Dynamic Effect of Exchange Rate Gap Shocks on Stock Market Deepening: Evidence from Nigeria

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The study examines the exchange rate gap shock–stock market deepening nexus in Nigeria using the structural VAR-X (SVAR-X) technique for the period 1986Q1 to 2018Q4. Findings reveal that exchange rate gap shock has a negative but statistically not significant effect on stock market deepening in Nigeria. It was also found that exchange rate passed–through interest rate from second to thirteen quarter, and further through financial openness whose effect, like exchange rate gap, was negative. This implies that exchange rate gap is significantly and negatively related to interest rate and financial openness in Nigeria. It is therefore recommended that the monetary authority should keep constant tab on the gap between official and parallel market exchange rates as its widening can have a damaging effect on stock market deepening. In addition, there is need to establish hedging instrument market to increase resilience of the stock market and improve stock market deepening in Nigeria.

1. Introduction

Stock markets in sub-Saharan Africa (SSA) became prominent due to their financial intermediation role in liquidity transformation by breaking the barriers of foreign investors' capital restriction and improve capital accumulation in the region. The resolve of the region's governments to improve capital formation led to the adoption of financial reform and this has greatly improved foreign portfolio investment coupled with domestic savings but this did not preclude the attendant effect of floating exchange rate regime, characterized by behaviour of exchange rate on stock market development which became more prominent since 1970s (Arikewuyo, 2018).

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Stock market deepening is viewed as growth of stock market, measured by increase in the trading volume of long-term investment (Richards, 1996; Aduda *et al.*, 2014). Applegarth (2004) sees stock market deepening as enlisting more firms to the stock exchange (bourse) as well as increased liquidity. Stock market deepening appears to have the ability to effectively mobilize savings for vast productive institutions and provide available investment sources for the investible public. This shows that a well-functioning and sound stock market broadens access to finance, reduce risk and vulnerabilities such as high cost of borrowing, while a shallow market constraints funds accessibility which leads to high borrowing cost from informal sources, thereby dampening the stock market development (King & Levine, 1993; Aduda *et al*, 2014). Stock market deepening therefore measures the extent to which credit to private sector is provided and enables investment (Sinha *et al.*, 2013). This is measured as proportion of market capitalization to domestic output.

Statistics reveal that the Nigerian stock market capitalization recorded growth rate of 2243.6% between 1999 and 2009, and 268.24% between 2009 and 2019. More so, the stock market deepening grew at 1064.72% between 1985 and 2007, reduced drastically to 362.97% by 2009 occasioned by the global financial crisis (GFC) and further to 286.73% in 2016 but increased to 423.32% by 2019 (CBN, 2019). Despite the growth rate experienced overtime, the stock market deepening in Nigeria failed to meet the market depth (% of stock market capitalization to GDP) threshold of 13.2%, 28.3% and 33.6% set for lower-middle-income (LMI) countries in 2003, 2008 and 2019/2020 respectively as average standard in global ratings (World Bank, 2019).

The gap between official and parallel market exchange rate was first experienced in the first quarter of 1987 when official exchange rate was N3.92 to a US dollar while that of parallel rate was N3.98, but reached its peak of N150.04, when official exchange rate was N305.22/$1 while that of parallel rate was N455.26, in the fourth quarter of 2016 which coincided with the period when Nigerian stock market deepening attained its minimum level. The gap reduced to N53.30, when official exchange rate was N306.95 while that of parallel rate was N360.25, in the fourth quarter of 2019.

There is no doubt about the pervasive effect of exchange rate volatility on the de-

velopment of stock market but studies on exchange rate gap shock–stock market deepening nexus are largely sparse in SSA. Several factors both external and domestic macroeconomic determine a country's relative economic health as these have impacted on the level of trading in the Nigerian capital market (Sinha & Kohli, 2015; Bhuvaneshwari & Ramya, 2017; Omodero *et al*, 2023). The instability of certain macroeconomic indicators, especially frequent changes in foreign exchange rate, do influence investment decisions (Bhuvaneshwari & Ramya, 2017). This study used Nigerian data as the country has the largest stock exchange in West Africa in terms of listed companies and market capitalization (Africa Capital Market Watch, 2019).

Although foreign investment is less attractive to countries with high level of foreign exchange rate volatility, the Nigerian case is different (Erdal, 2001; Kennedy & Nourizad, 2016; Abanikanda & Akinbobola, 2023). Thecountry's financial market is dominated by foreign investors amidst high foreign exchange rate volatility. About 67% of total transactions and 68.32% of cash inflows to the Nigerian stock market are from foreign investors (The Nigerian Stock Exchange - NSE, 2019). According to Okereke-Onyiuke (2007) as cited in Omokehinde (2017), the Nigerian stock market offers one of the highest returns in the world. Arguably, the influx of investors in the Nigerian stock market between year 2000 and 2019 was to take advantage of the high returns on investment in the market (Adedokun & Olakojo, 2012; NSE, 2019) but the economic downturn ranging from uncertainty built around foreign exchange availability, monetary policies as well as tough fiscal policies in the recent years have weakened investors' confidence thereby resulting in low trading of existing securities despite the cheap share valuation (Bagga, 2016; NSE, 2015; Abanikanda & Akinbobola, 2023).

