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FORECASTING CONSUMER PRICE INDEX AND EXCHANGE RATE USING ARIMA MODELS: EMPIRICAL EVIDENCE FROM NIGERIA

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ABSTRACT

Considering the high level of uncertainty in the foreign exchange market and the adverse effects of inflation in Nigeria, the need to utilize current data to work on appropriate models capable of predicting the future values of exchange rates and CPI has become necessary to guide monetary policy makers. This paper applies the techniques of Autoregressive Integrated Moving Average models to forecast the CPI and exchange rates of Nigeria using the dataset of monthly CPI and Exchange rates of naira against US Dollar from January 2010 to August 2022 obtained from National Bureau of Statistics. After the original series were appropriately differenced to attain stationarity, autocorrelation function (ACF) and partial autocorrelation function (PACF) were used to select a number of tentative models for parameter estimation. Based on selection criteria such as AIC, SBIC, HQC, R^2 and Durbin Watson Statistics, ARIMA(1, 2, 0) was chosen as the best model for forecasting Nigeria's monthly Inflation (CPI) and ARIMA(1, 1, 1) was selected as the most ideal model for forecasting monthly foreign exchange rates of Nigeria. The portmanteau tests carried out show that the residuals from both models are white noise which further confirms the adequacy of the fitted models. The results reveal that both inflation and Exchange rates of Naira against the Dollar will continue to rise. However, the rise in exchange rates for the short time is relatively steady. The findings from this study will furnish the monetary and policy makers with necessary information needed to reverse the expected trend and thereby stabilizing the economy of Nigeria.

Keywords: ARIMA model, Consumer Price Index, Exchange Rates, Residuals, Selection Criteria

INTRODUCTION

A good idea of the future economic direction of a country needed to formulate realistic economic policy and to allocate resources to the priority areas of the government can be obtained with an accurate forecast of exchange rates and the consumer price index. Therefore policy makers and researchers generally are concerned about developing a model with high predictive ability for this macroeconomic variable (Dongdong, 2010).

Both developing and developed countries have inflation as one of the major economic problems they are facing. Nigeria is currently facing a severe economic crises occasioned by high rise in general price level, high exchange rates and high unemployment rates. Nigeria's inflation rates are calculated using the CPI and the primary role of the monetary policy has been to maintain a relatively stable level of CPI as high inflation rates reduces a country currency values and inflicts untold hardship on the citizenry. Investors are often scared when inflation continues to rise unabated. Also, inflation causes inequality in income distribution as fixed income earners suffer more (Kharimah, et al., 2015). Therefore predicting future inflation values is indispensable to guide CBN on the best monetary and fiscal policy required to stabilizes any expected rise in inflation that could have negative impact on investment, saving and consumption (Nyoni, 2019). Exchange rates measure the worth of a country currency relative to another country's currency. According to Jhingan, 2005, exchange rate is defined as the rates at which a unit of a country currency is exchanged for another. Exchange rate is said to depreciate if the amount of domestic currency required to purchase a foreign currency increases, while the exchange rate appreciates if the amount of domestic currency required to obtain a foreign currency reduces. It determines the relative prices of domestic and foreign goods, as well as the strength of external sector participation in the international trade. It plays a huge role in determining the prices of both domestic and foreign goods as well as the strength of the economy. According to Guha and Bandyopadhyay (2016), the fluctuation of exchange rate can be examined using advanced time series models in order to have an ideal understanding of the underlying mechanism as well as obtaining more realistic estimates.

The inflation and exchange rates affect price stability and currency stability. Persistent exchange rate volatility often makes investment very risky as a result international trade decision become difficult. To formulate robust economic recovery strategy, insightful idea of the future values of the macroeconomic variables of CPI and exchange rates is indispensable. The future direction of a nation economy such as sustained economic growth, rise in production and productivity can only be effectively examined with the knowledge of future values of some macroeconomic variables such as CPI and the exchange rates. Studies have been conducted to forecast the future values of Nigeria's CPI using the Box and Jenkins methodology but none has simultaneously considered the two macroeconomic variables being studied in this work. David and Raymond (2016) analyzed and predicted yearly Nigeria's CPI by applying Autoregressive Integrated Moving Average (ARIMA) modeling technique. The dataset used covered a period of 1950 to 2014. ARIMA (3, 1, 0) was identified as the best fitting model to examine Nigeria's CPI data series. Based on the estimated model, six years out of sample forecasts ranging from 2015 to 2020 were predicted. The forecasts revealed a steady rise in the yearly values of CPI in Nigeria. However, the results have also revealed that ARIMA (0, 1, 0) and ARIMA (0, 1, 13) were more suitable for describing rural and urban inflation rates in Nigeria. Osuolale, Ayanniyi, Adesina and Mathew (2017), in their work applied ARIMA models to forecast inflation rates of Nigeria for the periods covering

2006 to 2015. ARIMA (0, 1, 1) was identified as the best model to forecast a two year out of sample forecast of inflation rates. Bokhari and Feridun (2006) also compared the performance of Vector Auto regressive (VAR) and Autoregressive Integrated Moving Average Method (ARIMA) model in forecasting Nigeria's inflation time series with data from 1991 to 2004 in Nigeria . Their findings from the study reveals that ARIMA model forecast model outperform that of the vector autoregressive method.

