Essay on Stock Market Performance and Dynamic Reactions to Monetary Policy Shocks in Nigeria

Ekong, Christopher N. and Onye, Kenneth U.

University of Uyo, Uyo, University of Uyo, Uyo

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[1] Christopher N Ekong, [2] Kenneth U Onye

[1, 2] Department of Economics, Faculty of Social Sciences, University of Uyo, Uyo, Nigeria.

Abstract
This paper examines the dynamic response of three popular measures of stock market performance, namely; Stock Market Turnover, Market Liquidity and All-Shares Index, to innovations in monetary policy shocks. Relying on the structural Vector Autoregressive (SVAR) regression technique, our findings reveal that monetary policy (money supply and interest rate) shocks are not altogether neutral to the performance of the Nigerian stock market. The quantity-based nominal anchor (M2) proved to be more effective than the price-based policy variable (MPR) in enhancing the overall performance of the Nigerian stock market. In this regard, the central bank should implement contractionary monetary policy when stock prices become persistently bullish. Since stock prices are found to respond quickly and positively to shock in real GDP, boasting real economic activities becomes a fundamental prelude for stabilizing the stock market in Nigeria.

Keywords: Stock Market Performance, Dynamic Reactions, Monetary Policy Shocks.

1. Introduction

The stock market plays an important role for monetary policy because it reflects the expectations of economic agents regarding the outcome of monetary policy in the macro economy. As a result, the stock market reaction to monetary policy decisions can reveal information to central banks concerning the market's perception of the outcome of central bank's policy (see Sousa 2004:1) [37]. In addition, by performing its financial intermediation functions, the stock market plays an important role in the smooth functioning of the economy. The central banks operate through the stock market by influencing the cost and availability of credit. Its monetary policy actions, therefore, potentially constitutes an important factor affecting the behavior of stock market. In term of stock market performance, three major indicators are discernable. These are: (i) market turnover which is measured as total value of transactions as a percentage of total market capitalization of the exchange; ii) All-Shares index – A market capitalization weighted index that reflects the price behavior of all common stocks quoted in the Nigerian Stock Exchange (NSE); and iii) a measure of overall effect of the stock exchange on real economic activities which is computed as market capitalization as a percentage of real GDP (see Olewe, 2007 for more expositions)

In Nigeria, hardly can one find any attempt to investigate the effect of monetary policy stocks on stock market performance. This, we argue, is perhaps due to the 'Old Consensus view' i.e., the old consensus view that central banks should focus on price and output stabilization and ignore development in the stock market even at the cost of temporarily deviating from their out and inflation targets (Bernake 2000, Bernanke 1999; kohn 2006) [5, 26]. In this regard, many past studies generally conclude that monetary policy account for an insignificant part of stock market behavior (Bernanke and Gertler 1999, Khon 2006) [5]. As a result of this, in Nigeria for instance, past studies have tended to focus more on the effect of monetary policy shock on output and inflation (see e.g. Chuku 2009; Chude and Chude 2013; Olowe, 2007; Adamge 2009; Bernanke and Getler, 2001) [12, 11, 33]. Consequently, therefore, there is avalanche of literature on studies focusing instead on the effect of monetary policy on the real sector activities while sidelining the effect of monetary policy on the financial sector. Nonetheless, this is in contrast with the importance usually attributed to the central banks in an economy, especially in terms of its contribution to maintaining financial stability and promoting economic growth.

Regrettably still, as Sousa (2004) [37] notes, most studies in advanced countries have tended to suffer from problem of variable omission bias. Thus, the question is posed whether the weak contribution of monetary policy to stock market performance, as purported by supporters of the 'Old Consensus View' is due to omission of relevant variables/ information both for identifying monetary policy shocks and for explaining the dynamic behavior of the stock market. This study, therefore, sets out to investigate the dynamic response of the stock market to monetary policy shocks (unanticipated changes) with emphasis of the effect of interest rate and money supply on the stock market performance. This is important because, as De Grauwe (2008) [14] notes, policies that stabilize the financial market has potential to trickle down to output and inflation stabilization. As the same author notes, asset price stabilization is paramount since price bubbles inevitable leads to crashes as the 2008/2009 economic and financial crisis clearly demonstrates. Another important contribution of this study is that of inclusion of sufficient set of relevant variables that are likely to be part of a typical reaction function[1] of the central bank and that can adequately explain stock market behavior in Nigeria. The findings will not only supply lessons for policy –making in Nigeria, it will also provide insight on how the Central Bank of Nigeria should manage policy.

