KOGI JOURNAL OF MANAGEMENT
VOL. 7 No. 3, September, 2021
http://kogmanjourn.com.ng


# AN ANALYSIS OF FACTORS RESPONSIBLE FOR INFLATION DYNAMICS IN NIGERIA: PRINCIPAL COMPONENT ANALYSIS

**[1]Agya Atabani Adi; [2]Amadi W. Kingsley & [3]Nyiputen Ishaku Rimamtanug**

[1]Department of Economics,
Faculty of Humanities, Management and Social Sciences,
Federal University Wukari,
Taraba State, Nigeria.

**Abstract**

*The paper employed principal component analysis to identified factors responsible for inflationary pressure in Nigeria, spanned second quarter 2015 to first quarter 2018. Several well recognized criteria for factorability of a correlation were used. It was found that 19 items correlated at least 0.4 with other factors and sample is adequate and sphericity was significant. The first three PCs explained 94.30 percent of the total variability in inflation. The first component explained 53.59 percent; second component 27.79 percent of the variance while third component account for 10.92 percent of the variance. Component 1 is denoted as Food crop factor, Component 2 is energy factor while component 3 is denoted as Cash crop factors. Hence, we conclude that inflation in the period under reviewed is driven by increase in food crops price, energy prices and cash crop price were the major factors that fueled recent episode of inflation in Nigeria. We recommend that Government should take proactive step to increase food production on sustainable bases. Energy price should be cut down as short term measure while a sustainable measure aim at increased local production of petroleum products and Government should rapidly improve power generation and better distribution for commercial and domestic uses should be put in place*

***Keyword:*** *Inflation factors, Inflation dynamics, Principal Component Analysis, Nigeria Economy.*

## INTRODUCTION

Nigeria had experienced unprecedented rise in general price level (inflation) in the past three and half years. The consequence of persistent rise in price level is felt in all strata of the economy. Individuals and household saw their livelihood and living condition deteriorated on daily basis. Also, aggregate demand slumped led the economy falling into a recession for more than a year.

The importance of inflation is premised on distortions that high inflation can exert on domestic macroeconomic conditions, with potential to derail the economy from sustainable economic growth path and development. Inflation adversely affects the overall growth,

financial sector development and vulnerable poor segment of the population. It also induces uncertainty, discourages savings, promote consumption, poses serious threat to macroeconomic stability and result in high social costs (Greenidge and Dacosta, 2009; Ratnasiri, 2009; Aurangzeb and Haq, 2012; Bawa and Abdullahi, 2012 and Amadi and Agya, 2018).

Though, inflation encourages investment and production, which increase growth in wages and consumption. But, high inflation rate in the range of double digit may produce negative economic effect. This will adversely affect purchasing power of consumer. It can lead to uncertainty in value of gains and losses, borrowers and lenders as well as buyers and sellers (Abdul, Syed and Qazi, 2007). Furthermore, higher level of inflation creates uncertainty which discourages savings and investment. Savings are discouraged as inflation reduces the real rate of return on financial assets. This again leads to low investment and declining economic growth. High inflation rate erodes gains from growth and leaves the poor worse off, thereby increase the divide between the rich and poor in the society. A high inflation rate resulted from increase in food prices; it hurts the poor because of their high marginal propensity to consume. Inflation in 2018 is expected to remain high at double digit levels in Nigeria, reflecting persistent effects of past inflationary shocks coming from sharp currency devaluation in both official and parallel exchange rates, as well as increase electricity and fuel prices in Nigeria.

There has been enormous researched on cause, impact and factors that determined inflation in Nigeria at macro level over the years. However, inflation in Nigeria and world over is not just an aggregate phenomenal. There are micro level triggers or shock to the economy that usually set off a chain reaction in an economy. There is a need to take microscopic view of inflation in the past two and half years, by looking at subsector of the economy. In this study we employed component analysis to determine the outlining factors that explained variation in inflation dynamics in Nigeria and first to apply this method to study inflation dynamics in Nigeria.

The rest of the paper is organized as follows: section II review related literature, section III present econometric methodology employed. Chapter IV deals with analyses and discussion of result while section V concludes the paper and policy recommendations.