In studying China CPI, Dongdong (2010) used monthly CPI data covering January 2001 to December 2009 to make out of sample CPI for china. After the CPI series was differenced to attain stationarity, Auto correlation and Partial auto correlation functions were used to identify a number of models. Following test of adequacy on the identified models, ARIMA(12, 1, 12) provided a better out of sample forecast. He recommended the identified ARIMA model for the government in their effort to formulate an effective monetary policy. Onasanya *et al* (2013), in their work, used exchange rates data of Naira per US dollar from January 1994 to December 2011 to model a non seasonal ARIMA and used it to forecast future values of exchange rates. ARIMA(1,2,1) was identified as the best fit for the data after evaluating the selection criteria for all the ARIMA models entertained. the twelve months out of sample forecasts made with the identified model revealed that Naira will continue to depreciate against the US dollar.

Ette (1998), applied a technical approach in his study to forecast Nigeria exchange rates to US dollar using SARIMA model with data covering the period of 2004 to 2011. He concluded that exchange rate series maintained a negative trend between 2004 and 2007 but remain stable in the year 2008.

Olanrewaju et.al (2008) evaluated the forecasting performance of ARIMA and ARFIMA in modeling exchange rates of US-UK pounds foreign exchange. As indicated by measurement criteria, ARFIMA model outperformed the ARIMA model. They concluded that given the current economic realities in the two countries, ARFIMA model is a more realistic model to be used for making future forecast of exchange rates. They discovered that their study result is in agreement with the study conducted by Boutahara (2008).

This research work will contribute to the available literature by modeling and forecasting Nigeria's CPI and the exchange rates between Naira and US dollar using up-to date data on monthly CPI and Naira/US dollar exchange rates from January 2010 to September 2022 obtained from National Bureau of Statistics (NBS) Abuja using the most appropriate advanced univariate time series model known as Autoregressive Integrated moving Average model (ARIMA). Stage two unveils the methodology used for unit root testing, model identification and estimation of parameters. Stage three deals with display of results in tabular form and figures with discussion of results, conclusion and recommendation.

MATERIALS AND METHODS

The data used in this study are monthly CPI and Naira/US Dollar data from January 2010 to August 2022 sourced from National Bureau of Statistics. Eviews 9 and STATA 15 were used for data analysis. The methodology and theorem propounded by Box and Jenkins (1976) known as Autoregressive Integrated Moving Average model (ARIMA) was applied. ARIMA is an advanced time series forecasting model which considers historical data and breaks it down into autoregressive (AR) process concerned with memory of past values, an integrated process which accounts for data stationarity order and a moving average (MA) process, which accounts for previous error terms.

A process Y_t is said to be an ARIMA (p,d,q) if $\Delta^d Y_t = (1-B)^d Y_t$ is ARMA (p, q). The model is generally written as

$$\varphi(B)(1-B)^d Y_t = \theta(B) Z_t \qquad (1)$$

Z_t follows a white noise process (WN). The lag operator is defined as given below:

$$B^k Y_t = Y_{t-k} \qquad (2)$$

The autoregressive (AR) and moving average (MA) operators are as defined below.

$$\varphi(B) = 1 - \varphi_1 B - \varphi_1 B^2 - \cdots - \varphi_p B^p \qquad (3)$$

$$\theta(B) = 1 - \theta_1 B - \theta_1 B^2 - \cdots - \theta_q B^q \qquad (4)$$

$\varphi(B) \neq 0$ for $|\varphi| < 1, the\ process\ Y_t$ is said to be stationary if $d = 0$, in this case it becomes ARMA (pq) process.

Test of Unit Root

Unit root test is usually carried out on time series data to know if the series should be differenced to attain stationarity. Presence of a unit implies that the series is not stationary. There are many statistical test for unit root but in this study, Dickey Fuller and Philip perron tests with the following statistics would be employed for unit root testing

$$.Y_t = \alpha_0 + \rho_1 Y_{t-1} + \sum_{i=2}^{\rho-1} \beta_i \nabla Y_{t-1} + Z_t \qquad Z_p = n(\hat{\rho}_n - 1) - \frac{1}{2}\frac{n^2\hat{\sigma}^2}{n}(\hat{\lambda}_n^2 - \hat{\gamma}_{0,n}) \qquad (5)$$

Identification of the Model

The sample ACF and PACF computed from the data will be used to determine the order of p,d and q which will be compared to known ARIMA properties. The number of significant spikes at

Estimation of the Model Parameter

The parameter of the model will be estimated by maximum likelihood methods. In order to determine the adequacy of the identified model estimates, model with the least value of Akaike Information criterion (AIC) and Schwarz Bayesian Information Criterion (SBIC) and Hanan-Quinn Information Criterion (HQC) will be entertained. AIC and BIC have their statistics as represented below

$$\text{AIC} = nlog\left(\frac{RSS}{n}\right) + 2k, \qquad BIC = \{\ln(\hat{\sigma}_e^2)\} + k\{\ln(n)\} \quad \text{HQC} = -2L_{max} + 2k(\ln(n)) \qquad (6)$$

RSS is the residual of the fitted model, n is the sample size of residual and k is the number of estimated parameters in the fitted model, $\hat{\sigma}_e^2$is the error variance and L_{max} is the log likelihood.

