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Capital Market Volatility and Real Sector Expansion in Nigeria

Alex Oisaozoje Iriabije: *Department of Economics, University of Uyo, P.M.B. 1017, Uyo, Akwa Ibom State, Nigeria.*

[a]***Ubong Edem Effiong:*** *Department of Economics, University of Uyo, P.M.B. 1017, Uyo, Akwa Ibom State, Nigeria.*

Nora Francis Inyang: *Department of Economics, University of Uyo, P.M.B. 1017, Uyo, Akwa Ibom State, Nigeria.*

ABSTRACT: *This study utilized data from the first quarter of 2010 to the fourth quarter of 2021 to explore how volatility in the capital market can influence the real sector of the Nigerian economy. With the use of the generalized autoregressive conditional heteroscedasticity (GARCH) approach, we realized that there is no volatility clustering in the Nigerian market capitalization given that the estimate of lagged value of residual is negative and significant. Also, the decay of the respon se function on a quarterly basis being 0.3054 is quite low and is symptomatic of response functions to shock dying at a faster pace. Therefore, a new shock in the Nigerian capital market it will have impact on the market capitalization for a short period making the market less predictable. This makes the Nigerian capital market to be efficient since the market is not easily predictable. The VAR result revealed that the market capitalization put forth a positive and significant influence on economic growth; with the impulse response function indicating that economic growth responded positively to shocks in market capitalization. The paper concludes that the capital market needs be streamlined in order to avoid volatility clustering in the future, in order to maintain the efficiency of the market.*

Key words: *Economic growth, Efficient market hypothesis Financial institutions, Stock exchange, Supply-Leading finance, Volatility clustering.*

1. Introduction

To mobilize and distribute long-term money in the economy, a network of financial institutions and infrastructure known as the capital market works together (Echekoba, Ezu, & Egbunike, 2013). Businesses and governments can raise long-term finance from the savings of other economic actors by selling stocks and bonds on the market. "Due to its capacity to ease and mobilize saving and investment, the capital market is a highly specialized and structured financial sector that in fact plays a crucial role in driving economic growth". For self-sustaining economic growth, which is consistent with external adjustment and rapid economic expansion, the capital market must be used as a source of long-term financing (Iyola, 2004). Without a doubt, the economy's degree of growth and development depends heavily on the capital market. According to Chinwuba and Amos (2011) "one of the key institutions that contributes to an economy's growth and development is the capital market". To Emeh and Chigbu (2014) the capital market contributes to financial growth by providing a number of services, either directly or indirectly. Notable among these are the following: "mobilization of savings, creation of liquidity, risk diversification, improved dissemination, information acquisition, and increased incentive for corporate control" (Udo, Nwezeaku, & Kanu, 2021). The capital market serves as a lubricant or driver that keeps the economy's wheel turning toward growth and development because of its crucial role in not only mobilizing long-term funds and directing them toward productive investment but also efficiently allocating these assets to projects that will provide the fund owners with the highest returns (Adeusi, Sulaiman, & Azeez, 2013). The Nigerian capital market function under different structures. These include the primary market, the secondary market, and the derivative market. The Primary Market is responsible for issuing new shares through

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private placement or the stock market. They employ the following strategies: right issue, subscription offer, sale offer, private placement, and listing by introduction. The secondary market, often known as the stock market, is a venue for capital market operations (trading in stocks, bonds, debentures, and other long-term assets), and it is normally available to all sorts of investors, whether large or little, governmental entities or private persons. The Derivatives Market is a market that trades on the right to title on the underlying security or on the basis of future title to the security rather than the issued securities. The Nigerian derivatives market is still in its infancy, with the only derivative now actively traded on the Nigerian Stock Exchange being 'right offer issue options' (Taiwo, Adedayo, & Evawere, 2016). Development banks, private enterprises, the Treasury, and the Central Bank of Nigeria (CBN) is the key participant in the Nigerian capital market, while commercial and merchant banks, individuals, states, and local governments are small players.

The Nigerian capital has experienced series of growth over the years as captured by its indicators in the Nigerian stock exchange. With the instruments including Government Stocks/Securities, Corporate Bonds, Exchange Traded Fund (ETF) introduced in 2011, and equities, the Nigerian capital market has witnessed tremendous growth arising from growth in the equities market and government stocks/securities. The proportion of government stocks/securities rose from 19.64% in 2010 to 41.10% in 2016 before sliding slightly to 34.25% in 2017. This was followed by a massive rise to 48.51% in 2019 before declining to 44.04% and 45.24% in 2020 and 2021 respectively. In regards to equities, a declining trend in its composition in the market capitalization has been recorded. It declined from 79.79% to 57.93% in 2015 before plunging further to 50.09% in 2019. A slight increase in its proportion was recorded in 2020 where its proportion rose to 54.57% in 2020 before declining to 53.02% in 2021. At aggregate level, the market capitalization in Nigeria rose from ₦9,918.21 billion in 2010 to ₦17,003.39 billion in 2015 which reflect 71.44% increase over the period. A subsequent 59.96% was recorded between 2016 and 2019 as the market capitalization rose from ₦16,185.73 billion in 2016 to ₦25,890.22 billion in 2019. Between 2020 and 2021, the market capitalization rose from ₦38,589.58 billion in 2020 to ₦42,054.50 billion in 2021 which is equivalent to an 8.98% increases. For government stocks/securities that constitutes part of the total market capitalization, it increased form ₦1,948.09 billion in 2010 to ₦4,457.14 billion in 2014 before more than doubling to ₦6,942.87 billion in 2015. This represent a 128.80% increase between 2010 and 2013, with a 55.77% increase between 2013 and 2015. Further, it increased to ₦9,920.63 billion 2018 before reaching a record high of ₦19,026.10 billion in 2021 (Central Bank of Nigeria, 2021). This represents a 42.90% increase between 2015 and 2018 and a 91.73% increase between 2018 and 2021.

