

Demonstration of the Random Changes in the Nigerian Financial Market and a Prediction to the Future.

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ABSTRACT

Random changes in financial markets have motivated the extensive use of stochastic processes in finance. With the advent of digital technology and the accompanying gains in processing speed and data storage, techniques in signal processing have become increasingly sought after in the finance industry. These techniques, although traditionally used exclusively in engineering to analyze electrical signals, have proved general enough that their use now transcends engineering and form the basis of any field where time varying signals are subjects of interest. Finance is one such field since financial data is very often compiled with reference to time as the independent variable. More specifically, most forms of time varying financial data may be interpreted as discrete time signals. In this research, we demonstrate the fluctuation in financial markets by investigating the past recent changes in the Naira and four other foreign currencies i.e. United States dollar (bureau de change (BDC) rate and Inter-bank Foreign Exchange IFEM) rat) Euro, and Britches Pounds (GB) and their relationship is shown in the form of signal graph using Microsoft Excel. The observations were discussed and a projection is made for the year 2025.

KEYWORDS: Financial market, Digital technology, financial data, Signal processing, Exchange rate.

1. INTRODUCTION

Prediction of Naira price has always been an enticing and intriguing area of study in Nigeria as the price of the Naira continues to rise and fall in the world currency market in recent years. Predicting the exchange rate behavior through techniques and various methods is a useful tool to assist investors in the country to act with greater certainty, and taking the risks, and volatility of an investment into consideration and know when to buy goods at the cheapest price and when to sell. A few of the published articles, such as Feng, (2015) and Nocera (2009) shed some light on the fact that signal processing techniques play an important role in today's finances. Indeed, today's financial analysis and risk managers depend on mathematical tools that, at their core, are based on signal processing techniques. Increase and decrease of the Naira depends on various factors, but in this work, we consider the Naira price variation as time series and without notation to the any factor, and just by finding the sequence rules of price train within the past five years, and make the price prediction into the future. The first step is to acquire large amounts of historical data for analysis, put the data in Excel format and using the set of input training data, a curve is plotted using Excel to predict the future (2025) of the Nigerian currency.

1.1 Relevance of Signal Processing to Finance

Yes, looking at this instance; assume that a producer is asked by a customer to sell some stock products to him at any moment in time that the customer chooses within the next few months, but at the same prices as today rather than that moment's prices. Obviously, the customer is prepared to pay today a premium to the producer for exercising this option. How much should the producer place its price so that the deal proves profitable for him/her? And how will the customer choose the optimal point in time to exercise the option he/she paid for? Both the customer and the producer will have to monitor the price of the product and extrapolate its future evolution according to past available information. Viewing the price as a signal, this is a classical problem in signal processing.

In financial investment strategy, there are two prominent schools of thought: fundamental analysis and technical analysis. The former aims to assess the true value of a business regardless of its transient market value. This approach has limited use for signal processing because it specifically avoids the troves of data such as daily share prices and uses more modest quantities of data for a somewhat subjective assessment. In contrast, at the heart of technical analysis lies the aim of using historical financial data to predict the future market value of a business. This is precisely the type of task for which signal processing is suited because the quantity of historical data is often immense and the sheer objectivity demanded in calculations is scarcely different from that seen in electrical engineering applications.

Signal processing techniques are generally used for technical analysis by major investment banks and especially by hedge funds. It takes advantage of very momentary random fluctuations in the market to generate reasonable profits on low margins but enormous volumes and fortune telling.

The rest of this paper is arranged thus; section 2: Review of related literatures, section 3: Methodology, section 4: result and discussion and section 5: conclusion.

2. REVIEW OF RELATED LITERATURES

Oyelami, & Edooghogho 2013 in their paper carried out simulation to study the exchange rate of the Nigerian Naira against the exchange rates of the US dollar, British pound and the Euro currency using Euler-Maruyama forward difference approximation.

Hina & Qayyum, 2015 disclosed that Exchange rate modeling and forecasting is important for policy making. Also, Ramzan *et al*, 2012 stated that forecasting exchange rate is crucial as it has significant impact on the macroeconomic fundamentals such as oil price, interest rate, wage, unemployment and the level of economic growth.

Adeoye & Atanda (2011) access the volatility of the Naira/Dollar exchange rate using the Purchasing Power Parity model and found non consistency in the nominal and real exchange rates for Naira/Dollar currency thereby suggesting the relevance of long term shocks in understanding the movement in the rates.