Model Diagnostic Checking

The adequacy of a fitted statistical model is evaluated by comparing the observed or actual values with the values of the corresponding fitted model. The assumption of ARIMA model is that the residuals are white noise. ACF plot of the residuals are expected to be zero if the residuals are white noise. the Ljungbox test, Portmanteau test and Durbin-Watson test with the respective given statistics below can be used for diagnostic check.

$$Q = n(n+2)\sum_{k=1}^{m} \frac{\hat{r}_k^2}{n-1}, \quad Q_m = n\sum_{i=1}^{m} \hat{r}_k^2 \sim y^2{}_{m-p-q} \quad d = \frac{\sum_{i=2}^{n}(\varepsilon_i - \varepsilon_{i-1})^2}{\sum_{i=1}^{n} e^2} \tag{7}$$

Where $\hat{r}_k^2$ is the estimated autocorrelation of the series at lag k, m is the number of lags being estimated and $\sum_{i=1}^{n} e^2$ is the residuals sum of squares.

Table 1: Summary statistics of CPI and exchange rates naira/US dollar from January, 2010 to August, 2 022

Descriptive statistics	CPI	Exchange rates
Mean	224.3954	251.3046
Median	195.6500	197.0350
Maximum	471.8000	421.0700
Minimum	103.1000	149.7800
Standard deviation	98.41207	95.57777
Skewness	0.740942	0.359877
Kurtosis	2.481445	1.631060
Observation	152	152

The descriptive statistics as revealed by Table 1 shows that the two economic variables being examined are normally distributed in terms of their skewness and Kurtosis. Both variables maintain a low and positive coefficient of skewness. However, while the exchange rates have a higher average value, its standard deviation is smaller compared to that of CPI. There are 152 observations used for this study.

RESULTS AND DISCUSSION

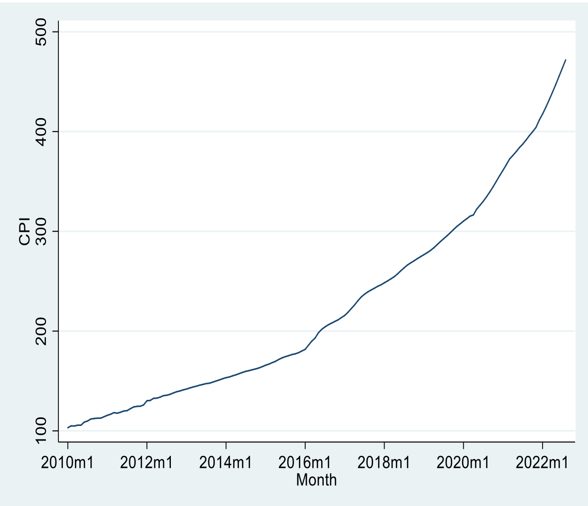

Figure 1: Time series plot of original CPI series

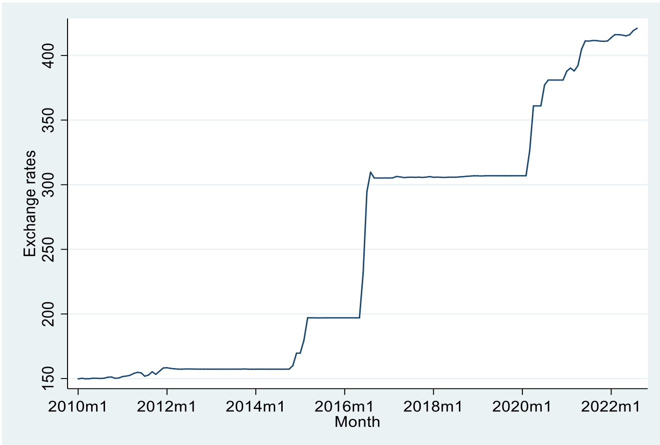

Figure 2: Time series plot of original Exchange Rates series

Figure 1 and 2 above display the time series plot of the original values of CPI and the Exchange rates from January 2010 to August, 2022. The both graphs show that there is a positive trend and the series are non-stationary. However, there is a noticeable sharp rise in exchange rates at the beginning of 2016 and a further unprecedented rise at early 2020.

Table 2: Dickey Fuller test for unit root of CPI series

```
. dfuller cpi, trend constant

Dickey-Fuller test for unit root                    Number of obs   =       151

                         ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             8.886            -4.023            -3.443            -3.143
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 1.0000
```

Table 3: Phillip Perron test for unit root of CPI

```
. pperron cpi, trend constant

Phillips-Perron test for unit root                 Number of obs   =       151
                                                   Newey-West lags =         4
```

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(rho)	4.017	-27.740	-20.904	-17.670
Z(t)	5.343	-4.023	-3.443	-3.143

MacKinnon approximate p-value for Z(t) = 1.0000

Table 4: Dikey Fuller test for unit root of exchange rates series

```
. dfuller exchangerates, trend constant

Dickey-Fuller test for unit root                   Number of obs   =       151
```

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-1.968	-4.023	-3.443	-3.143

MacKinnon approximate p-value for Z(t) = 0.6185

Table 5: Phillip Perron test for unit root of exchange rates series

```
Phillips-Perron test for unit root                 Number of obs   =       151
                                                   Newey-West lags =         4
```

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(rho)	-8.657	-27.740	-20.904	-17.670
Z(t)	-2.293	-4.023	-3.443	-3.143

MacKinnon approximate p-value for Z(t) = 0.4377

The existence of unit root in both CPI and Exchange Rates series was further confirmed by the Dikey Fuller test and Phillips Perron tests as presented in Tables 2, 3, 4,and 5. The null hypothesis of a unit root couldn't be rejected owing to respective p-values of greater than 0.05.