**LITERATURE REVIEW**

Sulaiman (2015) examines price stability effect of Nigerian monetary policy from 1981 to 2012. Error correction model (ECM) was employed. He posits that monetary policy had not played prominent role in ensuring price stability. Treasury bill and policy interest rate are significant factors to reduce price instability while liquidity ratio and exchange rate are insignificant to reduce price instability in Nigeria. Saibu and Oladeji (2004) examined monetary policy effect in inflation control in Nigeria. They investigate whether the ineffectiveness of monetary policy could be explained in term of non-credibility of policy and loss of public confidence monetary policies; they used quarterly data set from 1970 to

2000 for Nigeria economy. They adopted rational expectations framework and specified a monetarist's model with agent's expectation formed rationally using two stage least square (TSL) techniques. They found public response to government monetary policy was sluggish and with persistent lags. They also found unanticipated rather than anticipated policy was significant in determining the inflation trend for Nigeria. This implied inconsistence and incredible monetary policy framework in Nigeria.

Doyin and Kelikume (2012) examined the quantity theory relationship between money and price volatility in other to determine if inflation is always and everywhere a monetary phenomenon. They used quarterly time series data spanned 1970 to 2011. They employed autoregressive distributed lag (ARDL) methodology. Contrary to quantity theory, inflation is not always and everywhere a monetary occurrence in case of Nigeria casting serious doubt on the continuous used of monetary policy instrument as a way of attaining price stability in Nigeria. Also, Amassoma, Nwosa and Olaiya (2011) posit that monetary policy exert statistical significant impact on money supply and exchange rate while monetary policy was observed to have exert insignificant influence on price stability in Nigeria. Many critics have argued the wisdom in employing monetary policy instrument to controlled inflation. For instance, Mishra (2012) argued monetary policy is of no effect because inflation arises from importation. On the contrary, Svensson (2000) argued that there is close relationship between inflation rate and monetary policy, monetary policy can checkmate or aggravate inflation.

Apanisile and Taiwo (2013) examined inflation targeting monetary policy approach adopted in Nigeria by employing Taylor policy rule. They used quarterly data from 2000:1 to 2010:4 and Engle-Granger Co-integration approach. The result shows monetary policy function was effectively implemented in order to achieve price stability in the economy that is enmeshed with persistent inflation for a very long time.

Okwo, Eze and Nwoha (2012) evaluate the effectiveness of monetary policy impact on macroeconomic stability in Nigeria, the study covered 1985 to 2010, using simplified ordinary least squared technique. Monetary policy rate, net credit to the government, credit to private sector has insignificant impact on gross domestic product while monetary policy has been ineffective in curbing price instability in Nigeria. Imimole and Enoma (2011) examined effect of exchange rate depreciation on price instability in Nigeria, spanned the period of 1986-2008, they applied ARDL Model. They found real gross domestic product, money supply and real effective exchange rate depreciation were the major determinants of price instability. Naira depreciation has positive and significant long run impact on price stability. Exchange rate depreciation brings about acceleration in inflation rate. They also found inflation rate in Nigeria has a lagged cumulative effect. They concludes that Naira depreciation is important factor in attaining an improvement in production of exportable products, however, they caution on reliance on exchange rate as a potent instrument in curbing inflationary pressure in Nigeria. Kromtit (2015) held that monetary policy rate exert

positive statistical insignificant effect on inflation rate; broad money supply and exchange rate impacts negative and insignificant on inflation rate, and economic growth has significantly impacted positively on inflation rate in Nigeria, this results provide evidence of price puzzle and validate ineffectiveness of monetary policy to stabilize prices in Nigeria. Danjuma, Jibrin and Blessing (2012) investigates the effects of monetary policy on inflation in Nigeria in combination with reviews of inflation theories. They showed that liquidity ratio and interest rate were the main monetary policy variables that could be employed to curb inflationary pressure in Nigeria. Chuku (2009) employed exchange rate, domestic credit, money supply (M2) and gross domestic product to study the effect of monetary policies on inflation in Nigeria, spanning 1980 to 1995. The results showed that M2 and exchange rate exert negative impact on inflation; however, inflation was significantly impacted by exchange rate during the period while M2 was not. Ojo (1979) reviewed developments of major inflationary trend in Nigerian economy. He showed that inflationary trend started soaring in the country at the end of the civil war in 1970, and factors responsible for the upward inflationary trend includes production disruption during the civil war period and wage increased by Adebo and Udoji committee. Kermal (2006) state that money supply in long run has positive impact on inflation rates and quantity theory of money holds in long run. He emphasized that inflation is a monetary phenomenon and short run money supply has weak influenced on inflation, an average of three quarters are required to propagate impact.