[1] See Romer and Romer, 2003; for central bank reaction function (Taylor's rule).

Against this background, the demand for deep investigation of the relationship between monetary policy and stock market performance become topical. The balance of the paper is structure as follows. Section 2 analyzes the performance profile of the Nigerian stock market from 1980 to 2014. In section three we present the theoretical framework and literature review. Section four discusses the method of study while five analyzes the results. The paper is concluded in section six with some lessons for policy.

2. Performance Profile of the Nigerian Stock Market (1980-2014)

The Nigerian Stock Exchange (NSE) which was founded in 1960 as the Lagos Stock Exchange started operations in 1961 with 19 securities listed on the exchange. In 1977 it was renamed the Nigerian Stock Exchange (sometimes used inter-changeably with the term Nigeria stock market) with branches in major cities in Nigeria. The exchange was deregulated[2] in 1993 with prices in the primary market (for new issues) being determined by *stock brokers and issuing houses* while prices in the secondary market (for quoted securities) were determined solely by *brokers*.

The three most commonly used measures of stock market activities are All-Share Price Index, ASI proxing stock price (STOCKP), market capitalization (MC) and value of shares traded (a measure of market liquidity) – both in relation to each other and as a percentage of the gross domestic product (GDP). In terms of stock market performance, three major indicators are also discernable. These are stock market turnover (measured by Value of transactions as a percentage of market capitalization, VTMC), the All- Shares Index (a measure of the average value of shares of all quoted firms in the market) and an indicator of the effect of NSE on the economy (measured by market capitalization as a percentage of real gross domestic product – (MCGDP)[3].

Table 1 presents time series on Performance profile of Nigeria stock market indicators and real GDP real GDP

Table 1: Stock Market Indicators and Real Economic Performance (N´ million)

Years	ND	VT	RGDP	RGDPG	ASI	MC	VTMC	NDRGDP	MCRGDP
1980	1,980	3,960.00	250100	-		5000	79.2	0.791683	1.9992
1981	10,199	304.8	251050	-1.72%	-	5000	6.096	4.062537	1.991635
1982	10,014	215	246730	-6.63%	-	5000	4.3	4.058688	2.026507
1983	11,925	397.9	230380	-1.36%	-	5700	6.9807	5.176231	2.474173
1984	17,444	256.5	227250	11.34%	100	5500	4.66364	7.676128	2.420242
1985	23,571	316.6	253010	1.89%	117.3	6600	4.79697	9.316233	2.608593
1986	27,718	497.9	257780	-0.69%	149.8	6800	7.32206	10.75258	2.637908
1987	20,525	382.4	256000	7.58%	176.9	8200	4.66342	8.017578	3.203125
1988	21,560	850.3	275410	19.32%	210.8	10000	8.503	7.828329	3.63095
1989	33,444	610.3	295090	11%	273.9	12848.7	8.768	10.6798	3.8954
1990	39,270	225.4	328610	0.01%	423.7	16300	1.38282	11.95034	4.960287
1991	41,770	242.1	328640	2.63%	671.6	23100	1.04805	12.70996	7.028968
1992	49,029	491.7	337290	1.56%	931	31200	1.57596	14.53616	9.2502
1993	40,398	804.4	342540	0.79%	1,229.00	47500	1.69347	11.79366	13.86699
1994	42,074	985.9	345230	2.15%	1,913.20	66300	1.48703	12.18724	19.20459
1995	49,564	1,838.80	352650	4.13%	3,815.10	180400	1.01929	14.05473	51.15554
1996	49,515	6,979.60	367220	2.89%	5,955.10	285800	2.44213	13.48374	77.82801
1997	78,089	10,330.50	377830	2.82%	7,638.60	281900	3.6646	20.66776	74.61027
1998	84,935	13,571.10	388470	1.19%	5,961.90	262600	5.16797	21.86398	67.59853
1999	123,509	14,072.00	393110	4.89%	5,264.20	300000	4.69067	31.41843	76.31452
2000	256,523	28,153.10	412330	4.72%	6,701.20	472300	5.96085	62.21303	114.5442
2001	426,163	57,683.80	431780	4.63%	10,185.10	662500	8.70699	98.69911	153.4346
2002	451,850	59,406.70	451790	9.57%	11,631.90	764900	7.7666	100.0133	169.3043
2003	621,717	120,402.60	495010	6.58%	15,559.90	1359300	8.85769	125.5969	274.6005
2004	973,526	225,820.00	527580	6.51%	24,738.70	2112500	10.6897	184.5267	400.4132
2005	1,021,967	262,935.80	561930	6.03%	22,876.70	2900100	9.06644	181.8673	516.0963
2006	1,367,954	470,253.40	595820	6.45%	27,647.50	5120900	9.18302	229.5918	859.471
2007	2,615,020	1,076,020.40	634250	5.98%	48,773.30	13181700	8.16299	412.3011	2078.313
2008	3,535,631	1,679,143.70	672200	6.96%	50,424.70	9563000	17.5588	525.979	1422.642
2009	1,739,365	685,717.30	718980	7.98%	23,091.50	7030800	9.75305	241.9212	977.8853
2010	1,925,478	799,910.90	776330	7.43%	24,775.50	9918200	8.06508	248.0231	1277.575
2011	1,235,467	638,925.70	834000	6.58%	23,393.60	10275300	6.21807	148.1375	1232.05
2012	1,147,174	808,991.40	888890	6.89%	23,432.60	14800900	5.46583	129.0569	1665.099
2013	3,224,639	2,350,875.70	950110	11.00%	36,207.10	19077400	12.3228	339.3964	2007.915
2014	1,211,269	1,334,783.10	951120	-	39,409.80	16875100	7.90978	127.3519	1774.235