Table 6: Dickey Fuller test for unit root of the second differenced CPI series

```
Dickey-Fuller test for unit root                   Number of obs   =       149
```

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-20.142	-3.494	-2.887	-2.577

MacKinnon approximate p-value for Z(t) = 0.0000

Table 7: Phillips Perron test for unit root of the first differenced exchange rates series

```
. pperron d.exchangerates, regress

Phillips-Perron test for unit root                 Number of obs   =       150
                                                   Newey-West lags =         4

                            ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(rho)          -70.794           -19.967           -13.800           -11.067
 Z(t)             -6.983            -3.493            -2.887            -2.577
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

CPI series attains stationarity after the second difference of the series. This result was confirmed by Dikey Fuller test as presented in Table 5. However, Exchange rates was stationary after the first differencing having confirmed the result of unit root by Phillips Perron unit root test as given in table 6.

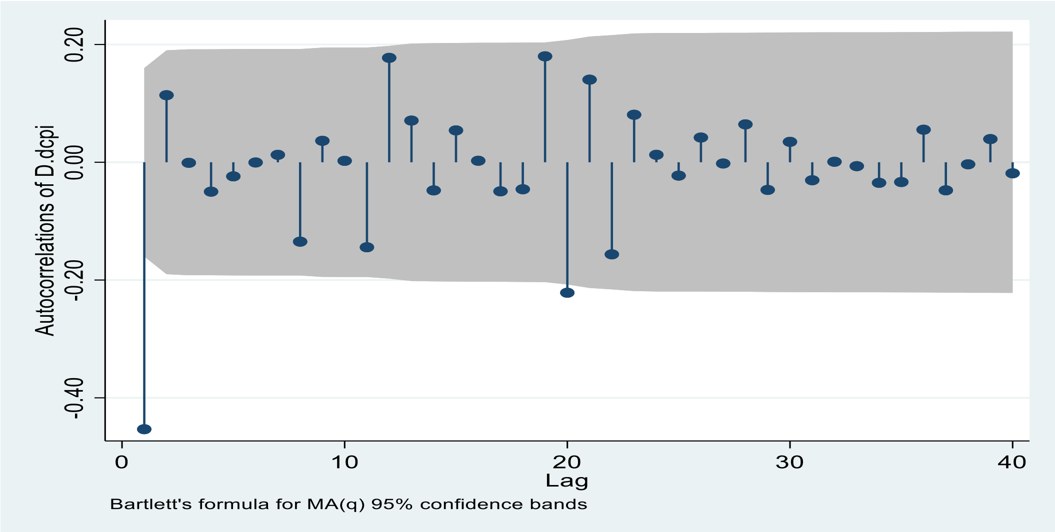

Figure 3: ACF of second order difference of CPI

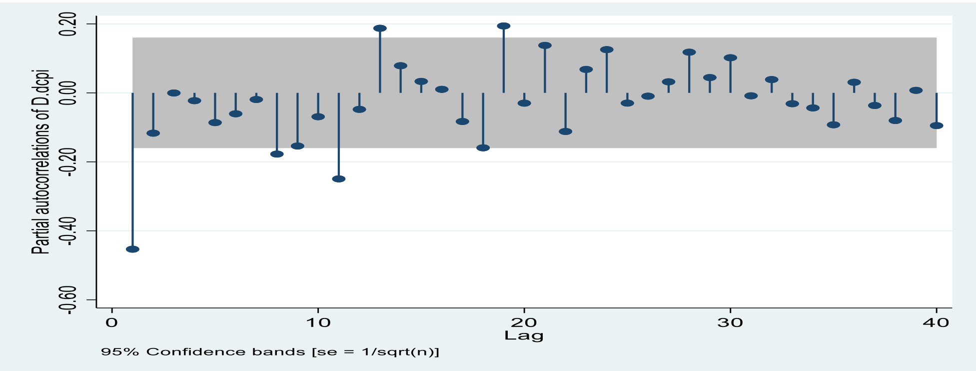

Figure 4: Partial autocorrelation function of the second order difference of CPI

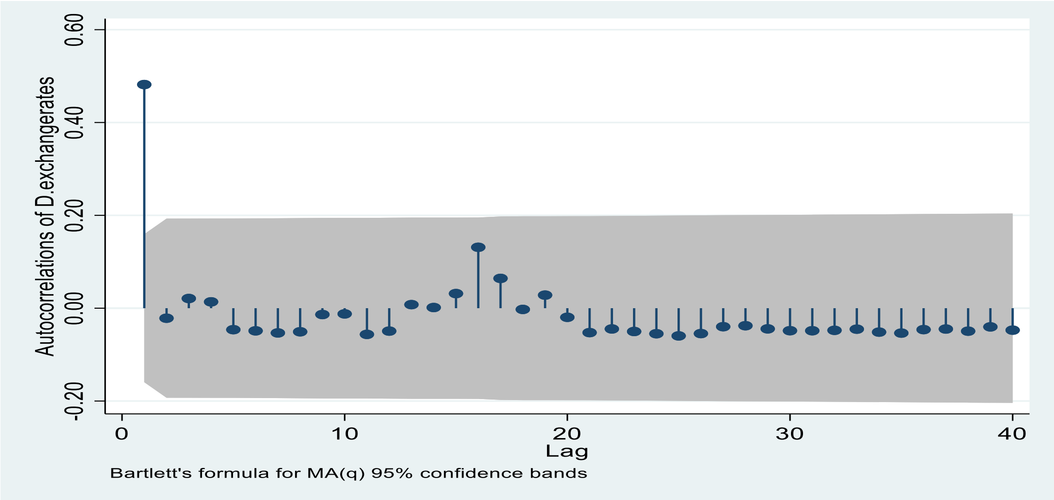

Figure 5: ACF of first order difference of Exchange Rrates

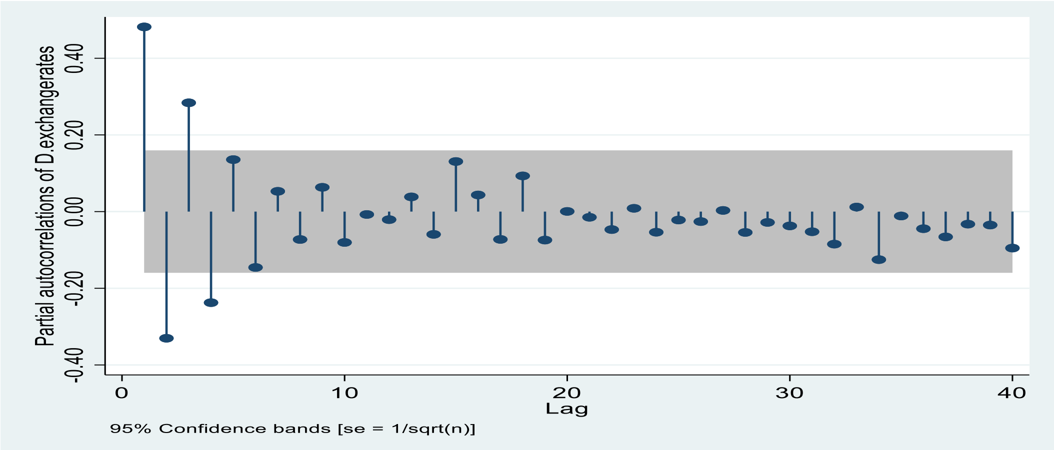

Figure 6: PACF of first order difference of Exchange Rates

Having Satisfied that the series have attained stationarity (no longer contain unit root), ACF and PACF of the diffrenced series are used to identify the appropriate order of AR (p) and MA (q) components. While the AR component is identified by careful inspection of PACF plot, the MA component is identified with the aid of ACF plot. Figures iii and iv display the ACF and PACF of CPI. Both ACF and Pacf tail off at lag 1 . Although, there are some few significant spikes at hgher lags, but considering the principle of model parsimony, they are ignored. Therefore this implies that AR(1) and MA(1) are suspected. Models to be examined include ARIMA(1,2,1) ARIMA (2,2,1), ARIMA(2, 2, 0), ARIMA(0, 2, 2).