With respect to corporate bonds, there has been some degree of volatility as the value was marked with periodic oscillations. It increased significantly form a meagre ₦56.37 billion in 2010 to a whooping ₦1,341.29 billion in 2011 which further increased to ₦1,400.43 billion in 2012 before declining to ₦1,394.00 billion in 2013. This value declined substantially to ₦144.96 billion in 2014 of which it continued to increase at a slow pace, reaching ₦256.56 billion in 2018 and ₦718.30 billion in 2021. The ETF has been showcasing some steady growth over the years as it increased by 2.02% from ₦0.99 billion in 2011 to ₦1.01 billion in 2012 before plummeting to ₦0.28 billion in 2013. Subsequent years was marked with steady growth in the ETF up to a value of ₦4.02 billion in 2015 which rose steadily to ₦6.58 billion in 2019 before a sharp increase to the tune of ₦24.51 billion was recorded in 2020. This sharp increase was also followed by a momentous decline to ₦7.35 billion in 2021, representing a -70.01% growth. the equities market is the only market that has continually maintained a rising trend over the years. It increased from ₦9,918.21 billion in 2010 to ₦17,003.39 billion in 2015 (a 71.44% growth), with a tremendous increase to ₦25,890.22 billion and ₦42,054.50 for 2019 and 2021 respectively (Central Bank of Nigeria, 2021). The real sector of the Nigerian economy as captured by the gross domestic product (GDP) has over years exhibited some positive and negative growth in some years. The GDP increased from ₦12,790.38 billion in the first quarter of 2010 to ₦15,020.88 billion in the fourth quarter, and maintaining an average growth rate of 5.56% within the four quarters of the year. In 2011, the economy experienced a negative growth of -9.31% as its value declined form ₦15,020.88 billion in the fourth quarter of 2010 to ₦13,621.79 billion in the first quarter of 2011. Meanwhile, a comparison of the economy between the fourth quarter of 2011 and the fourth quarter of 2012 revealed that the economy grew by 3.84% with an increase from ₦15,633.66 billion in 2011Q4 to ₦16,233.94 billion in 2012Q4 (Central Bank of Nigeria, 2021). The GDP also increased to N17,318.41 in the fourth quarter of 2013 to N18,419.51 billion in the fourth quarter of 2014. With a growth rate of 1.77% recorded between 2014Q4 and 2015Q4, the economy recorded a GDP of ₦18,419.51 billion in 2014Q4 and ₦18,745.36 in the 2015Q4. However, the economy experienced a negative

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growth rate of -1.63% between 2015Q4 and 2016Q4 as the value of the GDP declined to ₦18,439.94 billion in 2016Q4 as against ₦18,745.36 in 2015Q4. This was followed by a recovery as the GDP was put at ₦18,819.66 in the 2017Q4 which represent 2.06% increase (Central Bank of Nigeria, 2021). Still on the fourth quarter by fourth quarter basis, the GDP experienced a 2.43% growth between 2017Q4 and 2018Q4, 2.46% increase between 2018Q4 and 2019Q4, and 5.42% increase between 2019Q4 and 2020Q4.

The primary topic that dominates discussions in capital market literature is efficiency. The notion of efficiency is important to every financial market segment. It can refer to any of the three categories. Pricing efficiency, allocation efficiency, and operational efficiency The Efficient Market Hypothesis, on the other hand, provides a thorough theoretical explanation for the relationship between the capital market and economic development (EMH). The Efficient Market Hypothesis is an academic notion that provides a framework for analyzing the efficiency of the capital market. According to the EMH, "financial markets are efficient since prices on traded assets have previously reflected all available information and are thus impartial because they represent all investors' aggregate ideas about future possibilities" (Olawoye, 2011). In other words, the EMH asserts that all relevant information is quickly and fully reflected in the market price of a securities. Previous EMH tests focused on the long-term reliance of equity returns. It demonstrates that historical data has been shown to be effective in boosting forecasting accuracy. In most underdeveloped nations, this assumption renders the EMH invalid (Echekoba et al., 2013). Schumpter introduced the idea that financial development fosters economic progress for the first time in 1911 (Schumpeter, 1912). Additionally, authors like Goldsmith (1969); McKinnon (1973) and Shaw (1973) further emphasized this. There are opinions on the connection between financial development and economic expansion. According to the demand-following thesis, financial development is seen as a catalyst for economic growth without taking into account the demand for financial services in a developing nation. The expansion of the real sector of the economy contributes to a more gradual expansion of the financial sector. The feedback hypothesis, on the other hand, contends that the various stages of economic development have a significant role in the bidirectional link between financial development and economic growth (Khetsi & Mongale, 2015).

A strong and efficient financial system increases domestic savings and mobilizes resources for profitable initiatives that promote economic growth (Khetsi & Mongale, 2015). When there are inefficiencies in the financial sector, successful projects are frequently underutilized for growth. The real sector's expansion and the process of economic development are facilitated by the role that capital markets play as a connection between the monetary and real sectors. Although stock prices may have a beneficial influence on growth, other elements, such as the market's size, liquidity, and efficiency as well as the environment's quality, also play an important role (Khetsi & Mongale, 2015). The social and economic circumstances of the participating nations are taken into consideration together with the environmental quality. Stock markets would be restrained in nations with high levels of political instability and perceived dangers (Agbetsiafa, 2003). Al-Awad and Harb (2005) went on to say that "international portfolio investors are important for boosting local savings levels and that capital markets also draw them". It makes it easier for foreign financial resources to enter the national economy.

Recent empirical studies relating the development of the capital market to economic growth opine that the capital market promotes economic growth and development. In this regards, the aim of this paper is to test this assertion by examining the influence of the capital market on the growth of the Nigerian economy from the first quarter of 2010 to the fourth quarter of 2021. In particular, the study seeks to examine the influence of capital market volatility on the economic growth; to explore the nature of the causal relationship existing between the capital market and economic growth in Nigeria; and to detect how the real sector of the economy responds to shocks in the capital market.

2. Literature Review

The influence of the capital market in influencing growth has been explored from diverse theoretical angles. The capital market helps in economic growth by mobilizing savings, creating liquidity, diversifying risks, improving information diffusion and acquisition, and increasing incentives for corporate control. Improving the efficiency and efficacy of these operations by providing timely services can boost economic growth (Angaye & Frank, 2020). Obstfeld (1994) also claimed that the capital market may have an impact on economic growth activities by creating liquidity. The liquid equity market makes money available for lucrative investments that demand a long-term financial commitment. The stock market's illiquidity makes it harder for investors to invest in major, long-term initiatives (Angaye & Frank, 2020). Obstfeld (1994) further stated that the capital market

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can influence economic growth through the "risk diversification" function. When stock markets are globally interconnected, it allows for more economic risk sharing; since high-return initiatives are typically more hazardous (Angaye & Frank, 2020). As stated by Filler, Hanousek, and Campos (1999), the link amid capital market development and economic growth varies depending on the country's degree of economic development, with less developed nations bearing the brunt of the influence. Consistent with Bencivenga, Smith, and Starr (1996) and Levine (1991) the stock market (the capacity to exchange equities readily) is critical for growth. Contrary to popular belief, Conte and Darrat (1988) suggest that "stock market liquidity, regardless of size, is a minor source of corporate funding" (Angaye & Frank, 2020). In line with Spears (1991) and Kiviet (1995) the stock market may stimulate economic growth through "acquisition of information". Levine (1991) observed that a larger and more liquid stock market will make it simpler for informed investors to trade at quoted prices. Investors can profit before the information becomes widely known and prices shift. To Levine and Zervos (1996), the stock market influences economic growth through mobilizing savings. They believe that big, liquid, and efficient stock markets may lead to the mobilization of savings (Angaye & Frank, 2020).

