The Feedback effects of Exchange Rate Pass-through Inflation on sustainable Development in Nigeria

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Abstract
The Nigerian Naira has become largely unstable due to the import-dependent nature of the economy and its over-reliance on oil revenues. The feedback effect of exchange rate pass-through inflation on sustainable development in Nigeria is the aim of the study. Annual time series data over the period of 1980 to 2018 from Central Bank of Nigeria statistical bulletin were collected and the Structural Vector Autoregressive (SVAR) estimation technique was employed in the analysis. The outcome indicates that inflation had a significant positive impact on sustainable development while interest rate has a negative significant impact on inflation in Nigeria. The study concluded that inflation had a positive, substantial influence on sustainable development and that the exchange rate had a long-term inflation relationship. The study therefore, recommends that excess dependency on primary commodities as a source of foreign exchange should be minimized by ensuring that value is added to all primary commodities before being traded abroad to reduce the country exposure to disturbances in the international commodity markets and improve the value of the local currency.

1. Introduction
The new development model is sustainable development, as launched by the United Nations (UN) in 2015 and embraced by world leaders with a priority on ensuring healthier lives for everyone by 2030 following the expiration of the Millennium Development Goals (MDGs) in 2015 (Ssozi & Amlani, 2015). It is described as 'growth that meets the needs of the present generation without sacrificing the capacity of the future generation to meet their own needs' (World Commission on

Environment and Development, 1987). To a greater degree, this form of development depends on access to adequate and inexpensive supplies of goods and services. Hence, two of the seventeen (17) goals of sustainable development which relate to the eradication of poverty and hunger, as well as the achievement of improved health care and education, rely on access to adequate and inexpensive supplies of goods and services (Environmental Management, 2017).

The trend in purchasing power otherwise refers to inflation and its stability or otherwise primarily depends on the direction of movement in the exchange rate and how sensitive domestic prices are to changes in the exchange rate referred to as the pass-through exchange rate (ERPT) (Akofio-Sowah, 2009). Despite the reliance of stability in inflation on the exchange rate and the pass-through exchange rate, an increase in prices triggered by an exchange rate shock in a low inflation setting may not push companies to increase the price of their products because price increase would make the company less competitive. If the organization considers the price shock to be temporary, it will bear the cost spike by reducing its mark-up, and therefore its profit margin to keep the price steady (Taylor, 2000).

While the exchange rate has external consequences on the economy, such as its effect on trade and capital transfers, one of the most serious internal effects of the exchange rate on the economy is its effect on inflation, officially referred to as the pass-through exchange rate (ERPT) for inflation (Vo, 2009). On the one side, when the pass-through exchange rate is low, international importers will not want to adjust prices due to the shock from the exchange rate, while companies will be able to adjust prices in the event of a high pass-through exchange rate in response to the shock from the exchange rate. The pass-through of the exchange rate thus defines the purchasing capacity of foreign exporters. Also, the monetary authority's management of monetary policy relies, in addition to inflation forecasting capability, on the degree of exchange rate pass-through in the economy. Therefore, when the degree of the pass-through exchange rate is considered low, the monetary authority will be less concerned with the inflationary impact of exchange rate shocks, while the monetary authority will be less concerned with the inflationary effect of exchange rate shocks in the case of an assessed high degree of exchange rate pass-through (Vo, 2009).

Due to the import dependent nature of the Nigerian economy and her over-reliance on oil proceeds, the Nigeria Naira has been relatively unstable when compare with the basket of world currency and ever since 1970s Naira till date Naira has depreciated magnificently and this has eroded the consumer purchasing power with its adverse implication on sustainable development. The persistent depreciation of the Nigeria exchange rate trended with major economic variables such as inflation, GDP growth, and fiscal deficit/GDP ratio. In this context, the exchange rate movement trended with inflation rate.

Because of the Nigerian economy's import-dependent attributes and her over-reliance on oil revenues, the Nigeria Naira exchange rate has been comparatively unstable compared to the world currency basket, and Naira has depreciated magnificently since the 1970s to date, eroding consumer buying power with its

adverse effect on sustainable growth. The persistent depreciation of the Nigerian exchange rate has been trending with major economic variables such as inflation, GDP growth, and fiscal deficit/GDP ratios. In this sense, exchange rate movement had trended with the inflation rate. During the periods of high inflation rate, volatility in the exchange rate was high, which was also reversed in a period of relative stability (Eme and Johnson, 2013). Data from the Central Bank of Nigeria statistical bulletin indicted that the pace of sustainable development in Nigeria as proxy gross domestic per capital has been increasing sluggishly from 1980 to 2018 while inflation rate over the period fluctuated significantly upward and downward. Meanwhile, Naira exchange rate over the entire period has been rising and falling in an increasing direction.