3. METHODOLOGY

To obtain data from the Internet, data scraping was used. The Excel opens the URL which includes the start and end date between which data points are retrieved. The monthly average rates of United State, United Kingdom, European countries and Nigeria were downloaded from the Central Bank of Nigeria (CBN) statistics and data website. This data is pulled and sorted into an excel sheet. The excel sheet is refreshed to pull new data. Data containing the monthly currency price, from January 2014 to November, 2018, a period of five years - was used. The choice of the period was deliberate as it is large enough to strongly depict and verify the predictive quality of the algorithms employed and to predict the future (up to 2025). The data set was divided into two parts for all algorithms. Two-thirds of it was used for training, while one-thirds was reserved for testing.

4. RESULTS AND DISCUSSION

Arising from the above description, the tables containing the price of Naira monthly exchange rate with respect to other currencies are given for the different years as follows;

Table 1: Year 2014 (Source: CBN)

Months\Currency	IFEM (USD)	BCD (USD)	GB POUNDS	EURO
January	160.23	171.71	256.59	212.10
February	163.62	169.45	257.81	212.72
March	197	320.93	280.4	218.89
April	162.19	170.25	260.67	215.14
May	161.86	166.85	262.41	213.98
June	162.82	167.17	263.29	211.68
July	162.25	167.71	265.93	211.24
August	161.99	170.36	260.12	207.41
September	201.00	254.06	168.64	162.93
October	164.64	169.43	250.27	197.63
November	171.10	175.85	249.96	197.60
December	180.33	188.45	262.86	207.16

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The annual changes in the Naira against different currencies for 2014 are given in form of signal as shown in the graph below.

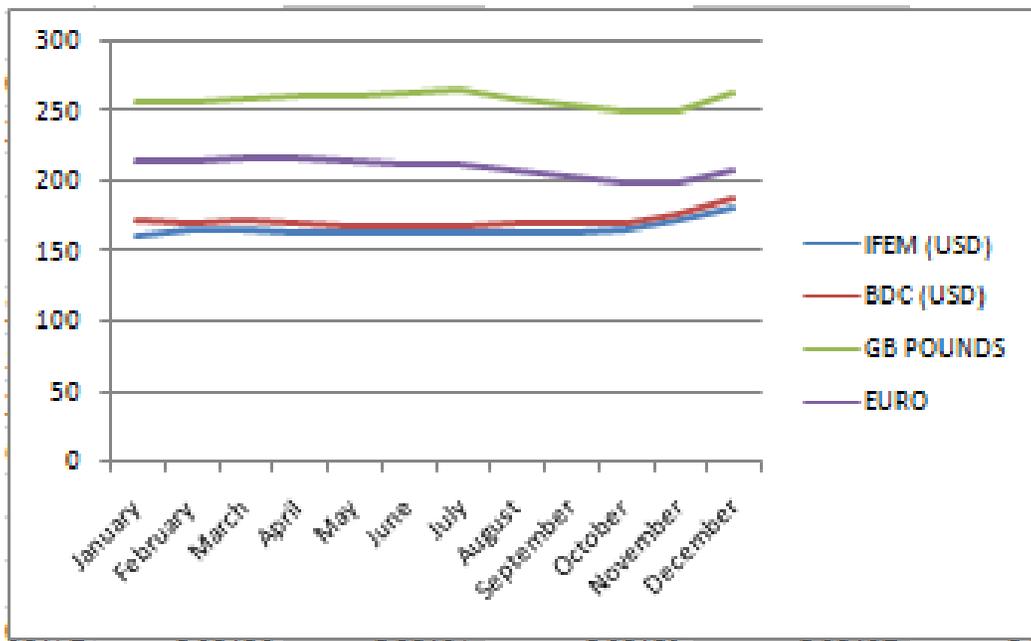


Figure 1: Signal processing graph for 2014.

From the above graph, the prices of pounds remain stable from January but slightly increased from February through to September, It then falls in October but rose-up again in November and December respectively. The price of Euro remains stable between January and June, decreased slightly through to September and was stable between September to November after which it rose up in December. The price of (IFEM and BDC) dollar was high in early part January but fell down towards the end through to October but increases from October to December.

