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Predictive Modeling of Nigeria's Currency in Circulation Using X-12 Autoregressive Integrated Moving Average Method

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ABSTRACT

In Nigeria, the average monthly quantity of currency in circulation (CIC) has increased by 269 billion nairas, reaching 2.13 trillion as of 2019 and 2.41 trillion as of 2020. The current value of currency in circulation is expected to be 2.88 trillion naira. The economy of Nigeria is impacted by the seasonal fluctuations in its currency, and it is unavoidable that the economy would need to be adjusted. The purpose of this study was to adjust the seasonal effect of eight days to Easter and Muslim holidays on CIC, model and predict the CIC in Nigeria using the United State Census Bureau's X-12 ARIMA Seasonal adjustment software. The data utilized in the study was the monthly amount of money in circulation that was taken from the Central Bank of Nigeria (CBN) Bulletin between January 2012 and March 2022. Natural logarithm was used to standardize the data, and series seasonality was removed using seasonal differencing. Based on these data, it is clear that X-12-ARIMA (2 1 1)(0 1 1) is the most accurate forecasting approach for Nigeria's CIC. The money in circulation in Nigeria from April 2022 through December 2022 will rise at a positive rate of 2.8% growth rate each month, with a predicted monthly mean CIC of 3.40 trillion by the end of the year 2022, according to this method's predictions. This is the first study on modeling and forecast of CIC in Nigeria that have utilize the United State Census Bureau X-12-ARIMA software, the findings can be extrapolated to the coming year, Nigerians may want to get ready for an increase in the amount of money in circulation during this time.

Keywords: CBN, Currency in circulation, Money Supply, Seasonality, Seasonal Adjustment, X-12 ARIMA

INTRODUCTION

Paper money and coins held by the general public and in the safes of depository institutions both count as currency in circulation. The sum comprises the estimated amount of Treasury paper currency and coins in circulation (FRB, 2020). It is a fraction of the total amount of money in circulation, some of which is kept in checking and savings accounts. The amount of money in circulation is a crucial part of a nation's financial system. A perfect form of money would be robust, long-lasting, simple to count, impossible to forge, portable, and recognizable. Eight different banknotes the N1000, N500, N200, N100, N50, N20, N10, and N5 as well as three different coin denominations the N2, N1, and 50k are used in Nigeria. The Central Bank of Nigeria (CBN)'s currency and branch operations division is responsible for managing currency through the acquisition, distribution, processing, reissue, and disposal of banknotes and coins. Being one of the most liquid asset classes, physical currency is one that the CBN pays close attention to. The quantity of currency is relatively less flexible than other forms of money (such as bank reserves), it is less important to central banks' monetary policy, (Chappelow, 2020; CBN, 2020). Nigeria's banknote printing and mint, Nigerian Security Printing and Minting Company

Limited produces some of the most secure banknotes and coins in the world and expresses style and assurance, and their prints are visibly persuasive. At first, Nigeria produced little over 2 million notes each week, but to effectively keep up with its rapid economic expansion, which number has already increased to nearly 40 million notes per week. Currency is distributed to deposit money banks (DMBs) in Nigeria through CBN facilities, and faulty notes are returned through the same mechanism. According to the Clean Notes Policy, the CBN processes and separates currency deposited by deposit money banks into fit and unfit notes (Yahaya,, Oyinloye, & Adams, 2022; Adams & Balogun, 2020).

The CIC increased by 95.64 percent from N1.032 trillion at the end of Q3, 2009 to N2.019 trillion at the end of Q3, 2019, according to the CBN's quarterly economic reports. Additionally, according to the CBN's 2018 annual reports on currency operations, CIC increased by 0.8% to N2.33 trillion at the end of 2018. Analysts noted that the rise in CIC at the time was a reflection of the economy's increased activity and high cash dominance. According to a breakdown of the CIC at the end of 2018, the percentage of higher denomination bank notes (N100, N200, N500, and N1000) increased both in terms of volume and value from 41.9 to 44.3 percent between 96.9% and 97.6%, respectively. The lower currency continued to dominate in terms of volume, accounting for 55.7% of the total, as was predicted. However, in terms of value, it made up a minimal 2.4% of all banknotes in the nation (Adams, Awujola, and Alumbugu 2014). The CBN record shows that in 2018, the ratio of CIC to nominal GDP, which gauges the economy's lack of money, decreased significantly by 0.1 percentage to 1.8%. The CIC/GDP ratio declined as a result of more people using electronic payment instruments, such as credit cards. In addition, according to the apex bank's annual reports, CIC climbed by 0.80% to N2.49 trillion. The increase in CIC was due to the 2019 election and the increase in economic activities. On currency disposal, as of the end of December 2018, a total of 1.8 billion pieces, or 181,054 boxes valued at N915 billion were disposed of, compared with 2.58 billion or 257,501 boxes valued at N977.23 billion disposed of in 2017. The boxes of unfit notes disposed of in 2018 decreased by 76,447 boxes, while the value decreased by N62.16 billion or 6.36% (CBN, 2020).

