

# Can Twitter Sentiments Help To Predict Exchange Rate Movements In Nigeria?

by

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## PROBLEM STATEMENT

*Can Twitter Sentiments Help To Predict Exchange Rate Movements In Nigeria?*

- Nigeria is an import-dependent economy. Historically, upward movements in the exchange rate have been a notorious driver of inflation.
- Inflation expectation is fundamental in forecasting inflation. However, accurately capturing this information has been fraught with difficulty.
- This study takes advantage of raw sentiments about the naira, and daily frequency exchange rate data, in modeling sentiments as a predictor of exchange rate trends.

**Goal:** *Improve reliability of essential data used to forecast inflation*

**Audience:** *The Central Bank, other policy institutions, business entities*

# DATA

- Using `snscrepe`, pulled 122,763 tweets with search terms “naira dollar”, “naira value” over the period Jan 1, 2014 to Dec 31, 2020.
- Daily exchange rate data (2014-2020) was sourced from the Central Bank of Nigeria.
- Computed percentage change in exchange rate.

Data Cleaning	
Tweets	<ul style="list-style-type: none"><li>- Dropped duplicates.</li><li>- No data was pulled for Feb 2016, May 28th 2017, April 1&amp;2 2016.</li><li>- Removed links and special characters.</li><li>- 116,330 unique tweets from 51,226 users.</li></ul>
Twitter Sentiments	<ul style="list-style-type: none"><li>- Aggregated sentiments into daily averages.</li><li>- Filled in nulls with average sentiment scores.</li><li>- 2,526 observations total.</li></ul>
Exchange Rate	<ul style="list-style-type: none"><li>- Dataset excluded weekends &amp; holidays.</li><li>- Filled in nulls with last known observation.</li><li>- Filled in nulls on 1/1/2014 with next known observation.</li><li>- 2,526 observations total.</li></ul>



"Currently the CBN since its new intervention has spent close to \$1.4bn to bring the value of the naira down" 1/3 #occupycbn

Please what economy is Dr. Mrs. Ngozi Okonjo Iwealla saying is growing? ...Is One Dollar still not more than One Hundred and Fifty Naira???

Naira Crashes to Record Low Against Dollar...See Latest Exchange Rate via @concoursesnews

Got my teeth whitened and waxed, I've got that million dollar smile now ;)"  
let's price this smile... 20 Naira?

Pls what's the dollar exchange rate to naira today?

I almost cried when I changed Naira to Dollar today – Davido \n

: Imagine a Nigeria where a girl will actually like me and say it... Via DM" one day. When Naira equals dollar I'm sure

Focus on money more than people. Cause I never met a dollar I didn't like."

Nigerians all seem to have forgotten that it was during buhari's tenure that naira lost its value

Wow!!! So US Dollar to Naira is now 173 ... SWEET!!! Good sign for this year's hustle.



Identified and removed stop words.



Instantiated TF-IDF Vectorizer and optimized hyperparameters to obtain “most relevant words”.

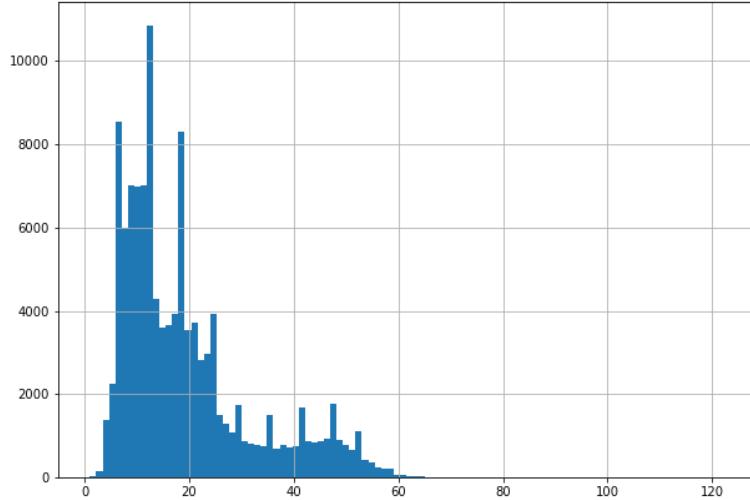


Conducted Sentiment Analysis using VADER Model to obtain positive, negative, neutral and compound sentiment scores.