Table 2: 2015 (Source: CBN)

Months\Currency	IFEM(USD)	BCD (USD)	GB POUNDS	EURO
January	181.78	196.13	254.39	194.85
February	194.48	213.03	274.79	204.78
March	197.07	222.93	295.60	213.74
April	197.00	210.70	294.24	212.11
May	197.00	219.55	304.79	219.85
June	196.92	218.98	306.06	220.84
July	196.97	237.15	306.41	216.87
August	197.00	216.64	307.21	219.33
September	197.00	222.68	302.55	221.22
October	196.99	224.83	302.26	221.45
November	196.99	232.40	299.38	211.53
December	196.99	258.30	295.39	214.00

The annual changes in the different prices for 2015 are given in form of signal as shown in the graph below.

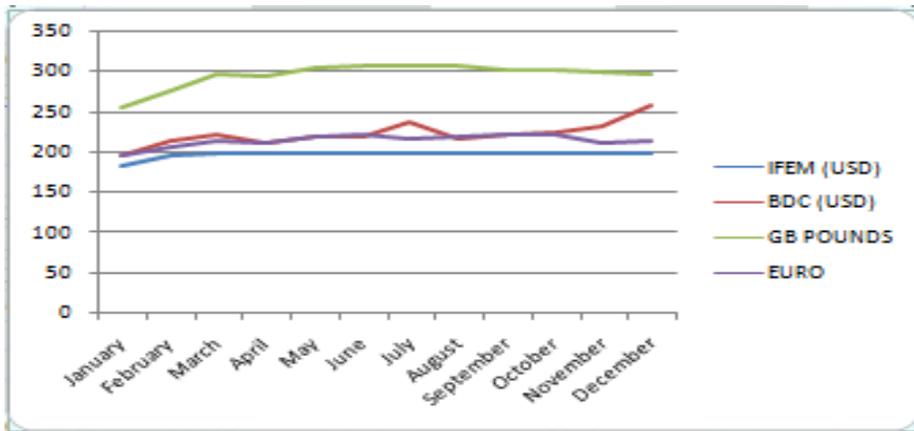


Figure 2: signal processing graph for 2015.

The price of Pounds increased sharply from January through to March but remained stable from then till December 2015. He price of Euro increased steadily throughout the year. The price of IFEM US dollar was a little bit increased in January but remain stable throughout the year.

Table 3: Year 2016 (Source: CBN)

Months\Currency	IFEM(USD)	BCD (USD)	GB POUNDS	EURO
January	197.00	289.78	283.62	214.09
February	197.00	329.83	281.79	218.55
March	197.00	320.93	280.40	218.89
April	197.00	320.71	282.07	223.46
May	197.00	336.93	286.33	222.85
June	231.76	351.82	328.53	260.03
July	294.57	364.47	388.37	325.90
August	309.73	396.15	406.13	347.33
September	305.23	431.10	401.08	342.17
October	305.21	462.03	375.71	336.21
November	305.18	415.36	379.49	329.84
December	305.22	455.26	381.39	322.13

The annual changes in the different prices for 2016 are given in form of signal as shown in the graph below;

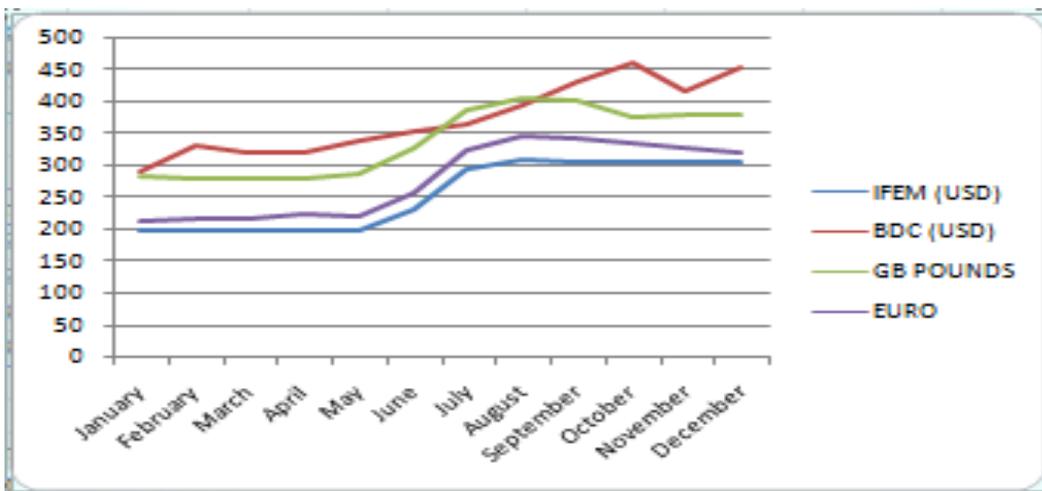


Figure 3: signal processing graph for 2016

The price of BCD US dollar increases gradually from January to October and decreased slightly mid October and finally increased from October through to December. Pounds remains stable from January to April but increased gradually and was stable at a some point in time, it remained stable till September and the price was stable from October through to December.