Source: Central Bank of Nigeria (CBN) statistical Bulletin, 2011, 2014

[2] In order to enhance the liquidity of quoted stocks, following the deregulation of the stock market in 1993, and to ensure improved surveillance against shoddy deals, the NSE has been operating an Automated Trading System (ATS) starting from 1999 with brokers trading through a network of computers that are connected to a server. The market is now regulated by the Security and exchange commission, SEC, as the apex regulator which administers the investment and securities Act, of 2007 while trading on the exchange is regulated by the NSE

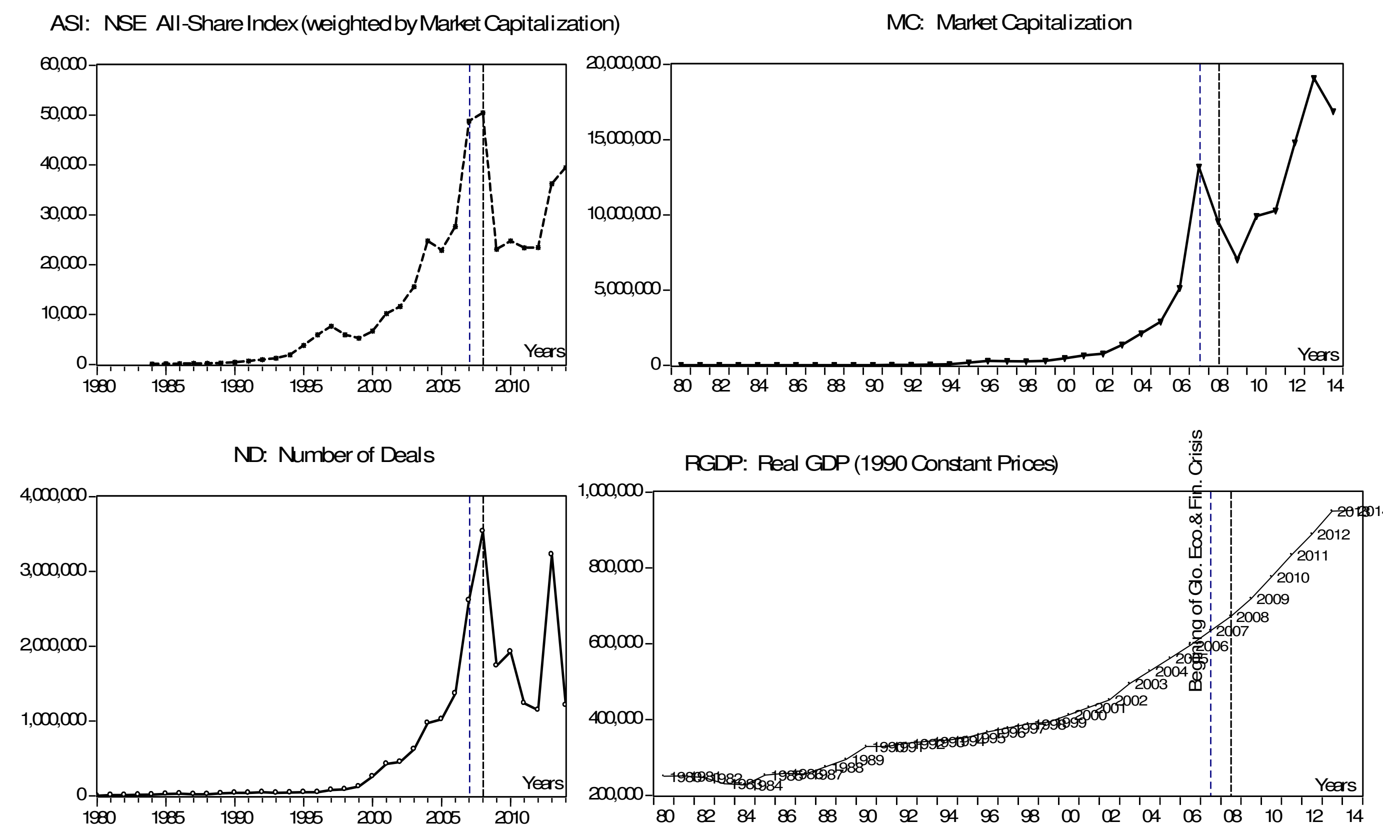
[3] See for e.g. Olowe (2007) [33] and Galebotswe and Tlhalefang (2010) [19] who used these indicators in analyzing Nigeria's and Botswana's stock exchanges.