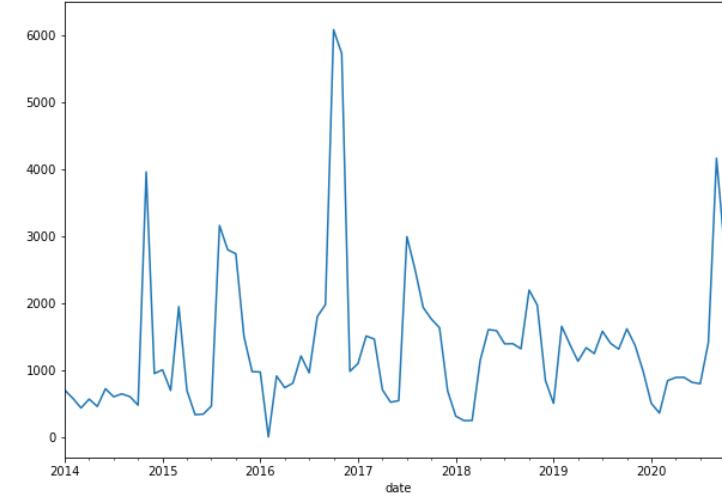
## PREPROCESSING

# EDA (I)

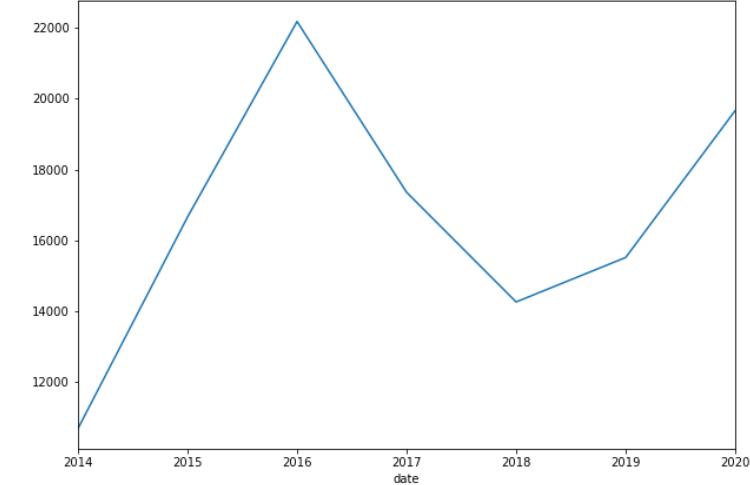
Distribution of Word Counts for Naira Tweets



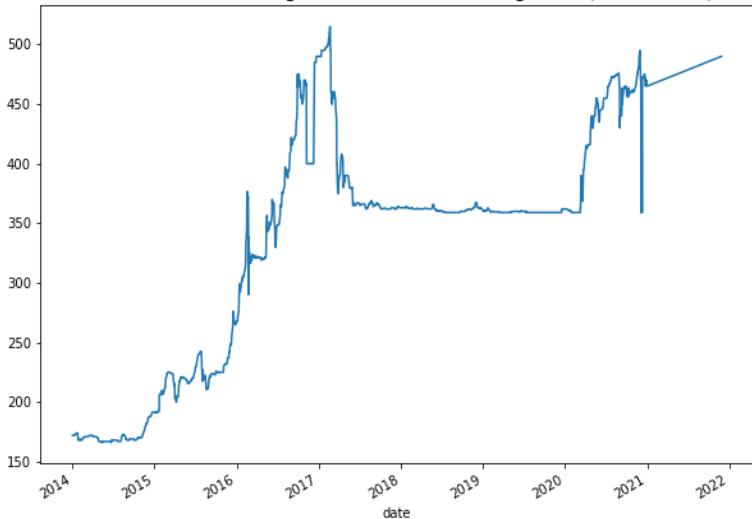
Number of Tweets Pulled for Each Month in Sample Period