The various currencies at 2016 from the graph above continue to fluctuate with its pick at December.

Table 4: Year 2017 (Source: CBN)

Months\Currency	IFEM(USD)	BCD (USD)	GB POUNDS	EURO
January	305.20	493.29	376.32	324.37
February	305.31	494.70	381.17	324.95
March	306.40	429.48	378.13	327.35
April	306.05	392.89	386.92	328.15
May	305.54	384.48	395.04	337.72
June	305.72	366.25	391.57	343.24
July	305.86	365.38	397.36	358.50
August	305.67	365.57	396.08	360.93
September	305.89	365.55	408.57	364.53
October	305.62	362.21	403.25	359.34
November	305.90	362.41	404.45	359.07
December	306.31	362.83	410.48	362.36

The annual changes in the different prices for 2017 are given in form of signal as shown in the graph below;

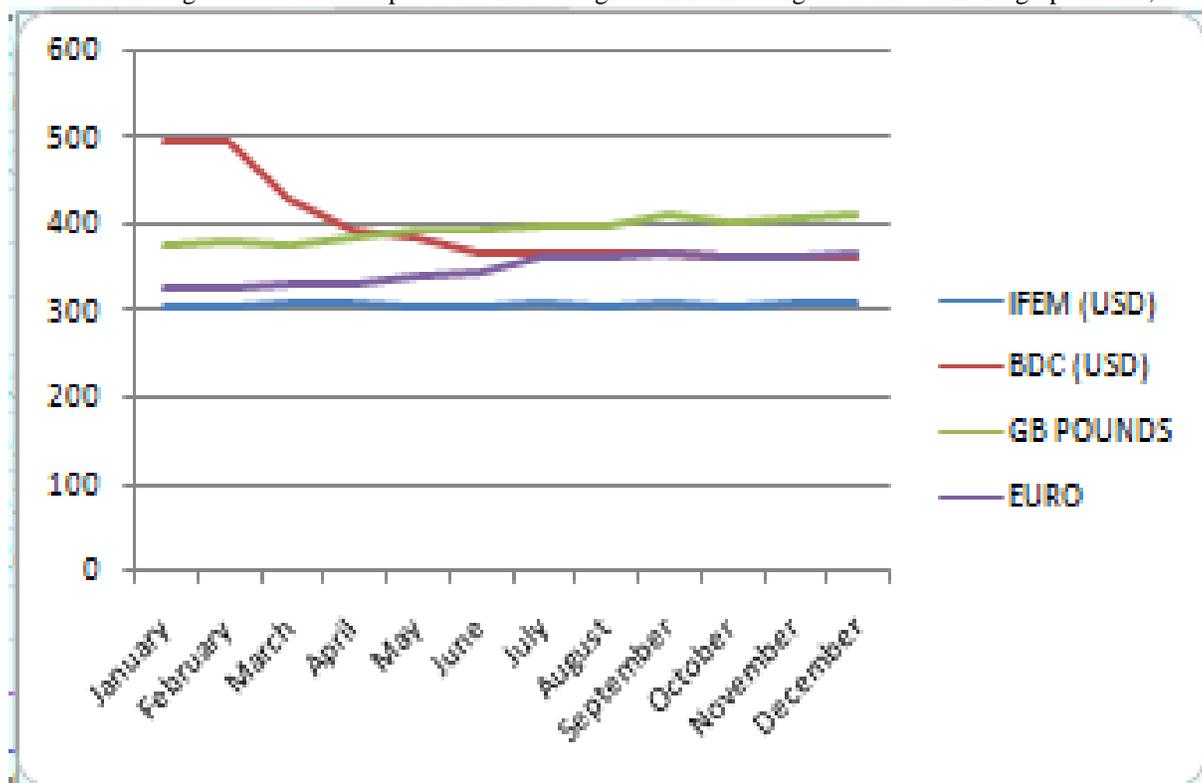


Figure 4: signal processing graph for 2017

The price of BDC (US dollar) was stable from January down to February after which it gradually falls from ₦500 to ₦360 in June and was stable till December. The price of Euro slightly increased from ₦330 to ₦360 and then remained stable till the end of that year. The price of GB Pounds increased slightly increased from January at ₦370 to ₦400 in June and remained at that through to the end of August, at September, it increased to ₦420 where it remained till the close of the stock market year. The price of Euro dropped down slight;u February and was stable at ₦362 till December.