Similarly, in Figures 5 and 6, while the ACF tails off after the first lag Pacf dies off after the forth lag suggesting a possible combination of MA(1), AR(1), AR(2) AR(3) or AR (4) could be required to describe the series. Models examined include ARIMA(1,1,1) ARIMA(2, 1, 1) and ARIMA(2, 1, 0). However higher order of AR (for p>2) are not entertained as their parameters are insignificant)

Table 8: Results of the estimated tentative models for sample CPI

Model	AIC	SBIC	HQC	DW	R^2
ARIMA(1,2,1)	2.5899	2.650	2.614	1.95	0.446
ARIMA(1,2,0)	2.5882	2.628	2.605	1.969	0.487
ARIMA(2,2,0)	2.5893	2.650	2.614	1.951	0.415
ARIMA(0,2,2)	2.5910	2.651	2.616	1.968	0.415
ARIMA(2,2,1)	2.5889	2.669	2.621	1.958	0.428

Table 9: Results of the estimated tentative models for sample exchange rates

Model	AIC	SBIC	HQC	DW	R^2
ARIMA(1,1,1)	6.268	6.328	6.293	1.985	0.416
ARIMA(1,2,0)	6.281	6.361	6.313	1.980	0.417
ARIMA(2,1,0)	6.461	6.521	6.485	1.80	0.288

Considering all the entertained models with significant parameters as presented in Table 8 and judging by the model selection criteria such as AIC, SBIC, HQC and R^2, ARIMA(1, 2, 0) was chosen as the most appropriate model to describe the dynamics of Nigeria's CPI for the period under review. Model with the least of AIC, SBIC, and HQC is considered as the best fit. Besides, considering the percentage of the variation in CPI explained by the model, the chosen model with $R^2 = 48.7\%$ also perform better than any of the other models.

Also, as presented in Table 9, ARIMA(1, 1, 1) is chosen as the best model to capture the fluctuation in Nigeria's exchange rates having outperformed other entertained models in terms of the selection criterion previously described.

Table 10: Estimation of model parameters of ARIMA (1,2,0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(1)	-0.459736	0.061012	-7.535218	0.0000
SIGMASQ	0.757346	0.047194	16.04760	0.0000