Ezekiel (2013) attribute the inability of CBN to mob up excess liquidity in the economy with tightening monetary policy to exogenous factor operating in the economy. In the same token, the exogenous factor destabilizing steady advancement of growth in the economy that would have evolves from a relaxed monetary policy. That exchange rate is more effective instrument to achieved price stability than monetary policy rates. Omanukwue (2010) evaluate effectiveness of modern quantity theory of money, he used quarterly time series of Nigeria for the period of 1990:1-2008:4. Engle-Granger two stage approaches for co-integration to determined existence of long run relationship among prices, broad money, output, interest rate and ratio of demand deposits/time deposits as proxy for financial development and found explicit evidence of long-run relationship compatible with quantity theory of money. That restrictions imposed by quantity theory of money on money supply and real output do not hold in an absolute sense. This study established existence of weak uni-directional causality from money supply to consumer prices in Nigeria.

Abidemi (2013) states the ability of monetary policy to achieve major objective of price stability has not been successful in Nigeria, especially in long run. There is no evidence of synchronization among different monetary policy variable towards achieving price stability in Nigeria. The interest rate has shown very weak potential in signaling price level movement in Nigeria. Adamgbe (2004) examined relationship between price instability, inflation expectation and monetary policy in Nigeria. He applied maximum likelihood

estimator and GARCH model to determine inflation steady state model. He found that inflation expectation and price volatility does not only influence inflation contemporaneously, it also results in persistence in monetary growth and interest rate differential, hence compromising monetary policy objective.

**METHODOLOGY**

Principal Component Analysis (PCA), is a data analysis tool that is usually used to reduce the dimensionality (number of variables) of a large number of interrelated variables, while retaining as much of the information (variation) as possible. PCA calculates an uncorrelated set of variables (factors or PC's). These factors are ordered so that the first few retain most of the variation present in all of the original variables.

Let X be a vector of p random variables, the main idea of the PC transformation is to look for a few (< p) derived variables that preserved most of the information given by the variance of the p random variables (Jolliffe, 2002). Let the random vector $X^{'}$ = [$X_1$, $X_{1,\ldots,}$ $X_P$] have the covariance matrix with Eigen-values $\lambda_1 \geq \lambda_2 \ldots \geq \lambda_p \geq 0$.

Suppose we have linear combinations

$$Y_j = \alpha_j^{'} X = \alpha_{j1} X_1 + \alpha_{j2} X_2 + \ldots + \alpha_{jp} X_p = \sum_{k=1}^{p} \alpha_{jk} X_k,$$

…1,2,,…,p of the element of X where $\alpha_j$ is a vector of p components $\alpha_{j1,}$ $\alpha_{j2,}$…, $\alpha_{jp}$.

Then

$$Var(Y_j) = \alpha_j^{'} \sum \alpha_j \qquad \text{j=1,2,…p……..(1)}$$

$$Var(Y_j, Y_k) = \alpha_j^{'} \sum \alpha_k \qquad \text{j, k=1,2,…p……..(2)}$$

The PCs are those uncorrelated linear combinations $Y_1$,$Y_2$,…,$Y_p$ whose variances in (1) are as large as possible (Richard and Dean, 2001). In finding the PCs we concentrate on the variances. The first step is to look for a linear Combination $\alpha_1^{'} X$ with maximum variance, so that

$$\alpha_1^{'} X = \alpha_{11} X_1 + \alpha_{12} X_2 + \ldots + \alpha_{1p} X_p = \sum_{k=1}^{p} \alpha_{1k} X_k$$

Next, look for a linear combination $\alpha_2^{'} X$ uncorrelated with $\alpha_1^{'} X$ having maximum variance, and so on, so that at the k$^{th}$ stage a linear combination $\alpha_k^{'} X$ is found that has maximum variance subject to being uncorrelated with $\alpha_1^{'} X, \alpha_2^{'} X, \ldots, \alpha_{k-1}^{'} X$ . The k$^{th}$ derived variable $\alpha_k^{'} X$ is the k$^{th}$ PC up to p PCs could be found, but we have to stop after the q$^{th}$ stage (q ≤ p) when most of the variation in X have been accounted for by q PCs.

