

# FOREIGN EXCHANGE RATE DYNAMICS AND STOCK RETURN VOLATILITY IN THE NIGERIAN STOCK EXCHANGE MARKET

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## Abstract

*Stock return volatility plays a vital role in mobilising long term finance for the private and public sectors of any economy. Despite the exchange rate stability policy by the Central Bank of Nigeria (CBN), the Nigerian Stock Market still experience high volatile stock return and loss of investors' confidence. The study examined the effect of foreign exchange rate dynamics on stock return volatility in the Nigerian Stock Market. E-GARCH was employed using monthly data sourced from the CBN within the period of January 2008 to March, 2020 for All Share Index, Inflation and Exchange Rates. The study revealed that foreign exchange rate dynamics and inflation rate inversely affect stock return volatility in the Nigerian Stock Market and recommended that the CBN and other monetary authorities should employ stringent measures to control overvaluation of foreign currencies against Nigerian local currency so as to truncate level of volatility in stock return in the Nigerian stock market.*

**Keywords:** EGARCH, Foreign Exchange Rate Dynamics, Inflation Rate, Nigerian Stock Market and Stock Return Volatility

**JEL Codes:** E63, G12

## 1.0 Introduction

It is a known fact that an economy with high level of foreign exchange rate dynamics couple with inflation rate determines stock return volatility and stock market patronage. Stock return volatility plays a vital role in mobilising long term finance for the private and public sectors of any economy. Generally, stock exchange markets are characterised with high calibre of stock returns and low return volatility, foster capital formation and economic growth. Globally, Fakunmoju, Abdullahi, and Fasola (2020) asserted that foreign exchange and inflation rates as well as stock market volatility play vital role in an economy, facilitate and forecast stock prices as well as determine stock market investors' decision. Fakunmoju *et al.* (2020) further pointed that in a modern behavioral finance literature, foreign exchange rate dynamics and their relationship with volatility of stock returns have experienced a surge of interest in different economies, especially in developing economies like Nigeria with unstable or unpredictable exchange rate.

Volatility of stock return instigated a lot of financial risks such as high cost of capital, abridged investors' participation and transactions of large magnitude instantaneously, which may have long term implications for portfolio allocation, asset pricing, market risk measure and enormously hampered economic growth and development. Demir (2019) pointed that continuous unstable trends in exchange rate dynamics, increased inflation rate, level of market liquidity and stock return volatility in the stock market reduced market size and public confidence, enhanced market illiquidity and stock market inefficiency, which had adverse effects on the economy. Yadav (2017) and Osaseri and Osamwonyi (2019) argued that without stable foreign exchange rate, high

level of stock market liquidity and efficient stock market information, economic performance and convergence in actual-expectation of stock return cannot be achieved, thus, caused increase in stock return volatility.

Despite the exchange rate policy and procedures as well as monetary policies to curb inflation rate that were put in place by the monetary regulators and authorities as well as the policy of the Central Bank of Nigeria (CBN) to shield against the adverse effect of unstable exchange and inflation rates, Nigerian Stock Market still experience high volatile stock return, loss of investors' confidence, decline in market size (Abdullahi, Lawal, & Etudaiye-Muhtar, 2012; Bala-Sani & Hassan, 2018; Fakunmojuet *al.*, 2020; Kuhe, 2018). Okonkwo (2019) further pointed that volatility of stock returns in the Nigerian Stock Market is caused by unstable exchange rate in Nigeria, which negatively affects stock patronage in the Nigerian stock market. This problem of high volatility in stock return caused by unstable exchange rate informed this current study on foreign exchange rate dynamics and volatility of stock returns in the Nigerian stock exchange market. Based on the problem identified, this study hypothesised that;

**H<sub>0</sub>:** Foreign exchange rate dynamics does not significantly affect volatility of stock returns in the Nigerian stock exchange market

## **2.0 Review of Relevant Literature**

This section focused on theoretical review and synthesised related empirical studies on the objective of the study. This study is anchored on Arbitrage Pricing Theory (APT).