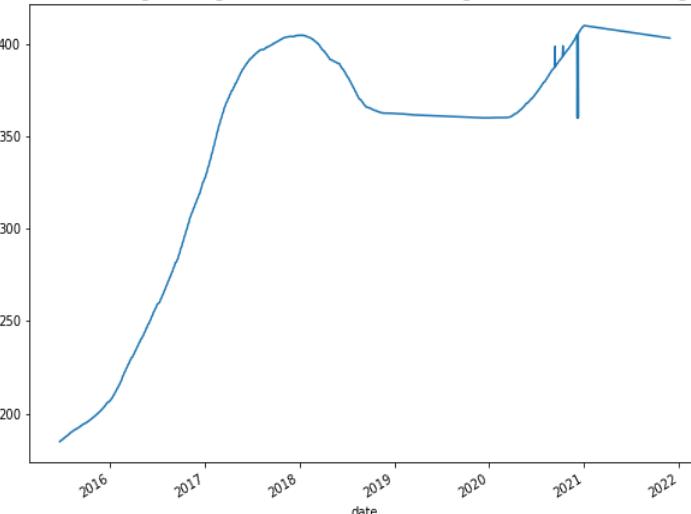
Number of Tweets Pulled for Each Year in Sample Period



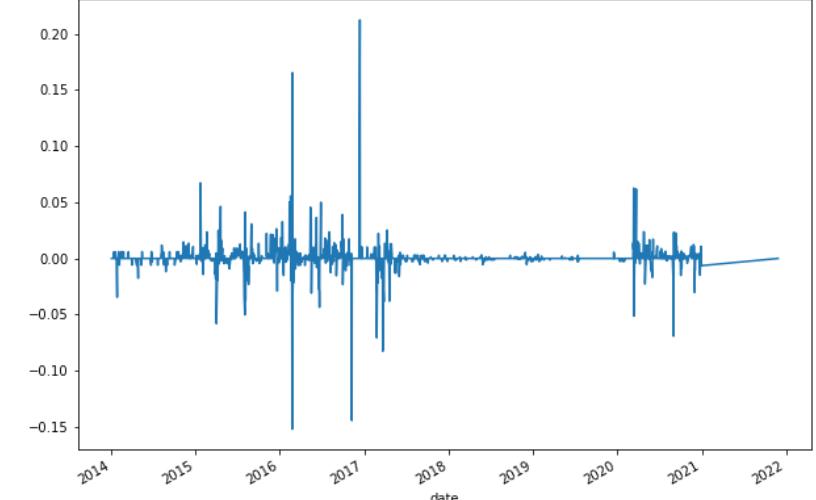
Naira/Dollar Exchange Rate at the BDC Segment (2014-2020)



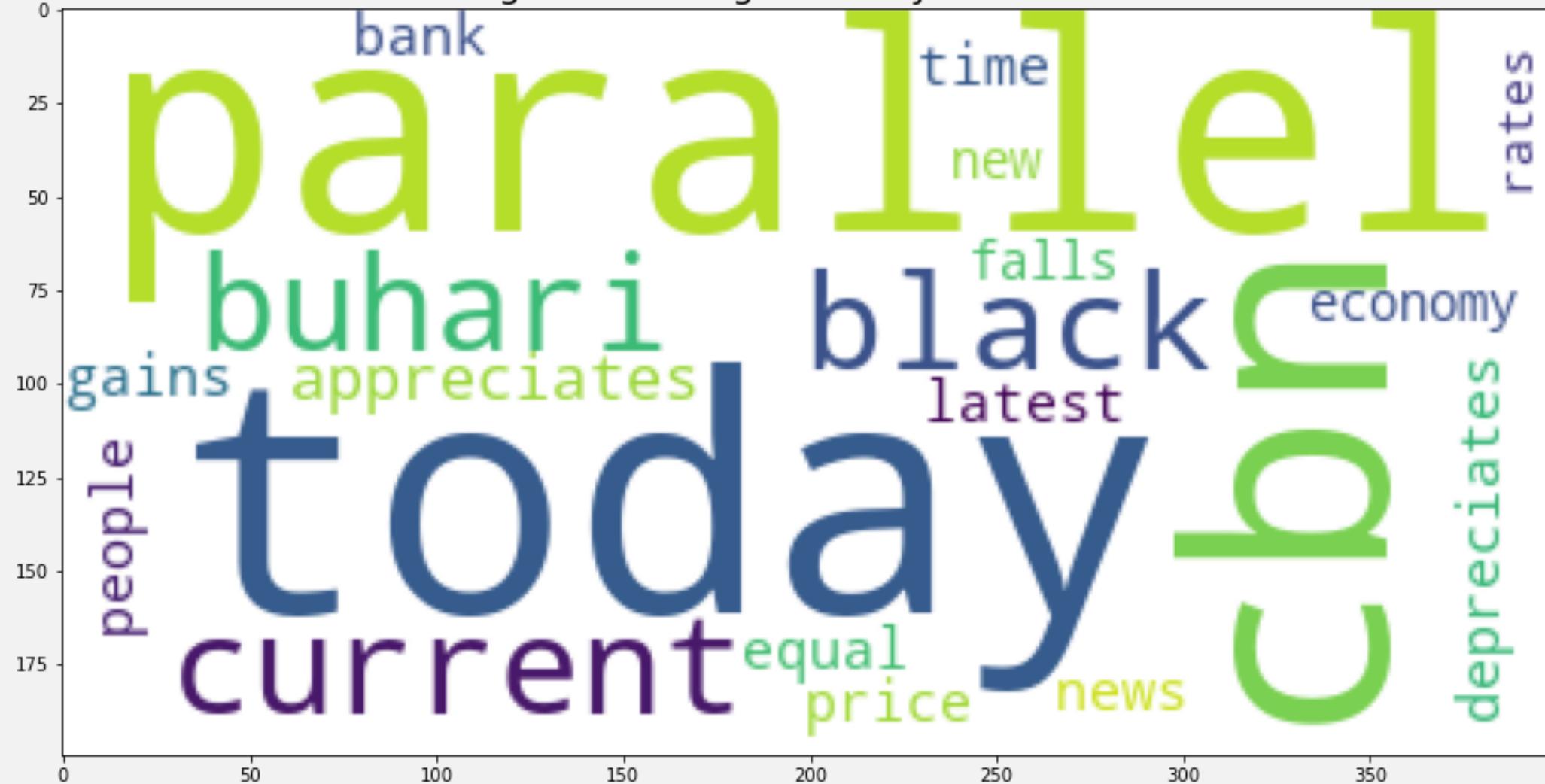
One Year Moving Average of Naira/Dollar Exchange Rate at the BDC Segment



