EFFECT OF SELECTED MACROECONOMIC FACTORS ON STOCK MARKET CAPITALIZATION IN NIGERIA: A NON-LINEAR APPROACH

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Abstract

This paper investigated the interaction between selected macroeconomic factors (exchange rate, money supply and trade openness) and stock market capitalization using the non-linear autoregressive distributed lag (NARDL) model and the Error Correction Model (ECM) for the period 2000 to 2019. The secondary data used were extracted from CBN statistical bulletin 2019 and Nigeria bureau of statistics reports. The findings revealed that only exchange rate and money supply had a long-run effect on market capitalization. The findings also revealed that at 10% significance level all the factors asymmetrically affected market capitalization in Nigeria. It is recommended that the asymmetric relationship between macroeconomic factors and stock market capitalization should be taken into consideration while making investment or policy decisions in Nigeria.

Keywords: Exchange rate, Money supply, Trade openness, Market capitalization, NARDL

JEL Classification: E44

1. Introduction

The gradual collapse of the financial boundaries across countries has increased financial systems integration and accentuated the critical role performed by the system in promoting and sustaining a vibrant and stable economic system. In fulfilling this role, the financial system must exhibit growth, stability, soundness and resilience. These features according to Hossain, *et.al.* **(**2016) depends crucially on its interaction with the existent economy and the system of interconnections between monetary organizations as well as the strategic interactions and externalities that these linkages create. Given these important implications, numerous theoretical and empirical studies have investigated the interactions between financial system and the factors that potentially determine its level of activities. Such factors as revealed by Fredman and Schwartz (cited in Imegi & Wali, 2018) include macroeconomic

factors. Supporting the relevance of the macroeconomy in financial market discourse, Palley (2009) claimed that the roots of the global financial crisis could be traced to a faulty U.S. macroeconomic paradigm.

Furthermore, Lee, *et.al* (2015) identified the need for financial regulatory authorities to identify and continually monitor the buildup of macroeconomic risks that could threaten the financial system. In view of these statements and the commitment by the Nigerian government to the pursuit of fulfilling the vision of being the leading stock exchange in the African region in terms of capital formation, innovation, efficiency and liquidity, there is a critical demand for in-depth analysis of the existence or the strength of existence of interactions between macroeconomic factors and specific financial market variables (such as market return, market capitalization, market liquidity).

Despite the existence of several studies that have investigated the macroeconomic-stock market performance nexus by examining the effect of monetary policy, fiscal policy and other economic factors on all share index (Balagobei, 2017; Chen & Jin, 2010; Garthika & Rajapakse, 2018; Shrestha & Subedi, 2014), only an insignificant stream of research focused on stock market capitalization (Kemboi & Tarus, 2012; Omodero, 2020; Shahbaz, *et.al.*, 2015). It is also pertinent to note that though most of these studies documented the presence of interactions, the direction and strength of the effects seemed to depend on the state of the market and the nature of the economic sectors of the considered country.

Furthermore, a review of the researches on the impact of macroeconomic factors on market capitalization exposed a predilection to an assumption of the existence of a linear relationship. This assumption has been questioned by some studies (Tealab, 2018) who argued that many financial and economic series exhibit non-linear behavior thereby questioning the sufficiency of the linear approach to represent their dynamics. This study, therefore, extends the extant literature by making use of a nonlinear autoregressive distributed lags (NARDL) model with a dynamic error correction representation that allows for the asymmetric responses of market capitalization to macroeconomic changes. The main objective of the study is to examine the existence of asymmetry in the interaction between macroeconomic factors and stock market capitalization in Nigeria.

2.1 Stock Market Capitalization

Chen (cited in Omodero, 2020) defined market capitalization as the total monetary value of all outstanding shares of a company. It refers to the total value of shares

traded on the stock market with respect to the number of shares and the share prices (Etale & Tabowei, 2019). Quantifying the concept, Fapetu, *et.al. (2017)* stated that the total capitalization of a financial market is equal to the sum of the capitalizations of companies listed on a market. From these definitions, market capitalization can be viewed as the current value of the total shareholders investments within a stock market. It is the total value of all the shares in the market at a particular point or the average of this value over a period. Stock market capitalization in Nigeria can then be defined as the estimate that captures the total worth of securities of quoted companies in the Nigerian capital market. It captures the total value of stock in a specific equity market by aggregating the market value of the quoted stocks.

2.2 Macroeconomic Factors

Exchange Rate: Exchange rate is the purchasing power of one currency for another (Imegi & Wali, 2018). It is price of one currency in terms of another (Mishkin, 2012). Barbosa (2018) also stated that exchange rate is the ratio of the two countries' price levels measured in the same currency while Rusydi and Islam (2007) defined it as the price of foreign goods in domestic currency relative to the price of domestic goods. The definitions by Imegi and Wali (2018) and Mishkin (2012) captures the nature of nominal exchange rate while the other definitions relate to real exchange rate. Succinctly, exchange rate measures the value of a local currency relative to a foreign currency. Exchange rates are important because they affect the relative price of domestic and foreign goods. The *nominal* exchange rate simply measures the relative value of the currency without considering inflation and hence is not as relevant as movement in the *real exchange rate*, which adjusts for inflation differentials between countries. However, the *effective exchange rate*, a country's exchange rate relative to other currencies weighted by their importance in the country's trade has been found to be of even greater importance.