Stock market volatility may be explained in terms of finance theory. According to the theory, "stock market volatility is related to the business cycle" (Mele, 2008). So far, no single theory has been found to adequately explain the business cycle. However, Keynes (1936) revolutionary macroeconomic theories from 1936 place an emphasis on the significance of factors affecting aggregate demand in determining the business cycle. The "multiplier acceleration theory," developed by Paul Samuelson, is one of the integral business cycle theory that resulted from this basis. This theory contends that robust production growth encourages investment, which ultimately results in higher output (Osazevbaru, 2014). When the economy reaches its capacity, this reciprocal process stops, and the rate of expansion starts to slow down. An economic downturn will be caused by slow growth, which will cause investment spending and inventory building to decline. The process reverses after the trough is reached to promote recovery (Lucas, 1981).

Mele (2008) asserts, using this methodology, that "stock market volatility is principally countercyclical, being greater in bad times than in good times". So, stock predicted returns tumble considerably more during expansions than they rise during recessions. This is due to the fact that "the required return for investors is not only countercyclical but also asymmetrically related to the progression of the business cycle, which occurs when risk premia (i.e., the expected return for stock market investments) rise more during difficult times than they fall during prosperous times"(Osazevbaru, 2014). Umstead (1997) using internal theories of the business cycle once more, claims that expectations, which are regrettably not easily measurably, drive stock prices. However, he pointed out that if these expectations are reasonable, they may be deduced from the economy's current metrics. As a result, expectations are established in a methodical manner in connection to the key components of economic activity (Osazevbaru, 2014).

According to Engle and Ng (1993) the advent of fresh, unexpected information that modifies projected returns on a stock is one of the reasons of volatility. Information that is accessible to the market may change due to changes in the local or global economic climate, trade volume, trading habits, or trading trends. According to Shiller (2000) "the reason for market volatility is a fundamental change in investment behaviour". Consistent with the behavioural finance model, as identified in Osazevbaru (2014) such behaviour is thought to be more influenced by sociological and psychological factors, such as cultural shifts and analyst predictions that are becoming more positive, rather than by fundamental variables (as suggested by the efficient market hypothesis).

This is a phenomenon that Veronesi (1999) and Brennan and Xia (2001) attribute to learning. They stated that "investors try to deduce the economy's growth rate from a number of public signals because it is unclear". This inference process results in increased return volatility since it causes asset values to additionally depend on investors' predictions of the dividend growth rate. Roll (1984) asserts that market microstructure influences volatility, while Glosten and Milgrom (1985) explained it in terms of the liquidity provision process, whereby market makers adjust their trading ranges when they suspect the possibility of adverse selection, which in turn widens the band of oscillation.

The enhanced efficiency and speed of financial transactions, the growing interdependence and interconnectivity of stock markets (which might result from cross-border listing), and the increased uniformity of investor behaviour are further factors contributing to market volatility (Osazevbaru, 2014). These variables generally have an impact on how quickly the stock market adjusts to shocks and incorporates important information into pricing. These factors create various volatility dynamics features, even if they may increase

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volatility. For instance, a market where information is absorbed into prices more quickly must return to a normal level of volatility more quickly and therefore have less volatility shock persistence.

The above postulations have been subjected into empirical studies by several scholars. Using quarterly data for Nigeria from 1990:1 to 2009:4 and the vector error correction model (VECM) technique on the widely used stock market development indicators, Adenuga (2010) investigated the hypothesis that "stock market development promotes economic growth in Nigeria" and attempts to confirm its validity or otherwise. The model supports the claim that throughout the analysis period, Nigeria's stock market encouraged economic development. Similarly, determining the weight of the capital market on Nigeria's economic expansion was the goal of Aiguh (2013) study. The Ordinary Least Squares (OLS) technique of analysis was used to evaluate data from 1980 to 2009, and the results demonstrated that the capital market has a desirable and substantial influence on the nation's economic growth. It also demonstrated how little the market has contributed to the growth of the manufacturing sector. Edame and Okoro (2013) used the OLS estimate technique to examine the influence of the Nigerian capital market on the country's growth. The study found that the capital market variables (Market Capitalization (MAKAP), Number of Deals (NDEALS), and Value of Transaction (VTRAN)) all had a favourable effect on economic growth from 1970 to 2010. NDEALS and VTRAN had a favourable and substantial impact, whereas MAKAP had a positive but negligible effect. The study advised that the government undertake measures that will increase market efficiency and reposition the market for development.

Echekoba et al. (2013) investigated the effect of the capital market on the expansion of the Nigerian economy from 1999 to 2011 while the country was governed democratically. The results of the multivariate regression analysis revealed that while total market capitalization and all share indices have a positive impact on the GDP growth rate, the total stock value has a negative impact on the GDP growth rate, and none of these effects are statistically significant. The study thus suggests that in order to promote the growth of the capital market, the government should show coordinated effort and sincerity of purpose.

Atoi (2014) generated first order symmetric and asymmetric volatility models in each of the Normal, Student's-t, and generalized error distributions using the Nigeria All Share Index from 2nd February 2008 to 11th February 2013. The findings point to the existence of the leverage effect, which states that volatility reacts more strongly to negative news than it does to positive news of the same size.

Osazevbaru (2014) investigated whether volatility clustering existed or not in the Nigerian stock market. The "Autoregressive Conditional Heteroscedasticity" (ARCH) model and "Generalized Autoregressive Conditional Heteroscedasticity" (GARCH) models were estimated with the aid of time series data of share prices for the years 1995 to 2009. Consistent with the estimates, the market displays volatility clustering. It was learnt that the response function decays at a high rate. It was suggested that bellicose trading be invigorated across a far-reaching range of securities for doing so will expand the market and thus lessen volatility.

Yadirichukwu and Chigbu (2014) investigated the influence of the Nigerian capital market on economic growth. The study used a time-series research approach, relying heavily on secondary data from 1985 to 2012. The study use regression analysis as a data analysis tool, integrating multivariate co-integration and error correction, to investigate time series data features using a disaggregated capital market indexes methodology. With the cointegration analysis reporting the existence of an equilibrium relationship, the findings suggested that New Issues and Transaction Value have a positive and statistically significant effect on economic growth, whereas Market Capitalization and Number of Listed Securities have an inverse and statistically significant relationship.

