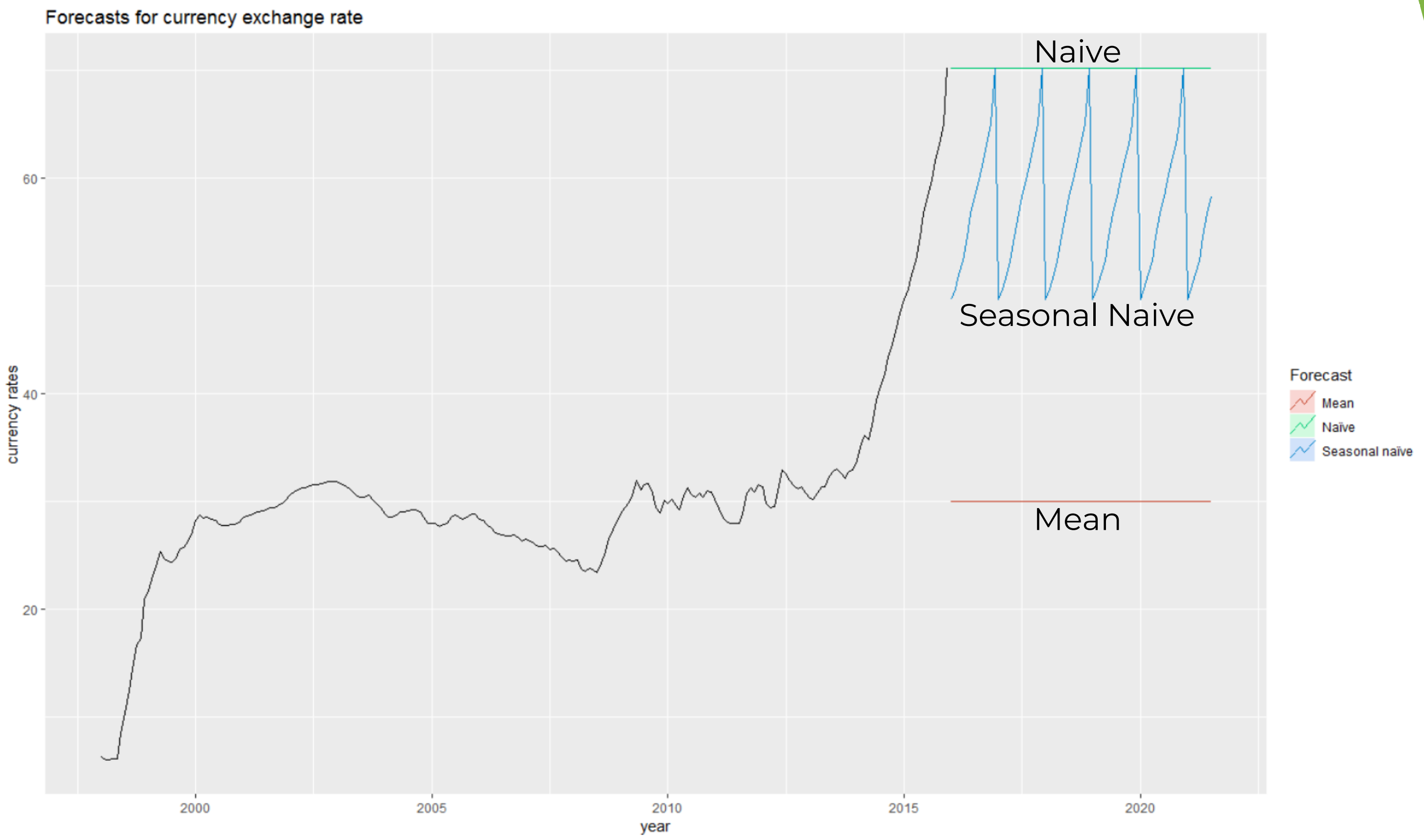
DATA | SEASONALITY | TREND



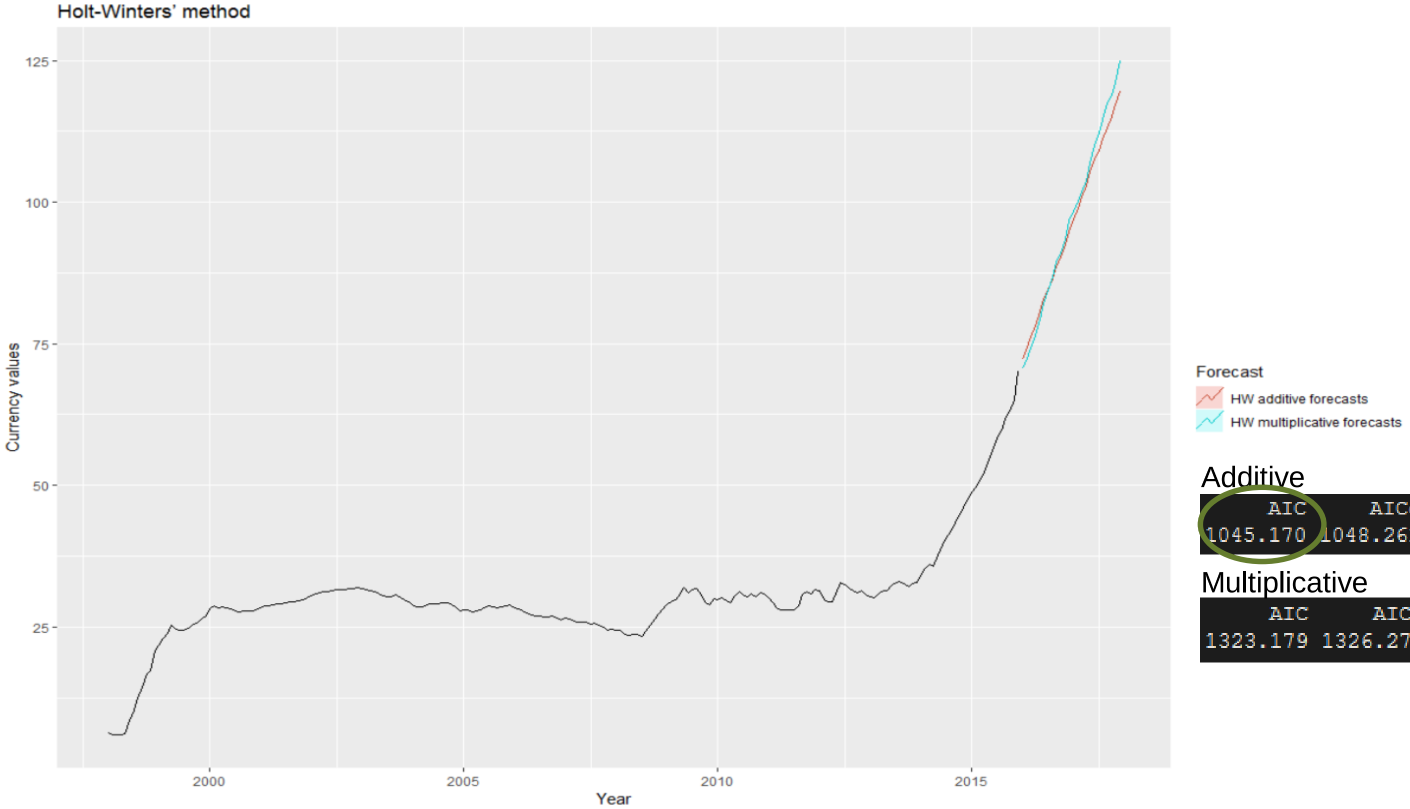
MOVING AVERAGE METHOD



SIMPLE FORECASTING METHODS



HOLT WINTERS METHOD



Additive

AIC	AICc	BIC
1045.170	1048.261	1102.549

Multiplicative

AIC	AICc	BIC
1323.179	1326.270	1380.559

TEST FOR STATIONARY

augmented Dickey–Fuller test (ADF)

- Null Hypothesis (H0): If failed to be rejected, it suggests the time series has a unit root, meaning it is non-stationary. It has some time dependent structure.
- Alternate Hypothesis (H1): The null hypothesis is rejected; it suggests the time series does not have a unit root, meaning it is stationary.
- p-value > 0.05: Fail to reject the null hypothesis (H0), the data has a unit root and is non-stationary.
- p-value <= 0.05: Reject the null hypothesis (H0), the data does not have a unit root and is stationary.

Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test

- The null hypothesis (H0) for the test is that the data is stationary.
- The alternate hypothesis (H1) for the test is that the data is not stationary.
- p-value > 0.05: Reject H0
- p-value <= 0.05: Accept H0

TEST FOR STATIONARY

```
p-value greater than printed p-valuep-value smaller than printed p-value
        Augmented Dickey-Fuller Test

data:  count_ts
Dickey-Fuller = 1.3739, Lag order = 5, p-value = 0.99
alternative hypothesis: stationary


        KPSS Test for Level Stationarity

data:  count_ts
KPSS Level = 1.8503, Truncation lag parameter = 4, p-value = 0.01
```

Stationary test before differencing

```
        Augmented Dickey-Fuller Test

data:  ts_d1
Dickey-Fuller = -1.9613, Lag order = 5, p-value = 0.5922
alternative hypothesis: stationary
```

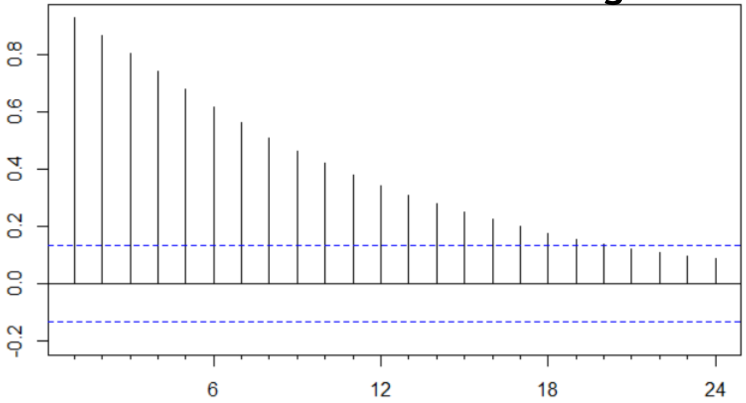
Differencing the data d = 1

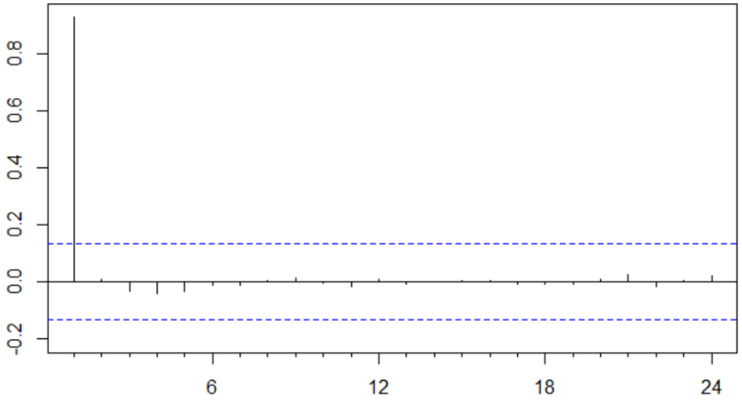
```
p-value smaller than printed p-value
        Augmented Dickey-Fuller Test

data:  ts_d2
Dickey-Fuller = -7.932, Lag order = 5, p-value = 0.01
alternative hypothesis: stationary
```