The Central Bank of Nigeria operated different exchange rate policies at different times. The most prominent is a peg against a basket of currencies to maintain a stabilized real effective exchange rate at narrow/minimal trading range. Single exchange rate market maintenance is highly important to the economy as it aids current account transactions. Achieving single exchange rate market requires balancing of supply and demand for foreign exchange by the CBN as this can only be sustained if there is enough foreign exchange reserves to meet its demand. The excess demand

for foreign currency in the official window coupled with economic imbalances led to high inflation rate and the balance of payments weakness, resulting in multiple exchange rates. Transactions in the market led to profiteering due to wider spread between official and parallel rates. With this, price levels in the economy are likely to reflect the parallel market rate because that is the rate most economic agents are likely to use (Gray, 2021).

Although, several studies have been conducted (on stock market deepening (Nwanna & Chinwudu (2016); Ogbuagu & Ewubare 2017), the issue of its relationship with exchange rate gap shock is largely sparse in literature. Most extant studies on stock market deepening only considered legal factors, economic openness and some macroeconomic factors without considering exchange rate gap. The question that requires an empirical investigation is: to what extent has the gap between official and parallel market rates affects the deepening of the Nigerian stock market?

This study investigates the nexus between exchange rate gap shocks and stock market deepening. The study focuses on exchange rate gap because it can adversely influence stock market deepening and GDP.

The rest of this paper is organized as follows. Section 2 centres on literature review. Section 3 describes the methodology. Section 4 presents the results and discussions, while Section 5 concludes the study.

2. Literature Review

2.1 Theoretical Literature

Stock market deepening has its origin from financial development as it constitutes one of the means of measuring financial development. Stock market deepening is used interchangeably with financial depth, but the specificity of financial depth lies in bank deepening, insurance deepening and stock market deepening. However, extant studies have revealed that stock market activities react to different shocks, ranging from domestic to external (Adebiyi *et al.* 2009; Chatziantoniou *et al.*,2013; Cyril, 2016).

However, the above measures depict that financial development of any nation revolves around financial institutions and markets. Private sector development can be

sustained through banks and stock market by facilitating transactions, capital accessibility and other financial products (Department for International Development [DFID, 2004]).

Conceptually, foreign investors establish an interest in any domestic stock market as long as the economy is stable and interest rate is high enough to give a better return on investment. This presupposes that an increase in interest rate on domestic securities and local currency would create a leverage for foreign investors to demand for domestic assets, thereby increasing the demand for local currency which would lead to an appreciation of the local currency, and vice versa.

The theoretical underpinnings employed in this study are portfolio balance theory (PBT) of exchange rate determination which connects foreign exchange rate to stock market, and the financial market theory of development. The PBT stresses the significance of financial assets in exchange rate determination as it links demand and supply of money with bonds to equilibrium foreign exchange rate. This model views foreign exchange rates as asset prices that adjust to equilibrate international trade in financial assets.

The PBT, according to Gavin (1989), considers the interaction between the exchange rate and stock price based on capital account, and posits that stock price changes will lead to exchange rate fluctuations. Foreign exchange is treated as every other commodity and its price depends on the supply and demand of the currency in the market. The behavior of domestic stock market influences wealth of investors thereby stimulating local currency demand and interest rates.

This theory plays a cardinal role in international finance as it assumes a perfect capital mobility and imperfect substitutability due to the presence of country risk. The monetary approach that emphasizes the role of money in equilibrium exchange rate determination under flexible exchange rates. The PBT improves on the monetary approach by including financial assets. The market for financial asset becomes more prominent due to economic openness as this increases foreign activities in the stock market, thereby increasing foreign participation in the demand and supply of currencies. This brings connectivity of the two markets (foreign exchange rate and stock

markets) into play. The roles of interest rate in portfolio balance approach are ambiguous (Khan & Abbas, 2015) as economic stability influences the interest of the external investors.

The financial market theory of development emphasizes the need to attract foreign investors and discard the slow process of capital accumulation. The development of stock market is dependent on depth, access, efficiency and stability of the market. This is achievable if trading in the stock market is active. Furthermore, the openness of Nigerian capital market allows foreign participation thereby promoting fund flows, upward drive of market liquidity as well as enhancement of stock price efficiency (Ilo, 2015). However, Gherig and Menhkoff (2004) posits that future expectation of traders tend to be adjusted due to the behaviour of macroeconomic fundamentals underlying foreign exchange rate, hence portfolio rebalancing accordingly.

Portfolio rebalancing creates foreign exchange rate movements, and causes shocks in the stock market through market deepening. Accessibility and stability of stock market relies heavily on the depth of the market. Thus, efficient stock market deepening translates to increased fund mobilization to the private sector, hence economic development. The difference between official and parallel market foreign exchange rates influences the decision of investors in composing their assets, as too much gap between the rates can result in capital flight, since foreign exchange rate plays an essential role in balancing asset demands with supplies.