Where: ND= number of deals, VT= value of transactions (a measure of market liquidity), MC=total market capitalization, MCE= market capitalization (equity only), RGDP= real Gross Domestic Product (1990 constant prices), VTMC= Market Turnover (value of transaction as a percentage of market capitalization), NDRGDP= number of deals as a percentage of real GDP, and MCRGP= market capitalization as a percentage of real GDP. '–' represents 'not available'.

The NSE All-Share which stood at 117.3 million naira in 1985 rose to 48, 773.3 million naira in 2007 (the beginning of the financial crisis) recorded the highest value of 50424.7 million naira in history in year 2008. The represents a compounded growth rate of over 4, 2887% (a 428.87 basis points increase against it 1980 value). However, this phenomenal growth could not be sustained as the All-Share Index plummeted, starting from 2009. The sharp drop in the value of ASI from 50,474.7 million naira in 2008 to 23,091.5 million naira in 2009 coincided with the global economic and financial crisis, the so-called Great Recession. In 2012, 2013 and 2014, the All-Share Index stood at 23,432.6 million, 36,207.1 million and 39,409.8 million naira respectively – suggesting that the market may not have fully recovered from the effect of the crisis. Turning to stock market capitalization – the value of all domestic stocks that are listed on the Nigerian Stock Exchange – the picture is similar. The NSE Market Capitalization rose consistently from 5 billion in 1980 to 13.1817 trillion in 2007, implying a compounded growth rate of over 263534% (an increase of over 263.534 basis points above the 1980 value). By 2008, the market capitalization declined to 9.563 trillion, owing to the crisis. However, modest recovery has been made in recent years. In 2013 and 2014, market capitalization rose to 19.0774 trillion and 16.8751 trillion naira respectively which are above its pre-crisis zenith of 13.1817 trillion. In terms of value of transactions, VT (a measure of the value of stocks that are traded), the value peaked at 1.679 trillion in 2008 over the period of 1980 through 2008. In 2009, the value plummeted to a paltry 685.7173 billion. However, like market capitalization, VT has recorded modest recovery in recent years. By 2013 and 2014, the value of transaction stood at 2.35 trillion and 1.334 trillion naira respectively.

The cursory look at the trend of real GDP seems to suggest that it may not have been affected by the crisis. But a more perceptive analysis shows that the growth rate of real GDP plummeted following the crisis (Table 1). In fact as Ekpo and Afagideh (2009) note, the crisis affected virtually all sector of the economy; as foreign direct investment, for instance, divested from the Nigerian Stock exchange and market capitalization plunged drastically.