Analysis of a separate document obtained by the CBN revealed that the total CIC has declined by 3.9% to N2.05 trillion from N2.14 trillion in January 2019, while in the last 10 years; it has almost doubled, growing by 95.6% compared with N2.16 trillion in 2017 (CBN, 2020). Industry experts have generally attributed this trend to the enormous uptick in the popularity of using electronic channels for payment settlement during the eras. For instance, 3.81 billion different transactions on different e-payment channels, including Point of Sales (PoS), online banking, and NEFT, among others, totaled 2.84 trillion naira in the Nigerian economy during the first half of 2019. The Nigerian economy has long been based on cash, but the implementation of a cashless policy and recent advancements in the financial sector's electronic payment segment has caused a steady shift away from dealing in actual currency toward the use of electronic payment channels. Despite the growth of electronic payment records, there is still some physical currency in use increased by 9.9% to N2.2tn, with a decline of 0.4% at the end of the third quarter of 2019. The development, relative to the level in the preceding quarter, reflected mainly the increase in its currency outside banks component and seasonal factors (CBN Economic Report, 2017).

The problem in research that the study seeks to address is the lack of seasonally adjusted macroeconomic statistics on money circulation in Nigeria at the moment. The removal of all seasonal influences from the data requires the use of seasonal adjustment, which is crucial. Typically, it is carried out with the commercial software most frequently utilized across the globe by one of the X-11 family's programs, X-12 ARIMA. Therefore, the purpose of this study is to investigate how seasonal adjustment of eight days to Easter and Muslims' holiday affects the CIC in Nigeria. Additionally, the study utilized United State Census Bureau X-12-ARIMA software to model and forecast Nigerian CIC.

The findings of the study will be very helpful to Nigeria's central bank and other international banks in making better decisions, formulating sound financial policies, and adjustment in future plan and strategies as far as CIC is concerned. A literature overview on the modeling and forecasting of money in circulation is offered in section 2 along with some empirical findings. The X-12 ARIMA model's theoretical underpinnings are explained in Section 3, while Section 4 provides information on the study's data, model specifications, and model selection criteria. The results were presented in section 5 while the conclusion and recommendation are presented in the last section.

EMPIRICAL REVIEW OF LITERATURE

The modeling and forecasting of CIC often use two techniques: univariate time series models, which aim to mimic trends observed over a certain period, and structural models, which use economic factors to measure the demand for money. Numerous research has looked into how seasonal adjustment affects a country's currency circulation. This is crucial for tracking the expansion of the currency in developing nations. Using the Seasonal Autoregressive Integrated Moving Average (SARIMA) model, the monthly currency in circulation in Ghana was modeled. The results showed that the ARIMA (0,1,1)(0,1,1)12 model was suitable for modeling the monthly currency in circulation (Albert et al., 2013). A different method for calculating and projecting Sri Lanka's cash in circulation CIC was put forth. The high-frequency data was processed using three different techniques, including the assembly of tools for predicting trends, seasonal patterns, and cycles in distinct series individually. Regression on trend and seasonal dummies was used to identify trends and seasonal impacts while allowing for the ARMA effect in the regression disturbance recorded cyclical patterns. All three models produce accurate predictions for the post-sample period and suit the data well (Dheerasinghe, 2009). The daily series of currency in use as part of the Eurosystem's liquidity management employs both the structural times series approach and the ARIMA-based approach. The effectiveness of the two models' predicting was evaluated in the context of their effects on liquidity control (Alberto et al., 2002). Nigerian CIC forecast the most accurate models for liquidity management were mixed models with structural and ARIMA components supplemented by seasonal and dummy factors, which were constructed using ARIMA, ARIMA with structural variables, Vector Autoregressive and Vector Error Correction models. Additionally, it was shown that the demand for money may be explained by the exchange rate, interbank rate, seasonality, holidays, and elections (Ikoku, 2014). After removing seasonality and trend, it was found that the Multiplicative seasonal Autoregressive Moving Average, SARIMA (0.1,0)x(0,1,1)12 was the best model for describing the pattern in the series (Omekara et al. 2015; Mohammed et al. 2022). Currencies in circulation in Nigeria were investigated, and a forecast of future growth was sought using the ARIMA model of currencies in circulation.