2.3 Empirical Literature

The empirical investigation of this study rests on the submission of Gardanecz and Mehrotra (2011) that greater foreign exchange rate volatility may affect the development of the stock market. This shows that the channels through which stock market development (depth and efficiency) can be partly achieved may be influenced by shocks arising from foreign exchange rate behaviour through stock market rebalancing. Frankel (1983) suggests that the adjustment in exchange rate instantly rationalize international demand for stocks of domestic assets.

Ani *et al*. (2013) examined the effect of foreign exchange reforms on the Nigerian financial deepening using an annual data from 1982 – 2009. The study employed

multiple regression technique and found that ratio of foreign direct investment (FDI) to GDP, market capitalization, and real interest rate have positive relationships with financial deepening, while exchange rate has a negative relationship.

The study by Mlambo *et al.* (2013) assessed the effect of currency volatility on the Johannesburg Stock Exchange. Results show that currency volatility has a weak but positive impact on stock market activities in South Africa.

Chatziantoniou *et al.* (2013) studied how stock market responds to monetary policy shock using multi-country evidence. The study covers the period 1991:1 – 2010:4 using SVAR. The findings reveal that the interaction between the fiscal and monetary policies is very important in explaining stock market development.

Falahaty and Hook (2013) provide evidence from Middle East and North Africa (MENA) region on the determinants of financial development in for the period 1991-2009 using fully modified ordinary least squares (FMOLS). It was found that financial development is influenced by economic growth, trade openness, bank concentration, institutional quality and government ownership of banks. However, more emphasis was placed on trade openness and bank concentration without given attention to foreign exchange rate.

Also, the intertwining relationship between oil volatility and Standard & Poor 500 (S & P 500) returns on stock returns in Nigeria was examined by Riman *et al.*, (2014). Three foreign variables and one domestic variable were estimated using SVAR and the finding, in line with Kilian (2009), revealed that Nigerian stock market was affected by changes in international oil prices.

Cuestas and Tang (2015) employed granger causality test and Markov Switching SVAR technique to investigate the spillover effects between exchange rate changes and stock returns in China. The study found that stock returns granger–caused exchange rate changes. However, exchange rate changes exhibited little effect on stock returns.

Using vector error-correction and Granger-causality techniques, Shahbaz *et al.* (2015) investigated the macroeconomic determinants of stock market development in Pakistan for the period 1974-2010. Findings revealed that economic growth, inflation,

financial development and investment have positive and significant relationship with stock market development.

Cyril (2016) employed multiple regression to examine the effect of variations in foreign exchange on financial deepening in Nigeria using the annual data from 1985 – 2015. It was found that real interest rate and ratio of market capitalization of listed equities to GDP exhibited positive relationship with financial depth, while exchange rate exhibited negative relationship. This implies that exchange rate dampens financial deepening in the Nigerian economy.

Abraham (2016) examines the effect of crude oil price movement on the Nigerian stock market and the role of exchange rate as a plausible countercyclical policy target. Using autoregressive distributed lag (ARDL) with daily data covering 2008 – 2015. The study reveals that exchange rate policy could be used to cushion the effect of crude oil price shock on the stock market. In another study, Adebiyi *et al.* (2009) using quarterly data covering 1985 – 2008, investigated the effects of oil price shocks and exchange rate on stock market returns with VAR, Granger causality and GARCH (1, 1) models. Their results show that oil price shocks immediately and negatively influence stock returns in Nigeria. Also, there is unidirectional causality from stock returns to real exchange rate.

Rahman and Mustafa (2017) examined the effect of financial deepening on stock market returns in 40 economies comprising 19 developed and 21 developing nations covering 1988 - 2014. Pedroni's panel cointegration and panel vector error correction models were statistical methods employed. Findings revealed that stock market liquidity is marginally positive and statistically insignificant to stock market return.

Fapohunda *et al.* (2019) investigated the relationship between money market instruments and financial deepening in Nigeria for the period 1981–2016. Johansen's cointegration and error correction model were employed. Results showed strong effect of money market instruments on financial deepening in Nigeria.

Ogoun and Adumein (2020) examined the effect of exchange rate on financial deepening in Nigeria covering 1980 – 2015. The study considered ratios of broad money supply to GDP and exchange rate as variables. Findings revealed that exchange rate

affects financial deepening.

Tiamiyu (2022) employed ARDL approach to examine the relationship between financial deepening and the development of stock market in Nigeria covering 1981 – 2019. It was found that significant drivers, in the long run, of stock market development include financial deepening indicators while financial deepening exerted negative influence on stock market in the short run.

Omodero *et al.,* (2023) examined the effect of financial deepening on equity investment in emerging markets. The study employed ARDL technique covering between 1981 and 2021. It was found that financial widening indicators have significant effects on equity investment in the short- and long-run. The study by Abanikanda & Akinbobola (2023) investigated the role of financial deepening in exchange rate volatility–foreign investment nexus in Nigeria between 1981Q1 – 2020Q4. Results from ARDL technique revealed that exchange rate stimulates foreign investment in the short run, while it reduces it in the long run.

