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The Effect of Exchange Rates on Nigerians Currency and Projecting the Naira for the Year 2025

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Abstract: Exchange rate instability is a good pointer for monitoring Nigerian currency and it has always been a key economic indicator to sustain Nigeria and her economic growth. Linear regression is a great statistical tool used to find, predict and also to assess whether there is an undeviating correlation and dependences between numerical variables. This study investigates the instabilities in exchange rate of five countries' currencies which includes European Euro, United Kingdom Pounds, Saudi Arabian Riyal, Switzerland swissf and the Nigerian Naira with key interest on Naira. This was done to ascertain whether changes in other countries will affect the exchange rate of Naira. The stable and fluctuating exchange rate of these countries were examined and used to plot a digital signal structure. Data used for this study is the daily exchange rate of five countries' currencies (Euro, Pounds, Riyal, Swissf and Naira) from 12th October, 2005 to 2nd October, 2018 obtained from https://www.cbn.gov.ng/rates/exchratebycurrency.asp. We applied linear regression tool on our source data and also applied the equation for prediction on our coefficients so we were able to predict the exchange for Naira come year 2025 which gave us ₦311.076. The rate of accuracy (R2) and the coefficient of our model were used in predicting Nigerians exchange rate for year 2025. The 99% rate of accuracy of our model reveals that our model is perfect and the impression from this study is that the exchange rate of other countries affects Naira.

Keywords: Exchange Rate, Machine Learning, Linear Regression, Digital Signal Processing,
Supervised Machine Learning, Unsupervised Machine Learning

1. Introduction

In Nigeria today, exchange rate exchange rates and its random movement is of countless significance to the country and its residents. In several ways, exchange rate fluctuation has enormous effect on the proficiency of the economy to achieve optimum productive capacity [1].

The Exchange rate reveals the proportion at which one currency can be interchange with another currency, this is the ratio of currency prices. It is the rate of a foreign nation's currency versus the rate of the home nation's currency. It also stipulates the worth of one currency to the other. Exchange rate has been one of the greatest factors that affects economic growth of most advanced countries, however regular random walk or unstable exchange rate is a major stumbling block to

the economic growth of numerous countries of which Nigeria is inclusive. Nigeria gained independence since October 1960 and her currency has not been stable since then desperate the bid to raise the countries standard of living, alleviate poverty and acquire economic and political power, stability and prestige. All these were done administratively to adjust other countries exchange rate of Nigerians currency [1]. Yet there is still fluctuation in place despite all of government's effort to stabilize exchange rate.

History has it that governments all over the world use several macroeconomic devices to reach their economic objectives. Monetary plans and mechanisms derived from it remain to be one of the important tools in accomplishing economic stability and financial advantages for countries. No same currency regime is right for all countries or at all times [2]. This implies that exchange rate varies depending on each

country circumstances. Countries decide on their exchange rate based on their domestic characteristics, such as geographic, political, demographic, or institutional features. As such depending on external and internal conditions, an exchange rate rule for a certain country may create advantages or cause disadvantages and monetary inefficiency [3].

2. Related Works

2.1. Machine Learning

Machine learning provides computers the where with all to learn without being programmed. It has to do with statistics, mathematical optimization, image handling, etc. Machine learning set of rules use computational techniques to learn information directly from available data without depending on a set equation as a guide. The algorithms applied on available data improve their performance as the number of samples obtained for learning increases [4].

Machine learning processes discover acceptable patterns in data that produces understanding, that assist in making better decisions and predictions. These patterns are applied in our day to day activities to make critical decisions in medical diagnosis, stock dealing, projections, and more. Business organizations use it to understand their customers procuring behavior. There exist two category of Machine learning, the supervised learning and unsupervised learning

Supervised centers on available data only, clusters and interprets them. Its aim is to have a model that makes extrapolations based on signals in the presence of doubt. Algorithm for supervised learning takes the available set of data and identified reactions to the data (output) and trains a model to produce equitable predictions for the response to new data [5]. Supervised learning uses classification and regression methods to develop analytical models.

Unsupervised learning deals with data only, no labels. From our available structured data, rules are identified that will enable us make decisions and to develop a predictive model based on our input and output data [6]. Unsupervised learning seeks to find unknown patterns or fundamental structures in data. Interpretations from datasets involving input data without labeled reactions are gotten. Unsupervised learning uses clustering and its association for its analysis.

2.2. Signal Processing

Signals are series of mathematical facts that differs by means of a fundamental independent variable. It is suitable in handling problems from various categories of fields.