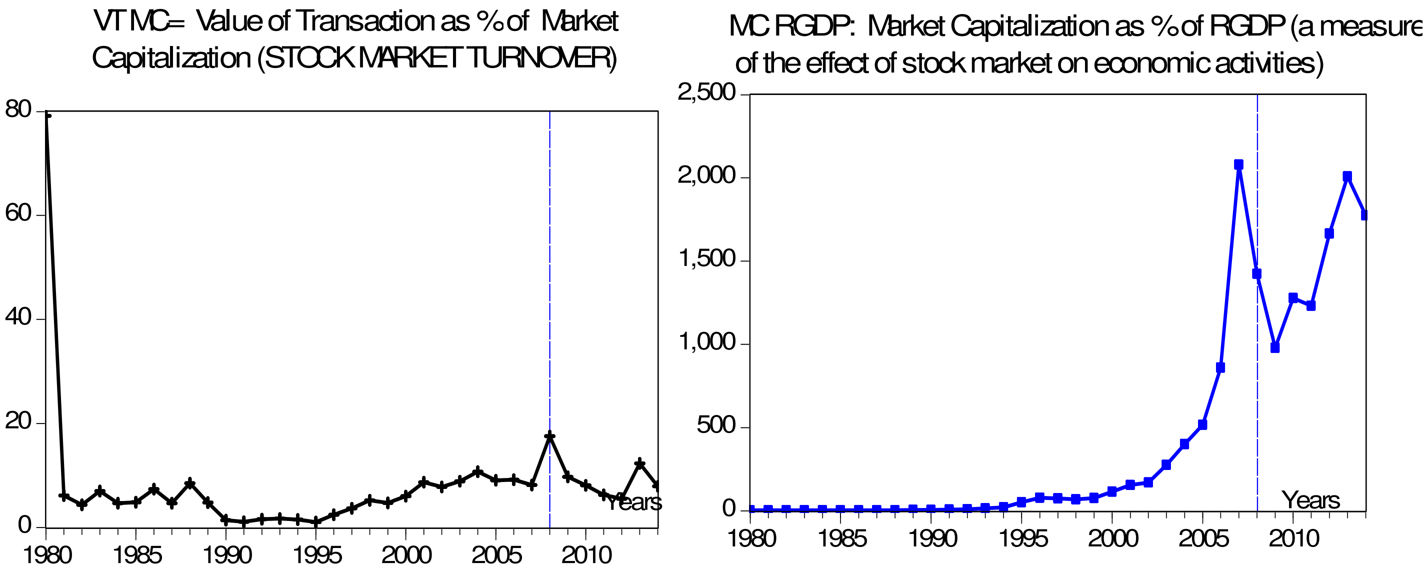
Figure 1 plots the annual trends of the level values of the stock market variables (Nigeria Stock Exchange All-share Index, ASI; market capitalization, MC; and number of deals, ND) and that of real GDP. In Figure 2, we plot the time-trend of major stock market performance indicators, namely: stock market turnover (measured by Value of transactions as a percentage of market capitalization (VTMC) and market capitalization as a percentage of real gross domestic product (MCGDP)[4].



Source: Author's calculations based on Stock Market Indicators (Table 1).

Fig 1: Development of Stock Market Indicators and Real GDP

[4] See for e.g. Olowe (2007) [33] and Galebotswe and Tlhalefang (2012) [19] who used these indicator for analyzing the performance of Nigerria's and Botswana's stock exchanges respectively.



