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IMPACT OF FOOD BEVERAGE PRICE INDEX AND EXCHANGE RATE VOLATILITY ON ECONOMIC GROWTH

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ABSTRACT

Many factors such as money supply, exchange rate, interest rate, gross domestic product, inflation rate, unemployment rate, frictional unemployment and other flow variables have great impact on economic growth rate. These factors have significant effect on capital movement, business outlook and economic development. Over past decades, numerous studies have used these variables to investigate their impact on economic growth especially using the econometric approach. Results obtained from such studies have motivated further research. However, this research seeks to address the impact of food, beverage price index and exchange rate volatility on economic growth using annual time series data for the period: 1980 to 2010. The research entailed the use of three different unit root test techniques, Engle Granger step procedure for cointegration test, vector error correction mechanism, variance decomposition, Johansen trace test, impulse response function, Engle Granger causality test and vector auto regression. The research findings reveal that Argumented Dickey Fuller test method was the best method to identify Stationarity at 2nd difference i.e. I (2). A long run relationship was found to exist among the variables since the error of the cointegrating regression was stationary, and a singleton of long run relationship was found based on the result obtained from Johansen trace test. An independent causality was observed among the variables i.e. lagged values of real exchange rate and food beverage price index do not correlate with the lagged values of real gross domestic product rate. Statistical and positive / negative relationships were observed for real exchange rate and food beverage price index respectively. Real exchange rate has a significant effect on real gross domestic product in both long and short runs while food beverage price index has a significant effect in short run but a slight effect on real gross domestic product in long run. Short run disequilibrium was exhibited by vector error correction indicating that at about 90.1% the error will be corrected in the next period which shows that real gross domestic product will converge to its equilibrium when there is a sudden change or shock between real exchange rate and food, beverage price index.

Keywords: Univariate cointegration test, Johansen trace test, Vector error correction, Vector auto regression, Causality, Impulse response function.

Contribution/ Originality

10 years back, studies of flow variables and all other macroeconomic variables have been used to study effect on economic growth rate using econometric approach. Hence results obtained have motivated for further research. This paper makes the use of "*Time series econometrics*" as alternative approach to justify on how macroeconomic variables affect economic growth rate. It was realized that fluctuation of real exchange rate has a significant effect on real gdp in both long and short run relationship while food, beverage price index do have significant in short run but slight effect on real GDP growth rate in long run.

1. INTRODUCTION

A large body of research suggested that some commodity price, stock index fluctuate with exchange rate volatility and which leads to consequences on real economic growth activity. Also many factors such as enterprise performance, dividend stock of other price of other countries, reer, gdp, exchange rate, interest rate, or in general all other financial variables have great impact on economic growth. With little view Rabah *et al.* (2012) looked at the impact of commodity price and exchange volatility from South Africa's capital account liberation and confirms that prior to capital account liberation, the causality runs from south African *Rand* to *Gold* volatility but the causality runs the other way around for the post – liberation period. From this view, it records that the *gold* price volatility plays a key role in explaining both the excessive exchange rate volatility and current disproportionate share of speculative (short run) inflows. Considering a research of Aghion and Banerjee (2005) explore the various causal connections between the trend growth of output and the volatility of output and the trend, concluding from empirical cross country evidence that volatility hurts economic growth. Aghion *et al.* (2009) often an empirical evidence that real exchange rate volatility can have a significant impact on the long term rate of economic growth productivity, but the effect depends on a country's level of financial development. Relationship between commodity indexes and exchange rate volatility as continue improve or increase as improve in capital movement and they have some keys to success of determinant of business profitability and equity prices. The relationship between both has preoccupied the minds of economist and time series analyst, since they play important roles in the fluency of the development of a country. In the recent years, because of increasing the international diversification, cross market, return correlation, the two markets have become interdependent. These changes have increased the variety of investment opportunities as well as volatility of exchange rate and risk of investment decisions and portfolios diversification process. Understanding this relationship will help domestic nation for hedging and diversifying process. This understanding these relationships will help to predict the future trend of each other, though economic theory suggest that real exchange rate have great impact on commodity price index, cash flows, investments, profitability of firms and economic growth. There is no consensus about these relationships and empirical studies is inclusive. However, the linkage between financial and