The reviewed empirical studies have shown that previous studies ignored the dynamic relationship between exchange rate gap shock and stock market deepening in Nigeria. This study incorporated international oil prices and changes in U.S. fund rates, which previous studies ignored, to ascertain the contemporaneous effect of foreign factors on stock market deepening in Nigeria.

3. Data and Methodology

3.1 Data

The variables of interest include stock market deepening (market capitalization as a ratio of GDP, in million naira) sourced from NSE Factbook and CBN Statistical Bulletin, while data for exchange rate gap (gap between the official and parallel market foreign exchange rate, measured in naira), inflation (in percentage), minimum rediscount rate (MRR) and monetary policy rate (MPR) were obtained from CBN Statistical Bulletin and National Bureau of Statistics (NBS). MRR and MPR were used to proxy for interest rates (in percentage). Data on financial openness (foreign portfolio investment – inflow plus outflow; in million naira, as a ratio of GDP) were sourced from the NSE's domestic & foreign portfolio investment report. Also, in-

ternational oil prices (in U. S. dollar) was sourced from the CBN, while the United States federal funds rate was obtained from Federal Reserve Economic Data. All data cover the period 1986:Q1 – 2018:Q4.

3.2 Model Specification

The model for the study is developed using multivariate technique. The functional relationship is presented in Equation (1).

$$Y_t = (\text{inf}_t, \text{int}_t, \text{fop}_t, \text{exrgv}_t, \text{mcy}_t, \text{opr}_t^*, \text{usr}_t^*) \tag{1}$$

Where: inf_t is inflation rate, int_t is interest rate, fop_t stands for financial openness, exrgv_t is exchange rate gap volatility, mcy_t represents stock market deepening, opr_t^* denotes Oil price, and usr is the United State federal funds rate.

This study modelled the unexpected disturbance of exchange rate gap volatility on stock market deepening in Nigerian, taking clues from the earlier works of Dokpe & Pierdziock (2000), Basher *et al.,* (2010), Chatziantoniou *et al.,* (2013), Hatipoglu *et al.,* (2014), Riman *et al.,*(2014), and Abounoori and Zobeiri (2010).

The inclusion of foreign variables is motivated by the need to control for foreign shocks since the Nigerian economy is influenced by external factors. The US Federal Funds rate is chosen because United State is one of the major business partners to Nigeria, and because of their relevance in the global economy. This is in line with the study by Riman *et al.* (2014) for developing and emerging economies whose foreign exchange rates are denominated in US dollar. Situating the model specified for this study into the SVAR-X, Equation 1 can be stated as:

$$\text{mcy}_t = \varphi_i K_t + \Psi_i R_t + \varepsilon_t \tag{2}$$
$$K_t = (\text{exrgv}_t \text{inf}_t \text{int}_t \text{fop}_t) \tag{3}$$
$$R_t = (\text{opr}_t \ \text{usr}_t) \tag{4}$$

where K_t is a vector of domestic explanatory variables at time *t*, comprising of policy (inf, int) and non-policy variables (fop, exrgv), R_t is the vector of foreign variables at time *t*, φ_i is the coefficients of each explanatory variables (domestic), Ψ_i= coefficients of each explanatory variables (foreign) and ε_t = white noise.

3.3 Identification Scheme: Non-recursive Approach

Equation 2 models a situation where foreign exchange rate gap shock affects stock

market deepening, while accounting for foreign variable shocks. The identification structure of this study is mixed as the restriction is guided by economic theory. All endogenous variables are assumed not to have any influence on external variables.

On the issue of identification and restrictions, Equation 5 reveals the set of restriction imposed on contemporaneous parameters of the SVAR-X model. The identifying structure slants mostly toward lower triangular rather than upper one. The coefficients of α_{ij} indicate how variable is contemporaneously influenced by variable j. The diagonal coefficients are set to be unity. The foreign variables were ordered last to ensure that foreign variables are not influenced by domestic variables, consistent with the block exogeneity assumption (Cushman & Zha, 1997; Dungey & Pagan, 2000). Also, the domestic variables comprise of two blocks – policy and non-policy.