Money Supply: Money supply represents money in circulation. It is the quantity of money available in the economy **(**Mankiw, 2017**)**. Money supply quantifies the value of currency in circulation. The use of the word circulation may be misconstrued or might limit the definition as capturing only a narrow component of money supply. However, there exists a broader component of money supply. Mankiw (2017) further stated that money supply consisted of currency and demand deposits. Comprehensively, Samuel, et al. (2019) explained that money supply measures currency and liquid instruments held in different types and sizes of account in

operation within an economy. This definition captures the concept of narrow and broad money supply.

Trade Openness: Trade openness is a measure of the involvement of a local economy in international trade, which include; imports and exports. It is a concept that captures the level of financial openness of an economy and hence can be used to evaluate the extent structures and government policies encourage foreign investors to invest in a country. Trade openness is commonly represented as the sum of export and import as a percentage of GDP. This ratio captures the contribution of international trade to the economic activities within an economy. Even though, its efficiency as a proxy has been questioned Awiagah and Choi (2018) argued that as a proxy, trade ratio depicted actual exposure to international markets and hence was a sufficient measure of trade openness. Buttressing the relevance of the proxy, the study further stated that the ratio was well defined and unambiguous. Nikmanesh and Nor (2016) also lent their support by positing that trade ratio is less exposed to methodological shortcomings faced by most trade openness indexes, commonly used in empirical literature.

2.3 Theoretical Framework

Arbitrage Pricing Theory (APT)

Ross proposed APT as an alternative approach to characterization of expected return on risky securities in 1976. It is the first fully specified multi- factor model in finance. The APT assumes that a linear relationship of past asset returns on the span of factors generates the factor loadings for the expectation of present security prices (Paul & Asarebea, 2013; Read, 2013). Read (2013) explained that the factors can be chosen based on intuition of the variable's reasonably expected effect on unexpected movements in an asset's price and empirically examined to provide the most reliable fit. The study further explained that the factors may represent macroeconomic influences that would otherwise be diversifiable and included in the systematic market risk.

Much like the assumption of the CAPM pricing that past covariance are used to generate the expectation of today's security pricing, the APT assumes that a linear regression of past asset returns on the span of factors generates the factor loadings for the expectation of present security prices (Read, 2013). The strength of the APT, based on an arbitrage argument for the accuracy of the factor loadings, is that these loadings, while not as easily interpreted as the betas of the CAPM, provide an explanation of the effect of factors on asset returns rather than simply a statistical

correspondence as provided by the CAPM. However, these factor loadings are not the constant and easily interpreted risk premiums relating one asset to another, as occurs in the CAPM model. Instead, these "betas" are not static, and differ over time across portfolios and across different economies (Zubairi & Farooq, 2011). Supporting the relevance of APT, Read (2013) stated that APT was formulated to overcome some unrealistic assumptions of the CAPM while managing both systematic risk and the idiosyncratic risk.

2.4 Empirical Review

Several authors have examined the relationship between macroeconomic factors and stock market capitalization using different methodologies on relevant data, however the findings of these studies revealed variations in the interactions with relation to state of economy and robustness of methodology used.

2.4.1 Exchange Rate and Stock Market Capitalisation

Mlambo, et al. (2013) used the Generalised Autoregressive conditional heterodaskicity model (GARCH) model to examine the relationship between exchange rate volatility and stock market performance in South Africa for the period 2000 – 2010. The study result did not lend any support to the presumption that the uncertainty surrounding exchange rate market distorts efficient investment allocation as it indicated an insignificant relationship. Even though the study period is relatively short, the use of monthly frequency ensured a sufficient number of observations for empirical analysis. Contrariwise, in a related study on twelve emerging economies over the period 1980–2010, Hajilee and Al-Nasser (2014) found that in the short run, exchange rate volatility had a significant impact on stock market capitalization in all the countries excluding Brazil and Hungary. However, considering the long term effect, the absence of significant relationship was found in four other countries (Chile, Malaysia, Poland and Romania). The bounds test and error-correction modeling (ECM) revealed variations in the link between the study variables with relation to economies and time period, hence the study posited that country's specific structure and characteristics had a moderating effect on exchange rate/ market capitalization nexus.

Differing from the insignificant effect reported by Hajilee and Al-Nasser (2014), Lawal and Ijirshar (2013) revealed that exchange rate adversely affected the stock market performance in Nigeria. The study had applied the Johansen co-integrating and Vector ECM estimation technique on annual data of 23 years (1986 - 2013). In the study, stock market performance was measured as market capitalization while

fluctuation in exchange rate was estimated as volatility using GARCH. The GARCH model, the work explained, was sufficient to captured observed trend within the time series of the variable. A dissimilar result was found when Tripathi and Seth (2014) employed a triangulation of factor analysis, Regression, Autoregressive conditional heterodaskicity (ARCH) model, impulse response analysis, and Johansen Co-integration test to analyze the association between exchange rate and market capitalization. The results from the analysis of monthly Indian data from July 1997 to June 2011 indicated an absence of a significant effect of exchange rate on market capitalization in the long term. The insignificant effect persisted even when in an attempt to observe any vagaries in the long run relationship overtime, the study period was further divided into two sample periods; sub period I (July 1997–July 2007) and sub period II (August 2007–June 2011).

In line with the position of Lawal and Ijirshar (2013), the study by Korsah and Fosu (2016) revealed that exchange rates had as significant but negative effect on stock market capitalisation in the short run. The same association persisted in the long run. Korsah and Fosu used Johansen cointegration technique and VECM to determine the effect of exchange rate movements on stock market capitalization in Ghana, a developing country, for the period from 1990 to 2013 with quarterly time series. Unlike most of previous studies, the research estimated market capitalization as a ratio of GDP. Emphasizing on the credibility of the findings, the authors explained that with the heavy reliance of Ghana on importation, any depreciation in the value of its currency would increase the cost of imports and cost of production leading eventually to reduction in value of firms. This view aligned with the conclusion by new structuralist economists that devaluation has contractionary effects on growth.