commodity price can be established through the instrument of demand for money, interest rate, for example, real exchange rate changes affects the competitiveness of firms through the impact of inputs and outputs. When real exchange rate appreciate, since importers will lose their competitiveness in international markets, the sales and profit of exporters will shrink and the commodity price index will decline and these will lead to a little down fall in economic growth. The question is "what are the financial variables and the commodities variables we need to consider to illustrate the impact on economic growth and "how" they can be carried out to develop a relationship between them for the development of a country. Research as shown that there are series of financial variables and economic variables have been linked to study their effect on economic growth like the impact of oil shock, exchange rate volatility on economic growth found out that oil shock does not affect output and inflations in Nigeria, but the oil shock do play an important or significant influence on the real exchange rate which gives rise to wealth effect on the appreciation of the real exchange rate. Also exchange rate and the consumer price index in Nigeria was carried out and found that there was less significance between autonomous exchange rate and the consumer price index than the official rate. Research also proceed on exchange rate variation and inflation rate in Nigeria (Omosewalu, 2007) and found out that some financial variables like exchange rate, inflation rate, oil revenue follows a random walk and that they all cointegrated which reveals that no long term relationship exist between inflation rate and exchange rate , but short term relationship exist between them. More research shows that financial variables like exchange rate entails large real cost to the economy (Antonio, 2004), among the harmful effect of real exchange rate, the negative consequence of real exchange rate volatility is of particular interest or concern. Volatile periods are hectic periods with price fluctuations. Intuitively such period reflects commodity indexes uncertainty about the fundamental in the economy systems. opined that higher financial variables (exchange rate) leads to greater volatility and higher exchange rate is detrimental to economic growth. This lack of exchange rate stability exerts on commodity indexes, have harmful effect on the economy not even only through changes in exchange but also through increases in rate uncertainty. So in this research findings, we less about how exchange rate volatility, commodity price index (food beverage) affects economic growth, using Nigeria as a case study. This research emphasis on their relationship between them and how they both contribute to the effect on Nigeria economy. The research questions here come:

- Does real exchanger rate volatility and commodity price index have any significant impact on economic growth in Nigeria?
- What is the direction of causality among food, beverage price index, real exchange rate and economic growth rate of Nigeria? In other words does each (FBPI, REER) granger cause growth rate?
- Is there any long run relationship exist between real exchange rate, commodity price index on real growth rate?

- Is there any short run relationship exist between the real exchange rate, commodity price index on real economic growth rate?

This research paper provides the solution to the research question base on the data collected for period 1980 – 2010. The remainder of this paper is section as , section 2 describe the data source and methodology, section 3 focuses on empirical result and discussion, section 4 focus on conclusion, and references.

2. DATA SOURCE

In carrying out this research, a time series data on food, beverage price index which is a measure of the changes in the food stuff, beverage and exchange rate in Nigeria that take place in time lapse between a base period and a current one is sited from www.indexmundi.com for period 1980 to 2010. Real gross domestic product rate also known as the real economic growth which is a measure of economic growth from one period to another expressed as a percentage and adjusted for inflation (i.e. expressed in real as opposed to nominal terms is sited from www.oanda.com for period 1980 to 2010. Real exchange rate also known as nominal exchange rate, which is a measure of the value of a currency against a weighted average of several foreign currencies divided by a price deflator or index of cost is also sited from www.oando.com for period 1980 to 2010.

2.1. Research Methodology

The main objective of this study is to build a plausible economic relation on the subject title using time series/ econometric approach. These approach encompasses the use of unit root testing, univariate cointegration test, vector auto regression, vector error correction mechanism to study both dynamic relationship and short run disequilibrium respectively that exists, causality analysis to look at the direction of relationship, predictive power of real exchange rate, and food, beverage price index, and stability analysis i.e. variance decomposition and impulse response function to study the proportion explained due to shocks on one another and the response of dependent variable from shock of error in the current and future time horizon of the dependent variable. In other not to have a spurious regression which may arise as a result of carrying out regression on time series data, we first subject each of the variable to unit root test by applying three different unit root, namely ADF test Dickey and Fuller (1979), Phillip Perron test considered under constant assumption on the data generating mechanism of each variable, and KPSS test. ADF test is incorporated because of serial correlation and Phillip Perron test is incorporated in purpose to correct or control for serial correlation by using non – parametric statistical method. In this view of unit root testing, the best method is appropriately selected. The model for ADF test is as follows:

$$\Delta p_t = \alpha_0 + \delta p_{t-1} + \sum_{i=0}^{k} \beta_i \Delta p_{t-i} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eq(1)$$

Δp_t = the first difference of series interested, α_0 = constant term parameter, δ = drift ter

β_i = coefficient associated to each of the first difference of lagged series, ε_t is the residual error.

$eq(1)$, above is described as ADF test round a constant term assumption.

The null hypothesis is stated as

$H_0 : \delta = 0$ (unit root round a constant term)

$H_1 : \delta < 0$ (presence of no unit root i.e stationary)

The above null hypothesis is not rejected when the absolute value of ADF test statistics is less than the MacKinnon critical values; hence we reject the null hypothesis and conclude that the series interested is stationary.