For the restrictions on the contemporaneous matrix of structural parameters, Q, this study adapts the general idea of Kim and Roubini (2000). The short-run restriction for stock market deepening applied is presented thus:

$$
\begin{bmatrix}
u_t^{\text{inf}} \\
u_t^{\text{int}} \\
u_t^{\text{fop}} \\
u_t^{\text{exrgv}} \\
u_t^{\text{mcy}} \\
u_t^{\text{opr}} \\
u_t^{\text{usr}}
\end{bmatrix}
=
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 & \alpha_{16} & \alpha_{17} \\
\alpha_{21} & 1 & 0 & 0 & 0 & \alpha_{26} & \alpha_{27} \\
\alpha_{31} & \alpha_{32} & 1 & 0 & 0 & \alpha_{36} & 0 \\
\alpha_{41} & \alpha_{42} & \alpha_{43} & 1 & 0 & \alpha_{46} & \alpha_{47} \\
\alpha_{51} & \alpha_{52} & \alpha_{53} & \alpha_{54} & 1 & \alpha_{56} & \alpha_{57} \\
0 & 0 & 0 & 0 & 0 & 1 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 1
\end{bmatrix}
\times
\begin{bmatrix}
\varepsilon_t^{\text{inf}} \\
\varepsilon_t^{\text{int}} \\
\varepsilon_t^{\text{fop}} \\
\varepsilon_t^{\text{exrgv}} \\
\varepsilon_t^{\text{mcy}} \\
\varepsilon_t^{\text{opr}} \\
\varepsilon_t^{\text{usr}}
\end{bmatrix}
\qquad (5)
$$

where u_t^{inf}, u_t^{int}, u_t^{fop}, u_t^{exrgv}, u_t^{mcy}, u_t^{opr} and u_t^{usr} are the structural disturbances – domestic inflation, interest rate, financial openness, exchange rate gap volatility, stock market deepening, international oil price and US federal fund rate shocks respectively, while $\varepsilon_t^{\text{inf}}$, $\varepsilon_t^{\text{int}}$, $\varepsilon_t^{\text{fop}}$, $\varepsilon_t^{\text{exrgv}}$, $\varepsilon_t^{\text{mcy}}$, $\varepsilon_t^{\text{opr}}$ and $\varepsilon_t^{\text{usr}}$ are reduced-form residuals that describe the unanticipated movement of each regressor respectively.

All coefficients related to the reduced form innovation on inflation are set to zero except for the impacts of foreign shocks (Kim & Roubini, 2000; Chatziantoniou *et al*, 2013). It is important to state that inflation would not respond to interest rate because real interest rate was used in this study. Fisher (1930) suggests that inflation

and real interest rate are not cointegrated. This becomes necessary because in a case of inflationary trend in an economy, savers may be averse to increasing their savings while lenders may be willing to increase the cost of borrowing due to inflation. To compensate for deficit-surplus ends, it is imperative to increase deposit and lending rates.

Also, interest rate reacts contemporaneously only to inflation and foreign shocks. More so, financial openness is contemporaneously influenced by inflation, interest rate and oil price. Foreign exchange rate gap volatility is contemporaneously influenced by all variables except market deepening. It is assumed that exchange and interest rates are reliant on each other (Kim & Roubini, 2000; Handoyo *et al.*,2013). Based on the objective of this study, stock market deepening is contemporaneously influenced by all variables (Afonso & Sousa, 2011; Chatziantoniou *et. al.*, 2013; Handoyo *et al.*, 2013).

The exchange rate gap employed in this study was the difference between official and parallel market foreign exchange rates. The gap between these rates promote volatility and accounts for unanticipated components of the foreign exchange rate premium.. Equation 6 shows how exchange rate gap is measured:

$$\text{exrg} = \text{exr}^o - \text{exr}^r \quad ^2 \tag{6}$$

where exr^o is the official market exchange rate; and exr^r is the parallel market exchange rate.

3.4 Estimation Procedure

Two conventional stationarity tests - Augmented Dickey-Fuller (ADF), and Phillips-Perron (PP) were carried out. PP test differs from the ADF test mainly in how they deal with serial correlation and heteroskedasticity in error terms. The ADF test uses a parametric autoregression to approximate the ARMA structure of the errors while PP test corrects the DF test by the bias induced by omitted autocorrelation.

The optimum lag length is selected empirically. Guay and Pelgrin (n.d) suggests that Hannan – Quinn Criterion (HC) is the appropriate lag selection criterion for quarterly data not exceeding 120 observations, but Schwatz Information Criterion

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[2] The computation of exchange rate gap was in line with Abounoori and Zobeiri (2010).

(SIC) is recommended if the observations exceed 120.

4. Results and Discussion

4.1 Descriptive Statistics

As shown in Table1, the average stock market deepening in the period under study was 0.535 with a standard deviation of 0.34 which shows the risk associated with funds available to industries in the stock market. This does not depict any higher risks, suggesting lower potential for losses. The skewness value of 2.65 is an indication that stock market deepening is positively skewed.

The mean point of inflation is 13.44% per quarter with a standard deviation of 4.36. The skewness value of 0.194 is positively skewed. The kurtosis value of 4.07 and *Jacque-Bera* statistic of 7.15 implied that inflation in Nigeria deviated from a normal distribution for the period under consideration.