Differencing the data d = 2

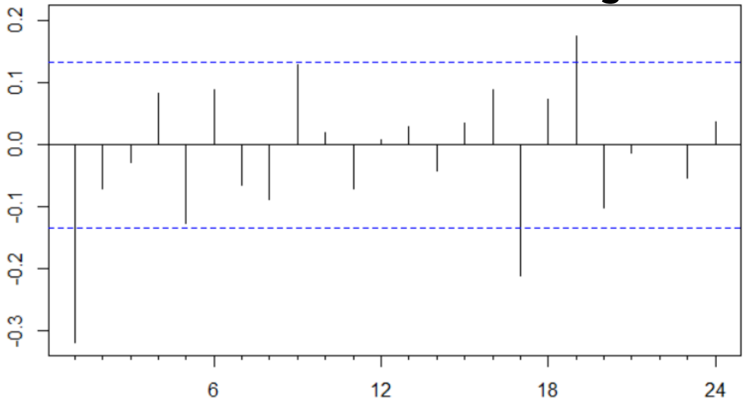
TEST FOR STATIONARY

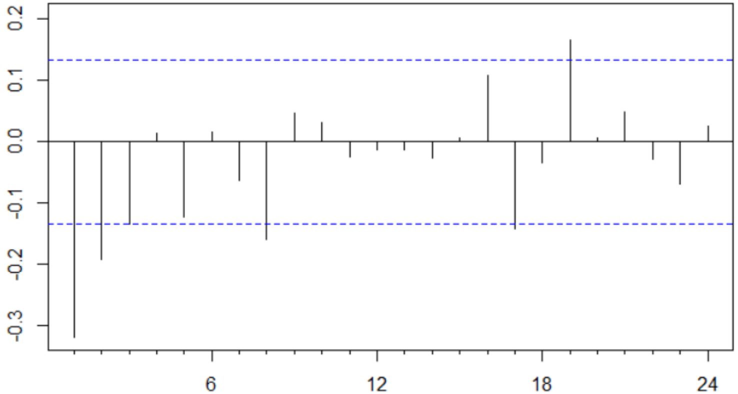
ACF and PACF before differencing



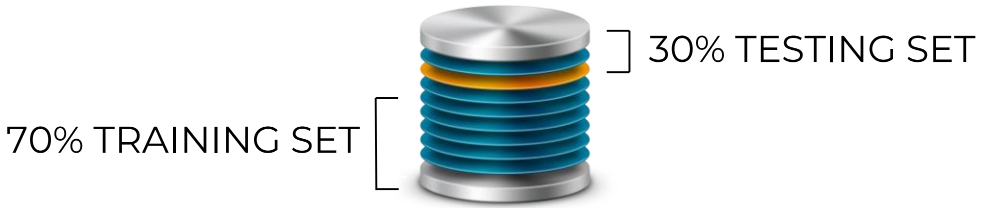


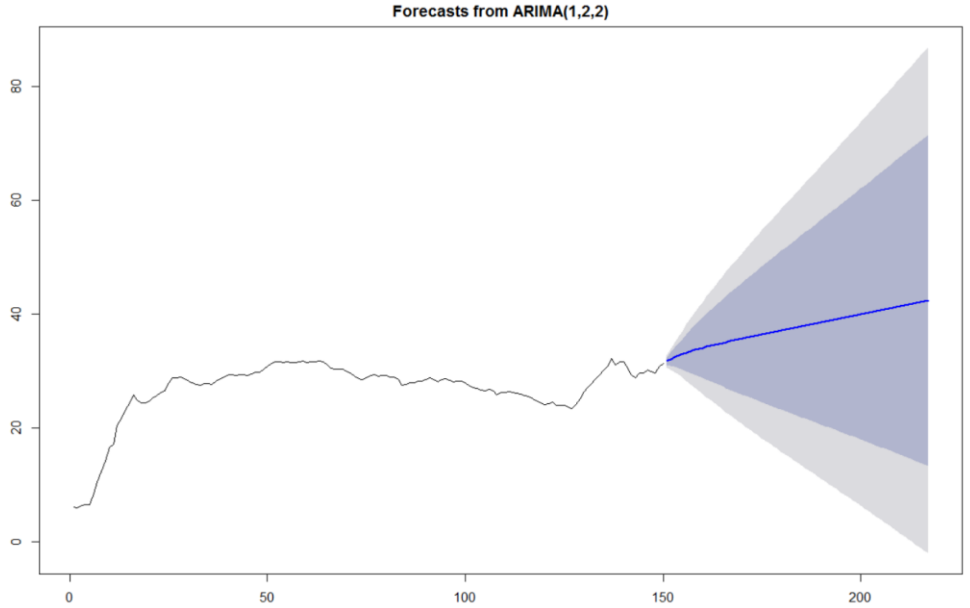
ACF and PACF after 2 differencing





ARIMA MODEL


30% TESTING SET
70% TRAINING SET


Forecasts from ARIMA(1,2,2)
0
20
40
60
80
0
50
100
150
200

CONCLUSIONS

Mean method

	ME	RMSE	MAE	MPE	MAPE	MASE
Training set	1.842341e-16	8.896925	4.914027	-13.50684	23.74663	8.449778
Test set	7.221067e+00	12.891380	7.566082	14.23475	15.44650	13.010045

Naïve

	ME	RMSE	MAE	MPE	MAPE	MASE
Training set	0.2972487	0.8824197	0.5815569	1.044885	2.068504	1.00000
Test set	-32.9360934	34.6241264	32.9360934	-100.450309	100.450309	56.63434

Seasonal Naïve

	ME	RMSE	MAE	MPE	MAPE	MASE
Training set	2.747478	6.327891	3.846758	7.482198	11.52544	6.614585
Test set	-19.879916	23.581694	21.746094	-63.377021	66.38235	37.392890

Holt Winters

	ME	RMSE	MAE	MPE	MAPE	MASE
Training set	0.05298339	0.6758088	0.4394268	0.4846092	1.834466	0.755604
Test set	-139.28644808	148.6694513	139.2864481	-371.6019886	371.601989	239.506133

ARIMA

	ME	RMSE	MAE	MPE	MAPE	MASE
Training set	-0.03513822	0.5275399	0.3566533	0.06092997	1.535543	0.796456
Test set	-0.38850643	8.5036860	6.7091207	-5.95947078	16.961706	14.982390

THANKS!

Any questions?