Khetsi and Mongale (2015) used the Granger causality test, the General Impulse Response Function, and the Vector Error Correction Model to examine the effect of capital markets on economic growth in South Africa from 1971 to 2013. According to the findings, economic expansion and the capital markets in South Africa are positively correlated. The nation should also concentrate on elements, like the growth of financial institutions, that support the development of capital markets.

Using Error Correction Model (ECM) technique, Taiwo et al. (2016) assessed the capital market's contribution to the expansion of Nigeria's economy from 1981 to 2014. The results of the normalized cointegrated series exhibited that Nigeria's vital macroeconomic variables swaying economic growth are the market capitalization, total value of listed securities, labour force participation rate, accumulated savings, and capital formation. It was therefore suggested that, in order for the capital market to fulfil its full potential, its environment should be able to promote and support investment possibilities for both domestic and foreign investors, because the stock market functions in a macroeconomic setting.

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Omoregie, Eromosele, and Edo (2016) investigated the sway of stock market volatility and additional factors such as inflation and interest rates on economic growth. Time series data from 1984 to 2012 were analyzed using the Error Correction Model. The findings demonstrated a favourable association between stock market volatility, inflation rate, and interest rate and economic growth. It was nevertheless advised that, because the undertakings of the stock market improve Nigeria's economic growth, the government implement additional developmental measures with the purpose of sustaining the nation's economic growth.

Coşkun, Seven, Ertuğrul, and Ulussever (2017) investigated the links between economic growth in Turkey between the years 2006:M1 and 2016:M6 and the degree of development of various capital market sub-components, including mutual/pension funds, corporate bonds, stock markets, and government bond markets. The study discovered that the expansion of the capital market and economic growth have a long-term cointegrating relationship as well as a unidirectional causality that runs from the expansion of the capital market to economic growth. Also, it was ascertained that capital market development has asymmetric effects on economic growth, with government bond market development having a negative impact while the total index of other sub-components has a positive impact. This is demonstrated using the "Autoregressive Distributed Lag (ARDL), Markov Switching Regression, and Kalman Filter models".

From 1985 to 2016, Onyenwe (2017) investigated the influence of capital market volatility on Nigerian economic development. The ACH model and its extensions were used to determine the presence of stock market volatility in Nigeria. The findings indicate that the influence of capital market volatility on economic growth in Nigeria is, at best, negligible. The variance decomposition analysis demonstrated, to a considerable extent, that capital market volatility can only explain a tiny part of the real GDP prediction error variation. As a result, there is evidence of a reduced influence of capital market volatility on Nigeria's economic development.

Avery and Obah (2018) used the OLS methodology to analyze the effects of the Nigerian economy's capital market expansion between 2000 and 2013. The study's findings indicate a significant relationship between stock market factors and economic growth. With the exception of the All Share Index, total transaction value and deal volume had no bearing on Nigeria's economic expansion over the research period. The long-term correlation revealed that the GDP is mostly impacted by market capitalisation.

The OLS approach was used by Enoruwa, Ezuem, and Nwani (2019) to analyze the effect of the capital market on Nigeria's economic growth over a 31-year period from 1985 to 2015. The main conclusions of the study showed that, with the exception of the number of deals and deal value, which showed a fair correlation with the dependent variable, all predictors (market capitalization, all share index, trade volume, and trade value) exhibit a significant rapport with economic growth in Nigeria at the 5% level of significance. According to the study, for the capital market to draw in investors and win the trust of the investing public, it will need to embrace innovation and implement fair information management practices.

Acha and Akpan (2019) investigated the association concerning stock market operations and economic growth in Nigeria from 1987 to 2014. The Granger causality test under the VAR model was used to analyze the causal link, while the Johansen co-integration test was utilized to determine if the variables were cointegrated. At least one co-integrating vector was discovered to be cointegrated with the variables. The findings show that the causation concerning economic growth and capital market performance indicators leads directly to GDP. According to the findings, the drive of stock prices on the Nigeria Stock Exchange reflects the country's macroeconomic conditions and may thus be utilized to forecast the future course of economic growth. The study demonstrates how the Nigerian economy has been favourably and significantly influenced by the capital market performance during the study period.

Ugbogbo and Aisien (2019) used time series data from Nigeria for the years 1981–2016 to study the effect of capital market development on economic growth. For the empirical analysis, the co-integration and error correction model was used, and it was discovered that some variables were co-integrated. The empirical finding showed that the expansion of Nigeria's capital market has a significant and favourable impact on economic growth over the long and short terms. In order to guarantee a dependable, effective, and stable stock market in Nigeria, the paper advised the government to inject significant funds into the capital market and implement appropriate reform policies.

Using multiple regression analysis, Alam and Hussein (2019) studied the impact of the capital market on Oman's economic expansion. For the studied time, the study demonstrated a favourable association between the capital market and economic development in Oman. As a result, the study advised that Oman place a stronger

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priority on financial sector development, with a particular emphasis on capital market development, in order to secure economic progress.

Between 1980 and 2017, Keji (2020) empirically investigated the relationship between Nigeria's capital market and economic growth. The inefficiency of the capital market, which has an impact on liquidity, information gathering concerning firms like risk divergence, savings synchronisation, and corporate management, predated the study. So, the ARDL model cum bound testing for cointegration were used in the research. The findings demonstrated a long-term relationship between Nigeria's capital market and economic expansion.

The link between the capital market and economic development in developing African nations (Nigeria, South Africa, and Kenya) was investigated by Adoms, Yua, Okaro, and Ogbonna (2020) from 1990 to 2018. The study used an ex-post facto research approach, and the data were analyzed using ARDL regression, granger causality, and OLS for the comparative country regression specific analysis. With the exception of Kenya, which is consistent with the "Finance Led Growth Hypothesis", the study empirically shows that the capital market has a substantial association with economic development in the chosen African nations in Nigeria and South Africa.

The impact of capital market development on economic growth in Nigeria from 2008 to 2018 was studied by Angaye and Frank (2020). Market capitalization rate served as a proxy for stock market growth, and GDP was used to measure economic growth. Multiple regression analysis was used in the study to establish the empirical findings. According to the empirical findings, the Nigerian stock market is favourably correlated with economic growth, although its impact is minimal. It is advised that market regulators for the capital markets, such as the Security and Exchange Commission (SEC), should be more adaptable and receptive to new ideas without endangering investor interests and protection or the effectiveness of the market.

With data between 1980 and 2016, Esian and Ebipre (2020) evaluated "the influence of the capital market on economic growth in Nigeria". Using the Augmented Dickey-Fuller approach, the data was evaluated for unit root, and the findings revealed that all variables were stationary after being differenced once. The Johansen Co-integration test a long-run connection. The findings found that Market Capitalization had a desirable long-run influence on Nigeria's economic growth but had no significant short-run impact; and Volume of Shares Traded had a desirable and substantial short-run sway on the economy but had a deleterious long-run influence.