- The variance of a PC is equal to the Eigen-value corresponding to that PC,

$$Var(Y_j) = \alpha_j' \sum \alpha_j = \lambda_j \qquad j=1, 2,\ldots p$$

- The total variance in a data set is equal to the total variance of PCs

$$\sigma_{11} + \sigma_{22} + \ldots + \sigma_{pp} = \sum_{j=1}^{p} Var(X_j) = \lambda_1 + \lambda_2 + \ldots + \lambda_p = \sum_{j=1}^{p} Var(Y_j)$$

The data was standardized for the variables to be of similar scale using a common standardization method of transforming all the data to have zero mean and unit standard deviation. For a random vector $X'$ = [$X_1$, $X_{1,\ldots,}X_P$] the corresponding standardized variables are:

$$Z = \left[ Z_j = \frac{(X_j - \mu_j}{\sqrt{\sigma_{jj}}} \right] \qquad j=1,2,\ldots,p$$

This can be represented in matrix notation thus

$$Z = \left(V^{1/2}\right)^{-1} (X - \mu)$$

Where $V^{1/2}$ is the diagonal standard deviation matrix. Thus Z(E)=0 and Cov(Z)= ρ□□□.

The PCs of Z can be obtained from eigenvectors of the correlation matrix of X. All our previous properties for X are applied for the Z, so that the notation $Y_j$ refers to the $j^{th}$ PC and ($\lambda_j, \alpha_j$) refers to the Eigen-value-eigenvector pair. However, the quantities derived from $\sum$ are not the same from those derived from ρ (Richard and Dean, 2001).

The $j^{th}$ PC of the standardized variables $Z'$ = [$Z_1$, $Z_{1,\ldots,}Z_P$] with cov(Z)=ρ, is given by:

$Y_j = \alpha_j' \left(V^{1/2}\right)^{-1} (X - \mu)$ , so that

$$\sum_{j-1}^{p} Var(Y_j) = \sum_{j-1}^{p} Var(Z_j) = p \qquad j=1, 2,\ldots,p$$

In this case, ($\lambda_1, \alpha_1$), ($\lambda_2, \alpha_2$),…($\lambda_p, \alpha_p$) are the Eigen value-eigen vector pairs for ρ with $\lambda_1 \geq \lambda_2 \geq \ldots \geq \lambda_p \geq 0$)

**Determination of Principal Components**

The loading or the Eigen-vector is the measure of the importance of a measured variable for a given PC. When all elements are positive, the first component is a weighted average of the variables and is sometimes referred to as measure of inflation rate. Likewise, the positive and negative coefficients in subsequent components may be regarded as inflating factors (Rencher, 2002 and Printcom, 2003). The plot of the first two or three loadings against each other enhances visual interpretation (Soren, 2006).

The score is a measure of the importance of a PC for an observation. The new PC observations $Y_{ij}$ are obtained simply by substituting the original variables $X_{ij}$ into the set of the first PCs. This gives

i=1, 2,…,n, j=1, 2,…,p

The plot of the first two or three PCs against each other enhances visual interpretation (Soren, 2006).

**The Proportion of Variance**

Data was analyzed using simple percentage method and Cochran Q - Test. The formula for the percentage method is denoted by:

$$\varpi_q = \frac{\sum_{j=1}^{p} \lambda_j}{P} = \frac{\sum_{j=1}^{q} Var(Z_j)}{P}$$