The model for Phillip Perron test is described below:

$\Delta p_t = \alpha + \psi T + (1-\beta) p_{t-1} + \varepsilon_t$, where Δp_t = the first difference of series interested, T = time trend, p_{t-1} = one lagged difference of series interested, ε_t is the residual error, $\delta = (1-\beta)$ = drift term

The null hypothesis is stated as:

H_0 : series is not stationary vs H_1 : series is stationary.

The above null hypothesis is rejected when the test statistics is greater than the MacKinnon critical value or hence otherwise is not rejected. If the series were found to be non- stationary, usually a differencing or transformation technique is applied to each variable and makes it stationary.

The model for KPSS test is described in two phases (i) when there is no linear trend term, the null hypothesis is:

$H_0 : y_t \sim I(0)$ vs $H_1 : y_t \sim I(1)$

(i.e the null hypothesis that the data generating process of each of the series is tested against a unit root)

The data generating process for each of the series will be $y_t = x_t + z_t$

where y_t is the series interested, and x_t is a random walk i.e $x_t = x_{t-1} + v_t$, where $v_t \sim iid(0, \sigma_v^2)$ and z_t is a stationary process.

Now the equivalent hypothesis will now be $H_0 : \sigma_i^2 = 0,$ versus $H_1 : \sigma_i^2 > 0$ and the test statistics is

$$kpss = \frac{\sum_{t=1}^{T} S_t^2 / \hat{\sigma}_\infty^2}{T^2}, \text{ where } S_t = \sum_{j=1}^{t} \hat{w}_j \text{ with } \hat{w}_t = y_t - \bar{y},$$

and $\hat{\sigma}_\infty^2$ is an estimator of $\sigma_\infty^2 = \lim_{T\to\infty} T^{-1} Var(\sum_{t=1}^{T} z_t)$ i.e. $\hat{\sigma}_\infty^2$ is an estimator of the long run variance of the process z_t

(ii) if a deterministic term trend is suspected, the revised data generating process of each of the variable is $y_t = u_1 t + x_t + z_t$ and w_t is the residual from a regression of $y_t = u_0 + u_1 t + w_t$ where y_t is the series interested, and t is the time trend, "w_t" is the residual error. With this, the test statistics is the same as for "no linear trend term. Small values will lead to not to reject the null hypothesis. The main reason of subjecting each of the variables is to determine the level of integrating order for the purpose to establish a long run relationship among them through the use of univariate cointegration technique.

2.1.1. Long Run Relationship

Having subjecting each of the variables to unit root test and confirm that each of the series are having the same level of integrating order the next is to find the long run relationship i.e. cointegration test. Economically, two or more variables will be cointegrated if they have they have long term or equilibrium relationship between or among them (Gujarati, 2008). Individual time series in a model may be spurious but their linear combination may not. This is the purpose of cointegration test. In this research, Engle Granger two step procedures are adopted.

a. We fit a cointegration regression as

$$RGDP = bo + b_1 REER + b_2 FBPI + u_t \ldots\ldots eq(2)$$

Where RGDP = real gross domestic product rate, REER = real effective exchange rate, FBPI = food, beverage price index, b_0, b_1, b_2 are the cointegrating parameters, and u_t = is the residual error

and we obtain the residuals

b. We now perform a unit root test on the residual obtain from step (a) above.

c. If the generated residual is stationary at level form or integrated of order zero i.e. I(0), then the variables RGDP, REER, AND FBPI, are all cointegrated of the same order or theoretically we say that long run relationship exist among them.

After we might have found the linear combination, we proceed ahead and establish the number of long run relationship existing among the variables or simply the cointegrating ranks, and these could be found by introducing johansen test. This test was named after Soren Johansen which is a procedure for testing cointegration of several I (1) time series. We adopt the Johansen trace test to establish the number of cointegrating ranks. The test statistics is given as:

$\lambda_{trace}(r) = -k \sum_{j=r+1}^{s} \ln\left(1-\lambda_j\right)$, λ_j is the Eigen value, and k is the total no of observation

The trace test statistic test that the null hypothesis "that the number of cointegrating equilibrium is less than or equal to "r" against the alternative hypothesis that more than "r" cointegrating equilibrium. If the likelihood ratio test statistic is greater than the critical value of 5%, and 1%, then we reject the hypothesized number of cointegrating vector.