2.3. Importance of Signal Processing to Finance

In financial speculations, two types of analysis are involved, the fundamental analysis and technical analysis. Fundamental analysis seeks to evaluate the true worth of a trade irrespective of its temporal market rate. On the other hand, technical analysis uses historical financial data to envisage the upcoming market rate of a trade. Signal processing is most appropriate for technical analysis because

of the magnitude of historical data is often required for calculations.

The methods for handling signals are largely used for technical analysis by most important banks asset and specifically by controlled funds. Relatively, for the reason of fewer government directives, it has precise exceptional and cautious deal policies. Signal Processing considers the improvement of temporary unplanned inconsistencies in the market to engender judicious proceeds on low margins but massive measurements.

2.4. Linear Regression

Linear regression is a great statistical tool used to find, predict and also to assess whether there is an undeviating correlation and dependences between numerical variables [7]. Many persons from reading of news have knowledge of regression, where graphs with straight lines are superimposed on scatterplots.

Linear regression as part of the family of regression algorithms belongs to the category of supervised learning algorithms. A model with a set of labeled data is trained and the model is used to predict unlabeled data. For instance, if you have values for X axis but none for Y axis, one can use the pattern of the graph to determine or predict the values for Y axis**.**

The multiple linear regression equation is as in equation 1.

$$Y = b_0 + b_1X_1 + b_2X_2 + \cdots + b_mX_m \qquad (1)$$

where Y is the predicted or expected value of the dependent variable, X_1 through X_m are m distinct independent or predictor variables, b_0 is the value of Y when all of the independent variables (X_1 through X_m) are equal to zero, and b_1 through b_m are the estimated regression coefficients.

2.5. Exchange Rate and International Trade

Exchange rate helps to communicate the price schemes of two different economies by ensuring their prospects for international trade, its effect is also on the volume of imports and exports, as well as country's balance of payments position [8]. Rose remarked that rising countries are moderately better in their choice of flexible exchange rate rules [6]. It is declared that increase of exchange rate conveys increased imports and decrease in exports while reduction would inflate export and dampen import [9]. Also, reduction of exchange rate causes a change from foreign goods to local goods which bring about diversion of income. The impact of exchange rate instability on the Nigerian economic growth for period of 1980 – 2010 was examined by Taiwo [10]. The result shows that real exchange rate has a progressive effect on the economic growth. Foreign exchange market and economic growth in developing petroleum based economy from 1970-2003 in Nigeria was studied in [11]. He affirmed that positive relationship exists between exchange rate and economic growth. Influencing exchange rate rules in emerging markets economies was evaluated in [12], and was pointed

out that the economic development, inflation and political dynamics were the key determining factor of exchange rate regimes. Analysis of exchange rate regimes in economies under evolution and was done in [13] and was found that the size of economy and the geographical focus on trade are major factors of exchange rate rules.

3. Research Methodology

The research adopted the principles of Machine Learning using Linear Regression, a supervised machine learning tool for digital signal processing. This tool aids in predicting the future and finding relationship amongst variables.

Data for this study was obtained from https://www.cbn.gov.ng/rates/exchratebycurrency.asp, which has to do with daily exchange rate of currencies (euro, pounds, riyal, swissf and naira) for five different counties from 12th Oct. 2005 to 2nd Oct. 2018. Part of the data for this study is shown in table 1.

Our interest in this study is to project the exchange rate for Naira, for the year 2025 and also, to plot the digital signals of exchange rate for the five countries under consideration. Naira is our dependent variable (Y axis) while other currencies are independent variables (X-axis).

Figure 1 shows the signal plotting for currencies of five different countries and daily rates using MatLAB 2015a.

Table 1. Part sample data of exchange rate.