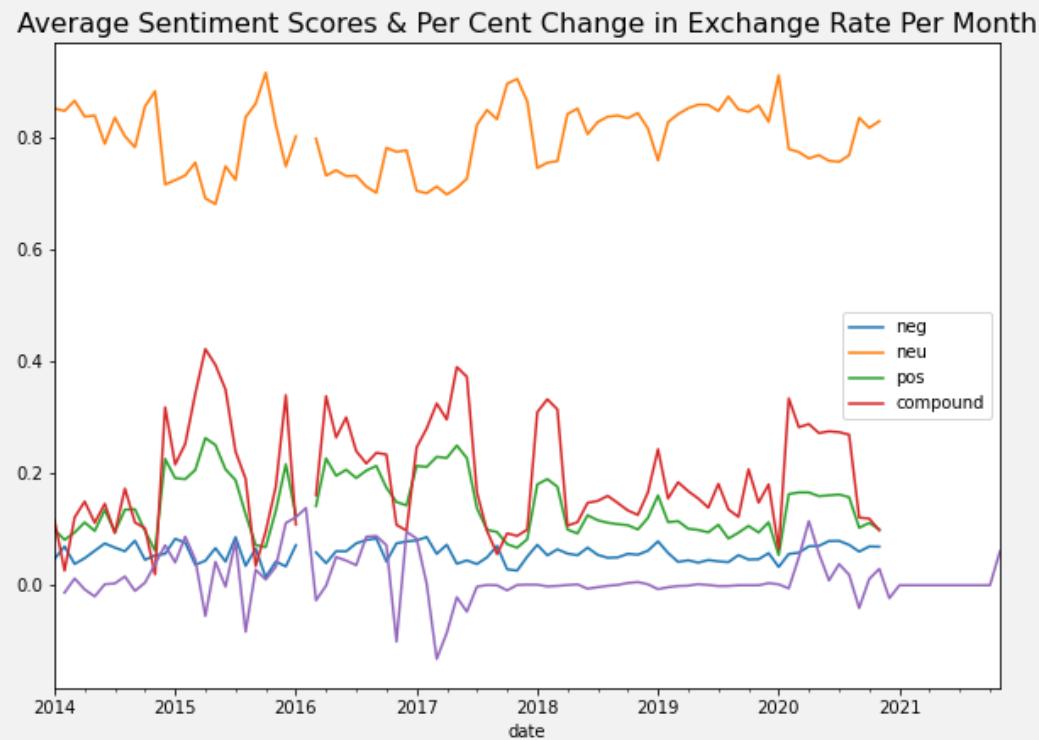
Naira/Dollar Exchange Rate Movements at the BDC Segment (2014-2020)