### **2.1 Theoretical Review**

#### **2.1.1 Modern Portfolio Theory (MPT)**

Portfolio Theory was propounded by Markowitz (1952). According to Markowitz (1952), modern portfolio theory is a theory on how risk-averse investors construct portfolios to maximize expected return based on a given level of market risk. Markowitz (1952) further stated that several assumptions must be formulated concerning investor behavior in portfolio management. The assumptions hold that the investor views each investment alternative to be represented by distribution probability of the expected returns over the period of the investment was held. Also, there is maximization of expected utility for one period in which the curves of utility demonstrate marginal wealth utility and utility curves of investors are a function of expected risk and returns because investors solely base decisions on expected risk and return. He also argued that less risk will always be preferred by investors for any given expected return level. A good understanding of the shareholders' wealth was advocated for in evaluating the asset classes for various investors by the fund manager as it also influences the risk appetite for trustees in a pension fund. Investors weigh all investment options as representations of potential classifications of future returns for a given period of time (Kuhe, 2018). Concurrently, variability of expected returns is used as basis for estimating risk. In this framework, assets and portfolios are efficient if no other alternative offers higher expected returns for similar or lower risk (Kuhe, 2018).

#### **2.1.2 Capital Asset Pricing Model (CAPM)**

The CAPM was independently propounded by Treynor (1961, 1962), Sharpe (1964), Lintner (1965) and Mossin (1966), building on Markowitz (1952) modern portfolio theory by establishing non-existence of a riskless asset in stock market. Mossin (1966) stated that CAPM explained the modelled relationship between the expected return and risk for traded securities. The CAPM assumed that all investors are alike when it comes to risk aversion and initial wealth, leading to that all investors are looking for the highest return facing the lowest amount of risk. The rest of CAPM's assumptions, in order for it to hold, are that the capital market is efficient, i.e. share prices reflect all available market information, that all investors holding periods are the same, that all investors have the same expectations about the expected return and risk as a security, that portfolios are created from the same publicly traded assets, that taxes or transaction costs are not regarded, so gains from stocks and bonds and dividends and capital gains are not considered different for investors and finally all investors are mean variance optimizers. The CAPM insinuates that an investor holds two portfolios, a risk-free asset and the market portfolio and finally that the

return that an investor actually receives is derived from only two sources: risk proportional market return plus non-systematic random return (Celebi & Hönig, 2019).

### **2.1.3 Arbitrage Pricing Theory**

Arbitrage Pricing Theory (APT) was developed by Ross (1976a). The APT predicts a security market line linking expected returns to risk. The APT model came into play as a result of several construct criticisms of Capital Assets Pricing Model (CAPM) on its unrealistic assumptions that security expected return is a function of only one factor, i.e. the general stock market. Compare with CAPM, Ross (1976b) stated that the APT Model is based on the assumption that equilibrium market prices should be perfect, so that prices will eliminate buying and selling without arbitrage opportunities, stock market investors have homogeneous risk expectations, investors are risk averse, no transaction cost and no taxes exist within the stock market. The application of Arbitrage Pricing Theory (APT) enables investors to relax the restrictions associated with CAPM. Consequently, greater freedom is achieved in the development of a model that explains expected returns. In APT, the correlation between an asset and the risk factors associated with it were used to predict its returns.

The main criticism or weakness of APT is that it is characterized by knife-edge equilibrium whereby no investor can change his/ her portfolio. Another greatest criticism or weakness of the APT is the large amount of ambiguity in its empirical predictions, particularly when compared to the CAPM. The CAPM is explicitly a one-beta model (Uwubanmwen & Obayagbona, 2012).

Relatively, APT is a multi-macroeconomic factors model with multiple Beta ( ) to measure macroeconomic risk factors like exchange rate dynamic risk that affects expected returns in the APT model, which arise from fundamental economic and financial variables (Assefa, Esqueda & Mollick, 2017; Uwubanmwen & Obayagbona, 2012). The APT, introduced by Chen, Roll and Ross (1986), involves identifying macroeconomic variables such as foreign exchange rate dynamics, which influences stock return volatility (Fakunmoju *et al.*, 2020). The following related studies Akram (2014), Ariwaet *al.*(2017), Balagobei (2017), and Bala-Sani and Hassan (2018) have found that the APT model is relevant and applicable to the link between foreign exchange rate dynamics and stock return volatility in the Nigerian stock market. Based on this evidence, this study was built upon APT.