Recently, there has been a rising concern in exploring the relationship between exchange rates pass-through, monetary policy behaviour and the inflationary climate. Most of the current studies are focused on cross-country analysis without considering the country-specific effect of the relationship among the variables (see Campa and Goldberg, 2001; Gagnon and Ihrig, 2001). Furthermore, most of these studies did not account for the effect on sustainable development of exchange rate pass-through inflation since the phenomena of sustainable development is a new paradigm, but have rather concentrated attention on other macroeconomic factors such as economic growth, interest rates, capital flows among others. This paper was inspired to resolve this gap by analyzing the feedback effects of exchange rate pass-through inflation on sustainable development in Nigeria, given the theoretical correlation between exchange rate pass-through inflation and sustainable development.

The broad objective of this study was to examine the effect of exchange and inflation on sustainable development in Nigeria. The specific objectives are to estimate the relationship among exchange, inflation and sustainable development in Nigeria; investigate the response of sustainable development to exchange rate pass-through inflation in Nigeria; and to examine the effect of monetary policy proxy by interest rate on sustainable development in Nigeria.

The content of this study is organized as follows. After this introduction section is section two which focus on the review of previous literature. Section two, is succeeded by section three which presents the methodology employed while section four analyse the result, discussion of findings and conclusion

2. Literature Review

Conceptual Review
The notion of exchange rate pass-through, inflation and economic growth is conceptualized for clarification. Inflation has been described in the literature from various viewpoints. Thirwal (1974), describes inflation as an increase in the general price level of goods and services arising from an increase in import rates or output costs. It is an overall and constant rise in the aggregate level of prices of goods and services (Morris and Morris, 1999). In Jhingan's (2005) view, inflation reflects a steady and appreciable increase in the average price level of goods and services. Inflation is a percentage rise in local currency import rates arising from a one

percent change in the exchange rate between the importing country and the exporting country, according to Akofio-Sowah (2009).In five key categories of inflation models comprising monetarist model, pure cost model, hybrid model which comprises of demand and cost components, structural models and expectation models, Thirwal (1974) identified five mixed factors that cause inflation. Meanwhile, in evaluating a single inflation experience, it is very difficult to differentiate between these models since they come as a result of many forces interacting with each other. The International Monetary Fund states measured inflation using the consumer price index (CPI) of a country, which calculates the average cost of living expenses of consumers for a year (The Economic Times Magazine August, 2010).

On the other end, the ratio between a unit of one currency and that of another currency for which the unit can be traded at a given time is the exchange rate. The Civil Society Budget Advocacy Organization (2015) describes exchange rate as the price of a country's currency weighted against that of the currency of another country. It is the rate at which one currency can be traded for another. Exchange rate pass through is a term used to describe the impact of exchange rate fluctuations on a country's domestic markets and the consequences that this would have on the central bank's policy-making decisions (Campa and Goldberg 2005). As specified by Mumtaz et al (2006), exchange rate pass-through (ERPT) is the percentage change in local currency import prices following a one-percent change in the exchange rate between importing and exporting countries. According to Barhoumi (2005), "ERPT can statistically be represented as the elasticity of import prices to a change in exchange rates".

Theoretical Review
The law of one price (LOOP) and purchasing power parity (PPP) is the primary theoretical basis for the existence of exchange rate pass-through (Eckstein and Soffer, 2008). The law is base on the position that changes in exchange rates that would lead to changes in the price of commodities in the local economy. Consequently, a shift in the exchange rate which is not preceded by a change in the price of commodities in the local economy will be called a deviation from the LOOP. It is also expected that demand and supply processes would bring about the required shift in local markets to bring international and domestic prices back to the same level. According to this assumption, if the market is sufficiently free, exchange rate pass-through can be absolute or close to 100% in the very long run. For most nations, though, most scientific research have considered ERPT to be incomplete (Soffer, 2008).

The central principle behind the PPP theory is that arbitrage in the commodity market equalizes prices globally once the prices of goods are calculated in the same currency (Pilbeam, 1998). The law of one-price (LOP) is the building block of the PPP, which clearly states that in the absence of a competitive market system and transport costs, quotas, tariffs and other exchange restrictions, trade and successful arbitration in the goods markets will guarantee the same price across countries. The LOOP is based on the principle of perfect goods arbitrage. Arbitrage exists where pricing disparities are manipulated by economic actors to have a risk less profit.