The trend and pattern of money circulation in Nigeria are reviewed, and Box-Jenkins methodology was used to analyze the monthly records of money in circulation that were received from the central bank of Nigeria. According to Adubisi et al. (2017), the Seasonal ARIMA (2, 1, 0) (0, 1, 1)12 model is suitable for describing the patterns shown in the dataset. On Turkish monetary aggregates, the performances of two seasonal adjustment methods X-12 ARIMA and TRAMO/SEATS as well as several important factors that must be taken into account throughout the seasonal adjustment process were examined. The working day effect has only been studied and shown to be substantial in the M1 series, it was found. Further research into the effects of the holidays has not revealed any signs of the particular holiday effect in the show being examined. Only the M2 and M2X series are proven to have the moving holiday effect (Atuk & Ural, 2002). It was suggested, discussed, and applied to money currently in circulation. The suggested neural network's forecasting abilities were contrasted with those of the conventional ARIMA model. The results show that neural networks perform better than ARIMA models, and both models may be used, at the very least as auxiliary tools for forecasting liquidity (Hlavacek, Konak, and Cada, 2005). Three models linear forecasting, regression, and seasonal ARIMA models were used to estimate and predict the daily and weekly CIC for the state of Qatar. Comparing the seasonal ARIMA to the three models for short-term forecasts, the model offers superior estimates. For the short-term CIC forecasts, the seasonal ARIMA model's forecast error range was less than 100 million QR (Bali & Elsamadisy, 2012; Zubair, Adams & Aniagolu 2022).

The SARIMA model was used to simulate the monthly CIC. In light of the findings, the ARIMA (0, 1, 1)(0, 1, 1)12 model was shown to be suitable for simulating currency in circulation. The lowest AIC, AICc, and BIC for this model are -372.16, -371.97, and -363.53, respectively. According to diagnostic tests of the model residuals using the Ljung-Box and ARCH-LM tests, the model is devoid of conditional heteroscedasticity and higher-order autocorrelation, respectively (Albert, Suleman, Leo, 2013).

The summary of the reviewed literature indicated that CIC has been modeled and forecast using time series techniques, regression analysis, Vector Autoregressive and Vector Error Correction models, but to date, no research have been carried out on seasonal adjustment, modeling and forecasting of CIC in Nigeria using the United State Census Bureau X-12-ARIMA software. This study intends to fill this research gap.

MATERIALS AND METHODS

Source of Data

The data used in this study were sourced from the CBN statistical bulletin, (2021). It is the monthly CIC in Nigeria, the data spanned between the periods January 2012 to March 2022, (one hundred and twenty-three (123) data points. The data on CIC was selected to be modeled and predicted from April 2022 to December 2022.

X-12 ARIMA Model Specifications

ARIMA models as discussed by Box and Jenkins (1976), are frequently used for seasonal time series. A general multiplicative seasonal ARIMA model for a time seriesZ_t, can be written;

$$\emptyset(\mathrm{B})\Phi(\mathrm{B}^s)(\mathrm{I}-\mathrm{B})^d(\mathrm{I}-\mathrm{B}^s)^D\mathrm{Z}_t = \theta(\mathrm{B})\mathrm{P}(\mathrm{B}^s)a_t \quad (1)$$

Where;

B = the backshift operator $(\mathrm{B}_{zt} - \mathrm{Z}_{t-1})$

S = the seasonal period

$\emptyset(\mathrm{B}) = \left(\mathrm{I} - \phi_1\mathrm{B} - \ldots - \phi_p\mathrm{B}^p\right)$ is the non-seasonal autoregressive (AR) operator

$\Phi(\mathrm{B}^s) = \left(\mathrm{I} - \phi_1\mathrm{B}^s - \ldots - \phi_p\mathrm{B}^s\right)$ is the seasonal autoregressive (AR) operator

$\theta(\mathrm{B}) = \left(\mathrm{I} - \theta_1\mathrm{B} - \ldots - \theta_q\mathrm{B}^q\right)$ is the non-seasonal moving average (MA) operator

$\mathrm{P(B)} = \left(\mathrm{I} - p_1\mathrm{B}^s - \ldots - \theta_Q\mathrm{B}^{Qs}\right)$ is the seasonal moving average (MA) operator

$(\mathrm{I} - \mathrm{B})^d(\mathrm{I} - \mathrm{B}^s)$ = non-seasonal differencing of order d and seasonal differencing of order D.