Further evidence of a positive linkage between market capitalization and exchange rate was provided by the study by Khalid (2017). The study explored the dynamic aspects of market capitalization and macroeconomic variables in Pakistan using the Johansen approach, ECM and Variance decomposition on the annual data for a relatively long period (1990 – 2017). The positive linkage existed in the short and long run. Noteworthy, the study standardized aggregate stock market capitalization and real exchange rate by taking the natural log of their first difference. This procedure, Khalid explained, would circumvent meaningless regression and present an effective set of policy measures. The long run result aligns with the findings of Garthika and Rajapakse (2018). The work had utilized the Johansen co-integration test, VECM and Granger causality models to investigate the association between macroeconomic variables and equity market performance in Sri Lanka utilizing data at quarterly intervals for the period 2004-2016. On the other hand, the paper did not validate the existence of a short run relationship. Stock market performance was

proxied as market capitalization.

Contrariwise, Fapetu, *et.al.,* (2017) applied Johansen Cointegration test on monthly data of stock market performance in Nigeria (1986 to 2014) and found the absence of long run cointegration between market capitalization and exchange rate. However, concerning the short run interaction, the GARCH models revealed that exchange rate had a positive effect on market capitalization rate. Notably, the study introduced an innovative approach by estimating market capitalization rate as a volatility series but the selection of the model with the highest AIC and SIC as the appropriate ARCH model instead of the model with the lowest could potentially lower the reliability of the results. Using similar GARCH model, Zubair and Aladejare (2017) investigated the impact of exchange rate volatility on the stock market performance in Nigeria. The objective of the study was to examine the extent to which fluctuations in market capitalization can be explained by exchange risk. However, differing from the result of Fapetu, *et.al.* (2017) the estimated model found an insignificant relationship. The annual secondary data utilized covered the period from 1986 to 2015. Zubair and Aladejare used nominal exchange rate unlike the study by Fapetu *et.al.* (2017) where real exchange rate was utilized.

Using a parsimonious ECM, Harcourt (2017) empirically investigated the effect of inflation, prime lending rate and foreign exchange rate on Nigerian capital market performance. The study used monthly average of official foreign exchange rate of the Naira vis-à-vis the United States' Dollar. The monthly data of all the variables averages were adjusted to quarterly averages. The empirical evidence of the study indicated the absence of a long run association between exchange rate and market capitalisation. The model of the study was based on the concept of APT while the data covering the period from 1986 to 2009 was examined. It is significant to note that the study made no attempt to explain why an updated data period was not used.

Consistent with the findings of Lawal and Ijirshar (2013), Etale and Tabowei (2019) utilised multiple regression analysis to reveal the negative influence exchange rate had on market capitalization in Nigeria. The study explored the linkage between selected macroeconomic variables and market capitalization in Nigeria over the period 2001 to 2018. Other macroeconomic variables examined by the research were gross domestic product, interest rate and inflation. Similar to the study by Harcourt (2017), exchange rate was measured as the ratio of Naira to the dollar. Though the study highlighted the advantage of multiple regression technique as the best linear unbiased estimator in terms of efficiency and consistency, a more reliable result would have been got using ARDL because the study used annual data that provided only 18 observations for each data. Furthermore, the absence of unit root was not

established by the study, hence the inherent possibility of spurious results.

Omodero (2020) also examined the impact of economic factors on capital market performance in Nigeria employing data covering the period from 1998 to 2018. The study reported the absence of any significant effect of exchange rate on market capitalization. Whereas the data for market capitalization was from the CBN statistical bulletin, exchange rate was sourced from the World Bank Development Indicators (WDI) and International Monetary Fund (IMF). It is significant to note that though the results from Etale and Tabowei's work and from Omodero had differed, both studies had investigated similar periods using the same tool of analysis. The difference might be because the capital market capitalization used as the proxy for capital market performance by Omodero comprised of total annual market capitalization of the government stocks/securities, debt/bonds, equities and exchange trust fund. Furthermore, Omodero had applied log transformation on both dependent and independent variables while the study by Etale and Tabowei used the original values.

2.4.2 Money supply and Stock Market Capitalisation

Kemboi and Tarus (2012) investigated the money supply/market capitalization nexus in Kenya for the period 2000 to 2009 using quarterly data. The result from ARDL, Johansen-Julius co-integration technique and ECM indicated that broad money had a positive long-run effect on stock market capitalization. The utilisation of quarterly data as opposed to annual data provided more parameters for empirical analysis consequently enhancing the robustness of the results. The positive relationship was not the case when Li (2012) examined monthly data for money supply and stock-market capitalization obtained for the whole of the euro area. The VECM revealed that contrary to the postulation of traditional theory, money supply had a negative effect on stock market capitalization from 2009 to October 2011. The study by Li is significant because it covered a period when the European debt crisis (global financial crisis) persisted.