Table 5: Year 2018 (Source: CBN)

Months\Currency	IFEM(USD)	BCD (USD)	GB POUNDS	EURO
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January	305.78	363.20	422.35	373.00
February	305.90	362.48	427.40	377.84
March	305.74	362.07	427.26	377.19
April	305.61	362.25	428.38	374.22
May	305.83	362.86	412.23	361.67
June	305.87	360.66	406.64	357.48
July	305.81	359.36	402.76	357.40
August	306.06	359.00	394.24	353.54
September	305.83	362.86	399.86	357.14
October	306.5	360.74	398.86	351.87
November	306.71	362.82	395.87	348.61

The annual changes in the different prices for 2018 are given in form of signal as shown in the graph below;

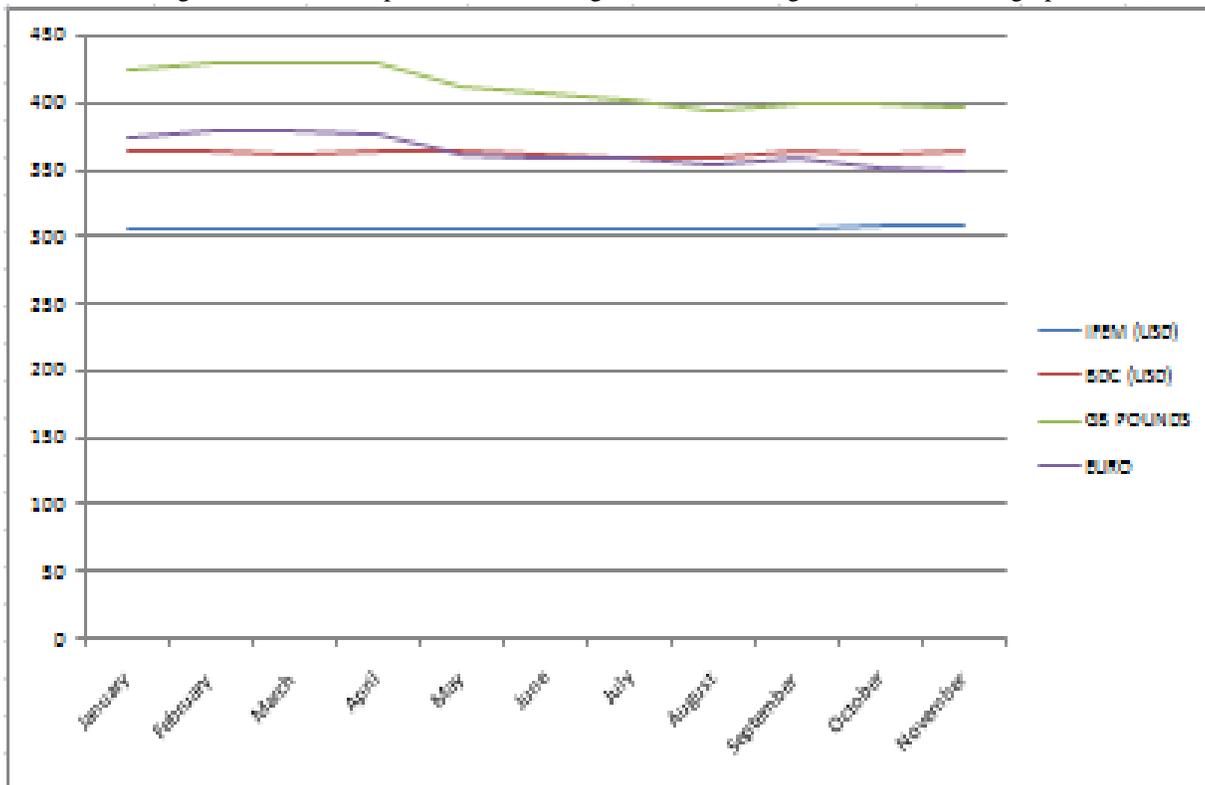


Figure 5: signal processing graph for 2018

In figure 5 above, the price of British Pounds was stable at ₦430 from January down to mid-March but decrease slightly to ₦410 from then through to July and became stable at ₦400 till December. IFEM us dollar was stable from January to April at ₦380 and then falls slightly to ₦350 in August were it remained stable till December. BDC (US Dollar) was stable through all months of the year at ₦370. Lastly for the year 2018, BDC (US dollar) was also stable all through the year.