2.1.2. Dynamic Relationship

After long run relationship and determination of number of long run has been examined, the next is to build up a plausible economic relation model i.e. finding the linear combination of the variables rgdp, reer, and fbpi and these can be done by vector auto regression model. This model was first introduced by Sims (1980) and this is based on stationary variables. These stationary variables are treated as pure endogenous variables, where the term "auto regression" is due to the appearance of the lagged values of the dependent variable on the right hand side and the term "vector" means dealing with three or more variables. The purpose of applying this model is to express real gross domestic product rate as a linear combination of real exchange rate and food, beverage price index and also to obtain the percentage contribution of reer, fbpi to rgdp. If the variables were not stationary, proper transformation will make them stationary. The matrix representation is

$$y_t = \begin{bmatrix} y_{1t} \\ y_{2t} \\ y_{3t} \end{bmatrix} = \begin{bmatrix} m_1 \\ m_2 \\ m_3 \end{bmatrix} + \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \begin{bmatrix} y_{1,t-1} \\ y_{2,t-2} \\ y_{3,t-3} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{bmatrix} = y_t = m + Ay_{t-1} + \varepsilon_t \rightarrow \text{ the var model.....eq}(3)$$

Where $y_{1,t}$ = real gdp rate, $y_{2,t}$ = real exchange rate, $y_{3,t}$ = food, beverage price index and y_t = $(k \times 1)$ column vector of endogenous variables, "M" is $(k \times 1)$ column vector of constants and "A" is $(k \times k)$ matrix of the coefficients and ε_t is a vector white noise process, called shocks or innovations, and which satisfy the following properties: $E(\varepsilon\varepsilon') = \begin{bmatrix} \Omega & \text{s=t} \\ 0 & \text{s} \neq \text{t} \end{bmatrix}$, where Ω is a covariance matrix, and the error term are uncorrelated or they may be contemporaneous correlated. Ordinary least square is applied in $eq(3)$ in estimating the VAR (p) model, where "p" is the lag order. Different VAR (p) is estimated and the best VAR (p) is selected based on the Akaike (1979) and Schwartz information criteria which aid in model selection.

The interpretation of VAR (p) is laborious when having too much of lags, base on these the parameters are likely to be correlated and insignificant, but these correlation and insignificancy do not have any effect on the dynamic relationship among the variables. The inference obtained from the parameters will be judge under the variance decomposition and impulse response function.

2.1.3. Short Run Relationship

Having done the long run relationship and confirm that long run relationship exist and likewise all the series are all integrated of the same order, the next is to confirm the presence of short run disequilibrium which is carried out by vector error correction mechanism (VECM). This method was first introduced by Sargan and later popularized by Engle and Granger and stated that if two or more variables are cointegrated of the same order, then there order of relationship is justified by vector error correction. This method is not ideal for correction of error in a model but to look at the short run disequilibrium. This analysis of short run dynamics is often done by eliminating the trend in variables, usually differencing. But this differencing procedure however throws away potential valuable information about the long run relationship which economics theories have a lot to say. The main usefulness of this mechanism is to know the discrepancy between the short and long run relationship or precisely if there is a sudden shock in food, beverage price index, and real exchange rate volatility will real gross domestic product rate converge to its equilibrium. So the above illustration is model as:

$$\Delta RGDP = \alpha + \sum_{i=1}^{k} \beta_i \Delta y_{t-i} + pu_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eq(4)$$

Where Δ is the difference operator, "β" Denotes $(n \times n)$ matrix of the coefficient containing information regarding about the short run relationship among the variables, "p" is $\Pi = \alpha\beta'$, where α and β are $(n \times r)$ adjustment and cointegrating matrices respectively. "p" is therefore called the coefficient of the vector error correction which is expected to be negative. The negative value will indicate that the long run can be influence by the short run or will describe the difference between each other. "u_{t-1}" is the lagged value of the error term, "ε_t" is white noise, called the equilibrium error. All the sign of the coefficient value of reer, fbpi on the right hand side are expected to be negative while the dependent variable (rgdp) is stochastic variable need not to be negative. The method of estimating $eq(4)$ is through the use maximum likelihood estimation proposed by Johansen. The estimation of VECM is done when the number of cointegrating vector is established. The optimal lag length (k) of the VEC is determined by the smallest AIC and Schwartz information criteria which aid the best VEC model to illustrate the short run dynamic.

2.1.4. Stability Analysis / Causality

For solution to the research question to be feasible, a stability analysis is carried out and which is the causality test to study the direction of causality between rgdp, reer and fbpi. The causality test was first proposed by Granger (1986) which aims to know whether some lagged values of variables will explain or predict dependent variable, and these were later popularized by Toda and Yamamoto which employs the use of Argumented level VAR (vector auto regression) with integrated and cointegrated process using WALD test for restriction on the parameters of VAR (p) model. Causality is applied only when all the variables are all stationary, if not found that variables are not stationary, proper logarithm of transformation will be taking in other for causality to be practicable. The main significance of introducing causality in this research is for the purpose of forecasting of real gdp with little information provided by the remaining two variables, and when the two variables are significant. The significance of these two variables means that the lagged values of these remaining variables will partake in explaining real gross domestic product rate or both granger cause RGDP, so we treat REER, and FBPI as a factor of RGDP. Since we are interested upon the effect of real exchange rate, food, beverage price on real gross domestic product growth rate, we consider below regression equation to carry out the directional causality when the variables are stationary.