The time series of regression error is assumed to follow the ARIMA model (1), modeling Z_t as ARIMA addresses the fundamental problem with applying standard regression methodology to time series data, which is that standard regression assumes that the regression error (Z_t in (2)) are uncorrelated over time. In a time series observation, the errors in (2) will usually be Autocorrelated with differencing. Assuming Z_t is uncorrelated in such cases will typically lead to grossly invalid results, the expression (1) and (2) taken together define the general reg-ARIMA model allowed by the X-12-ARIMA program. Combining (1) and (2), the model can be written in a single equation as;

$$Y_t = \sum \beta_i X_{i,t} + Z_t \qquad (2)$$

Where;

Y_t = the dependent time series

$X_{i,t}$= regression variables observed concurrently with Y_t

β_i= regression parameter

$Z_t = Y_t - \sum \beta_i X_{i,t}$

The reg-ARIMA model (3) can be thought of either as generalizing the pure ARIMA model (1) to allow a regression mean function $\Sigma Ó_i \beta_i x_{i,t}$), or as generalizing the regression model (2) to allow the errors Z_t to follow the ARIMA model (1) (Balogh, 2007; Adams., Zubair & Aiyedun-Olatunde 2022). In any case, the reg-ARIMA model implies that first the regression effect is subtracted from Y_t to get the zero mean series Z_t, then the error series Z_t is differenced to get a stationary series, say w_t , and w_t is then assumed to follow the stationary ARIMA model,

$$\emptyset(B)\Phi(B^s)w_t = \Theta(B)\rho(B^s)a_t \qquad (3)$$

Another way to write the reg-ARIMA model (3) is;

$$(\mathrm{I} - \mathrm{B})^d(\mathrm{I} - B^s)^D Y_t = \sum_i \beta_i(\mathrm{I} - \mathrm{B})^d(\mathrm{I} - \mathrm{B}^s)^D X_{i,t} + w_t \qquad (4)$$

Where; w_t follows the stationery ARIMA model just given. Equation (4) emphasizes that the regression variables $x_{i,t}$ in the reg-ARIMA model, as well as the seriesY_t, are differenced by the ARIMA model differencing operator$(\mathrm{I} - \mathrm{B})^d(\mathrm{I} - \mathrm{B}^s)^D$. Notice that the reg-ARIMA model as written in (3) assumes that the regression variable $x_{i,t}$ affect the dependent seriesY_t, only at concurrent time points, i.e., model (3) does not explicitly provide for lagged regression effects such a$\beta_i x_{i,t-1}$lagged effects can be included in the X-12-ARIMA program (Balogh, 2007).

RESULTS

Estimation of X-12-ARIMA Model

The outcome shown in **Table 1** demonstrates that the series exhibits seasonality at the one percent level. The automatic likelihood statistics test prefers multiplicative correction and log transformation. This is supported by the graphs in **Figures 1** and **2**. The original series appears to follow the same pattern throughout, based on a visual review of the graph. Therefore, there isn't a compelling reason to cut the series' length (if there is a pattern shift, the point where the new pattern begins may be a new starting point for a series). Additionally, **Figure 1** demonstrates that over ten years, December and, occasionally, March and April experience regular peaks. The multiplicative mode is used to implement the seasonal adjustment to the CIC because, like other economic time series, the amplitude of seasonal changes appears to rise and fall proportionally with the level of the program series. This type of seasonality in a series is referred to as multiplicative seasonality. The ratio-to-moving average method is used to determine the multiplicative components. This indicates that the series is probably seasonal because it consistently peaks in the same month or months. **Tables 2** and **3** include a list of the series along with the start date for the series as well as the date selected for the span statement in the series. The outcomes of the automatics and the final model, regressor, and outlier selections for the smooth, strong, and irregularly seasonal series are shown in **Tables 4** and **5**. For the smooth, strong, and erratic seasonal series, respectively, the models provided by the program of the X-12-ARIMA are (2,1,1)(0,1,1), (0,1,1)(1,0,0), and (4,1,0)(0,1,1). **Table 6** compares the three (3) models that were chosen based on the seasonal adjustment method X-12-ARIMA for projecting the amount of cash in circulation in Nigeria for the years 2012 to 2022. The best X-12-ARIMA model, X-12-ARIMA (2,1,1)(0,1,1), was chosen for forecasting the amount of currency in circulation in Nigeria from April 2022 to December 2022 based on the Average Absolute Percentage Error (AAPE) value in within-sample forecasts: (nine months).