The graph below gives a Single signal relationship graph of the 5 years comparing the three entities;

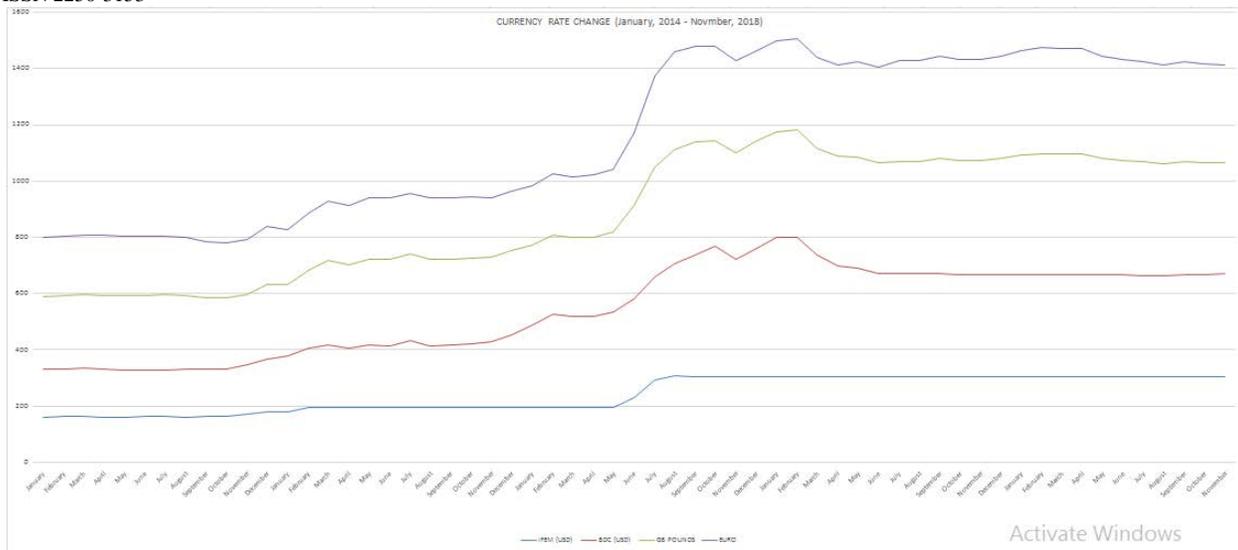


Figure 6: Signal processing graph showing all the years together.

The mean of the whole currency between the year 2014 and 2018 is shown in the table 6 below;

From the simulation, except with the IFEM US dollar, the difference in the cost of the currencies from the first year (2014) down to the concluding year is very glaring. The IFEM USDollar rose to its pick in August 2016 and has been constant even until the end (2018); this implies that the price of Naira with respect to IFEM USDollar would be stable for the next couple of years. Furthermore, the BCD US Dollar rose to its pick between January and February 2017 after which it gradually dropped in June that same year slightly and became stable till the end of 2018; this can predict that the price of the Naira with respect to BDC Dollar may likely be stable in the nearest future. Lastly it was observed that the GB Pounds and Euro has been highly unstable all along except during the very first year (2014), it goes up and comes down at any point in time. This may be as a result of constant changes in the interest rate; this brought us to our prediction that the Naira compared to GB Pounds and Euro respectively is likely to be even more unstable in 2025.

Table 6: Average (Mean) of the annual yearly currency exchange rate.

Year/Currency	IFEM(USD)	BDC (USD)	GB POUNDS	EURO
2014	170.75	191.19	253.25	205.71
2015	195.52	222.78	295.26	214.30
2016	253.49	399.61	339.58	280.12
2017	305.79	395.42	394.11	345.88
2018	306.14	361.66	374.22	362.72

5. CONCLUSION

The exchange rate model considered in the paper did not approach the simulation from the econometric Perspective, but rather represent their relationship in the form of wave signal. The data use for the simulation was gotten for the central bank of Nigeria’s website which most exchanges rates are found to be most accurate. It was predicted that the prices of Naira when compared to IFEM and BDC USDollar are likely to be stable in the nearest future while when compared to Euro and GB Pounds might exhibit some unstable characteristics in the as the years unfolds ahead.

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