Substantiating the presence of a linkage between aggregates of monetary policy and market capitalization, Abdelbaki (2013) used ECM and found that money supply exerted a positive influence on market capitalisation in Bahrain. The research posited that the selected study period (1990 to 2007) was to obviate the structural break induced by the global financial crisis. Hence, the study effectively provided a pre-crisis analysis comparable with a post crisis analysis within the Bahrain economy. Money supply was measured as M2/GDP while market capitalisation was computed as the average of two consecutive end of year market capitalization. Similarly, a

positive effect was found by El-Nader and Alraimony (2013) utilizing monthly data between 1990 and 2011 in Jordan. The findings were obtained from multivariate cointegration and variance decomposition analysis. The study claimed that the use monthly data solved the stock-flow problem in the measurement of market capitalization and macroeconomic variables. The similarity of the results from both studies seems to convey that within the Middle East region, the association between market capitalization and money supply may not have altered by the global financial crisis.

Consistent with theory and the works by Abdelbaki (2013) and El-Nader and Alraimony (2013), money supply was found to positively influence stock market performance in both short run and long run in Pakistan, an emerging economy. This was the outcome of the work by Ali, et al. (2015) using ARDL and ECM. Just like most of the literatures reviewed, stock market performance was proxied as aggregate market capitalization growth. However, while other studies used Broad money (M2) as money supply variable, Ali, et al., used Narrow money (M1). The study explained that M1 was more relevant to the study as narrow money estimated the most frequently used means of payments (cash and cheques) and hence captured the quantity of money most associated to the average man. The study had used annual data ranging from 1973 to 2012.

In Nigeria, Nwokoye and Otu (2018) studied the effect of monetary policy on the development of the stock market from 1981 to 2015. Stock market development was proxied by ratio of market capitalization to GDP while monetary policy was measured as growth rate of broad money supply. The cointegration test confirmed the existence of a long run relationship among the variables of the model, while the VECM result revealed that money supply positively influenced market capitalization in Nigeria. This study shifted emphasis from stock of broad money (M2) to its growth rate. Further support for the positive impact of broad money supply in Nigeria was provided by the findings of Igoni, et al., (2020). Igoni, et al. used updated data spanning between 1981 and 2018 to evaluate stock market capitalization response to money supply management in Nigeria using Johansen's Co-integration test and VAR model. Annual time series of broad money supply was used as money management indicator. These Nigerian studies have consistently provided a positive association but it is imperative to note that the studies applied similar methods of analysis over comparable study period.

2.4.3 Trade Openness and Stock Market Capitalisation

In the presence of structural shocks, Shahbaza, et al., (2015) examined the link between trade openness and market capitalization in Pakistan over the period of 1974–2010. The bounds cointegration test and ECM revealed an inverse association in the long term. Trade openness was measured by per capita real exports plus real imports. Still on an emerging economy, Awiagah and Choi (2018) scrutinised the effect of trade openness on stock market capitalization in Ghana from 1991 to 2015. However, instead of utilizing annual data as used by Shahbaza, et al., the research utilized data at quarterly frequency. The Johansen cointegration, VAR and VECM causality tests revealed that trade openness had positive effect on market capitalisation in the short and long run. The quadratic-match averaging method was used to interpolate the annual data to a quarterly frequency.

Similar to the study by Awiagah and Choi (2018), Ho and Odhiambo (2018) examined the empirical linkage between trade openness and stock market development in the Philippines during the period 2001–2016 using quarterly data. The ARDL bounds testing employed indicated a long run negative relationship. This result is consistent with the findings of Shahbaza, et al., (2015). This affirms, Shahbaza, et al's allusion to the similar features prevailing in the stock markets of the emerging economies within the region. Such features, the study stated included terms of market structure and liquidity provision arrangements. Stock market development was proxied as market capitalisation ratio.

In Nigeria, Onanuga and Onanuga (2016) tried to identify the contribution of trade openness to financial development. The study used market capitalization as a proxy for financial depth. The Generalized Method of Moments (GMM) estimation showed that increase in trade openness generated an increase in market capitalization. The GMM can potentially reduce the likelihood of endogeneity in the estimation. Contrariwise, Onyeisi, et al. (2016) explored the relationship using co-integration, VECM and Granger Causality econometric techniques and found the absence of any influence exerted by trade openness in the long run and the short run.

The empirical review has clearly revealed that the predictive ability of exchange rate, money supply and trade openness with regards to stock market capitalization is predicated on the economic and financial environment of a specific country. The studies also suggest a time varying dimension in such a relationship since the economic and financial environment within a country does not remain static. However, most of these studies have presumed the existence of a linear relationship between the variables and hence employed linear methodology without adequate

consideration for the potential presence of asymmetry thereby limiting the ability of such analysis to provide robust results.

3. Data and Methods

Ex-post facto research design and secondary data is employed for this study. The monthly time series data from 2000 – 2019 was sourced from Central Bank of Nigeria statistical Bulletin 2019 and National bureau of statistics trade reports. The Phillips-Perron test is adopted to show the unit root properties of the series.

ARDL has been found to adequately capture the dynamic attribute of financial and economic variables as it automatically includes the lagged values of the dependent variable and independent variables as regressors (explanatory variables). This procedure beyond providing the effect of independent variables, enables the model to estimate the expected dependence of contemporaneous value of the dependent variable on its previous values. Building on this advantage, the non-linear ARDL is able to separate the positive changes from the negative changes in a specified explanatory variable and independently estimate their effects on the dependent variable. This approach enables easy detection of asymmetric interactions between variables in the short- and long-run.