The PPP adherent argued that the exchange rate must adjust, to ensure that the LOOP holds for an identical bundle of goods in international market. When the price of a good differs in the market of two countries, there is an incentive for individuals seeking profit to purchase the goods in the low price market and resell it in the high price market. Similarly, if a market basket containing many different goods and services costs more in one market than another, profit-seeking individuals should be expect in the low-cost market to buy the relatively cheaper goods and resell them in the higher-priced market. If the one-price law leads to the equalization of prices of a commodity between two markets, then it seems reasonable to conclude that PPP should also hold, describing the equality of market baskets between countries.

Empirical Review

There is a growing interest in examining the relationship between the pass-through exchange rate, monetary policy behavior and the inflationary environment in the literature. For instance, Razafimahefa (2012), study exchange rate pass-through domestic prices and its determinants in sub-Saharan African countries from 1985 to 2008 auto-regressive (AR) and error correction estimation techniques. The analysis indicates that the pass-through is imperfect and that after a contraction, it is higher than a local currency appreciation. In the same vein, in Singapore economy, Chew, Ouliaris and Meng (2009) examine exchange rate pass-through while facilitating asymmetric pass-through effects using Band-pass spectral regression techniques across the economic cycle from 1980:Q3 to 2010:Q3. The study finds that the pass-through of the first step of the exchange rate to domestic import prices is complete, with adjustments in the exchange rate completely expressed by the fourth quarter of the shock in domestic import prices. By contrast, the second stage of the pass-through, which includes the transition of market prices to a change in domestic import prices, is more drawn-out. Consequently, the net pass-through of the exchange rate to consumer prices is reasonably moderate. The study further indicates the existence in the market cycle of asymmetric pass-through impacts.

In another report, Loloh (2014) used a recursive VAR to estimate the pass-through effect on domestic prices of exchange rate fluctuations between January 1994 and December 2012. The study shows that the effect of a nominal exchange rate shock on domestic prices is incomplete, usually moderate and decreases within 18-24 months, but these effects are felt mainly within 12 months. In general, the effect on total CPI inflation of the exchange rate shock is more benign than that of non-food inflation. In support of Taylor's theorem, there is also proof that the pass-through exchange rate is positively associated with the degree of inflation. Via the Vector Autoregression (VAR) method, Aleem (2012) explores the exchange rate pass-through to domestic prices to approximate the scale of the exchange rate pass-through to consumer prices. The empirical findings show that the pass-through exchange rate in Latin American countries is higher than in Asian countries and that monetary policy often plays a role in imports. Since an explicit inflation tracking monetary strategy was introduced, the exchange rate pass-through deteriorated. Similarly, using quarterly data from 1993: Ql -2008: Q4 using vector error correction model correction, Mnjama (2011) investigates the magnitude and

speed of exchange rate pass-through (ERPT) to domestic prices in Kenya (VECM). The findings showed that Kenya's ERPT is incomplete but in the long term, relatively poor at around 36%. In terms of asymmetry, the findings have shown that ERPT is greater than depreciation in times of appreciation.

In the same vein, using 1979-2000 data for 71 nations, Choudhri and Hakura (2003) derive a pass-through relationship based on modern open economy macroeconomic models. The research finds clear evidence of a positive and essential correlation between the pass-through and the average inflation rate across countries and times, using the VECM process. In addition, the inflation rate exceeds other macroeconomic considerations in clarifying cross-regime disparities in the pass-through. The nonlinear augmented modern Keynesian Phillips curve for Nigeria is calculated by Bello and Sanusi (2019) using the Smoot transition regression model over the period from 1995Q1 to 2018Q2. The outcome shows signs of towing inflation regimes over the period. In the low exchange rate depreciation system, food inflation, oil inflation, business marginal costs and product inflation account for much of the adjustments in the prices of the aggregate commodity basket. However as inflation switches to a high regime, the exchange rate merely describes market shifts in the aggregate commodity basket. Similarly, it has been shown that inflation changes in the system are largely caused by the depreciation or devaluation of the exchange rate. It was also clear that the exchange rate devaluation level that causes a policy transition from low to high inflation is around N75 relative to the dollar. Gidigbi, Babarinde and Lawan (2020) examine the effect on market inflation in Nigeria over the span of the exchange rate fluctuations pass through from 1981 to 2015. The VECM estimates suggest that the variables are relevant in granger causing inflation in the long-run. The long-run ECM coefficient reveals a relation of variance over one cycle and this is statistically important at one percent level. There was no short-term relationship between inflation and exchange-rate fluctuations, as was the case for government expenditures, imports, foreign direct investment, and access to trade. Money supply, though, indicates a strong short-run association with inflation.