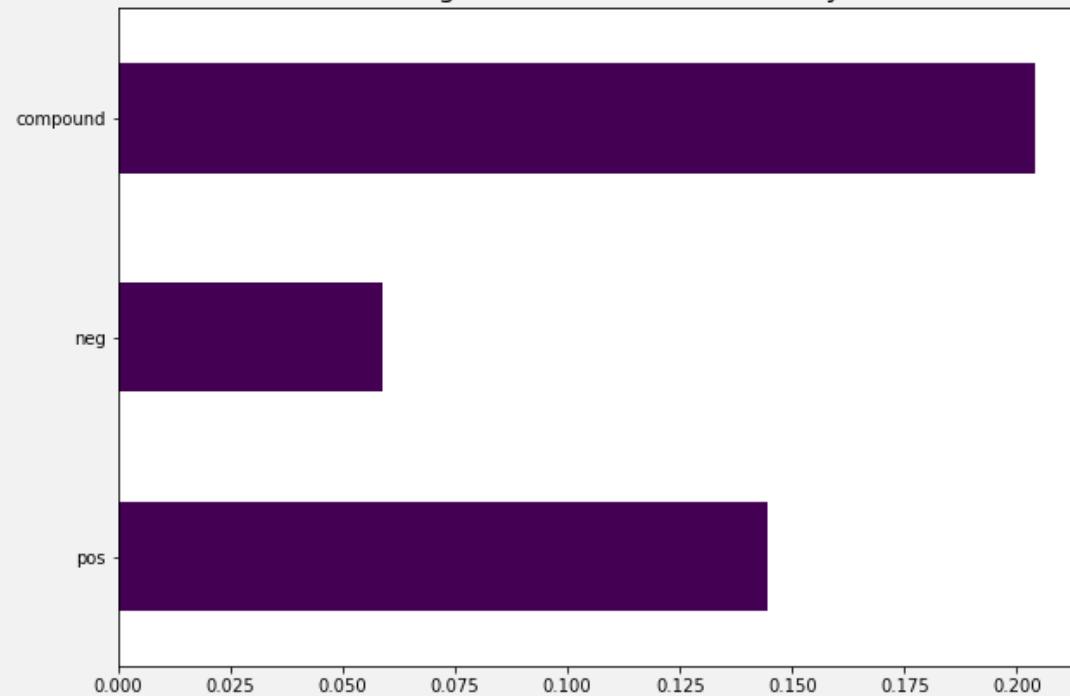
Highest Ranking Words by TFIDF Score



# EDA (3)



Average Sentiment Scores Per Day



positive sentiment : (compound score  $\geq 0.05$ )

neutral sentiment : (compound score  $> -0.05$ ) and (compound score  $< 0.05$ )

negative sentiment : (compound score  $\leq -0.05$ )

# MODEL (I)

## GRANGER CAUSALITY TEST

- Tests for causality by determining if one time series offers useful information in forecasting another time series.
- Found bi-directional causality between rate of change in exchange rate and sentiment – negative & compound sentiment scores.
- No significant causal relationship found between between rate of change in exchange rate & positive sentiment scores.