The study employed non-linear ARDL to estimate the relationship between macroeconomic factors and stock market capitalisation in Nigeria. The model employs the decomposition of the exogenous variables into their negative and positive partial sums for decreases and increases as follows;

For positive partial sums; $x_t^+ = \sum_{i=1}^{t} \Delta x_i^+ = \sum_{i=1}^{t} \max(\Delta x_i, 0)$

And for the negative partial sums; $x_t^- = \sum_{i=1}^{t} \Delta x_i^- = \sum_{i=1}^{t} \min(\Delta x_i, 0)$

Our non-linear model takes the following form as modified from Kocaarslan and Soytas (2019):

$$\Delta LnMcap_t = \partial_0 + \chi LnMcap_{t-1} + \omega_1^+ LnExr_{t-1}^+ + \omega_1^- LnExr_{t-1}^- + \omega_2^+ LnMs_{t-1}^+ + \omega_2^- LnMs_{t-1}^- + \omega_3^+ LnTopen_{t-1}^+ + \omega_3^- LnTopen_{t-1}^- + \sum_{i=1}^{p-1} \alpha_1 \Delta LnMcap_{t-i} + \sum_{i=0}^{q-1} \alpha_2^+ \Delta LnExr_{t-i}^+ + \sum_{i=0}^{q-1} \alpha_2^- \Delta LnExr_{t-i}^- + \sum_{i=0}^{q-1} \alpha_3^+ \Delta LnMs_{t-i}^+ + \sum_{i=0}^{q-1} \alpha_3^- \Delta LnMs_{t-i}^- + \sum_{i=0}^{q-1} \alpha_4^+ \Delta LnTopen_{t-i}^+ + \sum_{i=0}^{q-1} \alpha_4^- \Delta LnTopen_{t-i}^- + \varepsilon_t$$

Where Mcap, Exr, Ms and Topen are Stock market capitalisation, Exchange rate, Money supply and Trade openness respectively. The *?* denotes the first difference of variables. The coefficient w_j refers to the short-run coefficients of the model and the α_j represents the long-run coefficients for the variables with j =1, 2, 3.

The F statistic of bound test is used to test the null hypothesis of no cointegration, which is $\alpha_1 = \alpha_2 = \alpha_3 = 0$.

After which, the associated ECM is estimated. To ascertain goodness of fit the selected NARDL model, diagnostic and stability tests are conducted. Finally, employing the standard Wald test, the long-run symmetries are tested.

Table 1: Operationalization of variables

Type	Variables	Definition
Dependent	Market Capitalisation (MCap)	Stock Market Capitalisation
Independent	Exchange Rate (Exr)	Real Exchange rate
	Money Supply (Ms)	Broad Money (M2)
	Trade Openness (TOpen)	Export + Import / GDP

Source: Authors' compilation (2020)

4. Data Analysis and Discussion of findings

Table 2:Descriptive Statistics (2000M1-2019M12)

	MCap	Exr	Ms	TOpen
Mean	6779.790	95.66536	11114776	281.2906
Median	7036.684	90.06955	10602844	201.2374
Std. Dev.	4589.460	27.54198	8603061.	404.5952
Skewness	0.001407	0.930581	0.405644	7.621315
Kurtosis	1.651341	2.868515	1.861744	64.68798
Jarque-Bera	18.18889	34.81216	19.53815	40377.45
Probability	0.000112	0.000000	0.000057	0.000000
Observations	240	240	240	240

Source: Authors' computation (2020) using E-view

The standard deviation of Market Capitalization of 4,589.46 revealed a high degree of variation from the mean value. This suggests the existence of high volatility within the Nigerian stock market. All variables have a positive skewness, hence their distribution has a long right tail. However Market capitalization is relatively symmetric as its value is close to zero. The Kurtosis values for Market Capitalization, exchange rate and money supply are less than 3, suggesting that the distributions are flat (platykurtic) relative to the normal. Based on the results of the Jarque–Bera test, the hypothesis of normality is rejected for all variables.

The results of the unit root test as presented in Table 3 reveal a variation in levels of integration.

Table 3:Unit root Tests Results

	PP		
	Level	First Diff.	Order of Integration
LnMcap	-2.481082	-13.45073**	1(1)
LnExr	-2.133985	-14.29977**	1(1)
LnMs	-3.212676*	-18.42719*	1(0)
LnTOpen	-3.940479**	-47.55204*	1(0)

** and * indicate significance at 1% and 5% levels, respectively

Source: Authors' computation (2020) using E-view

In the next step, we utilize the non-linear ARDL and ECM procedure to test for an evidence of long run and short run relationship between the variables.

Table 4:Extract of NARDL, Diagnostic Tests and Bound Test

Variable	Coefficient	t-Statistic	Prob.*
LnMCap(-1)	1.011839	15.69183	0.0000
LnMCap(-2)	-0.109335	-1.738492	0.0835
LnExr_Pos	0.043720	1.725101	0.0859
LnExr_Neg	0.021287	0.149854	0.8810
LnExr_Neg(-1)	-0.211927	-1.089774	0.2770
LnExr_Neg(-2)	0.369607	2.570058	0.0108
LnMs_Pos	0.027449	0.570450	0.5689
LnMs_Neg	-0.225675	-2.143018	0.0332
LnTOpen_Pos	0.008256	0.724673	0.4694
LnTOpen_Neg	0.049906	2.237859	0.0262
LnTOpen_Neg(-1)	-0.045158	-2.083586	0.0383
C	0.605896	4.832953	0.0000
R-squared			0.996193
Adjusted R-squared			0.996007
F-statistic			5352.907
Prob(F-statistic)			0.000000
Durbin-Watson stat			2.032614
Diagnostic Tests			
Heteroskedasticity Test: ARCH	1.774267 (0.1719)	No Heteroskedasticity	
B-Godfrey Serial Correlation LM	0.533181 (0.5875)	No serial correlation	
Correlogram of Residuals	0.0724 (0.788)	No autocorrelation	
Ramsey Reset	1.549373 (0.2145)	No functional misspecification	
Bounds testing procedure result @ 5% significance			
F-statistic	I(0) Bound	I(1) Bound	
5.788496	2.45	3.61	

Source: Authors' computation (2020) using E-view

Note: Numerical in parenthesis are the p-values.