3. Methodology

Research Design and Model Specification
The paper incorporates quantitative analysis with ex post facto research. The study adapted the model used in the study carried out by Akpan and Atan (2014) on the impact of exchange rate fluctuations on real output growth in Nigeria, where the growth rate of real gross domestic product was the dependent variable and real exchange rate, interest rate and inflation rate. In line with the objective of this study, sustainable development proxy by gross domestic per capita was the dependent variable while real exchange rate, interest rate and inflation rate were used as the explanatory variables in the model. The functional model is defined as follows:

GDPC= F(INFL, EXR, INTR) ……………………………………………………. 1

The transformation of the model into a VAR model is expressed in a system as:

$GDPC_t = c_1 + \sum_{i=1}^{p} \pi_{11i}GDPC_{t-i} + \sum_{i-1}^{p} \pi_{12i}INFL_{t-i} + \sum_{i=1}^{p} \pi_{13,i}EXR_{t-i} + \sum_{i-1}^{p} \pi_{14,i}INTR_{t-I} + \mu_{1,t}$ 2

$INFL_t = c_1 + \sum_{i=1}^{p} \pi_{11i}INFL_{t-i} + \sum_{i-1}^{p} \pi_{12i}GDPC_{-i} + \sum_{i=1}^{p} \pi_{13,i}EXR_{t-i} + \sum_{i-1}^{p} \pi_{14,i}INTR_{t-i} + \mu_{1t}$ ..3

$EXR_t = c_1 + \sum_{i=1}^{p} \pi_{11i}EXR_{t-i} + \sum_{i-1}^{p} \pi_{12i}GDPC_{t-i} + \sum_{i=1}^{p} \pi_{13i}INFL_{t-i} + \sum_{i-1}^{p} \pi_{14i}INTR_{t-i} + \mu_{1t}$ 4

$INTR_t = c_1 + \sum_{i=1}^{p} \pi_{11i}INTR_{t-i} + \sum_{i-1}^{p} \pi_1 GDPC_{t-i} + \sum_{i=1}^{p} \pi_{13i}INFL_{t-i} + \sum_{i-1}^{p} \pi_{14,i}EXR_{t-I}$ 5

The VAR (p) system equation (2) to equation (5) can be represented in a reduced form within a matrix framework as:

$$\begin{bmatrix} GDPC_t \\ INFL_t \\ EXR_t \\ INTR_t \end{bmatrix} = \begin{bmatrix} c_1 \\ c_2 \\ c_3 \\ c_4 \end{bmatrix} + \sum_{i=1}^{p} \begin{bmatrix} \pi_{11} & \pi_{12} & \pi_{13} & \pi_{14} \\ \pi_{21} & \pi_{22} & \pi_{23} & \pi_{24} \\ \pi_{31} & \pi_{32} & \pi_{33} & \pi_{34} \\ \pi_{41} & \pi_{42} & \pi_{43} & \pi_{44} \end{bmatrix} X \begin{bmatrix} GDPC_{t-i} \\ INFL_{t-i} \\ EXR_{t-i} \\ INTR_{t-i} \end{bmatrix} + \begin{bmatrix} \mu_{1,t} \\ \mu_{2,t} \\ \mu_{3,t} \\ \mu_{4,t} \end{bmatrix}$$

The expected signs of the coefficients of the explanatory variables are summarized in terms of differentials as follows: Inflation is expected to exert a negative effect on sustainable development proxy by GDPC in Nigeria i.e $\frac{RGDPC}{INFL} > 0$; exchange rate is expected to exert a negative effect on sustainable development proxy by GDPC in Nigeria i.e $\frac{GDPC}{EXR} > 0$; interest rate is expected to exert a negative effect on sustainable development proxy by GDPC in Nigeria i.e $\frac{GDPC}{INTR} > 0$

Source and Measurement of Data and Estimation
Given the nature of the models, it is imperative to collect data to estimate the stochastic equations. The periods between 1980 and 2018 were covered by the data series. The data was obtained from the publication of Central Bank of Nigeria (CBN) Statistical Bulletin. Inflation was proxy by core and food that is all items minus farm produce: CPI twelve months average, exchange rate was proxy by average Naira cross exchange rates to US Dollar, interest rate was proxy by weighted average lending and deposit rate while Gross Domestic Per Capital measured sustainable development (GDPC)