Table 1: Descriptive Statistics

	mcy	inf	int	fop	exrgv	opr	usr
Mean	0.535	13.44	13.749	0.153	268.72	45.378	3.51
Median	0.423	13.50	13.50	0.123	23.091	28.43	3.28
Std. Dev.	0.339	4.36	3.951	0.128	843.25	34.037	2.75
Skewness	2.654	0.194	0.777	1.222	5.341	0.976	0.25
Kurtosis	10.988	4.07	5.061	4.228	37.461	2.726	1.90
No. of Observation	132	132	131	132	131	131	131

Where: inf is inflation rate, int is interest rate, fop stands for financial openness, exrgv is exchange rate gap volatility, mcy represents stock market deepening, opr denotes Oil price, and usr is the United State federal funds rate.

Furthermore, interest rate revealed an average of 13.75% per quarter with a standard deviation of 3.95 showing deviations from the mean. The skewness value of 0.78 indicates that interest rate is positively skewed from the expected value. The kurtosis value of 5.06 suggests that the distribution of interest rate in Nigeria was leptokurtic.

Financial openness showed a mean point of 0.15 with a standard deviation of 0.12. The skewness value 1.22 indicates that financial openness is positively skewed. The kurtosis value of 4.23 shows a leptokurtic distribution.

Exchange rate gap in Nigeria recorded a mean of 268.72. This is an indication that the gap between official and parallel market exchange rates in Nigeria was high during the period. Moreso, the skewness value 5.34 shows the gap positively deviated from its expected market value. The kurtosis value of 37.461 suggests that the distribution of the exchange rate gap was leptokurtic.

International oil prices had a mean score of \$45.38 per quarter with a standard deviation of 34.04 indicating high degree of variations in international oil prices. The skewness value of 0.98 reveals that international oil prices skewed positively from its expected value. The kurtosis value of 2.73 suggests that distribution of international oil prices was platykurtic.

United States Federal fund rates recorded anaverage of 3.51% per quarter with a standard deviation of 2.75. The skewness value of 0.25 suggests that U.S fund rates skewed positively from its expected value. The kurtosis value of 1.90 shows a leptokurtic distribution.

4.2 Stationarity Test

Table 2: Unit Root and Stationarity Tests

Variable	Model Specification	ADF	PP	Order of integration
mcy	Trend & Intercept	-7.689*	-8.155*	I(0)
inf	Intercept	-3.232**	-2.972**	I(0)
gms	Trend & Intercept	-13.084*	-13.087*	I(0)
fop	Trend & Intercept	-3.786*	-4.131*	I(0)
exrgv	Trend & Intercept	-7.375*	-7.643*	I(0)
opr	Trend & Intercept	-9.395*	-10.038*	I(0)
usr	Trend & Intercept	-6.820*	-7.052*	I(0)

Note: * and ** indicate 1% and 5% level of significance. inf is inflation rate, int is interest rate, fop stands for financial openness, exrgv is exchange rate gap volatility, mcy represents stock market deepening, opr denotes Oil price, and usr is the United State federal funds rate.

The variables for this study were subjected to stationarity test to avoid spurious re-

sults. In all situations considered, a constant and linear time trend was included and these were meant to enhance the robustness check (Hamilton, 1994). The outcome of the stationarity tests as shown in Table 2 revealed all variables were stationary at 5 per cent level of significance for all unit root techniques used.

4.3 Impulse Response Function

This study generated impulse response function from SVAR for which results are presented in Figure 1.

Response of Stock Market Deepening to Exchange Rate Gap Shock

The shock due to exchange rate gap (shock 4) showed a negative impact, though insignificant, on stock market deepening in the 2nd quarter and it maintained the negative percentage point without returning to equilibrium in the 20th quarter except in few occasions (i. e. 5th, 9th and 10th quarters) where positive impacts were felt. The periods, where positive impacts were felt, coincided with the period when autonomous foreign exchange market (AFEM) was introduced to encourage the inflows of non-oil foreign exchange proceeds into banks as a measure of relief to demand pressure on the CBN. This actually showed that the shortage of foreign exchange at the official market and continued flourishing of parallel market during this period dampened the deepening of stock market as well as destabilizing effect on the economy of Nigeria. This finding lends support to Ani *et al.* (2013).

This is a confirmation that the gap between the official and parallel market exchange rate has not been favourable to stock market deepening in the country. Further widening premium may dampen the stock market the more. The implication of this is that the widening premium between the official and parallel exchange rates has continued to affect the investors ' confidence in the Nigerian stock market.

Response of Stock Market Deepening to Own Shock

The result showed that stock market deepening (shock 5) positively responds to its own shock in the 1st quarter, declined in the 3rd quarter with a minimal peak in the 4th quarter before it returns to equilibrium in the 11th quarter. This depicts that the value of market deepening in the previous quarter is a predictor of the current quarter but at a decreasing rate. This result may be due to non-expansion and security innovation