The results of the diagnostic tests in table 4 indicate that the residuals of the NARDL specification are not affected by issues of auto-correlation, heteroscedasticity or misspecification. While the result of the CUSUM test showed below depicts constancy of the coefficients as the plot of the test has stayed within their critical values portrayed by two straight lines.

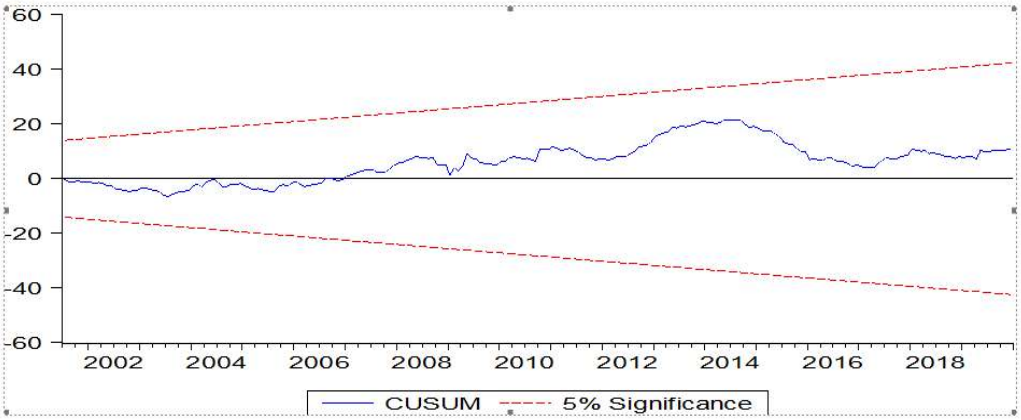

Figure 1: Stability test result

The F-statistic of bound test of the model 4.984845 is higher than the lower and higher bound at 5% level of significance indicating the existence of long run non-linear equilibrium relationship between the variables. Based on the bound test revelation of cointegration, an error correction model is estimated.

Table 5: ECM Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CointEq(-1)	-0.097496	0.021604	-4.512835	0.0000

Source: Authors' computation (2020) using E-view

The coefficient of the ECM cointegrating equation (-0.097496) is negative and less than one. It is also highly significant (p-value = 0.000), which is consistent with the NARDL bounds test. This means that there is a significant long-run relationship or cointegration between the changes in market capitalisation and the explanatory series. Specifically, this shows that there is an adjustment to equilibrium at the rate of 10%. This is relatively slow.

Table 6:Extract from ECM Output (Long run Coefficients)

Variable	Coefficient	Prob.	Variable	Coefficient	Prob.
C	6.214591	0.0000			
$LnExr^+$	0.448434	0.0882	$LnExr^-$	1.835646	0.0000
$LnMs^+$	0.281541	0.5465	$LnMs^-$	-2.314716	0.0489
$LnTOpen^+$	0.084679	0.4708	$LnTOpen^-$	0.048706	0.6831

Source: Authors' computation (2020) using E-view

The estimation results of the long-run coefficients included in the cointegration model showed that only negative changes in exchange rate and money supply have significant effect on market capitalization in the long run. Furthermore, with the exception of negative decomposition of money supply, all other variables had a positive relationship with stock market capitalization in the long run. The negative changes in money supply had an inverse relationship with market capitalization.

The long run equation is stated thus:

$$LnMCap = 6.21 + 0.45LnExr^+ + 1.84LnExr^- + 0.28LnMs^+ - 2.31LnMs^- + 0.08LnTOpen^+ + 0.05LnTOpen^-$$

This implies that a 1% increase in exchange rate will cause stock market capitalization to increase by 45% in the long run while a 1% decrease will reduce market capitalization by 184%. Consistent in direction with the effect of exchange rate, 1% increase in trade openness will increase stock market capitalization by 8% and 1% decrease reduce it by 5%.

Concerning money supply, even though a 1% increase in money supply will increase market capitalization by 28%, the result showed that a decrease of 1% will increase market capitalization by 231%. The empirical evidence of an inverse relationship can be explained via the effect of money supply on interest rate or velocity (demand for money). Decrease in money supply will drive up interest rate and demand for money consequently increasing the prices of financial assets.

The positive effect of exchange is not consistent with the results of studies conducted by Korsah and Fosu (2016), Tripathi and Seth (2014) and Lawal and Ijirshar (2013). It however aligns with Khalid (2017) and Garthika and Rajapakse (2018).

The insignificant impact of trade openness on stock market capitalisation differs from the findings of Awiagah and Choi (2018) and Onanuga and Onanuga (2016) while providing support for Shahbaza, *et.al.*, (2015), Ho and Odhiambo (2018) and

Onyeisi, *et.al.,* (2016).

Finally, the significant relationship between money supply and market capitalization aligns with the works of Li (2012), Abdelbaki (2013), El-Nader and Alraimony (2013), Ali, *et.al.,* (2015) and Igoni, *et.al.,* (2020). However, while Li (2012) found a similar negative influence, the results of the others revealed a positive influence.