Using data from 1983 through 2016 on Nigeria's Real GDP as a representation for economic growth and capital market as the independent variables Udo et al. (2021) investigated the sway of development in the capital market on the country's economic growth. For estimation, ARDL short plus long run error correction models (ECM) were combined with ARDL bounds testing for levels relationship. The study's conclusions show that, in both the short cum long terms, the number of listed securities and the All Share Index sustained a momentous rapport with economic growth in Nigeria. According to the study's findings, the government should assist in removing any tax, legal, and regulatory barriers that hinder stock market growth because they serve as deterrents to capital market investments. Algaeed (2021) examined and tested the impact of capital market expansion on the increase in per-capita GDP in the Saudi Arabian economy from 1985 to 2018 with the implementation of an ARDL, FMOLS, and Johansen tests. A log-linear eclectic model was used to estimate the following stock market pointers: share price index, capitalization, liquidity, number of share transactions, and number of shares as they affect growth. The share price index, the number of traded shares, and the ratio of the number of share transactions all showed positive signs while capitalization and liquidity showed negative results. When the Granger causality test is applied, the per-capita GDP is not granger caused by the share price index, market capitalization, or number of traded shares. This paper will utilize recent data from the first quarter of 2010 to the fourth quarter of 2021 to explore how volatility in the capital market has affected the real sector of the Nigerian economy. This period captures recent global economic misfortunes as brought about by the Covid-19 pandemic. The study will also employ different econometric approaches like the ARCH/GARCH, Granger Causality, VAR, impulse response function, and the variance decomposition.

3. Methodology

3.1. The Model

The models to be specified constitutes the volatility model and the vector autoregressive (VAR) model. These models are derived from the general functional form of:

$$RGDP_t = f(MRKC_t) \quad (1)$$

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Equation 1 is expressed in a form where RGDP is the growth rate of real gross domestic product at 2010 constant prices (a proxy for economic growth), and MRKC represents the market capitalization (a proxy for capital market).

3.1.1. The Volatility Model

The ARCH(q) Model

The Autoregressive Conditional Heteroscedasticity (ARCH) model can be named based on the number of lagged realization. For example:

$$\text{ARCH(1): } \sigma_t^2 = \gamma_0 + \alpha_1 \varepsilon_{t-1}^2 \quad (2)$$

$$\text{ARCH(q): } \sigma_t^2 = \gamma_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \varepsilon_{t-2}^2 + \cdots + \alpha_q \varepsilon_{t-q}^2 \quad (3)$$

In which Equation 3 can simply be expressed as:

$$\text{ARCH(q): } \sigma_t^2 = \gamma_0 + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2 \quad (4)$$

Equation 4, being the ARCH(q) model, states that the variance (volatility) in a given period depends on the magnitudes of the squared errors in the past q periods. The model examines the mean and variance of a variable at the same time. In Equation 4, $\gamma_0 > 0; 0 \leq \alpha_1 < 1$; and the ARCH(q) model often yields negative coefficients of the lagged periods of the squared error.

The GARCH(p, q) Model

The volatility model employed in the study is the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) Model. Equation 5 generally captures the conditional variance for GARCH (p, q) model:

$$\sigma_t^2 = \gamma_0 + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \beta_i \sigma_{t-j}^2 \quad (5)$$

In line with Equation 5, p captures the order of the GARCH components, σ^2; and q reflects the order of the ARCH term, ε_t. Also, it is required that;

$\gamma_0 > 0; \alpha_i \geq 0; i = 1, \ldots, q-1; j = 1, \ldots, p-1; \beta_p, \alpha_q > 0.$

From Equation 5, σ_t^2 reflects the conditional variance while ε_t^2 is the error term. By employing a GARCH(1, 1), Equation 5 becomes:

$$\sigma_t^2 = \delta_0 + \delta_1 \varepsilon_{t-1}^2 + \delta_2 \sigma_{t-1}^2 \quad (6)$$

Equation 6 is the reduced form of the GARCH model and it reflects a GARCH(1,1) model. The three parameters $(\delta_0, \delta_1, \delta_2)$ are often non-negative $(\delta_0 > 0;\ \delta_1 > 0; and\ \delta_2 > 0)$; and to achieve stationarity, the sum of δ_1 and δ_2 must be less than unity $(\delta_1 + \delta_2 < 1)$.

3.1.2. The Vector Autoregressive (VAR) Model

The VAR model for the study is specified as follows:

$$\begin{bmatrix} LOGRGDP \\ LOGMRKC \end{bmatrix} = \begin{bmatrix} LOGRGDP_{t-1} \\ LOGMRKC_{t-1} \end{bmatrix} \begin{bmatrix} c_{1,1} & c_{1,2} \\ c_{2,1} & c_{2,2} \end{bmatrix} + \begin{bmatrix} c_{1,3} \\ c_{2,3} \end{bmatrix} + \begin{bmatrix} \mu_1 \\ \mu_2 \end{bmatrix} \quad (7)$$

Equation 7 represents a VAR(1) model where the current value of the variable is dependent upon that one-period lag of itself and the explanatory variable. The log of gross domestic product (LOGRGDP) captures the gross domestic product in its log form while the log of market capitalization (LOGMRKC) is the log of the market capitalization. The c's are the parameters while the $\mu's$ are the error terms. With the aid of the VAR model, we will be able to obtain both the impulse response function to detect how our variables respond to shocks; and the variance decomposition to ascertain the proportion of the forecasted error variance in a variable that is being explained by the explanatory variable.

3.2. Granger Causality Test

In order to ascertain the nature of the causal relationship between the two variables of interest, the Granger causality test is conducted. The Granger causality test equation is similar to the VAR model, but in this case, we will employ a general form in which the lag length is automatically selected. The test equation is specified as follows:

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$$LOGRGDP_t = \emptyset_{1i} + \sum_{i=1}^{k} \beta_i LOGRGDP_{t-k} + \sum_{k=1}^{k} \gamma_{i,k} LOGMRKC_{t-k} + \varepsilon_{1t}$$
$$LOGMRKC_t = \emptyset_{2i} + \sum_{j=1}^{j} \beta_j LOGRGDP_{t-j} + \sum_{j=1}^{j} \gamma_{i,j} LOGMRKC_{t-j} + \varepsilon_{2t} \quad (8)$$

Estimating Equation 8 yields F-statistic which is used for inference. The significance of the F-statistic at the 5% level signifies that causality exists. In that scenario, we can have unidirectional causality (where only one variable causes the other), or a bidirectional causality (where the two variables causes each other). In the case where the F-statistic is not significant, the two variables exhibits no causality by any means.