## **2.2 Empirical Review**

Studies such as Alabi (2015), Aliyu (2011) and Amassoma and Adeniyi (2016) examined the effect of exchange rate volatility on economic growth and stock market interaction. Their studies employed regression and GARCH and found that exchange rate volatility significantly affect economic growth and stock market performance. Angko(2013) and Anusakumar, Ali, and Wooi (2017) investigated the determinant of stock market volatility and sentimental factor of foreign exchange rate on stock return in Ghana and emerging Asian markets. Both studies employed E-GARCH and regression method of analyses. Angko(2013) found that exchange rate affect market volatility in Ghana while Anusakumar, Ali, and Wooi (2017) revealed that sentimental factor of foreign exchange rate served as determinant of stock return. Asaolu and Ogunmuyiwa (2011), Aslam (2014), Balagobei (2017) and Bahmani-Oskooee and Saha (2016) investigated the relationship between macroeconomic variables, exchange rate and stock market development. Their studies employed correlation method of analysis and established that foreign exchange rate significantly correlate with stock market movement and development. Barakat, Elgazzar, and Hanafy (2016) examined the impact of macroeconomic variables on stock markets from emerging markets in Egypt and Tunisia. Their study employed regression and granger causality method of analyses and found that there is a causal relationship in Egypt between market index and consumer price index (CPI), exchange rate, money supply and interest rate. The same goes for Tunisia except for CPI, which had no causal relationship with the market index. Results also revealed that the four macroeconomic factors are co-integrated with the stock market in both countries. Likewise, Chandran (2016) carried out a study on the volatility and returns of the Indian Banking Sector Index with

Reference to NSE Nifty. He employed GARCH and established that volatility affects stock return in India banking sector

Furthermore, Celebi and Hönig(2019) investigated the impact of macroeconomic factors on the German stock market: evidence for the crisis, pre- and post-crisis periods. Their study employed regression method of analysis and found that Export Prospects Index, Export Climate Index, exports, the Consumer Price Index CPI, as well as German regime bonds yields show delayed impacts on stock returns. They further found that the delayed impact of the constituents of the monetary aggregate M2 on stock returns transmuted direction between the crisis and post-crisis periods, which insinuate that in the post-crisis period a macro-driven market prevails. Demir (2019) and Elly and Oriwo(2013) examined the effect of macroeconomic factors like foreign exchange rate on stock market return and performance. Their studies employed both regression and correlation method of analyses and they found that foreign exchange rate as part of macroeconomic factors significantly affect stock market performance and stock return.

Kuhe (2018) empirically modelled volatility persistence and asymmetry with exogenous breaks in the Nigerian stock returns. The study employed EGARCH and found that information caused long term volatility in the stock return. Manoel-de-Sousa, Noriller, Huppel, Vaz Lopes, and Meurer (2018) examined the relationship between the macroeconomic variables and the stock return in companies of the finance and insurance sector from Latin American stock market. The study employed regression method of analysis. Their study revealed that selected macroeconomic variables such as exchange and inflation rates affect stock return. Likewise, Megaravalli and Sampagnaro (2018) empirically investigate macroeconomic indicators and their impact on stock markets in ASIAN. Their study used regression method of analysis and found that gross domestic product, foreign direct investment and inflation rate significantly affect stock return in ASIAN stock markets.