Table 7:Summary of the long run Wald results

Variable	F-stat	Probability	Existence of Asymmetry (based on 5% level of significance	Existence of Asymmetry (based on 10% level of significance
Exchange rate	3.4147	0.0346	Yes	Yes
Money Supply	2.3582	0.0969	No	Yes
Trade Openness	2.5535	0.0801	No	Yes

Source: Authors' computation (2020) using E-view

The result from Table 7 suggests that at 5% level of significance, only exchange rate is asymmetrically related to market capitalization in Nigeria. However, it is pertinent to note that at 10% level significance, it would be interpreted that all variables exhibit asymmetric effects.

5. Conclusion and Recommendations

The macroeconomy-stock market performance nexus economics is a field that attracts major research attention, because of the significant information it provides to policy-makers who consider growth inducing measures. This study has investigated the effect of exchange rate, money supply and trade openness on stock market capitalization in Nigeria. To achieve the stated objective, we have employed the non-linear ARDL and ECM analysis using the time series data over the period 2000–2019. Specifically, the research sought to ascertain the presence of asymmetric relationship between the independent variables and stock market capitalization.

The long run equation revealed that the decrease in exchange rate had a positive effect on market capitalization, while decrease in money supply increased market capitalization in Nigeria. The Wald test result however, found the presence of asymmetric relationship for only exchange rate changes. Based on the research findings, the following recommendations are proffered:

i. The significance of the effect of exchange rate suggests a high level of foreign

participation in the Nigerian stock market; hence government must be committed to policies that encourage capital importation specifically foreign portfolio investment. Beyond economic stability, such policies include providing the right of free transfers related to an investment and protecting against arbitrary expropriation.

ii. While the ability of money supply to gauge prices remains significant, the increasing role of velocity of money in price determination places a demand on central bank to increase velocity by promoting financial innovations related to payment systems and cyber-security.

iii. The insignificance of trade openness maybe a reflection of the low degree of financial liberation which could potentially hinder capital inflow with regards to foreign portfolio investments. Policies that boost international connectedness such as duty- and quota-free access to world markets would send the right signals that would trigger increased capital importation.

iv. Finally, it is vital to establish the posited relevance of decomposition of the effects of independent variables for investors and policy makers in Nigeria. Consequently, studies should examine the interactions between other economic and financial variables using non-linear methodology.

References

Abdelbaki, H. H. (2013). Causality relationship between macroeconomic variables and stock market development. Evidence from Bahrain. *The International Journal of Business and Finance Research, 7*(1), 69 -84

Ali, R., Muhammad A., & Ullah, S. (2015). Macroeconomic indicators and stock market development. *Developing Country Studies, 5*(9), 139-149

Awiagah, R., & Choi, S. B. (2018). Stock market development in Ghana: Whither trade openness. *International Journal of Trade, Economics and Finance, 9(4),* 135-141. https://doi: 10.18178/ijtef.2017.9.4.603

Balagobei, S. (2017). Macroeconomic variables and stock market returns in Sri Lanka. *Asian Journal of Finance & Accounting, 9(2),* 206-218

Barbosa, F. D. H. (2018). *Macroeconomic Theory: Fluctuations, Inflation and Growth in Closed and Open Economies*. Springer.

Central Bank of Nigeria. (2019). *CBN statistical bulletin 2019*. https://www.cbn.gov.ng/documents/Statbulletin.asp

Chen, X., & Jin, X. (2010). Detecting the macroeconomic factors in Chinese stock market returns: A generalized dynamic factor model approach. *2nd IEEE International Conference on Information and Financial Engineering,* 184-188.

El-Nader, H. M., & Alraimony, A. D. (2013). The macroeconomic determinants of stock market development in Jordan. *International Journal of Economics and Finance, 5*(6), 91-103.

Etale, L. M., & Tabowei, P. I. (2019). Macroeconomic determinants of market capitalization in Nigeria: A further investigation**.** *International Journal of Quantitative and Qualitative Research Methods, 7*(4), 11-25

Fapetu, O., Adeyeye, P. O., Seyingbo, O. A., & Owoeye, S. D. (2017). Exchange rate volatility and stock market performance in Nigeria, *Nigerian Journal of Management Sciences, 6*(1), 308-317

Garthika, S., & Rajapakse, R. P. C. R. (2018). Stock market performance and the

macroeconomic factors: Evidence from Colombo stock exchange. *International Journal of Research*, *5*(20), 753 – 799

Hajilee, M., & Al-Nasser, O. M. (2014). Exchange rate volatility and stock market development in emerging economies. *Journal of Post Keynesian Economics/Fall 2014, 37*(1), 163-180

Harcourt, E. E. (2017). Macroeconomic variables and the performance of the Nigerian capital market. *International Journal of Managerial Studies and Research, 5*(5), 13-23.

Ho, S. Y., & Odhiambo, N. M. (2018). Analysing the macroeconomic drivers of stock market development in the Philippines. *Cogent Economics & Finance, 6*(1), 1-18.

Hossain, A., Adnan, A. T. M., & Reza, Md. M. (2016). Macroprudential policy: a tool for enhancing financial stability and resilience in developing economy. *European Journal of Business, Economics and Accountancy, 4 (7), 18-25*

Igoni, S., Onyejiaku, C. C., Egbo, O. P., Ifediora, C., Njoku, B. O., & Onwumere, J. U. J. (2020). Critical evaluation of stock market capitalization response to money supply management in the Nigerian economy. *International Journal of Advanced Science and Technology, 29*(12), 2433-2454

Imegi, J. C., & Wali, A. F. (2018). Macroeconomic variables and financial market stability in the Nigeria financial services sector. *European Journal of Accounting, Auditing and Finance Research, 6* (1), 55-66.

