Original Research Article

Volatility of Exchange Rate in Nigeria: An Investigation of Risk on Investment

ABSTRACT

The contribution of investment in currency trading in economic growth of a nation cannot be over emphasized. Hence, the examination of the risk involved in such trading because of volatility in foreign exchange rate. Time series data and model were used in this study. The monthly exchange rate of four major foreign currencies in Nigeria namely the US Dollars (USD), the Great Britain Pounds (GBP), the EURO and CFA Francs against Nigerian Naira (NGN) from January, 2004 to December, 2019 were extracted from website of Central Bank of Nigeria (CBN) with an open access to the public. Due to the volatile nature of the exchange rate, the Generalized Autoregressive Conditional Hetroscedastic (GARCH) model was a suitable model used at order 1 for parsimony to determine volatility used in computing Value at Risk (VaR). It was discovered that the maximum loss (risk), measured by VaR, that can occur at 95% confidence interval for twelve months forecast of trading with GBP was the highest, among the four currencies, with percentage loss of between 15.5% to 16.2%. While the CFA has the lowest risk with VaR between 0.02% to 0.03%. Based on the findings, the risk of investing in foreign exchange is the highest when trading in GBP with attendant high returns due to large fluctuations up and down of the exchange rate.

Comment [DO1]: Include the importance of this study to the government, investors and citizenry in general.

Keywords: [Exchange rate, Volatility, Value at risk, Loss, Foreign currencies)

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1. INTRODUCTION

Trading on foreign exchange has been a long time business and it has contributed immensely to economic activities of a nation with Nigeria not an exception. The exchange rate is very volatile in such a way that there can be price movement in seconds. The volatility do increase the uncertainty that surrounds overseas investments, suppressing foreign direct investment inflows as multinational corporations are faced with an opportunity cost of not 'waiting', before committing huge sum of money as capital [1].

The activities of foreign exchange market is of great important to the economic growth of Nigeria. This assertion was supported by [2] in a study carried out to empirically examine the contributions of the foreign exchange market to the economic growth of Nigeria discovered that there is a strong correlation between exchange rate and economic growth represented by Gross Domestic Product (GDP).

Investors stake their capital investing in buying and selling in the foreign exchange market where many use it as part of self-employment. Following recent anomaly in foreign exchange, there is an increasing important of the use of carry-trade strategy by investors [3]. The carry-trade is a strategy where investors invest funds in currencies with high nominal interest rates and obtain their funding from currencies with low interest rates [4, 3].

The foreign exchange market is becoming highly volatile day by day even though it is an age long trend that the risk involve in trading cannot be overestimated which may be due to various reasons. For instance, during the 2008 global financial crisis, the risk in foreign exchange rate was a scourge that has always been a burden because of the weakening of the exchange rate over the strength of the world's anchor currency [5].

Therefore, estimation of risk involve in trading on foreign exchange through the use of appropriate probability to determine period by period risk is of great important to investors. Some of the methods are VaR estimation and the forecast using the Monte-Carlo simulation [5], historical simulation method [6, 7] and parametric method [8].

The adoption of flexible exchange rate regimes in Nigeria in 1986 brought about excessive volatility of the *Naira* against major exchange rates [9]. The exchange rate volatility has effects on local investment in that its affects price volatility generally which might be positive or negative [10]. Due to this volatile nature of the exchange rate investors scramble for information to keep them abreast on their business. Those involve in foreign exchange (forex or fx) want to know which currency to buy or sell at a given point of time to reduce risk of losing their capital.

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Therefore, information on the risk of investing in foreign exchange market becomes pertinent to safeguard loss that sent investors out of the foreign exchange trading business. Hence, the need to work closely on Value at Risk (VaR) as a clue on what the future holds for the business. Value at risk can be described as a popular measure of risk used in the financial industry. It gives, at the current date, the maximum future loss that is expected in an investment (foreign exchange trade inclusive) for a given level of confidence and maturity [11].

The volatility of exchange rate can be viewed as an important parameter to be considered in investing in foreign exchange market because it plays a very important role in determining risk which is the probability of loss. This article is to undertake an empirical study of the exchange rate time series to estimate and forecast volatility which in turn use to compute the probability of maximum loss otherwise known as value at risk (VaR). The VaR will give the direction of foreign exchange market towards a particular currency against Nigerian Naira (NGN) which investors should follow.
The GARCH model has been a useful tool for estimating volatility. [12] used the model GARCH(1,1) to estimate volatility in their study of forecasting value at risk (Var). The standard deviation of the model which is the volatility was directly used in calculating VaR and thereafter a 1-Head forecast of the VaR was carried out. This study adopted their method of using standard deviation (volatitlity) directly to calculate VaR but differ in forecasting VaR by using the forecasted volatility to estimate future VaR. This is closely related to the work of [13] where the forecasted deviation of returns, instead of volatility from GARCH, was used in determining future VaR. This will be used to determine the foreign currency to invest on with NGN for survival of the business.

2. METHODOLOGY

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2.1 Source of Data

The monthly exchange rate data use in this study is a publication in the website of Central Bank of Nigeria (CBN) with an open access to the public. The time series data is the official exchange rate of the four major foreign currencies US Dollars (USD), the Great Britain Pounds (GBP), the EURO and CFA France against Nigerian Naira (NGN) which covered the period of January, 2004 to December, 2019.