$$LRGDP = \sum_{i=1}^{n} \gamma_j LRGDP_{t-i} + \sum_{j=1}^{n} \alpha_j LREER_{t-j} + \sum_{k=1}^{n} \beta_k LFBPI_{t-k} + u_{1t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eq(5)$$

The null hypothesis is

$H_0 : \alpha_i = \beta_i = 0$ (i.e lagged lreer and lfbpi do not belong in the regression equation)

$H_1 : \alpha_i = \beta_i \neq 0$ (i.e lagged lreer and lfbpi belong in the regression equation)

The null hypothesis is tested using F test, given by =

$\frac{RSS_R - RSS_{UR}}{RSS_{UR}/n-k} \square F(m, n-k)$, where RSS_{UR} is the unrestricted residual sum of squares, RSS_R is the restricted residual sum of squares, m = number of lagged "l_REER, and l_FBPI terms, and k is the number of parameters to be estimated in the unrestricted regression. L_REER, l_FBPI is the logarithm of each variable.

Decision: if the F value is greater than the critical value at any chosen level of significance precisely 5%, 1% and 10 % we reject the null hypothesis or else otherwise.

3. EMPIRICAL RESULT AND DISCUSSION

In other not to have a spurious regression, we subjected each to unit root test by employing three different unit root techniques, ADF test, PP test under the assumption that the data generating mechanism is assumed constant term and KPSS test. Table 1 displaces the unit root test on each variable.

Table 1 shows that under the constant term assumption, and lagged difference of 2 for ADF test at level form all the variables were non-stationary meaning that unit root is present despite valid in sign of their coefficient. At the 1st difference also, their coefficient were valid but reer was non – stationary at 1% but stationary at other level of significant including also fbpi was non – stationary at all level of significant but the reverse was for rgdp where it was stationary at all levels of significance, hence we conclude that all does not have the same level of integrating order. Mere looking at 2nd difference for ADF test, all variables were all stationary at all levels of significance, hence all variables are having the same level of integrating order (2). For PP test, only rgdp was stationary while other were non – stationary despite valid in their coefficient, but at 1st difference all were stationary except for reer was non – stationary at 1% indicating here we can't conclude that all are I(1). For PP test at 2nd difference, all variables were stationary at all levels of significance indicating that all the variables are concluded to be (2). This is in support of ADF test, that all the variables are I (2) i.e. Two times difference was applied to each of the variable before stationary.

Table-1. Test of Stationary / Level of Integrating Order

	variable	Test- stats	coeff	Critical value		
				1%	5%	10%
ADF TEST (constant, lagged diff of 2)						
At level	RGDP	-2.53	-0.66	NS	NS	NS
	REER	-1.71	-0.14	NS	NS	NS
	FBPI	-0.79	-0.06	NS	NS	NS
1st Diff	RGDP	-5.7	-2.1	S	S	S
	REER	-3.2	-0.8	NS	S	S
	FBPI	-2.7	-1.04	NS	NS	NS
2nd Diff	RGDP	-7.2	-3.08	**S**	**S**	**S**
	REER	-5.1	-1.84	**S**	**S**	**S**
	FBPI	-4.7	-2.6	**S**	**S**	**S**
PP TEST (constant, lagged diff of 2)						
At level	RGDP	-4.1	-0.75	S	S	S
	REER	-1.7	-0.12	NS	NS	NS
	FBPI	-0.61	-0.04	NS	NS	NS
1st Diff	RGDP	-8.29	-1.32	S	S	S
	REER	-3.31	-0.57	NS	S	S
	FBPI	-5.5	-1.06	S	S	S
2nd Diff	RGDP	-11.5	-1.4	**S**	**S**	**S**
	REER	-4.8	-0.93	**S**	**S**	**S**
	FBPI	-9.8	-1.57	**S**	**S**	**S**
KPSS TEST (1st Diff, lagged Diff of 2)						
At level	RGDP	0.0458		S	S	S
	REER	0.0789		S	S	S
	FBPI	0.0763		S	S	S
Trend	RGDP	0.0434		S	S	S
	REER	0.0542		S	S	S
	FBPI	0.069		S	S	S

S = stationary, NS = non-stationary

Since we have determined all the variables are having the same level of integrating order (2), we determine the existence of long run relationship and the number of cointegrating equation among the variables through the use of univariate cointegration test (Engle Granger two step procedure) and Johansen trace test respectively. Table 2, 3, and 4 displaces the Engle Granger cointegration test and univariate Johansen test.