In the analysis, the Jarque-Bera normality test and test for multicorrelation were carried in the preliminary analysis. In the actual estimation, the study used the Structural Vector Auto-Regression model (SVAR) to capture the level of ERPT and its transmission into domestic prices unlike most of the empirical studies that tackled the pass-through effect in line with a well-quoted study of McCarthy (2002) which used the VAR method to examine the pass-through effect of exchange rate and import price changes into producer (PPI) and consumer (CPI) inflation. The methodology was firstly proposed by Sims (1980) to determine the proportion of the price level variance that can be explained by the changes in exchange rate. Recent empirical studies preferred to use SVAR models as VAR models were criticized of being devoid of any economic content. The SVAR models provide historical decompositions that measure the cumulative contribution of each structural shock to the evolution of each variable over time (Omneia, Mona & Kholoud, 2010).

4. Results

Table 1 presents the result of the Jarque-Bera test of normality for the descriptive evaluation of the data and establish the nature of the distribution of the data.

Table 1: Descriptive statistics

	GDPC	INFL	EXR	INTR
Mean	30294002	20.04444	69.56610	20.89444
Median	22060982	12.30000	21.96860	21.17000
Maximum	69023930	72.80000	193.2792	36.09000
Minimum	13779255	4.700000	0.570000	10.00000
Std. Dev.	17253201	18.26759	66.40632	6.066190
Skewness	0.985031	1.497571	0.272821	0.029324
Kurtosis	2.591488	3.964889	1.368230	3.001837
Jarque-Bera	6.072038	14.85284	4.440595	0.005165
Probability	0.048026	0.000595	0.108577	0.997421
Sum	1.09E+09	721.6000	2504.380	752.2000
Sum Sq. Dev.	1.04E+16	11679.67	154343.0	1287.953
Observations	37	37	37	37

Source: Authors' Computation, 2020

The result of the descriptive analysis as presented in Table 1 showed that all the variables in the data set are positively skewed since their means are greater than their medians. The skewness coefficient of inflation which is greater than one indicates that among all the variables it is only inflation that is highly symmetrical. The positive values of the kurtosis of all the variables established that the variables are all leptokurtic in nature. The values of the Jarque-Bera statistic showed that while exchange rate and interest rate are not normally distributed, sustainable development and inflation are normally distributed since their p-values are statistically significant at 5% level of significance.

Table 2: Correlation Analysis Matrix

	GDPC	INFL	EXR	INTR
RGDP	1.000000			
INFL	-0.353704	1.000000		
EXR	0.906180	-0.403556	1.000000	
INTR	0.189430	0.173673	0.196251	1.000000

Source: Authors' Computation, 2020

The results of the correlation analysis of the set of variables in the model as presented in Table 2 showed that the correlation coefficients for the relationship among the variables sustainable development, inflation, exchange rate and interest rate is not very strong indicating the absence of the problem of multicorrelation among the independent variables. The result also shows that while the association between exchange rate, interest rate and sustainable development is positive, the association between sustainable development and inflation was negative.

Trend Analysis

The trend of sustainable development, inflation and exchange rate in Nigeria is presented using the line graph as follows:
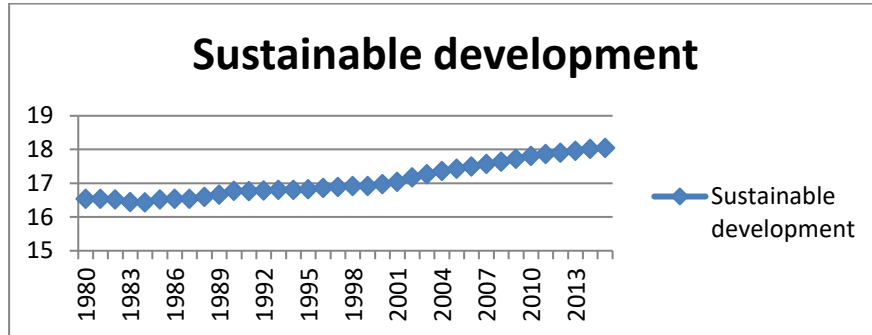

Figure 1: Trend of Sustainable Development 1980-2018
Source: Authors' Computation, 2020