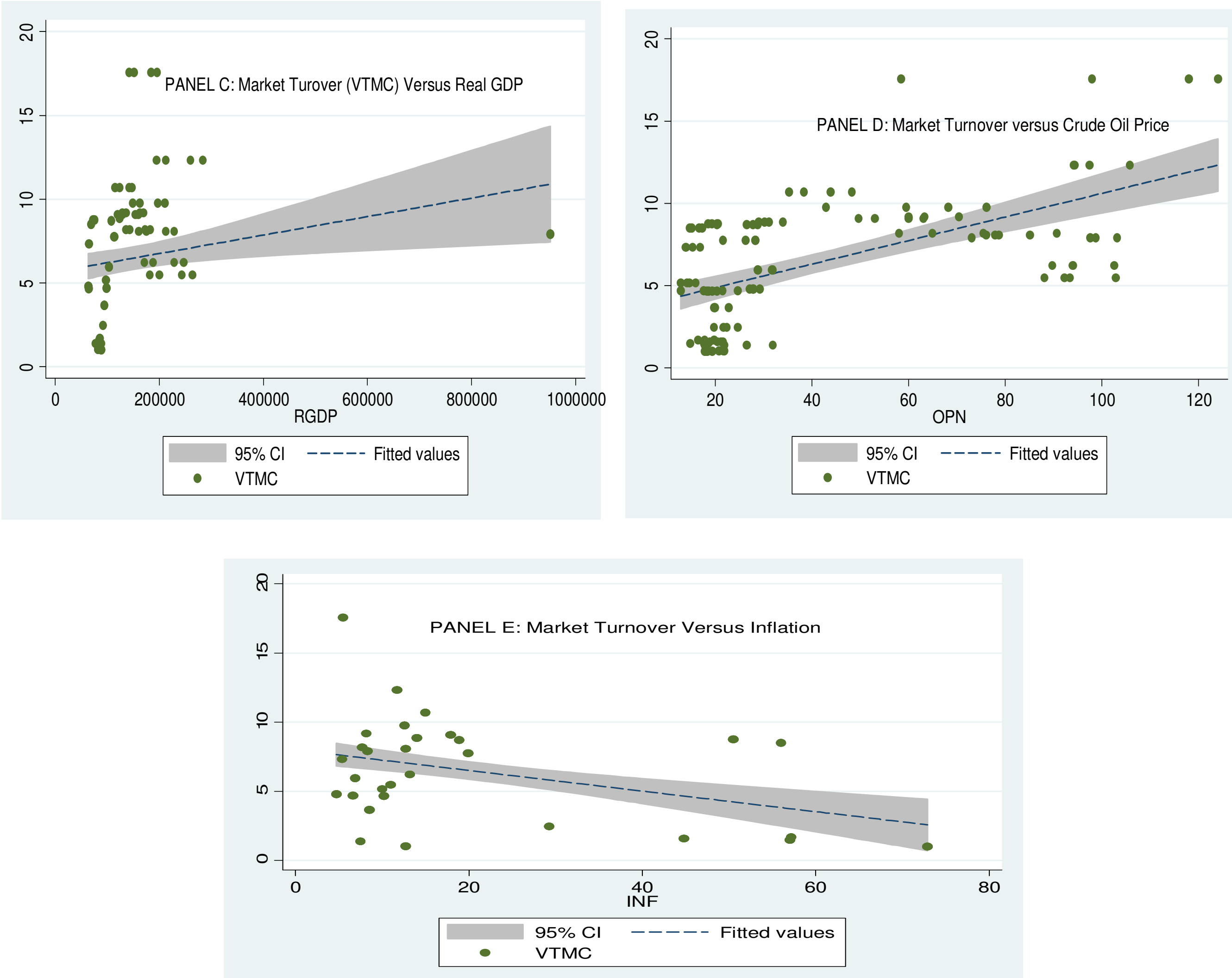
Source: Author's calculations based on Stock Market Indicators (Table 1).

Fig 2: Trend of Stock Market Turnover (VTMC) and MCRGDP

As it is clear from Figure 1, All-Share Index, market capitalization and number of deals achieved some phenomenal growth between the period 1980 and 2007/2008 (start of financial crisis). Nonetheless, beginning from 2008; stock market turnover, market liquidity, market capitalization, value of transaction and number of deals became worse hit by the crisis and were highly variegated, especially in post 2008/09 crisis era. Intuitively, these dynamic movements (variations) may also have resulted from post-crisis policy responses which may potentially impact the underlying market fundamentals that, in turn, influence the stock market variables. As earlier noted, the pertinent question for policy is, therefore, whether and how monetary policy can be used to prevent resurgence of similar crisis or reduce the effect of the crisis when and where it occurs. In other words, how can central bank respond to gyrations in stock market variables in order to forestall bubbles that inevitable lead to crashes? Therefore, more detailed study of the dynamic relationship between monetary policy shocks and the stock market will provide further evidence on the market's response to monetary policy shocks. This is important for policy choice.