Cointegrating regression equation

$$RGDP = 3.65935 - 0.003187REER + 0.022FBPI + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eq(6)$$

Table-2. Unit Root Test on the Residual of EQ (6)

Deterministic term	coefficient	ADF statistics	Critical values			Remarks on coeff	P value
			1%	5%	10%		
Without constant	-.808576	-4.42937	-2.61	-1.95	-1.62	valid	7.04e-005
With constant	-0.8085	-4.35208	-3.57	-2.92	-2.60	valid	0.001814
With constant & trend	-0.821904	-4.34496	-4.15	-3.5	-3.18	valid	0.008934

Table-3. Johansen Trace Test (Number of Long Run Relationship)

Eigen value	Likelihood ratio	5% critical value	1% critical value	Hypothesis no of CE(s)
0.595465	40.80981	34.91	41.07	None*
0.340839	14.56435	19.96	24.6	At most 1
0.081884	2.477525	9.24	12.67	At most 2

Table-4. Normalized Cointegrating Coefficient

RGDP	REER	FBPI	C
1	0.034207	0.017049	-11.77535

Following the regression of Eq(2), table 2 shows that under three different assumptions, their p – value for each ADF statistics was less than the exact observed probability of the test, indicating that under the above set assumption, the error derived from Eq(6) was stationary. The stationary of the error of the cointegrating regression equation (6) indicates the existence of long run relationship. Table 3 shows that the hypothesized no of cointegrating vector was rejected at 5% since the likelihood ratio (40.80981) was greater than the critical value (34.91) but not rejected for hypothesized "one cointegrating vector" since the likelihood ratio (14.56435) was less than 5% and 1% critical value (19.96 and 24.6) respectively, confirming that only one cointegrating vector was present i.e. one long run relationship exists. Table 4 shows that normalizing the cointegrating equation both were significant and has a positive relationship to rgdp with little contribution in percentage. A 100% increase in both reer and fbpi, rgdp increases by 3.4% and 1.7% respectively.

Since all the variables were all cointegrated, we established the dynamic plausible economic relationship through the use of vector auto – regression model. Matrix equation below and table 5 displace the VAR (6) model where (6) was the maximum lag order selected based on the smallest Alkaike and Schwartz information criteria, and F – test for zero restriction for rgdp equation.

$$\begin{bmatrix} lrgdp(t) \\ lreer(t) \\ lfbpi(t) \end{bmatrix} = \begin{bmatrix} 0.533 & -2.319 & 1.57683 \\ 0.2740 & -0.1331 & -0.00708 \\ -0.15547 & -0.170652 & 0.030133 \end{bmatrix} \begin{bmatrix} lrgdp_{t-1} \\ lreer_{t-1} \\ lfbpi_{t-1} \end{bmatrix} + \begin{bmatrix} 0.1742 & 1.213 & -0.2900 \\ -0.10297 & 0.8471 & 0.02214 \\ -0.06526 & -0.42766 & -0.07958 \end{bmatrix} \begin{bmatrix} lrgdp_{t-2} \\ lreer_{t-2} \\ lfbpi_{t-2} \end{bmatrix}$$

$$+ \begin{bmatrix} -0.1384 & -0.2829 & 0.3599 \\ -0.0573 & -0.3630 & 0.05193 \\ -0.03649 & -0.27011 & -0.00077 \end{bmatrix} \begin{bmatrix} lrgdp_{t-3} \\ lreer_{t-3} \\ lfbpi_{t-3} \end{bmatrix} + \begin{bmatrix} 0.0008 & 2.102 & 0.4138 \\ 0.05666 & 0.3174 & -0.0380 \\ 0.02964 & 0.1629 & 0.015709 \end{bmatrix} \begin{bmatrix} lrgdp_{t-4} \\ lreer_{t-4} \\ lfbpi_{t-4} \end{bmatrix} +$$

$$\begin{bmatrix} 0.2752 & -0.8122 & 0.1507 \\ 0.0379 & -0.4325 & -0.05165 \\ 0.04901 & -1.8452 & 0.04042 \end{bmatrix} \begin{bmatrix} lrgdp_{t-5} \\ lreer_{t-5} \\ lfbpi_{t-5} \end{bmatrix} + \begin{bmatrix} -0.0257 & +1.576 & -0.307125 \\ -0.0402 & -0.0895 & -0.04011 \\ 0.10289 & -0.26258 & 0.19212 \end{bmatrix} \begin{bmatrix} lrgdp_{t-6} \\ lreer_{t-6} \\ lfbpi_{t-6} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{bmatrix} .....eq(7)$$

$R^2 = 0.985$, DW= 2.311

Table-5. F test for Zero restriction

All Lags	F Value	P Value Of F- Value
LRGDP	6.3848	0.0201
LREER	36.185	0.0002
LFBPI	17.532	0.0014
ALL VARS, LAG 6	3.8959	0.0737

F-Value of overall regression of LRGDP = 22.18729, P value of F value = 0.000489

From Eq(7), the matrix equation is not easy to interpret since we have large lag order (6), and hence the coefficient were all insignificant but this insignificancy do not have any effect on the dynamic relationship. Table 6 and 7 displace the impulse response function and variance decomposition for the interpretation of Eq (7) for the long run.