3.3. Data Source, Transformation and Diagnostics

The data employed in the study are time series, and covers from the first quarter of 2010 (2010Q1) to the fourth quarter of 2021 (2021Q4). The data were obtained from the central bank of Nigeria statistical bulletin (2021 version). The dependent variable being gross domestic product at 2010 constant price (a measure for economic growth) and the independent variable being market capitalization (MRKC) were all transformed into logarithmic form to ensure the use of the parameter estimates as elasticities. The data are subjected to the augmented Dickey-Fuller (ADF) unit root test with breakpoint.

4. Empirical Findings

4.1. Graphical Analysis

The behaviour of the quarterly data on the variables of interest is captured in Figure 1; where the upper segment reflects on the behaviour of real gross domestic product (RGDP) and the lower segment captures the behaviour of the capital market variable represented by the market capitalization (MRKC).

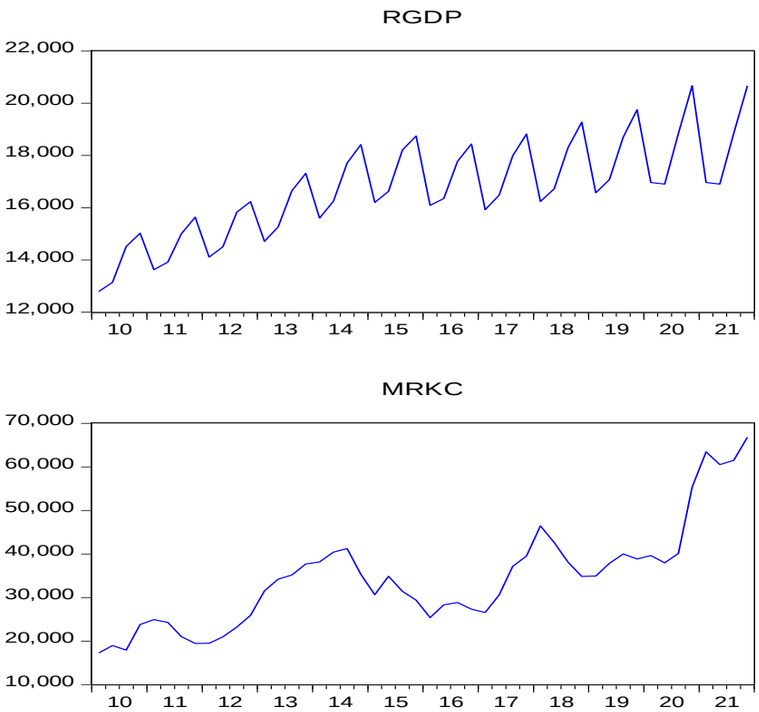


Figure 1. Graphical analysis of market capitalization and real GDP.

It is clear from Figure 1 that both RGDP and MRKC exhibits some forms of oscillations over the years; with greater fluctuations expressed by RGDP. Meanwhile, the MRKC does not exhibit ay form of stability over the years, as observed by the continuous ups and downs swings over the years. Consequently, it is pertinent to

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explore whether there is volatility in the variable and whether such volatility could affect the real sector of the Nigerian economy.

4.2. Unit Root Test

The unit root test follows the ADF test with breakpoint. Table 1 reflects on the result of the test, where the estimation is done consistent with the intercept and trend assumption.

Table 1. Unit root test result.

Variable	ADF Statistic (level)	Break-Point	ADF Statistic (first difference)	Break-Point	Order of Integration
LOGMRKC	-3.807 (-5.176)	2015Q3	-5.557 (-5.176)**	2020Q3	I(1)
LOGRGDP	-6.032 (-5.176)**	2012Q2	-------		I(0)

Note: ** denotes significance at 5% level.

In Table 1, the market capitalization (MRKC) only becomes stationary at first difference, with a breakpoint recorded in the third quarter of 2020. Conversely, the real gross domestic product (RGDP) is stationary at level with a breakpoint detected in the second quarter of 2012.

4.3. Granger Causality Test

In revealing the nature of the relationship amid MRKC and RGDP, the Granger causality test is conducted and the test result is as presented in Table 2.

Table 2. Granger causality test result.

Null hypothesis:	Observations	F-Statistic	Probability
LOGMRKC does not Granger Cause LOGRGDP	46	10.026	0.000***
LOGRGDP does not Granger Cause LOGMRKC		0.5209	0.598

Note: *** denotes significance at 1% level.

Given that the test result in Table 2 indicates that for the first null hypothesis, the F-statistic (10.0260) is significant at the 1% level given the p-value of 0.0003; it is clear that the null hypothesis is overruled. Therefore, market capitalization causes RGDP. On the reverse, RGDP does not cause MRKC since the F-statistic is not significant. This situation depicts a case of unidirectional causality from market capitalization to economic growth; portraying a case of a supply leading finance hypothesis.

4.4. Autoregressive Conditional Heteroscedasticity (ARCH) Analysis

4.4.1. Test for ARCH Effect on Quarterly Data for Market Capitalization

The test requires that the value of the squared residual must be positive for the ARCH-effect to be present. The coefficient is also expected to be statistically significant. The result for the test is captured in Table 3.

Table 3. ARCH (1) test result.

Variable	Coefficient	Standard Error	t-Statistic	Probability
C	10.396	0.065	159.568	0.000
RESID(-1)^2	2.114	7.172	0.295	0.770
F-statistic	101.135	Prob. F(1,43)		0.000
Obs*R-squared	31.575	Prob. Chi-Square(1)		0.000

Note: Obs*R-squared is the product of the number of observations and the R-squared.

As it can be adduced from Table 3, the overall model is significant at the 1% level as reflected by the significance of the F-statistic. Also, the value of the squared residual (2.1138) is positive though not significant. Form the first rule, we can say that the ARCH-effect exists in market capitalization though it is not significant. Therefore, volatility exists. The volatility emanates from factors that are attributable to financial liberalization

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and behavioural finance factors. For the fact that the overall model is significant (as reflected by both the F-statistic and the Chi-square statistic), the ARCH(1) and GARCH(1,1) models are therefore implemented.

4.4.2. ARCH/GARCH Result

The result in Table 4 reflects that the market capitalization has a positive and significant influence on the economic growth of Nigeria, given that the coefficient is statistically significant at the1% level. The coefficient being less than unity is an indication that economic growth is capital market inelastic. However, a 1% increase in capital market increases economic growth by 0.2192% on the average.

Table 4. Result of autoregressive conditional heteroscedasticity effect of market capitalization on real GDP.