Conversely, the studies of Du and Hu (2012) and Haruna, Yazidu, and Paul (2013) examined the effect of macroeconomic factors on stock return in Ghanaian and Nigerian stock markets. Their studies employed regression method of analysis and found that macroeconomic variables like foreign exchange rate have negative effect on stock market returns. Rupande, Muguto, and Muzindutsi(2019) examined the effect of investor sentiment (exchange rate and Treasury bill rate) on stock return volatility from Johannesburg Stock Exchange. Their study used regression method of analysis and found that sentimental factors such as exchange rate and treasury bill rate affect stock return volatility but insignificant in the Johannesburg Stock Exchange market. Du and Hu (2012) and Rupande *et al.* (2019) further empirically established that foreign exchange volatility has no power to explain either the time-series or the cross-section of stock returns volatility, which calls for more research on foreign exchange dynamics on stock return volatility especially in the developing stock market like the Nigerian stock market. In view of past studies reviewed, there were scanty studies, especially in Nigeria, that examined the effect of foreign exchange rate dynamics on stock return volatility in the Nigerian stock market. This, therefore, served as an empirical gap this study intended to fill. Similarly, considering past related studies reviewed on exchange rate dynamics and stock return volatility especially in Nigeria, no studies have employed market liquidity as control variable in modelling foreign exchange rate dynamics and stock return volatility within and outside Nigeria context; therefore, this served as control variable gap this study intended to fill.

### **3.0 Methodology**

This study adopted *anex-post facto* research design, using monthly secondary data within the period of 1998 and 2020. The study utilised monthly data from January, 1998 to March 2020. This study employed Exponential Generalised Auto-Regressive Conditional Heteroscedasticity (E-GARCH) for method of analysis to investigate the effect of foreign exchange rate dynamics on volatility of stock return in the Nigerian Stock Exchange Market. This study employed EGARCH so as to establish effect of asymmetric or innovation effect or leverage effect of exchange and inflation rates announcement on stock return volatility. The monthly data used for this study was mainly secondary data source from various issues of the Central Bank of Nigeria Statistical Bulletin,

the Nigerian Stock Exchange Market Report, and Security and Exchange Commission (SEC) Report between 1998 to March, 2020.

$$ASI_t = \alpha_0 + \sum_{i=1}^p \beta_i ASI_{t-i} + \mu_i \dots \dots \dots \text{eqn 1}$$

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^q \alpha_i \sigma_{t-i}^2 + \sum_{i=1}^p \beta_i \sigma_{t-i}^2 + \delta FERD + \delta INFR + \delta LIQ \dots \dots \dots \text{eqn 2}$$

Where; ASI = All Share Index proxied for stock return volatility

FERD = Foreign Exchange Rate Dynamic proxied with exchange rate between Dollar and Naira using monthly data; INFR= Inflation Rate; LIQ = Market Liquidity proxied with Stock Turnover and  $\mu_i$  = Error Term

Where  $\sigma_t^2$  is the return variance (one-period variance based on past information) of the error term from the mean return equations,  $\alpha$  is the constant,  $\alpha_{t-1}^2$  is the ARCH term depicting the previous period squared error term from the mean return equations,  $\sigma_{t-1}^2$  is the GARCH term depicting the previous period return variance and  $\delta FERD$  is the macroeconomic factor (exchange rate). The GARCH model implies that the current value of the return variance is a function of a constant and values of the squared residual from the mean return equation plus values of the previous return and macroeconomic factor like (exchange rate) variance.

#### 4.0 Research Finding/Result

Presented in Table 1 was results of ARCH test conducted for ASI, FERD, INFR and LIQ for the periods of 1998-March, 2020 under investigation. Table 1 results rejected the null hypothesis that there is no ARCH effect. The result implies that ASI, FERD, INFR and LIQ have ARCH effect, therefore, exhibits volatility.

**Table 1:** ARCH Test Results for All Share Index (ASI), Foreign Exchange Rate Dynamics (FERD), Inflation Rate (INFR) and Market Liquidity (LIQ).

	Statistic	Value	p-value
ASI	F-statistic	31.162	0.0000
	Obs*R-squared	30.414	0.0000
FERD	F-statistic	21.452	0.0000
	Obs*R-squared	29.674	0.0000
INFR	F-statistic	12.672	0.0000
	Obs*R-squared	8.967	0.0000
LIQ	F-statistic	18.945	0.0000
	Obs*R-squared	13.920	0.0000

Source: Authors' Computation, 2020.