Table-6. Response of one standard deviation shock of reer, fbpi on rgdp (long run) Sum of VAR coefficient (-1.68869)

Time Period	Reer	Fbpi
1	0.0000	0.00000
2	-0.34911	0.27741
3	-0.03736	0.065033
4	-0.045088	-0.054244
5	0.027821	0.18416

Table-7. Proportion explained on rgdp (long run)

Time Period	Reer (%)	Fbpi (%)	S.E Of Reer	S.E Of Fbpi
1	15.0770	0.1562	0.0702225	0.410505
2	29.3945	0.5072	0.0775043	0.411758
3	12.4926	1.0167	0.123155	0.421169
4	12.4005	1.2896	0.123788	0.424868
5	12.0551	1.2790	0.125895	0.428819
6	12.3061	1.9042	0.127134	0.449362
7	12.2533	3.5549	0.127539	0.470637
8	12.0540	4.1013	0.13029	0.499057
9	11.8973	4.0947	0.131215	0.50363
10	11.7868	4.0725	0.131832	0.506036

For variable to have a significant effect on other variable, the summation of the coefficient in the var analysis should be less than 1, and these will justify the closure significant relationship existing among the variables. From matrix equation (7), the summation of the coefficients is (-1.68829) which is less than 1, hence significant relationship exists. Mere looking at table 6 for the long run at each time period for reer, fbpi, the shock of reer, fbpi on rgdp are getting close to zero or they are reverting close to zero from time period 1 to time period 5 indicating that the effect of reer, fbpi on rgdp are decreasing. The steady decrease shows that reer, fbpi have significant effect on rgdp in the long run. From table 7, which describe the proportion explained by the shock on reer, fbpi on rgdp expressed as a percentage for long run relationship for period of 10 years explains that at 1st time period 15.1% was explained, at 2nd time period 29.39% was explained by reer on rgdp, from 2nd time period there was steady decline till period of 10 years and the values are large enough while its standard deviation has steady increase. Here such indicates that reer has significant effect on rgdp in long run. Also from that same table it explains that 0.2% was explained in the first year, 0.5% in the 2nd time period, and 1% in the third time period, and steady increase till 10th time period. These indicate that fbpi has slight effect on rgdp in the long run relationship. Table 5 shows that at all lags, the p –value of having (3.8959) F statistics is less than the exact observed probability of the test which means all the lags of both reer and fbpi are included in the VAR (6) model, likewise individually their p – value were also less than the observed p –value indicating that individually their lags are included in the VAR (6) model.

Since the presence of long run relationship has been examined, we looked in forward to study the presence of short run disequilibrium through the use of vector error correction mechanism. Table 8 presents the VEC model at lag 1, since it has the best model base on the selection from the smallest AIC and BIC.

Table-8. Vector Error Correction Model for period 1980 to 2010 (short run)

Variable	Coefficient	Std Error	T Ratio
P	-0.900792	0.16908	-5.32776
D(RGDP(-1)	0.045744	0.14182	0.32254
D(REER(-1)	0.033592	0.01533	2.19137
D(FBPI(-1)	-0.048524	0.05283	-0.91847

$$\Delta RGDP = P0.045744\Delta RGDP_{t-1} + 0.033592\Delta REER_{t-1} - 0.048524\Delta FBPI_{t-1} - 0.900792U_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots eq(8)$$

From Eq (8), fbpi was insignificant but has a negative relationship on rgdp while reer was significant but has a positive relationship. The error term was negative; this negative confirms the presence of short run disequilibrium. The interpretation of this is that it takes about 90.1% for the error to be corrected in the next period for rgdp to converge to its equilibrium or simply the RGDP is above equilibrium and will start falling in the next period to correct the equilibrium error. Table 8 and 9 displace the impulse response function and variance decomposition for short run.