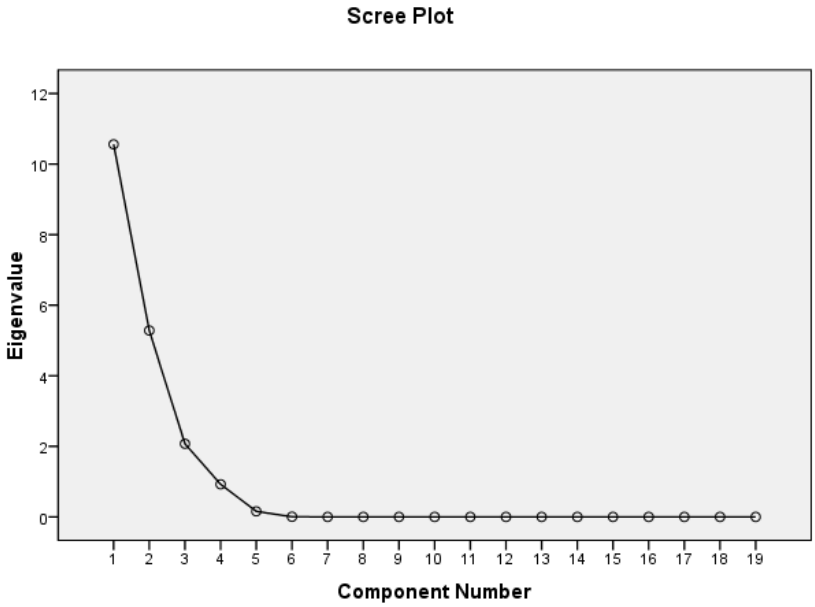
A cumulative proportion of explained variance is a useful criterion for determining the number of components to be retained in the analysis. A scree plot provides a good graphical representation of the ability of the PCs to explain the variation in the data (Cattell, 1966).

**PRESENTATION OF RESULT AND DISCUSSION**

**Principal component analysis (PCA)**

We initiate the analysis with 35 factors for component analysis to determine inflation base on economic theory and including factors that are relevant to Nigeria situation were examined. Several well recognized criteria for factorability of correlation were used. Firstly, 19 of the 35 items correlated at least 0.4 with at least one other factor, suggesting reasonable factorability. Secondly, the Kaiser-Meyer-Oblimin measure of sampling adequacy was 0.75, well above recommended value of 0.6, and Bartlett's test of sphericity was significant ($\chi^2$ (780)=2.85, (0.00) < *p* < (0.05). The Cronbach's Alpha reliability test is .84. The diagonals of anti-image correlation matrix were all over 0.5, supporting inclusion of each item in the component analysis. Finally, the communalities were all above 0.5 further affirmed each item shared some common variance with other items. Given these overall indicators, component analysis was conducted with 19 items.

**Figure 1 Scree Plot**




*Source: Author Computation*

**Table 1: Eigen-values and Percentage Variance explained by each factor**

| Component Number | Eigen-values | Percentage of explained Variance | Cumulative Percentage explained Variance |
|---|---|---|---|
| 1 | 10.561 | 55.585 | 55.585 |
| 2 | 5.282 | 27.799 | 83.384 |
| 3 | 2.074 | 10.915 | 94.300 |
| 4 | .923 | 4.860 | 99.159 |
| 5 | .156 | .823 | 99.982 |
| 6 | .003 | .017 | 100.000 |
| 7 | 4.697E-5 | .000 | 100.000 |
| 8 | 1.974E-6 | 1.039E-5 | 100.000 |
| 9 | 5.427E-9 | 2.856E-8 | 100.000 |
| 10 | 2.811E-9 | 1.480E-8 | 100.000 |
| 11 | 2.382E-10 | 1.254E-9 | 100.000 |
| 12 | 1.731E-10 | 9.112E-10 | 100.000 |
| 13 | 9.712E-11 | 5.111E-10 | 100.000 |
| 14 | 7.541E-11 | 3.969E-10 | 100.000 |
| 15 | 5.436E-11 | 2.861E-10 | 100.000 |
| 16 | 1.963E-11 | 1.033E-10 | 100.000 |
| 17 | 7.213E-12 | 3.796E-11 | 100.000 |
| 18 | 8.935E-13 | 4.703E-12 | 100.000 |
| 19 | 2.218E-16 | 1.167E-15 | 100.000 |

*Source: Author Computation*

The starting pointing in PCA is to determine the number of PCs. We employed Kaiser‟s selection criterion, which is consistent when factors are less than 30, to determine the factors or components to retain that provide maximum possible information on the phenomenon under investigation. According to Kaise's rule, all PCs with Eigen values greater than 1 should be retained. This leave us with first three PCs which explained 94.30 percent of the total variability in inflation from the data set as shown in table 4.3 and figure 4.1 displayed scree plot which shows the elbow appeared at the third component. For instance, the first component explained 53.59 percent of the variance, the second component explained 27.79 percent of the variance whiles the third component explained 10.92 percent of the variance. Therefore, we retain three components which explained 94.30 percent of information contain in these factors.