## MODEL (2)

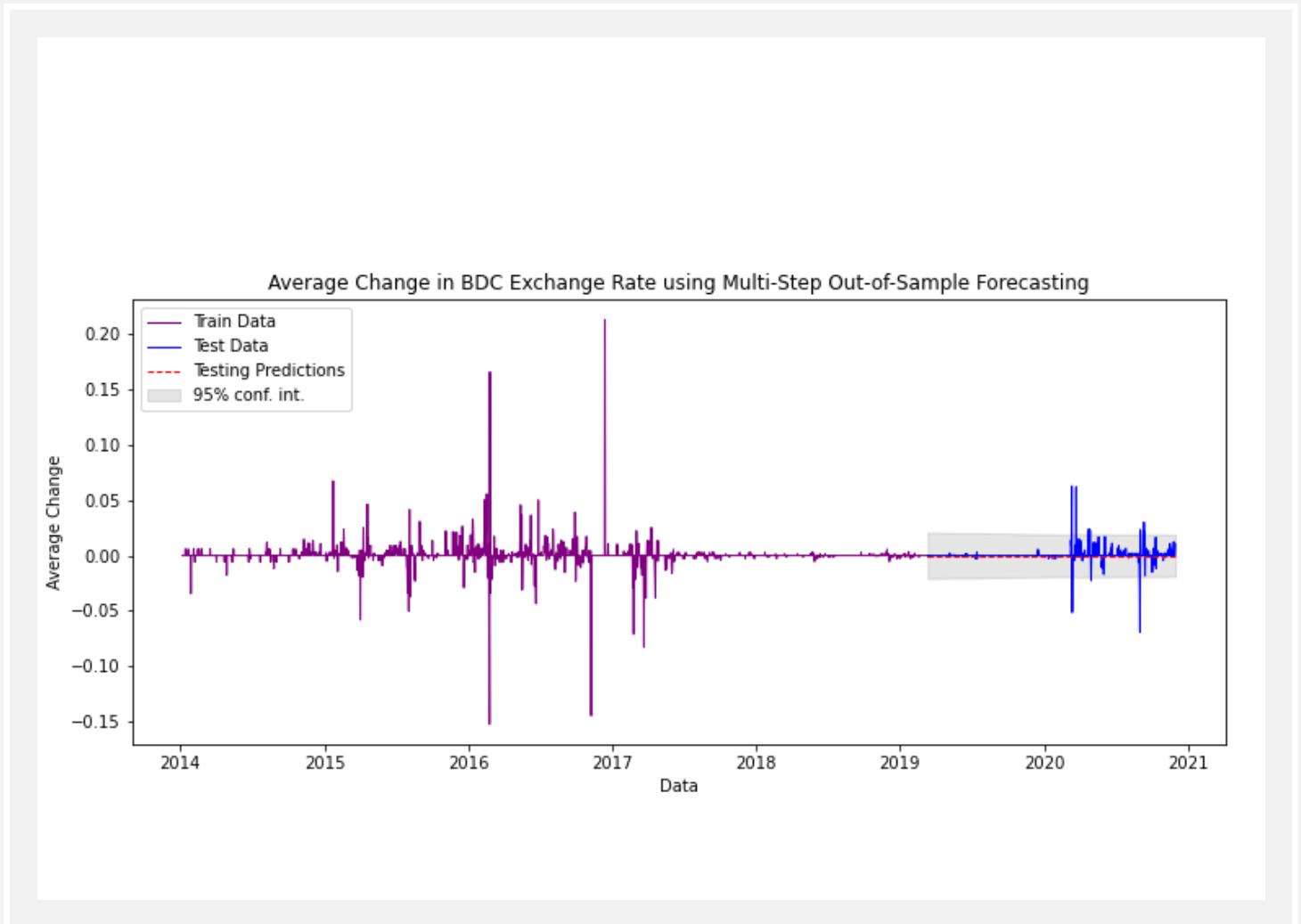
### **ARDL UECM COINTEGRATION**

- Autoregressive Distributed Lag Model is suitable and robust for modeling lags of explanatory variables.
- Unconstrained Error Correction Model/ Cointegration tests for long run relationship.
- Included lagged sentiment scores of up to 3 days as a predictor of %change in exchange rate.
- Found a significant long run relationship between negative sentiment score lagged by one day, and %change in exchange rate.
- For every 1 unit change in negative sentiment yesterday, we expect the NGN/USD exchange rate to increase by 1.14 percentage point today.

## MODEL (3)

### SARIMAX

- There was no seasonality in the data.
- Accuracy score and Mean Squared Error were negligible.



# CONCLUSION

- Yes, twitter sentiments can help to predict the trend of exchange rate in Nigeria. It appears negative sentiments matter more.
- Study specified 3 models – Granger Causality, ARDL & SARIMAX in analyzing the relationship between NGN/USD exchange rate and sentiments from 116,330 tweets by 51,226 users between 2014 and 2020.
- Granger Causality Test showed bi-directional causality running from sentiments (negative & compound scores) to exchange rate & vice versa.
- ARDL model corroborated this finding as significant long run relationship was reported for (negative) sentiments and exchange rate movements.

## RECOMMENDATIONS

- For future analysis, this study recommends scaling up the number of tweets analyzed to improve reliability of results.
- Future analysis could decompose sentiments into specific moods to better understand the nature of the relationship.
- Approach could be applied and/or utilized along with other tools to forecast other macroeconomic variables.

**THANK YOU**