Table-9. Response of one standard deviation shock of reer, fbpi on rgdp (short run)

Time Period	Reer	Fbpi
1	-2.20	-3.214843
2	-25.57621	-7.126506
3	-40.60053	-5.197429
4	-44.85234	-5.035984
5	-43.52264	-5.216612

Table-10. Proportion explained on rgdp (short run)

Time Period	Reer (%)	Fbpi (%)	S.E Of Reer	S.E Of Fbpi
1	0.136405	3.081720	59.83194	18.31316
2	5.369988	9.276545	110.7808	25.66587
3	10.13572	8.919528	150.8818	31.43436
4	13.11797	8.707456	181.4539	36.10322
5	14.64794	8.681254	205.9566	40.25973
6	15.41251	8.798109	227.2444	44.06280
7	15.85368	8.918695	246.7397	47.58387
8	16.17101	9.004364	264.9571	50.86365
9	16.42816	9.101577	282.0735	53.94102
10	16.64005	9.135144	298.2134	56.84974

Considering the short run relationship in table 8, it also shows that at each time period for reer, fbpi, the shocks of reer, fbpi on rgdp are also close to zero or reverting close to zero, these decreases in value indicate that reer, fbpi have significant effect on rgdp in the short run. From table 9, which describe the proportion explain by shock of reer, fbpi on rgdp expressed as a percentage in the short run relationship explains that at 1^{st} time period 0.1% was explained, at about 6% was explained in 2^{nd} time period and continually increasing from 3^{rd} time period till 10^{th} time period for reer and also at 1^{st} time period shock started increasing continually till 10^{th} time period for fbpi, indicating that both fbpi and reer have significant effect in short run dynamic.

For solution to the research question to be feasible, we studied the causality (direction of relationship) that exists among the variables. This is different from dynamic relationship obtained from vector auto regression model in Eq (7). Table 10, and 11, displaces the direction of relationship (independent and feedback causality).

Table-11. Direction of relationship (lagged values of reer / fbpi predict rgdp)

	Value	Df	F- Value
RSS_R	33.38000	1	0.66645
RSS_{UR}	32.14242	25	

$F_{(1, 25), 0.01} = 7.7698$, $F_{(1, 25), 0.05} = 4.2417$, $F_{(1, 25), 010} = 2.91774$

Table-12. Independent / Feedback causality test

Causality on RGDP												
Variable	**LAG 1**		**LAG 2**		**LAG 3**		**LAG 4**		**LAG 5**		**LAG 6**	
	F	**P**	**F**	**P**	**F**	**P**	**F**	**P**	**F**	**P**	**F**	**P**
lreer	0.013	0.91	0.08	0.923	0.02	0.995	0.12	0.97	0.12	0.98	1.68	0.2
lfbpi	2.665	0.14	2.434	0.109	2.33	0.102	1.95	0.14	1.52	0.24	1.26	0.34
Causality on REER												
lrgdp	0.0048	0.95	1.89	0.17	2.58	0..08	2.54	0.07	1.84	0.16	1.62	0.22
Causality on FBPI												
lrgdp	0.19	0.66	0.78	0.46	1.1	0.36	1.27	0.32	1.14	0.38	0.94	0.49

Causality on RGDP												
Variable	**LAG 1**		**LAG 2**		**LAG 3**		**LAG 4**		**LAG 5**		**LAG 6**	
	0.01	**0.05**	**0.01**	**0.05**	**0.01**	**0.05**	**0.01**	**0.05**	**0.01**	**0.05**	**0.01**	**0.05**
lreer	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
lfbpi	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Causality on REER												
lrgdp	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Causality on FBPI												
lrgdp	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

P = p- value, F = f – value, NS = non - significant

Table 10 shows that all the lags of reer and fbpi were not rejected at all levels of significant indicating that their lagged value are not included in predicting rgdp. At individual stage, an independent causality exist between reer, fbpi on rgdp indicating that both are not instrument in predicting rgdp at all lags.

4. CONCLUSION

In this research paper, the impact of food beverage price index and exchange rate volatility on Nigeria economy growth was examined using time series annual data for period 1980 to 2010. The research entails the use of three different unit root test, univariate cointegration test, univariate Johansen trace test, vector error correction mechanism, vector auto regression, causality analysis proposed by Engle and Granger (1987) later popularized by Toda and Yamamoto (1995). The research finding was that all the variables were all cointegrated with the same order of 2. Singleton of cointegrating equation was present indicating that long run relationship exists but this result from cointegrating equation is not referring to the direction of relationship between the variables. The contribution to be drawn from this study is that the fluctuation of real exchange rate has a significant effect on real gross domestic product rate in both long and short run relationship, while the food, beverage price index do have significant effect in short run but slight effect on rgdp growth rate in long run. It takes about 90.1% for the error to be corrected in the next period for real gross domestic product to converge to its equilibrium. An independent causality indicates that both variables reer and fbpi is not good instrument in predicting rgdp. Nevertheless, to achieve high sustainable output growth rate, there is a need of stable macro economy policy as regards to the exchange rate system of the

country. Exchange rate which one of the volatile macro-economic variable, but this variable has not been properly handled in such a way that the country will derive optimum benefit from it. As a result the growth of output in the economy has been thwarted. The government should put sound machinery in place to properly monitor the movement of exchange rate and regulate it indirectly through currency depreciation or directly through devaluation this will make the country's export to become cheaper and imports more expensive.

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Appendix