Table 7 shows the X-12-ARIMA diagnostic and modeling results of the original dataset contains seasonality. Multiplicative seasonal adjustment and log transformation are preferred by AICC (with aicdiff=-2.00). The choice of the final automatic model is (2, 1, 1)(0, 1, 1), Easter [8] and user-set holidays (such as Muslim holidays) with recognized outliers of AO2020 are examples of the calendar/holiday effect. Additionally, it was noted that the spectral plot shows at least one visually significant residual trading day peak and that there is no evidence of a lack of normalcy. There are no longer any seasonal peaks in the seasonally adjusted Series spectrum of currency in circulation from January 2012 to March 2022 (see **Figure 3** and **4**) now seasonally adjusted. This result is also confirmed by **Figure 5**.

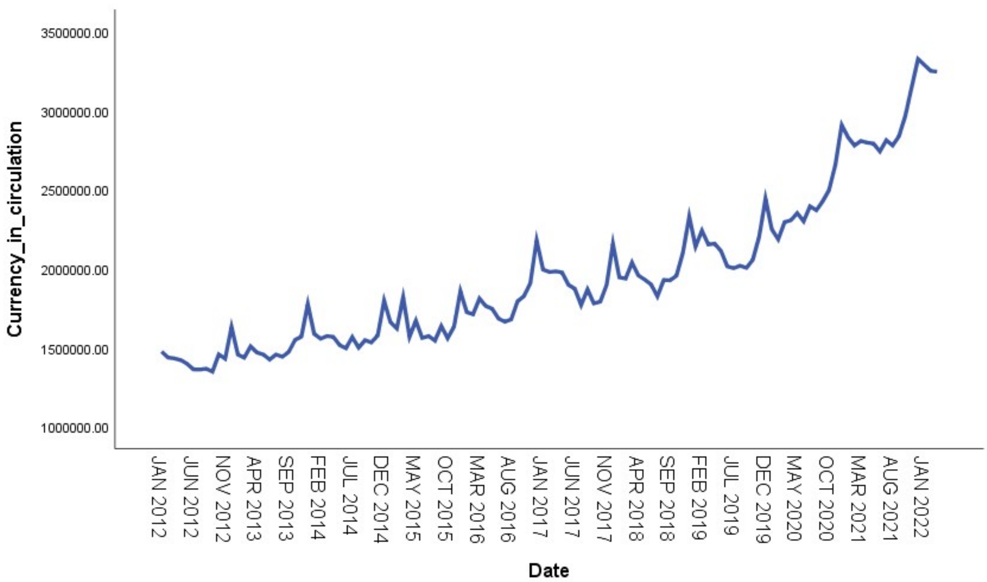

Figure 1. Time plot of the Original Series of Nigeria's Currency in Circulation from January 2012 – March 2022

Table 1. X-12-ARIMA Tests for Seasonality

	Sum of Square	Degree of freedom	Mean square	F-value	P-value
Between Months	3395.9048	11	308.72	105.73	0.0000**
Residual	323.8953	111	2.92		
Total	3719.8001	122			