The trend analysis as shown in Figure 1 shows that sustainable development in Nigeria throughout the entire period has increased slowly. Based on data from Central Bank of Nigeria statistical bulletin, the pace of sustainable development in Nigeria as proxy by GDP per capital between falls from 1982 to 1984 and later rose slowly from 1985 to 1988. There was another increase but more sharply in sustainable development between 1988 and 1990. Between 1990 and 2000 the rise in sustainable development was also meagre. However, from 2000 to 2014 there was a rapid increase in the pace of sustainable development in Nigeria.
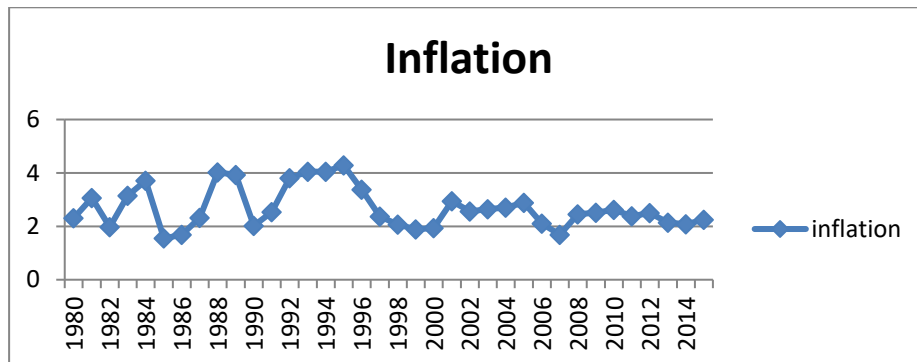

Figure 2: Trend of inflation in Nigeria 1980-2018
Source: Authors' Computation, 2020

The trend analysis as shown in Figure 2 indicates that inflation had fluctuated significantly upward and downward over the entire period. The data on inflation also shows that between 1980 and 1981 there was an upsurge in inflation rate in Nigeria followed by a sharp decline between 1981 and 1983. Between 1983 and 1984 and sharp increase occurred before a further increase between 1984 and 1985. There was another fall in inflation rate between 1985and 1986. Inflation rate further rise slowly from 1986 to 1988 before a small decline between 1988 and 1989.

Furthermore, inflation decline sharply from 1989 to 1990 and rose slowly from 1990 to 1995 and later on between 1995 and 2000 inflation decline very sharply but thereafter up till 2014 there has been upward and downward decline in inflation rate in Nigeria
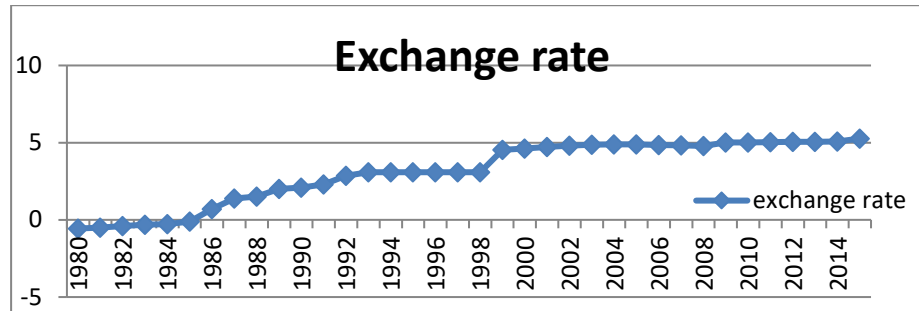

Figure 3: Trend of exchange rate in Nigeria 1980-2018
Source: Authors' Computation, 2020

Figure 3 shows that the Naira exchange rate which has increase rapidly over the entire period has been rising and falling in an increasing way. It is evident from figure 1, 2 and 3 that over the entire period there is a significant variation in the trend of sustainable development, inflation and exchange rate in Nigeria.

Empirical Result
The Table 1 below presents the result of the stationary tests of the variables in the model based on the Augmented Dickey Fuller (ADF) and Phillip Perron (PP) unit root tests. The tests were carried out at level and first differences.

Table 3: Unit root test

Variables	Level		First difference		I(d)
	ADF	PP	ADF	PP	
RGDP	-1.503391	-1.143849	-12.29850*	-11.18383*	I(1)
INFR	-3.893772*	-2.303103**	-1.643997	-1.313966	I(0)
INTR	-1.850066	-2.359728	-2.777683***	-2.919307***	I(1)
EXR	-1.086518	-1.094125	-6.593149*	-6.593149*	I(1)

*Note: * represents 1% significant level; ** represents 5% significant level and *** represents 10% significant level. Calculated at trend and lag lengths selected automatically using the Schwarz info criterion (SIC)*

The Result in Table 3 indicates that inflation is stationary at level while all other variables; sustainable development, interest rate, and exchange rate were non stationary at level but after taking the first difference the variables become stationary using both the Augmented Dickey Fuller (ADF) and Phillip Perron (PP) unit root tests.