R-squared	0.486831	Mean dependent var		0.042000
Adjusted R-squared	0.479472	S.D. dependent var		0.980431
S.E. of regression	0.876117	Akaike info criterion		2.588192
Sum squared resid	113.6019	Schwarz criterion		2.628333
Log likelihood	-192.1144	Hannan-Quinn criter.		2.604500
Durbin-Watson stat	1.969471			

Dependent Variable: D(CPI,2)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 10/20/22 Time: 14:37
Sample: 2010M03 2022M08
Included observations: 150
Convergence achieved after 14 iterations
Coefficient covariance computed using outer product of gradients

Table 11: Estimate of model parameters of ARIMA(1, 1, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(1)	0.063577	0.048514	1.310499	0.0192
MA(1)	0.835345	0.062658	13.33173	0.0000
SIGMASQ	29.43279	1.336736	22.01841	0.0000
R-squared	0.416025	Mean dependent var		1.796623
Adjusted R-squared	0.408133	S.D. dependent var		7.122974
S.E. of regression	5.479909	Akaike info criterion		6.268359
Sum squared resid	4444.352	Schwarz criterion		6.328305
Log likelihood	-470.2611	Hannan-Quinn criter.		6.292712
Durbin-Watson stat	1.984702			

Dependent Variable: D(EXCHANGE_RATES)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 10/20/22 Time: 16:01
Sample: 2010M02 2022M08
Included observations: 151
Convergence achieved after 136 iterations
Coefficient covariance computed using outer product of gradients

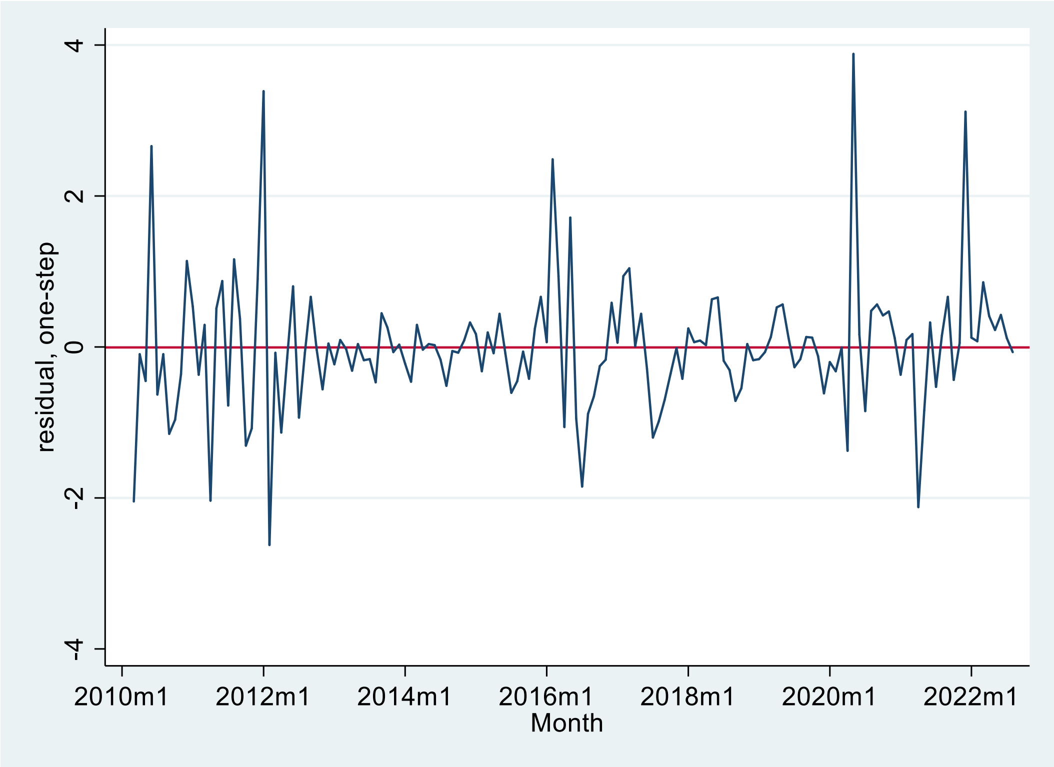

Figure 7: Mean residual plot of CPI

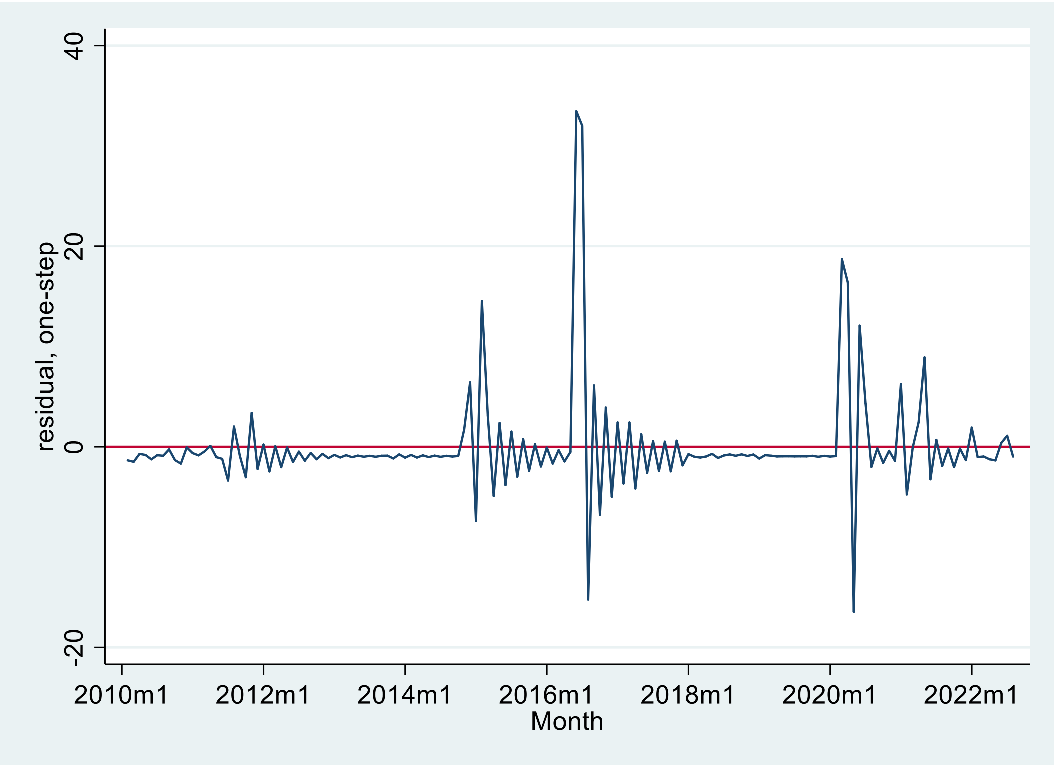

Figure 8: Mean residual plot of exchange rates.

As displayed in Figures 7 and 8, the residuals from both models for CPI and Exchange rates just dies off around the origin which means the residual are white noise. This is however part of what is required in a robust models.

Table 12: Portmanteau test of residual of fitted CPI model (ARIMA 1, 2, 0)

Portmanteau test for white noise	
Portmanteau (($\boldsymbol{Q}$)statistics	43.4165
Prob >chi2 (40)	0.3279

Table 13: Portmanteau test of residual of fitted exchange rates model (ARIMA 1, 1, 1)

Portmanteau test for white noise	
Portmanteau (($\boldsymbol{Q}$)statistics	12.4880