**Seasonality present at the 0.1 percent level

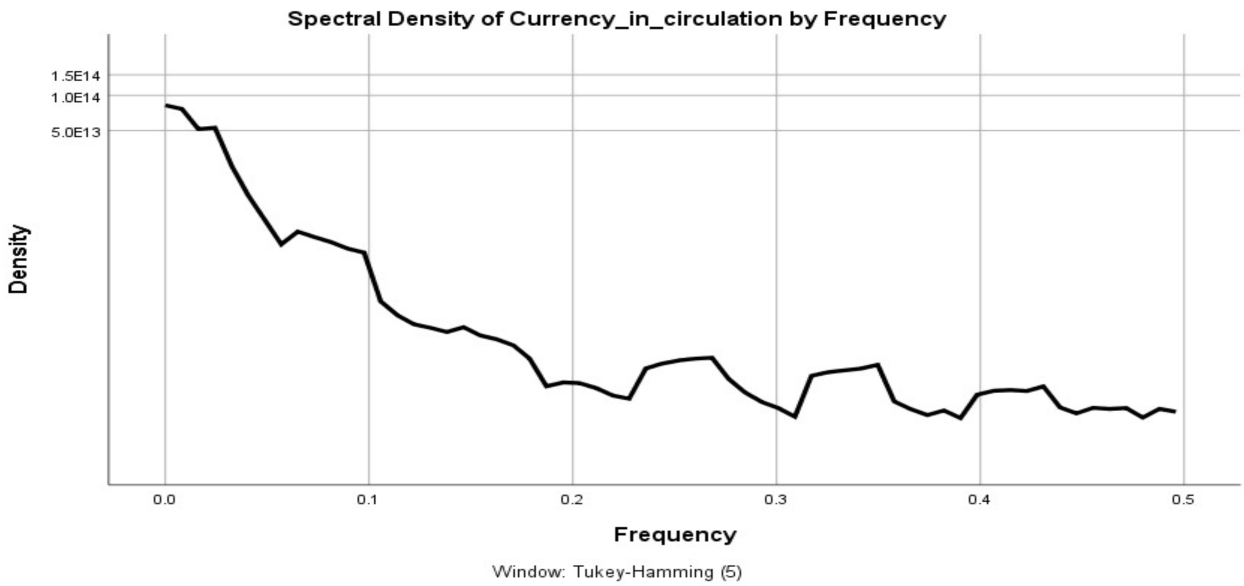

Figure 2. Spectrum Analysis of the Original Series

The spectrum shows visually significant peaks at seasonal frequencies 1/12, 2/12, 3/12,4/12, and 5/12 cycles per month. This means seasonality is present in the original series.

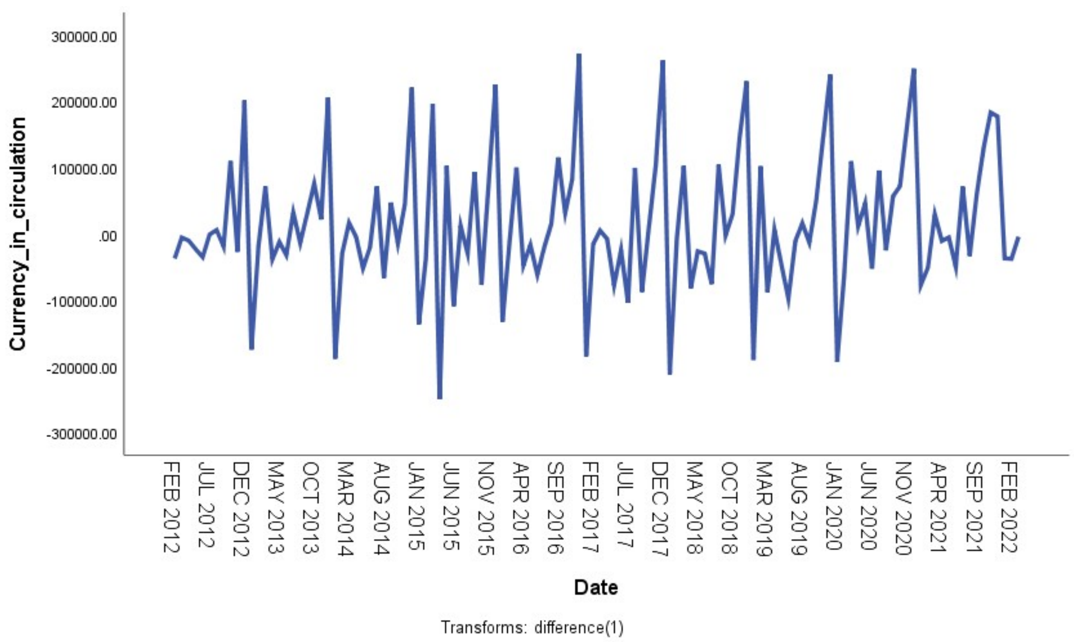

Figure 3. Plot of difference (1) transformed Series of Nigeria's Currency in Circulation from January 2012 – March 2022

Table 2. Original and Chosen Starting Date

Name	Original Starting Date	New Starting Date
Smooth Series CUSTSESR: Currency in Circulation	2012	2012
Strongly Seasonal Series CUSTSESR: Currency in Circulation	2019	2020
Erratically Seasonal Series CUSTSESR: Currency in Circulation	2018	2020

Table 3. Transformation Choices of X-12-ARIMA and TRAMO

Name	X-12-ARIMA	TRAMO
Smooth Series CUSTSESR: Currency in Circulation	Add	Log
Strongly Seasonal Series CUSTSESR: Currency in Circulation	Add	Log
Erratically Seasonal Series CUSTSESR: Currency in Circulation	Add	Add

Table 4. Results of Automatics Model, Regressor and Outlier Selections

Name	Model Selected by automdl	Regressors Chosen by aictest and outlier
Smooth Series CUSTSESR: Currency in Circulation	(2, 1, 1)(0, 1, 1)	
Strongly Seasonal Series CUSTSESR: Currency in Circulation	(0, 1, 1)(1, 0, 0)	TD, Easter[8]
Erratically Seasonal Series CUSTSESR: Currency in Circulation	Currency in Circulation*	LS1996.3

The currency in circulation model was used as the default model. No model was chosen by the automatic model selection procedure.