Variable	Coefficient	Standard Error	z-Statistic	Probability
LOGMRKC	0.219	0.001	220.507	0.000***
C	7.438	0.013	563.057	0.000***
Variance Equation				
C	0.004	0.003	1.641	0.101
RESID(-1)^2	-0.413	0.178	-2.329	0.020**
GARCH(-1)	0.719	0.213	3.371	0.001***
R-squared	0.506	Akaike info criterion		-2.192
Adjusted R-squared	0.496	S.E. of regression		0.080

Note: ** and *** denotes significance at 5% and 1% respectively.

For the ARCH effects in the variance equation, the estimate of lagged value of residual (-0.4133) is negative and significant at the 5%. For the fact that this coefficient is negative and significant, then there is no volatility clustering. Consequently, the stock market in Nigeria does not exhibit volatility clustering during the period of analysis. Going by the GARCH estimate, it is possible to obtain the variance scaling parameter. Since the estimate of lagged value of residual (-0.4133) is negative and the variance scaling parameter (0.7187) is positive, then there is no volatility cluster. Further, the sum of the lagged value of residual and variance scaling parameter gives an estimate of the rate of the decay of the response function on a quarterly basis. This rate being 0.3054 is quite low and is symptomatic of response functions to shock dying at a faster pace. Therefore, in the presence of a new shock in the Nigerian capital market, it will have impact on the market capitalization for a short period. Consequently, new information is deemed more important than old information and makes the market less predictable. This makes the Nigerian capital market to be efficient since the market is not easily predictable. This is in line with the requirement for an Efficient Market Hypothesis (EMH), as investors do not earn abnormal returns with a commensurate risk level (see Osazevbaru (2014)).

4.5. Vector Auto Regression (VAR) Analysis

The VAR analysis is conducted to ascertain the VAR estimates, the impulse response function, and the variance decomposition.

Table 5. Vector auto regression result on the relationship between RGDP and MRKC.

Variable	LOGRGDP	LOGMRKC
LOGRGDP(-1)	0.358 (0.134) [2.671]**	0.066 (0.204) [0.322]
LOGMRKC(-1)	0.151 (0.046) [3.316]**	0.938 (0.069) [13.518]***
C	4.684 (1.035) [4.527]**	0.029 (1.578) [0.019]
R-squared	0.566	0.891
Adj. R-squared	0.547	0.886
F-statistic	28.719	178.976
Akaike AIC	-2.361	-1.517
Schwarz SC	-2.243	-1.399

Note: ** and *** denotes significance at 5% and 1% respectively.

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4.5.1. VAR Result

From the VAR result in Table 5, it is observed that the past value of RGDP significantly affect the current value of RGDP. As such, RGDP is strongly endogenous in explaining itself. Given the coefficient, it can be inferred that the past realization in RGDP increases RGDP by 0.3576% on the average. The effect of MRKC is seen to be strongly exogenous in predicting RGDP as it put forth a positive and significant weight on RGDP. Consequently, a 1% increase in MRKC will put forth a 0.1509% increase in RGDP on the average. This is a proof of the causal relationship between RGDP and MRKC, with MRKC only causing RGDP. The R-squared of 0.5662 implies that both the past realization in RGDP and MRKC jointly account for 56.62% of the total variations in RGDP.

For the MRKC, it is observed that RGDP has a positive but insignificant weight on MRKC is a further evidence of the no causality flowing from RGDP to MRKC. Therefore, RGDP is weakly exogenous in predicting MRKC. However, the MRKC is strongly endogenous in predicting itself as its past realization accounts for 0.9383% increase in MRKC. The R-squared revealed that both the past realization in MRKC and RGDP account for 89.05% variations in MRKC.

4.5.2. Impulse Response Function

The impulse response functions (IRFs) captures how the variables of interest respond to shocks in other variables. The IRFs is captured in Figure 2 where the response follows a Cholesky One Standard Deviation shock (innovations).

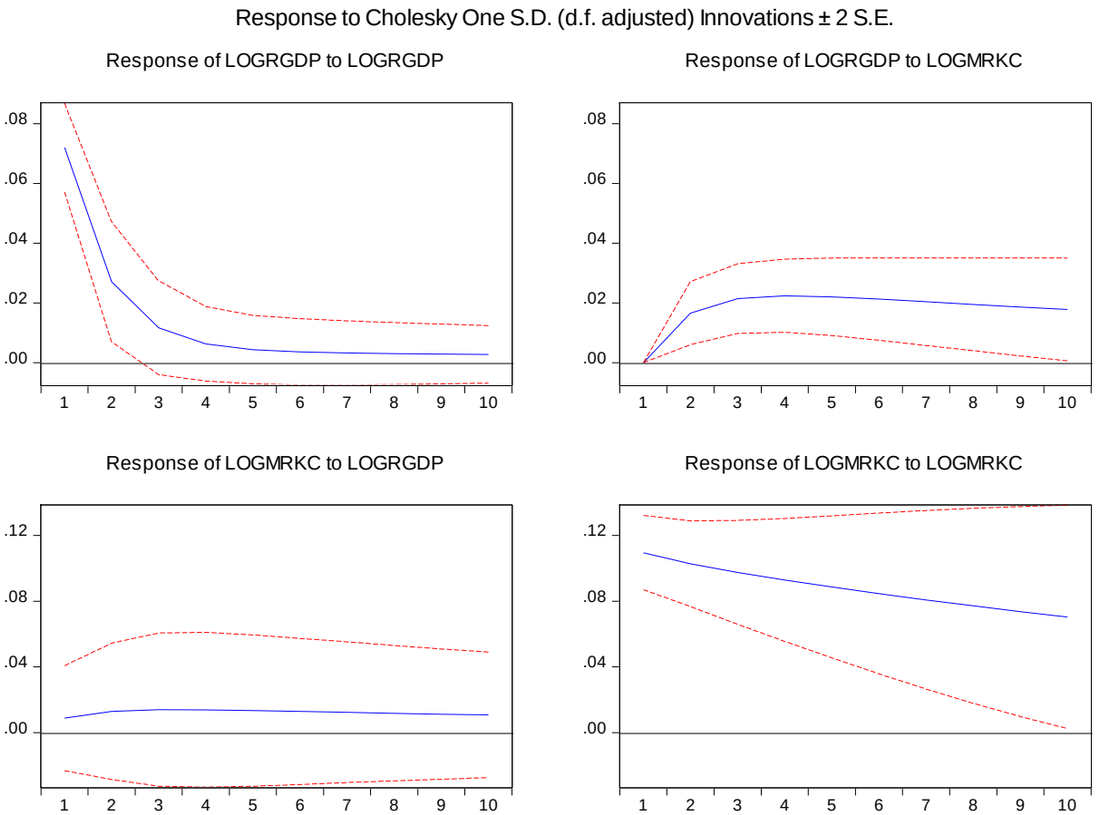


Figure 2. Response of RGDP to shocks in MRKC.