| rate date	euro	gbp	riyal	swissf	ngn
11/2/2018	350.4233	398.6034	81.6027	306.7749	306.1
11/1/2018	348.7091	395.2363	81.6027	305.002	306.1
10/31/2018	346.5664	390.0938	81.6027	303.9722	306.1
10/30/2018	348.3418	391.0734	81.6006	305.6721	306.1
10/29/2018	348.8316	392.6651	81.6006	306.1612	306.1
10/26/2018	347.1525	391.3461	81.5894	305.2868	306.05
10/25/2018	349.4173	394.8963	81.5894	306.2644	306.05
10/24/2018	348.7134	395.0493	81.5894	306.5098	306.05
10/23/2018	351.3454	398.7832	81.5742	307.4643	306.05
10/22/2018	351.9575	398.1404	81.5546	307.0325	306.05
10/19/2018	350.9514	398.7486	81.5522	307.2598	306
10/18/2018	351.9918	400.9824	81.5587	306.9823	306
10/17/2018	352.971	401.2578	81.5652	308.3745	306
10/16/2018	354.4704	404.379	81.5739	309.7166	306
10/15/2018	354.4092	402.849	81.5587	309.9362	306
10/12/2018	354.1983	404.1905	81.5671	308.6974	305.95
10/11/2018	354.3513	405.0778	81.5649	309.8855	305.95
10/10/2018	351.8731	402.5384	81.5649	308.2309	305.95
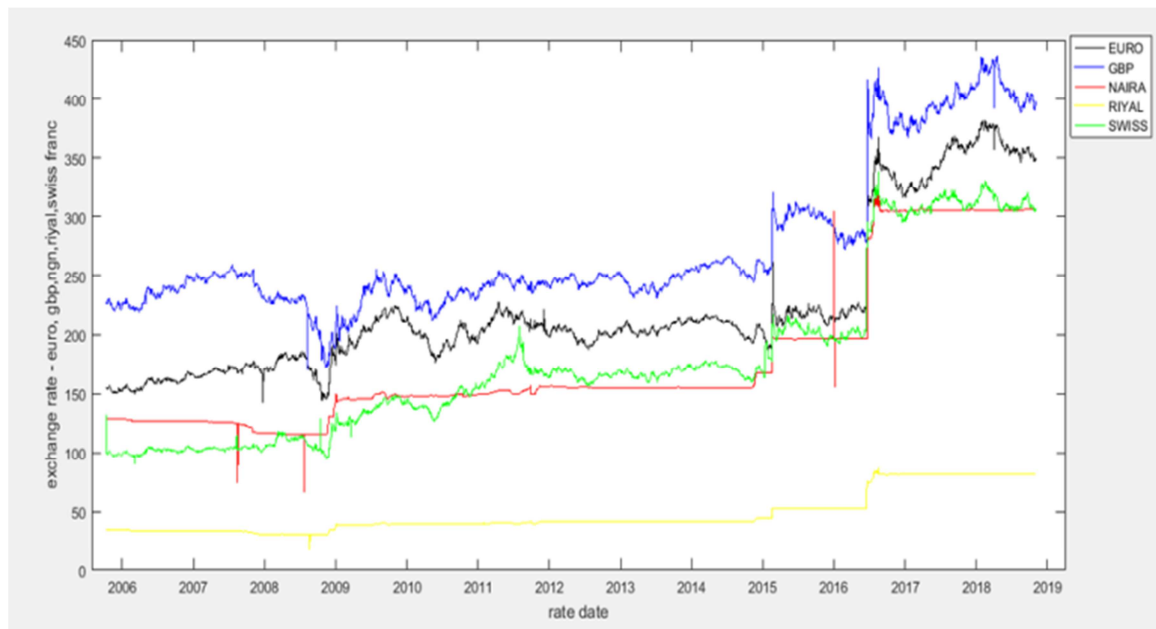
Figure 1. Graph of exchange rates versus rate date.

Linear regression was then applied on our raw data using excel. After running the regression model, R2 which is the rate of accuracy is 99%. Therefore, to project the exchange rate for naira in the year 2025, we applied the coefficient of our model in the equation 2.

$$y = -19.5766 + 0.0004777 * 43713.4 + 0.017612 * 351.4233 + 0.005303 * 399.6034 + 3.710399 * 82.6027 - 0.01949 * 307.7749 = 311.076 \tag{2}$$

The essence of the above formula is to predict the exchange rate for each currency with special interest on Nigeria. Finally, from the above equation and assuming 1st of June 2025, our projected value for naira in exchange rate is ₦ 311.076 as shown in the table 2.

Table 2. Projected value of exchange rate for Naira in year 2025.

Intercept	-19.5766	1	-19.5766
rate date (x1)	0.0005	6/1/2025	21.8567
Euro (x2)	0.0176	351.4233	6.1892
Gbp (x3)	0.0053	399.6034	2.1192
Riyal (x4)	3.7104	82.6027	306.4891
Swissf(x5)	-0.0195	307.7749	-6.0016
			311.076

4. Conclusion

Generally, in this paper we investigated the long run relationship between the exchange rates of five (5) countries in the world. We first drew a structure that showing their relationship using their exchange rates and rate dates. Thereafter, we applied linear regression tool on our source data and also applied the equation for prediction on our coefficients so we can predict the exchange for Naira come year 2025 which gave us N311.0793. The result of this study shows that there is clear relationship between naira and other currencies and changes in exchange rate of other currencies greatly affect the exchange rate of Naira. Also, the exchange rate movement is a good indicator for monitoring the economic growth of currencies.

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