Table 5. Final regARIMA

Name	Model Selected by automdl	Regressors Chosen by aictest and outlier
Smooth Series CUSTSESR: Currency in Circulation	(2, 1, 1)(0, 1, 1)	
Strongly Seasonal Series CUSTSESR: Currency in Circulation	(0, 1, 1)(1, 0, 0)	TD, Easter[5]
Erratically Seasonal Series CUSTSESR: Currency in Circulation	(4, 1, 0)(0, 1, 1)	LS1996.3

Table 6. Accuracy Comparison in Sample for Different Forecasting Models based on X-12-ARIMA seasonal adjustment method for the Period 2012-2022

Number	Model for Forecasting	AAPE (%)
1	X-12-ARIMA (2,1,1)(0,1,1)	2.129
2	X-12-ARIMA (0,1,1)(1,0,0)	2.665
3	X-12-ARIMA (4,1,0)(0,1,1)	2.131

Table 7. FINAL X-12-ARIMA MODELLED AND DIAGNOSTICS

Model Definition	
Transformation	Log(y)
Regression Model	Constant + Easter[8] + AO2020.sep + User-defined
X-12-ARIMA	(2, 1, 1)(0, 1, 1)
RegARIMA Model span	From Jan 2012 to 2020 Mar
Model Estimation/Evaluation	**Exact ARMA likelihood estimation**
Max total ARMA iteration	1200
Max ARIMA iteration w/in an IGLS iteration	16
Convergence tolerance	1.000e-05
Likelihood statistics for the model with Easter[8]	
Number of observations (nobs)	123
The effective number of observations (nefobs)	110
Number of parameters estimated (np)	9
Log-likelihood	363.5442
Transformed Adjustment	-2254.0574
Adjusted Log likelihood	-1956.433
AIC	3573.5844
AICC (F-corrected-AIC)	3574.5492
Hannan Quinn	3582.7889
BIC	3594.1290

***** AICC (with aicdiff= 0.00) prefers the model with Easter [8] *****

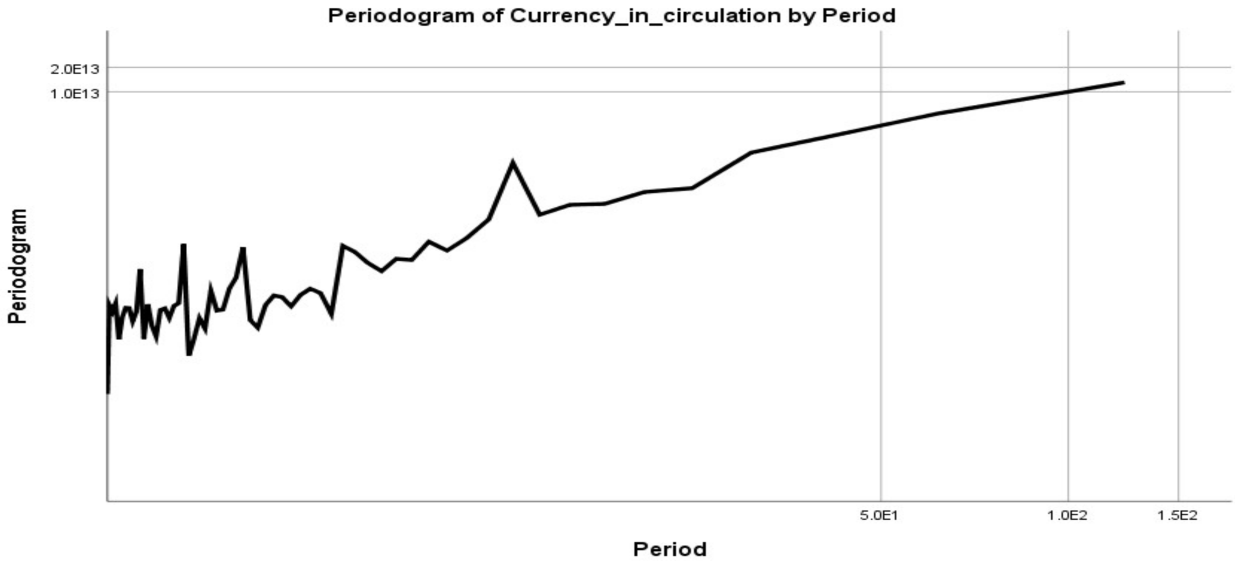

Figure 4. Spectrum of Seasonally Adjusted Series of Currency in Circulation of January 2012 – March 2022

Forecast using X-12-ARIMA Model

Table 8 and **Figure 5** present the results of forecasting by the best of X-12-ARIMA (p,d,q)(P, D, Q) models for the January 2012 – December 2022 currency in Circulation series. It is observed that the predicted CIC value will fluctuate between April to July 2022 and increase steadily from August to December 2022 at an average value of 0.3%, 1.6%, 3.1%, 5.3%, and 6.3% respectively during this period.