Hence, it is appropriate to state that first three components explained 94.30 percent of the total variation in the original data set and successfully reduce the dimensionality of the data from 19 to 3.

**Table 2: Loading Matrix of Component Solution Weight**

| Factors | Component 1 | Component 2 | Component 3 |
|---|---|---|---|
| Beans | .646 | -.496 | .570 |
| Cassava | .672 | -.439 | .595 |
| Cocoyam | .945 | -.041 | -.217 |
| Cotton | .899 | -.033 | **899** |
| Groundnut | .653 | -.485 | **.570** |
| Guinea Corn | .681 | -.424 | **.596** |
| Maize | **.955** | .709 | .234 |
| Melon | .904 | -.022 | -.287 |
| Millet | **.969** | -.148 | -.246 |
| Rice | **.968** | -.042 | -.188 |
| Yam | .373 | .781 | .234 |
| Oil Palm Fruit | .265 | .822 | .076 |
| Retail | .370 | -.126 | -.237 |
| Wholesale | **.906** | -.023 | -.180 |
| Electricity Tariff | .385 | **.870** | .233 |
| Petrol and energy price | .280 | **.821** | .080 |
| Transportation | .955 | -.119 | -.234 |
| Sales Maintenance | **.969** | -.029 | -.183 |
| Repair Motor Vehicle | | | |
| Motorcycles | | | |
| Export | .401 | .864 | .230 |

***Source:*** *Author computation*

After determining the component to retained, the next step is to look at the content of variables that load onto the same factor to identify common themes. Visual inspection of table 4.4, the coefficients of variables in each PC and combined with exact values of these coefficients (also known as loading matrix of PCA). We can clearly deduce which variables are dominant in each PC. For instance, Component 1 is dominated by food crop variables in absolute term, hence is denoted as Food factor. Component 2 is dominated by Energy variables factor and denoted as Energy factor while component 3 is dominated by cash crop variables, hence we denote it as Cash crop factors.

## CONCLUSION AND RECOMMENDATIONS

The paper employed principal component analysis to identified factors responsible for inflationary pressure in Nigeria, spanning second quarter of 2015 to first quarter of 2018. Several well recognized criteria for factorability of a correlation were used. It was found that 19 of the 35 items correlated 0.4 with at least one other factor. Kaiser-Meyer-Oblimin measure of sampling adequacy was 0.75 and Bartlett's test of sphericity was significant ($\chi^2$ (780) =2.85, (0.00) < $p$ < (0.05). The Cronbach's Alpha reliability test is .84.

The diagonals of anti-image correlation matrix were all over 0.5. The communalities were all above 0.5 further affirmed that each item shared some common variance with other items.

Our result showed first three PCs explained 94.30 percent of total variability in inflation. The first component explained 53.59 percent of variance, the second component 27.79 percent of variance whiles the third component 10.92 percent of the variance. Hence the first three components explained 94.30 percent of information contain in these factors.

Component 1 is denoted as Food factor, Component 2 is denoted as energy factor while component 3 is denoted as Cash crop factors. Hence, we conclude that inflation in period under reviewed is driven by increased in price of food crops, increases in energy prices especially petroleum products and cash crop price especially imported once, were the major factors that fueled recent episode of inflation in Nigeria that culminated in recession. However, our analysis did not take into account policy factors due to lack of data. We recommend thus; government should take proactive step aim at increasing food production on sustainable bases. Energy price should be cut down as short term measure while sustainable measure aim at increase local production of petroleum products and Government should rapidly improve power generation and better distribution for commercial and domestic uses should be put in place.

**REFERENCES**

Abidemi, C. A. (2014) A Dynamic Analysis of Monetary Policy and Price Stability in Nigeria', Department of Economics, Adeyemi College of Education, Ondo.

Adamgbe, E. T. (2004) Price Volatility, Expectation and Monetary Policy in Nigeria, JEL Code: C22, C32, D84, E31, E40, E5, E60, [online], pp. 1-18, Available: www.google.com.ng, [28th July, 2018].