The VECM is therefore used to examine the relationship among exchange rate, inflation and sustainable development in Nigeria since it is not all the variables that are stationary at level which show tendency for cointegration among the variables.

Table 4: Vector Error Correction Estimates

Dependent variables→	ΔGDPC	ΔINF	ΔEXR	ΔINTR
CointEq1	-0.002146	-0.355442	-2.774737	0.166360
	(0.00272)	(1.16486)	(1.12380)	(0.47321)
	[0.78865]	[-4.59751]*	[-2.46907]*	[0.35156]
ΔRGDP$_{t-1}$	0.701881	-192.0704	-39.66401	-5.904321
	(0.15055)	(64.4369)	(62.1656)	(26.1767)
	[4.66199]*	[-2.98075] *	[-0.63804]	[-0.22556]
ΔINFL$_{t-1}$	0.000789	0.171859	0.134377	-0.086881
	(0.00037)	(0.15808)	(0.15251)	(0.06422)
	[2.13593]*	[1.08714]	[0.88110]	[-1.35288]
ΔEXR$_{t-1}$	0.000857	-0.345992	-0.151886	-0.056032
	(0.00049)	(0.21027)	(0.20286)	(0.08542)
	[1.74367]	[-1.64545]	[-0.74872]	[-0.65595]
ΔINTR$_{t-1}$	0.001557	-1.342868	-0.208326	-0.315088
	(0.00126)	(0.53749)	(0.51855)	(0.21835)
	[1.23957]	[-2.49840]*	[-0.40175]	[-1.44305]
C	0.009147	10.26070	8.205561	1.098446
	(0.00943)	(4.03744)	(3.89513)	(1.64016)
	[0.96964]	[2.54139]*	[2.10662] *	[0.66972]
Diagnostic statistics				
R-squared	0.791791	0.453878	0.220456	0.212024
Adj. R-squared	0.701039	0.356356	0.081251	0.071314
F-statistic	5.419089	4.654111	1.583685	1.506816
Akaike AIC	-3.836205	8.282036	8.210268	6.480400
Schwarz SC	-3.566848	8.551394	8.479625	6.749758

Note: Standard errors in ( ) & t-statistics in [ ]
Source: Authors' Computation, 2020

The estimates of the VECM as presented in Table 4 show that there is statistical evidence that changes in sustainable development which is influenced significantly by changes in inflation (β= 0.000789, t= 2.13593) and P<0.05) and its own shocks as shown in column one. The result also indicates that changes in sustainable development (β=-192.0704, t=-2.98075) and interest rate (β=-1.342868, t=-2.49840) significantly influence changes in inflation. Hence, it is evident that while inflation has a positive significant effect on sustainable development (β= 0.000789, t= 2.13593), sustainable development (β=-192.0704, t=-2.98075) and interest rate (β=-1.342868, t=-2.49840) exerts a significant negative effect on inflation in Nigeria.

The result also shows that the speed of adjustment co-efficient for inflation in the model has a negative sign and the magnitude of the coefficient of error correction term lies between zero and one. This shows that 36% of the short run

disequilibrium adjusts to the long run equilibrium each year for exchange rate. The significance of the error correction term indicate that the speed of growth model to converge to the long run equilibrium point exist and moderate. This implies that exchange rate have a long-run pass through relationship with inflation.

Impulse Response Function

The impulse response function was used to investigate how economic growth respond to shocks in monetary policy. The results of the impulse response between sustainable development and exchange rate pass through to inflation are presented in figure 4 below:

Figure 4: Impulse Response Function: Sustainable Development and Exchange Rate Pass-through to Inflation
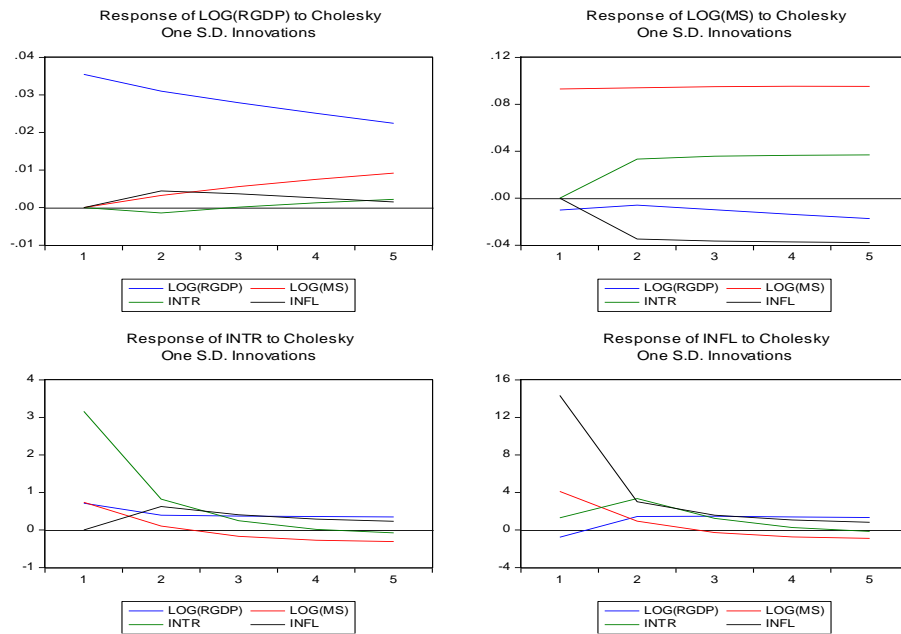
Shocks in inflation lead to a long term decrease in sustainable development as proxy by GDPC as shown in figure 4 above. The improvements in inflation resulted in a sharp decrease in sustainable development in the second year to the third year, but later remains under the steady state with a new equilibrium state implying permanent effect from the third to the fourth year after which there was a sharp increase in sustainable development in the fifth year. Shocks in exchange rate also leads to a rise in inflation and a decline in interest rate below the steady state.

Discussion of Findings

The estimates of the VECM show inflation has a positive significant effect on sustainable development (β= 0.000789, t= 2.13593) while sustainable development (β=-192.0704, t=-2.98075) and interest rate (β=-1.342868, t=-2.49840) exerts a

significant effect on inflation in Nigeria. The significance of the error correction term(ECM(-1)) -0.002146indicate that the speed of sustainable development model to converge to the long run equilibrium point exist at 0.21% speed of adjustment. This implies that exchange rate have a long-run pass through relationship with inflation.

By and large our result established that inflation has a positive significant effect on sustainable development and that exchange rate have a long-run pass through relationship with inflation. This result corroborated the findings in the study conducted by Ogundipe and Egbetokun (2013)on the effect of exchange rate shocks in consumer prices. The study found a substantially large exchange rate pass-through to inflation in Nigeria. Finding shows that exchange rate has been more important in explaining Nigeria's rising inflation phenomenon than the actual money supply. It also corroborated the study of Wattanakoon (2011) on the degree of pass through and short-run exchange rate adjustment toward long-run equilibrium to verify what monetary authority should do during the years of economic turbulence. The study found that there will be 4.7% of pass through from exchange rate to price level in Thailand and the error of the deviation from the actual value of inflation will be corrected by 14.06% in each period. The result also supported the findings of Umaru and Zubairu (2012) on the impact of inflation on economic growth and development in Nigeria between 1970-2010..The results also revealed that inflation possessed a positive impact on economic growth through encouraging productivity and output level and on evolution of total factor productivity. A good performance of an economy in terms of per capita growth may therefore be attributed to the rate of inflation in the country.

5. Conclusion and Recommendation

This study concluded that inflation had a positive significant effect on sustainable development and that exchange rate had a long-run pass through relationship with inflation. This result implies that despite the high and unstable level of inflation in Nigeria, its implication on sustainable development has been encouraging and desirable. This surprising result can be attributed to the position that a moderate level of inflation is necessary of sustainable development and to the prudence fiscal and monetary policy management of the government. Following the empirical findings, the following recommendations are made for effective policy formulations. Nigeria should cut-down her excessive dependence on primary commodities as a major source of foreign exchange by ensuring that value are added to all primary commodities before traded in international market to reduce the country exposure to disturbances in the international commodity markets and improve the value of her currency. Also policy makers need to control the volatility of the Naira exchange rate so as to ensure stable retail price levels. Finally, policy makers needs to also introduce policies that will boost the level of output in Nigeria by improving productivity/supply in order to reduce the prices of goods and services (inflation) so as to boost the growth of the economy.

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