In the section that follows we examine in more details the interaction of major stock market performance indicators (market Turnover, All-Shares index, and capitalization-GDP ratio) with policy and non-policy variables as a prelude to our econometric modeling strategy.

Figure 3presents the scatter plots of market turnover versus policy and non-policy variables. Whereas the policy variables include monetary policy rate, nominal naira-dollar exchange rate and broad money supply, the non-policy variable include real GDP, crude oil price and inflation rate.

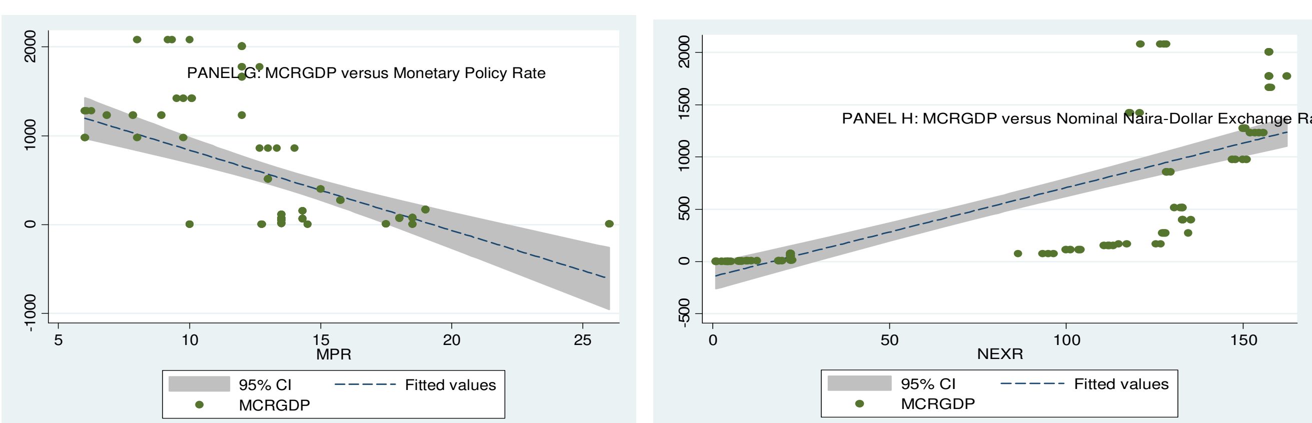


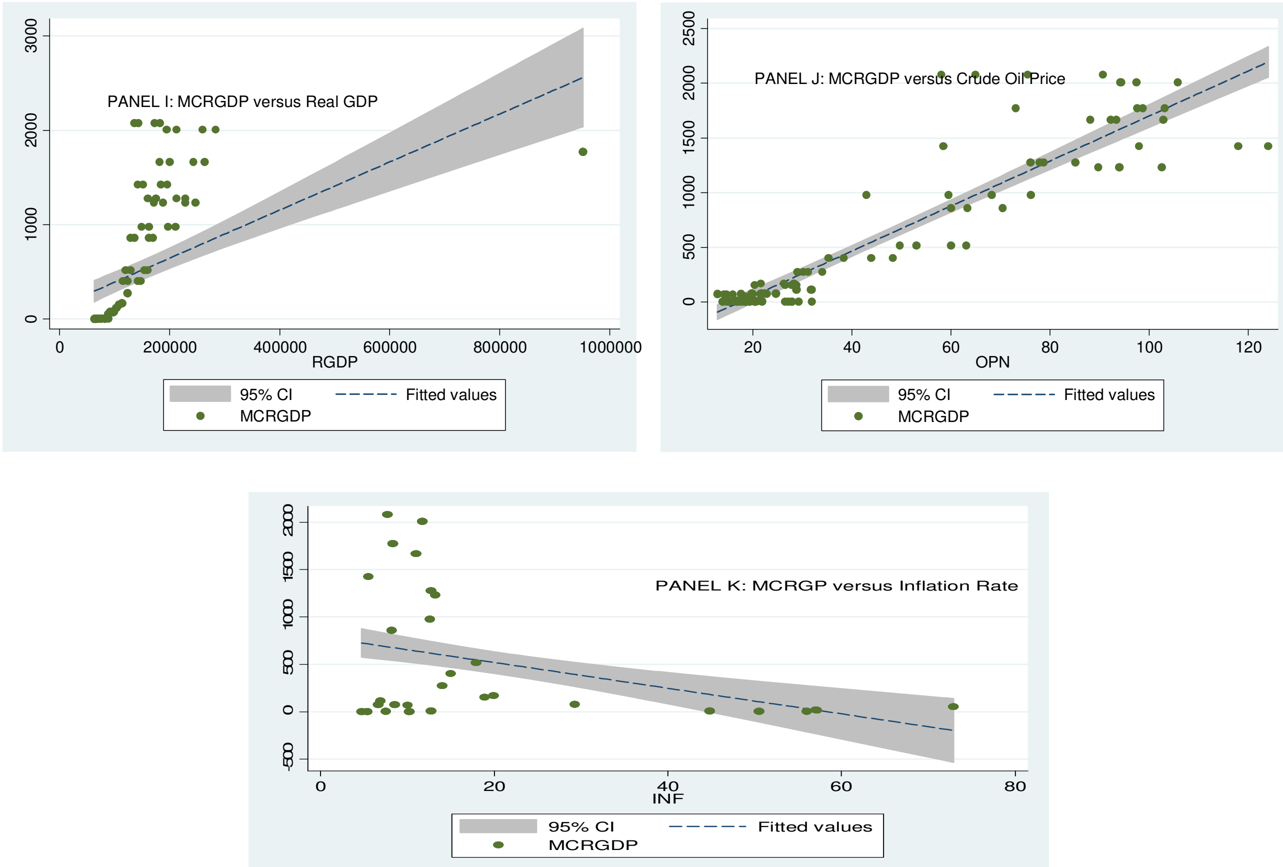
Source: Author

Fig 3: Scatter Plots of Stock Market Turnover versus Policy and Non-Policy Variables