Prob >chi2 (40)	1.0000

The results of portmanteau test for white noise for both CPI and exchange rates as presented in Table 12 and 13, show that the residuals are white noise. This is because the null hypothesis that the residuals are white noise cannot be rejected owing to p-values of above 0.05 in both tests. This implies that our fitted models are adequately satisfactory.

Forecasting with the Identified Models

The identified CPI model; ARIMA (1, 2, 0) can be written in terms of its backward shift operator $\emptyset(B)$ as:

$$(1-B)^2(1-\emptyset B)y_t = Z_t \tag{8}$$

Expanding the backward shift operator: $(\emptyset B)y_t = \emptyset y_{t-1}$ eq(8) is represented as

$$y_t = \emptyset y_{t-1} + 2y_{t-1} - 2\emptyset y_{t-2} - y_{t-2} - 3\emptyset y_{t-3} + Z_t \tag{9}$$

Substituting $\emptyset =$ -0.459736, the one step ahead forecast becomes:

$$y_{t+1} = -0.459736y_t + 2y_t + 0.919472y_{t-1} - y_{t-1} - 1.379208y_{t-2} + Z_t \tag{10}$$

The identified Exchange rates forecasting model; ARIMA (1, 1, 1) can be written in terms of its backward shift operator $\emptyset(B)$ as:

$$(1-B)(1-\emptyset B)y_t = (1-\theta B)Z_t \tag{11}$$

Expanding the backward shift operator: $(\emptyset B)y_t = \emptyset y_{t-1}$ and $(\theta B)\, Z_t$, eqn (11) is represented as

$$y_t = \emptyset y_{t-1} + y_{t-1} - \emptyset y_{t-2} - \theta B Z_{t-1} + Z_t \tag{12}$$

Substituting $\emptyset = 0.063577$, $\theta = 0.835345$ the one step ahead forecast becomes:

$$y_{t+1} = 0.063577y_t + y_t - 0.063577y_{t-1} - 0.835345Z_{t-1} + Z_t \tag{13}$$

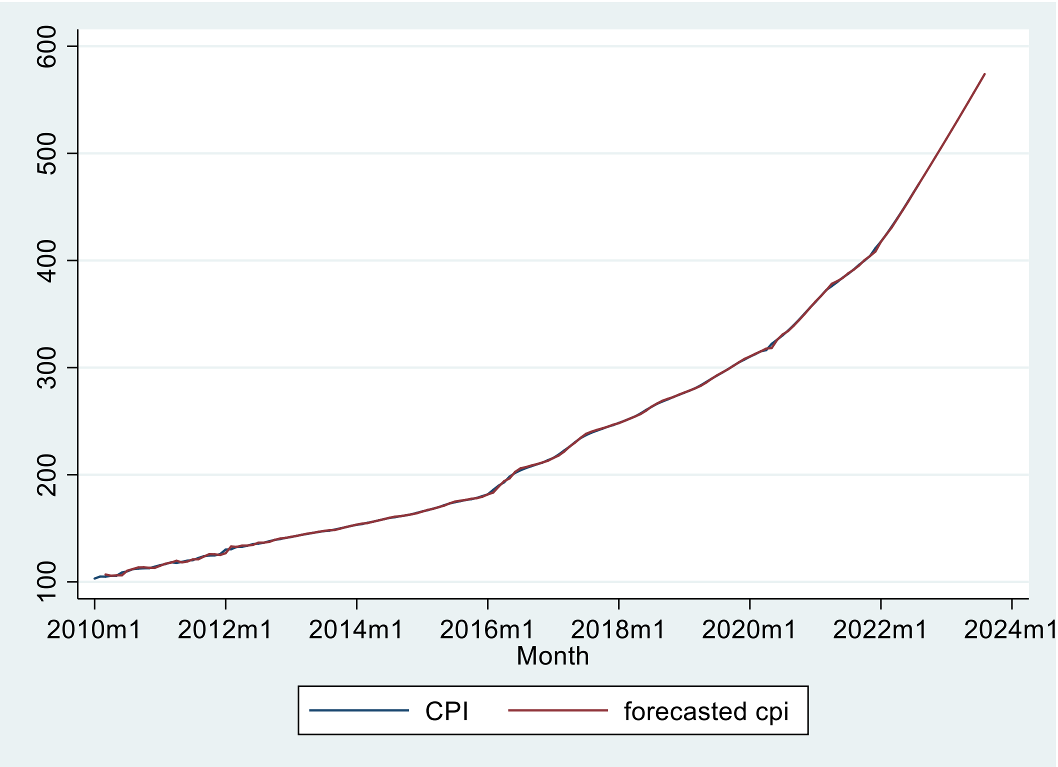

Figure 9: Plot of CPI and the 12 months Out of sample forecasts.

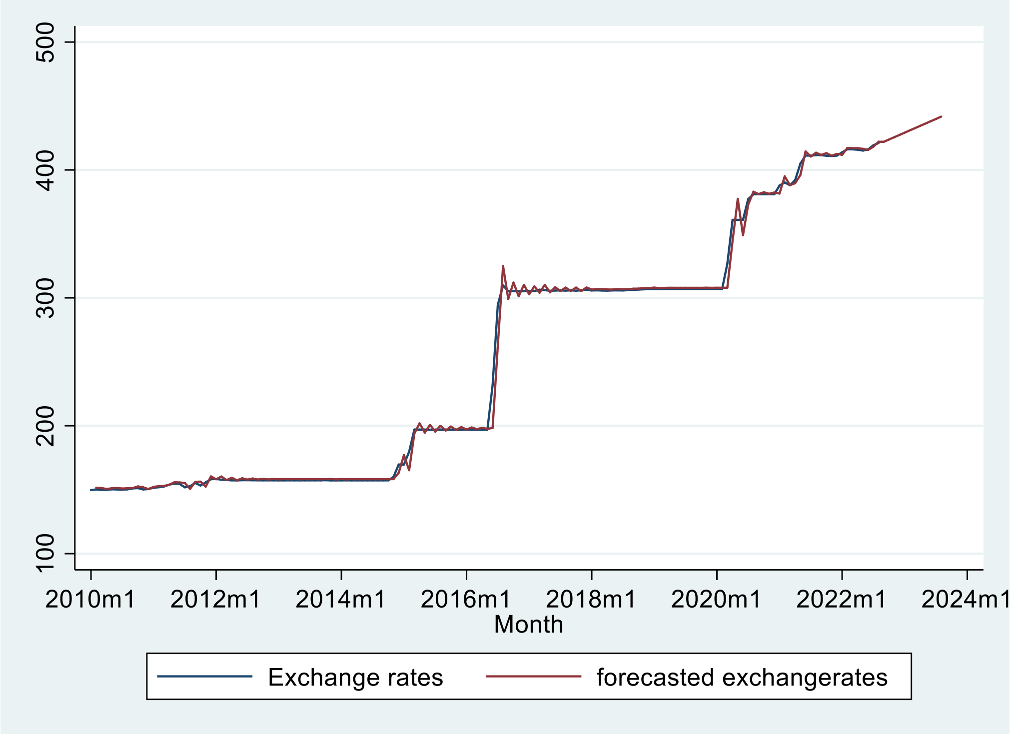

Figure 10: Plot of exchange rates and the 12 months out of sample forecasts.

As displayed in Figures 9 and 10, the actual values and predicted values of both CPI and Exchange rates have very similar trend. This however makes the forecast reliable and also confirm the fit of the model used

Table 14: ARIMA (1, 2, 0) and ARIMA (1, 1, 1) forecasting results for Nigeria's monthly CPI and exchange rates respectively from September, 2022 to August, 2023