#### 4.1 Results for the Hypothesis

In Table 2 shows that there exists volatility in stock return since the ARCH effect is less than 5%. The result in Table 2 also indicates that there exists impact of long term volatility, which has caused stock return volatility while there is negative news causing high speed of volatility in return since the leverage effect (EGARCH) shows negative coefficient and significant at 5%. This implies negative shock has a greater impact on volatility rather than the positive shock of the same magnitude. The significance of persistent negative shocks or the volatility asymmetry indicates that investors are more prone to the negative news in comparison to the positive news. This implies that the volatility spill over mechanism is asymmetric, i.e. bad information invokes higher volatility in stock return in Nigeria stock market within the sample period.

**Table 2: EGARCH Result for the Hypothesis**

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.057321	0.067430	-4.873250	0.0024
SR(-1)	-0.684526	0.0563213	-8.428643	0.0046
Variance Equation				
Constant	-0.453825	0.637473	-6.657435	0.0000
Information Effect (ARCH)	-0.071506	0.054733	-4.457611	0.0000
Information Asymmetry (GARCH)	-0.045321	0.043216	-3.672113	0.0007
Leverage Effect	-0.457276	0.067528	-2.879450	0.0140
Exchange Rate Dynamic	-2.564321	0.000723	-1.035163	0.0225
Inflation Rate	-6.61762	0.034522	-2.864523	0.0016
Market Liquidity	-10.4563	1.956352	-5.543721	0.0365
Durbin-Watson stat	2.20453			

**Source:** Authors' Computation, 2020.

Furthermore, Table 2 for EGARCH results also shows the effects of exchange rate dynamics, inflation rate and market liquidity on the volatility of stock return. In the mean equation, lag of stock returns was included and is seen with a negative coefficient of approximately -0.684, with a coefficient probability value of 0.0046. This indicates that previous stock returns affect current stock returns negatively and a point increase in current stock returns will lead to a decline in next period stock returns by about 0.68 percent points. In the variance equation, aside the constant term, the effects of information, information asymmetry, leverage are examined in the equation alongside that of exchange rate dynamics, inflation rate and market liquidity. All the coefficients of these variables were statistically significant in determining stock return volatility in the Nigerian stock market. The coefficient of exchange rate dynamics, inflation rate and market liquidity were negative (-2.56, -6.62 and -10.46) approximately. This implies that exchange rate dynamics, inflation rate and level of market liquidity have inverse effect on volatility of stock return while the Durbin-Watson statistic value of 2.20 reported in the result indicates that there is no presence of autocorrelation since the value is not greater than the upper bound of 2.4.

## 5.0 Discussion of Results and Implication of Findings

The finding of this study implied that foreign exchange rate dynamics, inflation rate and stock market liquidity have inverse effect on volatility of stock return, which indicated that the Nigerian Stock Market investors negatively react to macroeconomic announcement such as foreign exchange rates dynamics and inflation rate as well as stock market illiquidity because it triggers stock return volatility in the Nigerian stock market. This finding is supported by Arbitrage Pricing Theory (APT) that expected stock return is determined by macroeconomic risk factors like foreign exchange rate dynamics, inflation rate and market liquidity. Therefore, this study rejected the null hypothesis ( $H_0$ ) that there is no significant effect of foreign exchange rate dynamics on volatility of stock return in the Nigerian Stock Exchange Market. This study implies that by giving more attention to foreign exchange rate dynamics, inflation rate and stock market liquidity in determining their stock return, investors might run into loss of stock return or dividends. Therefore, it is crucial for stock investors to give maximum consideration to foreign exchange rate dynamics, inflation rate and market liquidity modelling stock returns.

## 6.0 Conclusion and Recommendation

This study focused on exchange rate dynamics and stock return volatility with inflation rate and stock market liquidity as the control variables. Background challenges and problem related to the study were discussed as well as hypothesis was formulated. Empirical literature and theories were reviewed, the study anchored on APT, methodology was employed in line with the hypothesis and nature of the data and findings were established.

Considering the finding of this study, it is concluded that foreign exchange rate dynamics affect stock return volatility in the Nigerian stock market. The study recommended that the CBN and other monetary authorities should employ stringent measures to curb or reduce overvaluation of foreign currencies against Nigerian local currency and stabilize exchange rate in order to reduce level of volatility in stock return in the Nigerian stock market.

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