Kemboi, J. K., & Tarus, D. K. (2012). Macroeconomic determinants of stock market development in emerging markets: Evidence from Kenya. *Research Journal of Finance and Accounting, 3*(5), 57-68.

Khalid, W. (2017). Effects of interest rate and exchange rate on the stock market performance of Pakistan: A cointegration approach. *Journal of Finance and Economics, 5*(5), 219-232

Kocaarslan, B., & Soytas, U. (2019). Asymmetric pass-through between oil prices and the stock prices of clean energy firms: New evidence from a nonlinear analysis. *Energy Reports, 5*, 117–125.

Korsah, P., & Fosu, P. (2016). The effects of exchange rates movements on stock

market capitalisation in Ghana. *Journal of Applied Economics and Business Research*, *6*(4), 312-327

Lawal, M., & Ijirshar, V. U. (2013). Empirical analysis of exchange rate volatility and Nigeria stock market performance. *International Journal of Science and Research*, *4*(4), 1592 – 1600

Lee, M., Asuncion, R. C., & Kim, J. (2015). Effectiveness of macroprudential policies in developing Asia: An empirical analysis. *ADB Economics Working Paper Series 439, Asian Development Bank*.

Li, Y. (2012). *Empirical study on the relationship between money supply and stock market in Europe*. B. Liu, M. Ma, & J. Chang (Eds.): ICICA 2012, LNCS 7473, pp. 539–544, 2012. Springer.

Mankiw, N.G. (2017). *Macroeconomics*. (8th ed.), Cengage Learning.

Mishkin, F. S. (2012). *Economics of money, banking, and financial markets* (10th ed.), Prentice Hall.

Mlambo, C., Maredza, A., & Sibanda, K. (2013). Effects of exchanger rate volatility on the stock market: A case study of South Africa. *Mediterranean Journal of Social Sciences*, 561–570. https://doi.org/10.5901/mjss.2013.v4n14p561

National Bureau of Statistics (NBS) Foreign Trade reports 2000-2019

Nikmanesh, L., & Nor, A. H. S. (2016). Macroeconomic determinants of stock market volatility: An empirical study of Malaysia and Indonesia. *Asian Academy of Management Journal, 21*(1), 161-180.

Nwokoye, E. S., & Otu, E. (2018). Impact of monetary policy on stock market development: Implications for the Nigerian economy. *International Journal of Development and Economic Sustainability, 6*(4), 29- 50

Omodero, C. O (2020). Capital market determinants and market capitalization in Nigeria. *International Journal of Financial Research*, *11*(1), 462 – 473

Onanuga, A. T., & Onanuga, O. T. (2016). Do financial and trade openness lead to financial sector development in Nigeria? *Zagreb International Review of Economics & Business, 19*(2), 57-68. https://doi: 10.1515/zireb-2016-0008

Onyeisi, O. S., Odo, I. S., & Anoke, C. I. (2016). Foreign portfolio investment and stock market growth in Nigeria. *Developing Country Studies*, 6(11), 64-76

Palley, T. I., (2009). America's exhausted paradigm: Macroeconomic causes of the financial crisis and great recession. *IPE Working Papers* 02/*2009*, Berlin School of Economics and Law, Institute for International Political Economy.

Paul, M., & Asarebea, F.A. (2013). Validity of the capital assets pricing model: Evidence from the Indian companies – The NSE India. *SSRN Electronic Journal*, http://dx.doi.org/10.2139/ssrn.2324767

Read (2013). *The efficient market hypothesis.* Palgrave Macmillan

Rusydi, M., & Islam, S. M. N. (2007). *Quantitative exchange rate economics in developing countries: A new pragmatic decision-making approach*. Palgrave Macmillan

Samuel, U. E., Udoh, B. E., Prince, A. I., Ifeanyi, O. J., & Ndu, O. M. (2019). Money supply and inflation rate in Nigeria: The missing link. *Humanities and Social Sciences Letters*, *7*(2), 156–166.

Shahbaz, M., Rehman, I. U., & Afza, T. (2015). Macroeconomic determinants of stock market capitalization in an emerging market: fresh evidence from cointegration with unknown structural breaks. *Macroeconomics and Finance in Emerging Market Economies*, 1-25.

Shrestha, P. K., & Subedi, B. R. (2014). Determinants of stock market performance in Nepal. *NRB Economic Review*, *Nepal Rastra Bank*, *Research Department*, *26*(2), 25-40. https://ideas.repec.org/a/nrb/journl/v26y2014i2p25-40.html

Tealab, A. (2018). Time series forecasting using artificial neural networks methodologies: A systematic review. *Future Computing and Informatics Journal*, *3*(2), 334-340.

Tripathi, V., & Seth, R. (2014). Stock market performance and macroeconomic factors: The study of Indian equity market. *Global Business Review*, *15*(2), 291–316.

Zubair, Z. A., & Aladejare, S. A. (2017). Exchange rate volatility and stock market performance in Nigeria. *Asian Journal of Multidisciplinary Studies*, *5*(11),

194-201

Zubairi, H. J., & Farooq, S. (2011). Testing the validity of CAPM and APT in the oil, gas and fertilizer companies listed on the Karachi stock exchange. *2012 Financial Markets & Corporate Governance Conference*. http://dx.doi.org/10.2139/ssrn.1912358