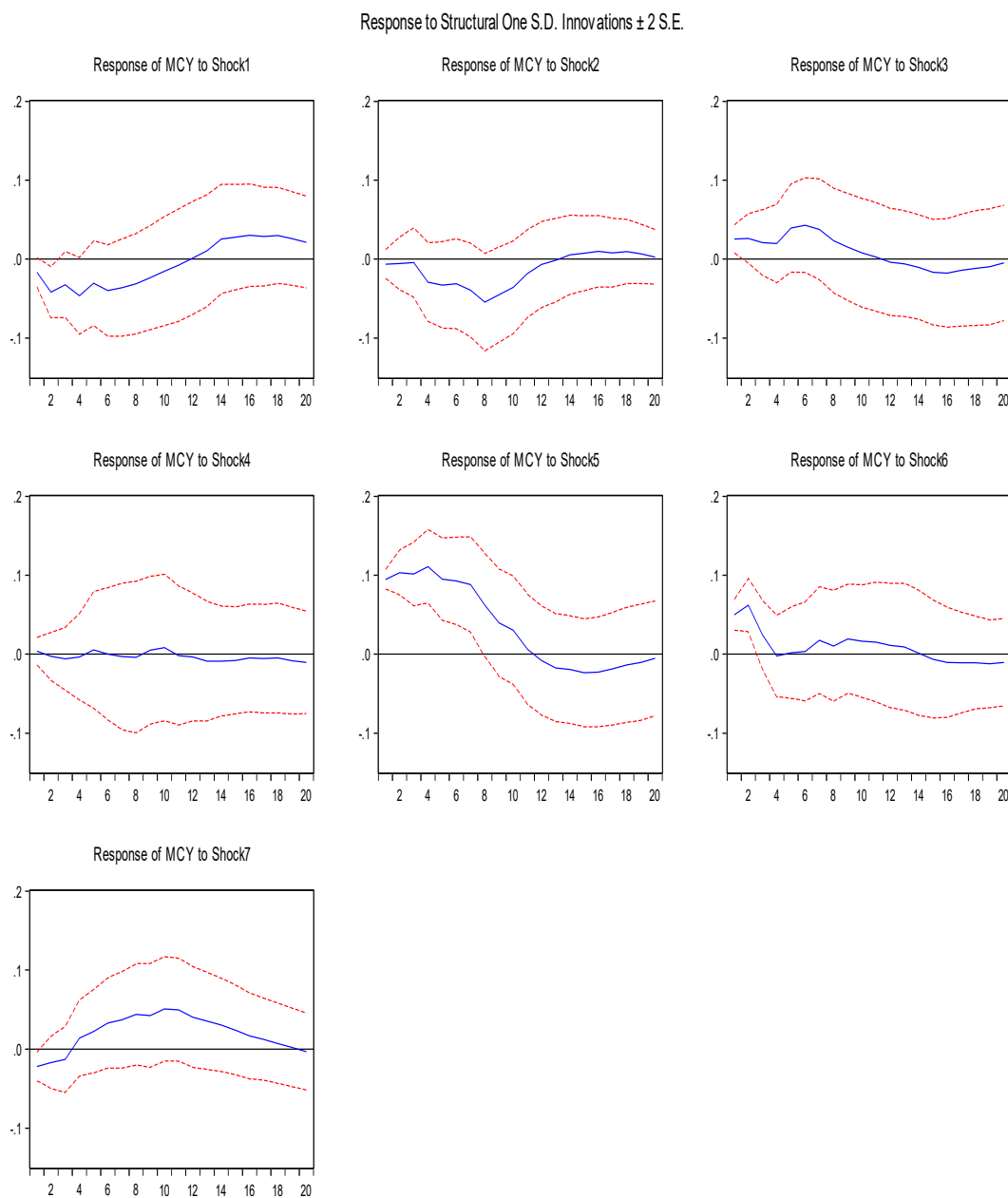in the market overtime.This finding has serious policy implications for stock market deepening in Nigeria.

Response to Structural One S.D. Innovations ± 2 S.E.

Figure 1: Impulse Response Function

4.4 Result from Forecast Error Variance Decomposition

Results from the forecast error variance decomposition (FEVD) revealed the major

sources of shock to stock market deepening.

Table 3: Variance decomposition of internal shocks to stock market deepening

Quarter	S.E	inf	int	fop	exrgv	mcy
1	0.4716	4.557	2.537	3.658	2.924	86.324
4	0.	3.797	2.014	3.359	2.317	88.513
10	0.	8.267	6.938	4.076	1.452	79.267
20	0.	13.626	6.004	5.636	3.618	71.116

Note: inf is inflation rate, int is interest rate, fop stands for financial openness, exrgv is exchange rate gap volatility, mcy represents stock market deepening, opr denotes Oil price, and usr is the United State federal funds rate.

Results from Table 3 revealed that stock market deepening was 86.3% affected by its own shock in the first quarter while changes in inflation and financial openness accounted for 4.6% and 3.7% respectively. The magnitude of exchange rate gap shock effect was of marginal value in the first quarter. Within 4 quarters, changes in stock market deepening due to own shock increased to 88.5%, while that of exchange rate gap marginally decreased. Between the fourth and twentieth quarters, the share of own shock declined to 71.2%, while there are increase in shocks arising from inflation, interest rate and financial openness as well as exchange rate gap.