As can be inferred form Figure 2, RGDP responded positively to shocks in MKRC both in the short-run and the long-run; with the model being explosive in nature. This is because the response function could not return to the base-line even after a 10th period. This indicates that the shocks in the capital market can have a very lasting effect on the economic growth of Nigeria. A similar nature long-run response is being observed in terms of the response of the MRKC to shocks in RGDP, as the response function could not return to the base-line even

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in the 10th period. Thus, shocks in the real sector of the economy could also have a tremendous influence on the behaviour of the Nigerian capital market.

4.5.3. Variance Decomposition

The variance decomposition (VD) reflects on how much of the forecasted error variance in the variables explains the other. Table 6 and Table 7 captures the VD for RGDP and MRKC respectively.

Table 6. Result of variance decomposition of RGDP on MRKC.

Variance Decomposition of LOGRGDP:			
Period	**S.E.**	**LOGRGDP**	**LOGMRKC**
1	0.072	100.00	0.0000
2	0.079	95.591	4.4088
3	0.082	89.220	10.779
4	0.086	83.183	16.816
5	0.089	78.072	21.927
6	0.091	73.855	26.144
7	0.093	70.371	29.628
8	0.095	67.469	32.530
9	0.097	65.027	34.972
10	0.099	62.954	37.045

In Table 6, it is observed that in the first period, RGDP accounts for 100% of its forecasted error variance, therefore validating that the variable is strongly endogenous in the short-run. Thereafter, the proportion declined but still quite significant up to 78.072% in the fifth period. In this short-run period, RGDP contributed slightly to the forecasted error variance of MRKC as the proportion was 0% in the first period but improved steadily to 21.927% in the fifth period. In the long-run, RDGP continued to account for a greater portion of its forecasted error variance, though at a declining rate, to up to 62.954% in the 10th period. The contribution of the forecasted error variance of RGDP in MRKC continued to increase up to 37.045% in the long-run (10th period).

Table 7. Result of variance decomposition of MRKC on RGDP.

Variance Decomposition of LOGMRKC:			
Period	**S.E.**	**LOGRGDP**	**LOGMRKC**
1	0.110	0.632	99.368
2	0.151	1.069	98.931
3	0.180	1.346	98.654
4	0.203	1.521	98.478
5	0.222	1.637	98.363
6	0.238	1.716	98.283
7	0.251	1.774	98.226
8	0.264	1.817	98.183
9	0.274	1.850	98.150
10	0.283	1.876	98.124

For VD of MRKC reflected in Table 7, it is observed that MRKC accounted for a very small proportion of the forecasted error variance of RGDP with just a 0.6317% in the first period to 1.8759% in the 10th period. MRKC maintained a very high endogeneity in accounting for 99.368% of its forecasted error variance in the first period to 98.124% in the 10th period (long-run).

4.5.4. Stability Test

With the Inverse Roots of AR Characteristic Polynomial, it is possible to detect whether the VAR result is stable. Figure 3 presents this result, where it is expected that all the roots must lie within the unit circle for stability to exists.

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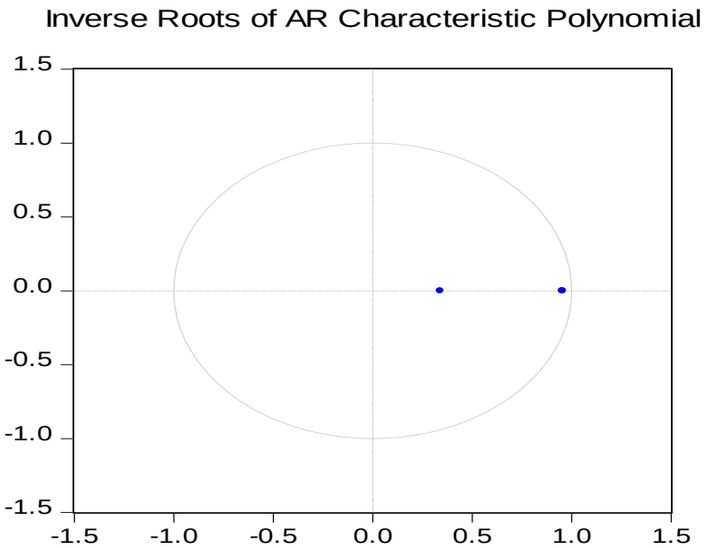


Figure 3. Test for stability using inverse root of the AR characteristic polynomial test.

It can be observed from Figure 3 that all the roots lie within the unit circle. Consequently, the null hypothesis of no stability is rejected. In that way, the VAR result is stable and the stability condition of the VAR framework is fulfilled.

5. Conclusion

Exploring the effect of capital market volatility on the growth of the Nigerian economy is what this paper hinges on. The capital market is being measured with the use of capital market, while the real gross domestic product was used to capture economic expansion. To really measure the volatility, the study utilized quarterly data ranging from the first quarter of 2010 to the fourth quarter of 2021. The data on these two variables were extracted from the 202 version of the Central Bank of Nigeria statistical bulletin. To detect the presence of volatility, the study tested for volatility using the ARCH effect. The result revealed the presence of volatility and such put forth a positive and significant influence on the growth of the Nigerian economy. The sum of the lagged value of residual and variance scaling parameter as obtained from the ARCH/GARCH gives an imperative that the Nigerian capital market obeys the efficient market hypothesis. Consequently, the Nigerian capital market is less predictable and using past information for prediction will not give room for any abnormal returns. By further utilizing the Granger causality test and VAR framework and exploring both the impulse response function and the variance decomposition, the paper portrayed how the Nigerian economy responds to shocks in the capital market. The Granger causality test revealed that the market capitalization granger-causes real GDP, pointing to the existence of the supply-leading financial hypothesis. From the VAR result, the past period realization of market capitalization put forth a positive and significant influence on the real GDP, with the real GDP also being strongly endogenous in predicting itself. The impulse response function revealed that real GDP responded positively to shocks in capital market both in the short-run and the long-run. This indicates that the shocks in the capital market can have a very lasting effect on the economic growth of Nigeria. This is further validated given that increasing proportion of the forecasted error variance of real GDP being accounted for by the capital market variable of interest. Thus, this paper concludes that the Nigerian capital market needs be streamlined in order to avoid volatility clustering in the future, in order to maintain the efficiency of the market.

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♣*Corresponding Author: Ubong Edem Effiong*
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