Amassoma, D., Nwosa P. I. & Olaiya, S. A. (2011) An Appraisal of Monetary Policy and Its Effect on Macro Economic Stabilization in Nigeria, Journal of Emerging Trends in Economics and Management Sciences, 2(3):232-237.

Apanisile, O. T. & Taiwo, A. (2013) Inflation Targeting Monetary Policy Rule in Nigeria: Estimates of the Policy Reaction Function, International Journal of Economics and Finance, 5(7):139-144.

Aurangzeb. A and Haq, A. U. (2012) Determinants of Inflation in Pakistan, Universal Journal of Management and Social Sciences, 2 (4):89-96.

Bawa, S. and Abdullahi, I. S. (2012) Threshold Effect of Inflation on Economic Growth in Nigeria, CBN Journal of Applied Statistics, 3(1):43 -63.

Cattell, R.B. (1966) The Screen test for the number of factors. Multivariate Behavioural Research, 1, 245-276.

Chuku A. C. (2009) Measuring the effects of monetary policy innovations in Nigeria: a structural vector autoregressive (SVAR) approach', African Journal of Accounting, Economics, Finance and Banking Research, 5(5):112-129.

Danjuma, I., Jibrin, S. M. & Blessing, S. E. (2012) 'An assessment of the effectiveness of monetary policy in combating inflation pressure on the Nigerian economy', Erudite Journal of Business Administration and Management, 1(1):7-16.

Doyin, S and Kelikume, I (2012) Is Inflation Always And Everywhere A Monetary Phenomenon? The Case of Nigeria, Global Conference on Business and Finance Proceedings, 7(2): 296-307.

Ezekiel, O. (2013) Achieving Price Stability in Nigeria: Monetary Policy Rate Approach vs. Foreign Exchange Policy Approach', Australian Journal of Business and management Research, 3(02):32-43.

Greenidge, K. and DaCosta, D. (2009) Determinants of Inflation in Selected Caribbean Countries, Business, Finance and Economics in Emerging Economies, 4(2):371-397.

Imimole, B. & Enoma, A. (2011) Exchange Rate Depreciation and Inflation in Nigeria (1986-2008), Business and Economics Journal, 2011: BEJ-28.

Jolliffe, I. T. (2002) Principal Component Analysis. 2nd edn, Springer-Verlag, New York.

Kemal, M. A. (2006) Is Inflation in Pakistan a Monetary Phenomenon?', The Pakistan Development Review, 45(2): 213-220.

Kromtit, M. (2015) Monetary Policy and Inflation in Developing Economies: Evidence from Nigeria's Data, Proceedings of 4th European Business Research Conference 9 - 10 April 2015, Imperial College, London, UK.

Okwo, I. M., Eze, F. and Nwoha, C. (2012) Evaluation of Monetary Policy Outcomes and Its Effect on Price Stability in Nigeria, Research Journal of Finance and Accounting, 3(11):37-47, Available" www.iiste.org, [17th February, 2018].

Omanukwue, P. N. (2010) The quantity theory of money: Evidence from Nigeria, Central Bank of Nigeria Economic and Financial Review, 48(2): 91-107.

Ratnasiri, H. P. G. S. (2009) The Main Determinants of Inflation in Sri Lanka: A VAR based Analysis, Central Bank of Sri Lanka Staff Studies, 39(1 & 2):12-35.

Rencher, A. C. (2002) Methods of Multivariate Analysis. 2nd edn, John Wiley & Son, New York.

Richard, A. J. and Dean, W. W. (2001) Applied Multivariate Statistical Analysis. 3rd edn, Prentice-Hall, New Delhi.

Saibu, F. & Oladeji, L. (2004) Monetary Policy and Inflation Control: The Relevance of Rational Expectation Hypothesis in Contemporary Nigeria', The India Journal of Economics, LXXXIV(335): 555-568.

Soren, H (2006) Example of multivariate analysis in R-Principal component analysis (PCA). httpgene://tics.agrsci.dk/statistics/courses/Rcourse-Djf2006 / day3/ PCA-notes.

Sulaiman, L. A. (2015) An empirical analysis of price stability effect of Nigerian monetary policy (1981-2012), Public and Municipal Finance, 4(1):37-42.