Month	Forecasted CPI with ARIMA(1,2,0)	Forecasted Exchange Rates with ARIMA(1, 1, 1)
September	480.0679	422.0388
October	488.3723	423.8042
November	496.7278	425.5921
December	505.1274	427.3807
January	513.5746	429.1694
February	522.0676	430.958
March	530.6074	432.7466
April	539.1934	434.5352
May	547.8259	436.3239
June	556.5048	438.1125
July	565.2302	439.9011
August	574.0019	441.6897

It can be observed from Table 14 above that Nigeria's inflation rates will continue to rise as well as the exchange rates of naira to US dollar. This implies that naira will further be more weakened.

CONCLUSION

The study worked on appropriate ARIMA models for forecasting Nigeria's monthly CPI and Naira/US dollar exchange rates. Based on the model selection criteria examined such as AIC, SBIC, HQC R^2 and Durbin Watson statistics, ARIMA (1, 2, 0) having performed the most, was chosen as the best model to forecast the monthly CPI of Nigeria. Similarly, as regards the exchange rates, ARIMA (1, 1, 1) edged the other models entertained based on the criteria stated previously. The plot of residuals in table shows that the residuals of both models mingle around the mean. Portmanteau test of residual was also conducted and the null hypothesis that the residuals are white noise could not be rejected since the p-values in both cases are more than 0.05 (0.3279 and 1.0000 for CPI and Exchange rates respectively). The 12 months out of sample forecasts for CPI reveal that inflation will continue to rise. Similarly, forecasts for Exchange rates also reveal a steady increase in the next 12 months which will further weaken the naira.

RECOMMENDATIONS

In line with these findings, we recommend that appropriate monitory policy be implemented by the government and economic stake holders to reverse the predicted trends of both CPI and the exchange rates. Future research should use ARIMA model with exogenous variable known as (ARIMAX) to Model Exchange rates and CPI and compare the forecasting performance of both ARIMA and ARIMAX.

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