The intuitive reasoning from this finding is that shock due to exchange rate gap on stock market deepening was negative and insignificant.. The implication of this is that the Nigeria's stock market deepening is contemporaneously affected negatively by exchange rate gap volatility but not significant.

From the variance decomposition in Table 3, exchange rate gap shock is the least effective, in the first 20th quarter of this study. What this connotes is that external shock affects stock market deepening more through inflation and financial openness than exchange rate gap -the exchange rate gap increased after increase in inflation and financial openness. What could be deduced is that internal shock (inflation & financial openness) through external shock incursion (changes in US fund rates) influence exchange rate gap which later transmits the shocks to stock market deepening in Nigeria.

Three post–estimation tests which include AR root Table AR roots and serial correlation LM tests were conducted, and the results are consistent with the theoretical postulation of SVAR-X methodology. The outcome indicates that all roots of the characteristic polynomial fall within the unit circle which showed that the defined SVAR-X model is stable.

The findings from this study further confirmed the effect of exchange rate gap shock on already existing negative disturbances on stock market deepening by widening the existing gap. This is because of the inability of the official market to meet the demand for international currencies, and this has a serious setback to improving stock market deepening in Nigeria. This submission is in line with Agenor (1992). Other variables whose disturbances were of great concern include financial openness, inflation and interest rate. The shocks due to financial openness had been consistent, though oscillating, but continued influencing Nigerian stock market deepening thereby enhancing capital flight.

This study is in contrast with findings of Adebiyi *et al* (2009) in the short run, consistent with their study in the long-run. This contradiction may be due to the variable used, and period covered.

5. Conclusion and Policy Recommendations

5.1 Conclusion

This paper employed quarterly data from 1986 to 2018 to investigate the effect of exchange rate gap shocks on stock market deepening in Nigeria using SVAR-X technique. Previous works have documented the interaction between exchange rate and stock market, but little attention has been given to exchange rate gap shocks and contemporaneous effect of foreign variables. The study finds that exchange rate gap shocks only complement the already existing disturbances of exchange rate on stock market deepening due to non-significance of the former. Thus, stock market deepening in Nigeria is dependent on the stability of foreign exchange rate as this may go a long way in influencing investment decision in the market. Further widening in the gap can have a damaging effect on stock market deepening in Nigeria. This study adds value to extant literature through the inclusion of exchange rate gap shocks to the explanation of stock market deepening.

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5.2 Policy Recommendations

The findings re-invigorate the need to give attention to the damaging effect of the gap between official and parallel market foreign exchange rates in Nigeria, considering that it thrived due to short supply of foreign exchange in the official market. This study recommends that the government should diversify the economy to improve current account balances to meet the domestic demand for foreign currency and stabilize the exchange rate, thereby deepening the stock market in Nigeria.

Domestic interest rate must be kept afloat over and above U. S fund rate to attract foreign portfolio investment as well as discourage capital flight arising from economic uncertainty created by exchange rate gap volatility. The attraction of foreign portfolio investment could be used to cushion the imbalances between supply and demand for foreign currencies, thereby improving the development of foreign exchange and stock markets.

Capital market operators and policymakers in conjunction with the CBN should establish hedging instrument market such as commodity market, separate from the existing stock market, to enhance greater domestication of foreign funds to increase resilience of the economy to foreign shocks.

In addition, the government must find a way of regulating the parallel market to ensure that its rate does not largely differ from that of the official market as a huge gap between both rates may have a damaging effect on the stock market deepening due to round-tripping activities.

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Appendices

Table A1: Optimal Lag Length

VAR Lag Order Selection Criteria

Endogenous variables: INF INT FOP EGV MCY

Exogenous variables: OPR1 USR

Date: 11/08/20   Time: 18:14

Sample: 1986Q1 2018Q4

Included observations: 121

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1816.767	NA	140442.3	31.71769	31.88477	31.78551
1	-1201.552	1144.836	7.440199	21.87046	23.20712*	22.41301
2	-1116.903	147.2149	4.038244	21.25049	23.75673	22.26776*
3	-1075.346	67.21416	4.702984	21.37993	25.05575	22.87193
4	-1023.590	77.40887	4.686500	21.33200	26.17740	23.29872
5	-960.1133	87.21136	3.924766	21.08023	27.09521	23.52168
6	-901.5559	73.32402*	3.726971*	20.91402*	28.09858	23.83019
7	-855.6967	51.84084	4.652709	20.96864	29.32278	24.35954
8	-805.1323	51.00407	5.734622	20.94143	30.46515	24.80706

Table A2

VAR Residual Serial Correlation LM Tests

Null Hypothesis: no serial correlation at lag order h

Date: 11/08/20   Time: 20:48

Sample: 1986Q1 2018Q4

Included observations: 123

Lags	LM-Stat	Prob
1	50.11991	0.4287
2	50.57259	0.4112
3	49.13268	0.4678
4	28.77240	0.9906
5	32.05274	0.9708
6	40.02862	0.8159

Probs from chi-square with 63 df.

Table A3

Inverse Roots of AR Characteristic Polynomial