Table 8. Forecasts of Monthly Currency in Circulation based on the Selected X-12-ARIMA (2, 1, 1)(0, 1, 1) models during the Period 2012–2022

Period	LCL	Forecast	UCL
Apr 2022	3168734.42	3278027.57	3387320.72
May 2022	3150669.07	3272197.04	3393724.94
Jun 2022	3092289.85	3240390.42	3388490.99
Jul 2022	3128507.03	3291773.09	3455039.14
Aug 2022	3121647.34	3302512.35	3483377.36
Sep 2022	3158136.02	3353297.77	3548459.53
Oct 2022	3242300.25	3451724.32	3661148.39
Nov 2022	3401608.24	3623955.00	3846301.76
Dec 2022	3618767.68	3853572.72	4088377.77

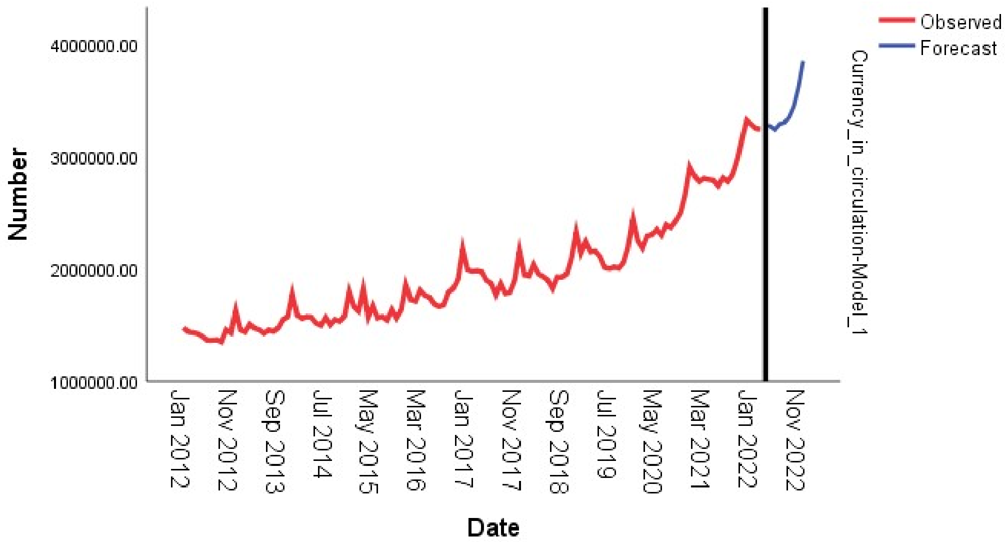

Figure 5. Plot of forecasting currency in circulation in Nigeria for April 2022 – December 2022 based on X-12-ARIMA(0,1,2)(0,1,1)

CONCLUSION AND RECOMMENDATION

In this study, we looked into the most effective X-12 ARIMA seasonal adjustment approach for seasonal adjustment, modeling and predicting Nigeria's CIC between January 2012 and March 2022. The data about Nigeria's legal tender was taken from the Central Bank of Nigeria's online database. The X-12-ARIMA model chose the Regression Model = Constant + Easter [8] + AO2020.sep + User-defined (Muslim Moving Holidays) after seasonally adjusting the series. Since the ARIMA (2, 1, 1)(0, 1, 1) model has the lowest Average Absolute Percentage Error (AAPE) of 2.13%, it is the most appropriate model for the data. According to the analysis, the monthly series of Nigeria's CIC from January 2012 to December 2022 shows substantial seasonal impacts.

The study's findings show that given the years taken into account, the amount of money in circulation is gradually increasing. The growth of the Nigerian currency in circulation from August to December 2022 will continue to follow the same trend and will increase steadily, increasing by an average of 0.3%, 1.6%, 3.1%, 5.3%, and 6.3%. Having predicted and modeled the flow of money in the Nigerian economy, we urge increased central bank independence to lessen the impact of fiscal pressure on monetary policy and to improve tactics for controlling the country's money supply. Additionally, we suggest addressing the problems with policy accountability and transparency. These will provide a better decisions making, formulation of sound financial policies, and adjustment in future plan and strategies for CIC in Nigeria's central bank and other international banks.

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