2.2 Generalised Autoregressive Conditional Heteroscedastic Model (GARCH)

The model adopted for this study is the GARCH (1, 1) model. The use of GARCH models allow the conditional variance to change over time as a function of past errors, leaving the unconditional variance constant [14,15].
The model is given as

$$\sigma^2_{t/t-1} = w + \alpha_1 e^2_{t-1} + \beta\sigma^2_{t-1}$$

Where

$\sigma^2_{t/t-1}$ represents conditional variance and $\sqrt{\sigma^2_{t/t-1}}$ is taken as the volatility.

2.3. Value at Risk (VaR)

The parametric method of [8] VaR will be viewed in this study as a function of volatility and a certain confidence interval. This is given as $VaR = \sigma_{t/t-1} Z_{\frac{\alpha}{2}}$ to determine the probability of maximum lost for 12 months ahead of December 2019; January to December, 2020 at 5% level of significance. This method will make it possible for monthly value at risk to be computed at ease as a probability of risk.

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3. RESULTS AND DISCUSSION

3.1. Stationarity

The time plot of the exchange rate was not carried out even though it can be described as a tradition when working with time series. This is because the focus of the study is on the returns series of the exchange rate which is measured by the change between the succeeding and preceding exchange rate. The plot of returns series of the four foreign currencies were stationary which was substantiated by Augmented Dickey-Fuller (ADF) test at 5% level of significance with all *P*-values less than 0.05.

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3.2. Volatility

The GARCH (1,1) applied on the returns series of exchange rate to get the estimate of the conditional variance where volatility is taken as the square root of the conditional variance was of good fit based on the QQ-Plot.

Figure 1 (a-d): Showing volatility plot of USD, GBP, EURO and CFA respectively against NGN

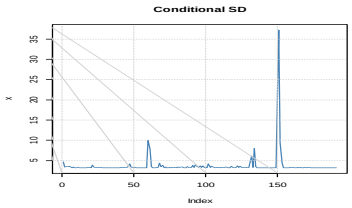
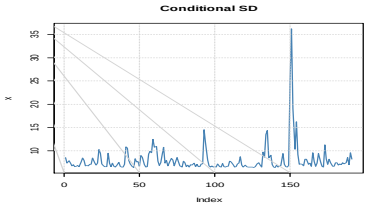


Figure a



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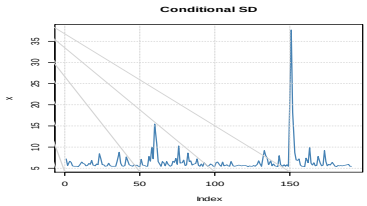

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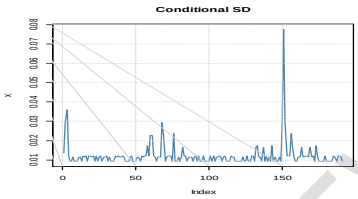

Figure d

The four figures exhibited almost the same behavior with attended high volatility at the same period of time that look like an outlier. This is due to a sharp increase of the foreign exchange rate of four currencies against the NGN in June, July and august, 2016 which thereafter volatility started behaving in their respective former patterns.

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3.3. Volatility Forecast and VaR

Comment [DO8]: Since you are using time series data, estimation of the parameters of your model(s) should come before forecasting with the model(s).

The forecasted volatility for twelve months from January to December, 2021 were used to predict VaR for the ten months.

Table 1: Forecasted Volatility and VaR from January to December, 2020

Month	USD	VaRUSD (%)	GBP	VaRGBP (%)	EURO	VaREURO (%)	CFA	VaRCFA (%)
Jan	3.28	6.42	7.91	15.50	5.46	10.70	0.01	0.02
Feb	3.80	7.45	8.09	15.86	6.22	12.18	0.01	0.02
Mar	3.97	7.78	8.18	16.04	6.52	12.77	0.01	0.02
Apr	4.03	7.90	8.23	16.13	6.64	13.02	0.01	0.03
May	4.05	7.94	8.25	16.17	6.70	13.13	0.01	0.03
June	4.06	7.95	8.26	16.19	6.72	13.17	0.01	0.03
July	4.06	7.96	8.27	16.20	6.73	13.19	0.01	0.03
Aug	4.06	7.96	8.27	16.21	6.73	13.20	0.01	0.03
Sept	4.06	7.96	8.27	16.21	6.74	13.20	0.01	0.03
Oct	4.06	7.96	8.27	16.21	6.74	13.21	0.01	0.03
Nov	4.06	7.96	8.27	16.21	6.74	13.21	0.01	0.03
Dec	4.06	7.96	8.27	16.21	6.74	13.21	0.01	0.03

The USD VaR (maximum loss) in month of July to December got stabilized at 7.96% while January to June witnessed some form of instability but not too high. That of GBP start stabilizing from August with 16.21% risk of maximum loss of investment in foreign exchange market. The VaR of EURO exhibit a different behaviour by being stable only in the months of August and September at 13.2% and rise to 13.21% from October to December. The most stable of them all is CFA with only two maximum loss of 0.02% and 0.03% for January to March and April to December respectively.

4. CONCLUSION

The risk of investing in foreign exchange has its highest in GBP with attendant high returns due to large fluctuations up and down of the exchange rate. The next currency in terms of ranking by maximum loss risk of investment is USD followed by EURO. The least among the four is CFA with the lowest maximum loss.

Comment [DO9]: Your conclusion is too scanty.

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