Panel A and B of Figure 3 indicate the scatter plots of market turnover (measured as percentage of value of transaction to real GDP ratio) against interest rate and exchange rate. The dark strand on each panel indicates the 95% confidence internal. As is obvious from Figure 3, interest rate is negatively related to market turnover while exchange rate is positively related to it, as expected. None of the panels indicate a significant relationship as bulk of the scatter points in all the panels lies outside the confidence band. Nonetheless, the analysis is insightful as it provides a cursory knowledge of the link between policy variables and stock market performance.

Turning to another market performance indicator (percentage of capitalization-GDP ratio) a similar pattern emerges as shown in Figure 4.



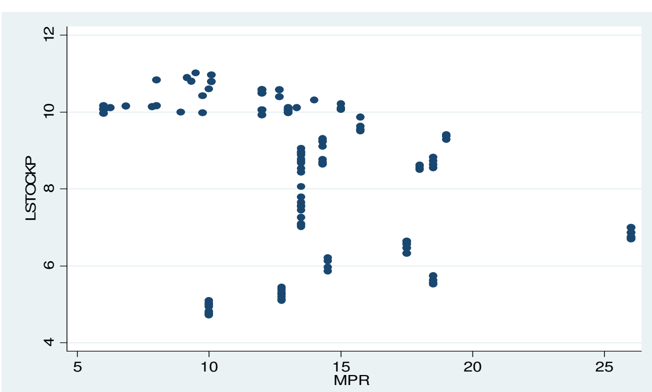


Source: Author

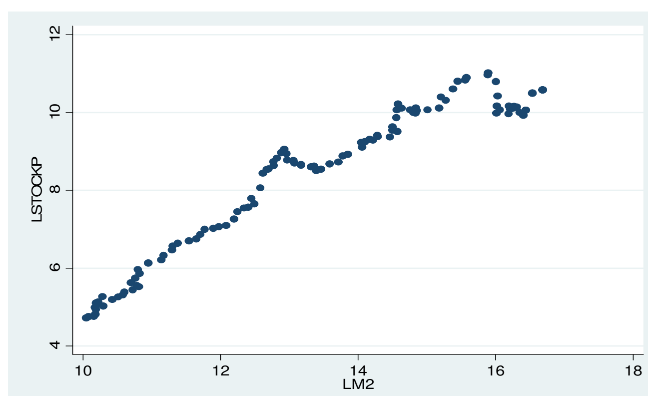
Fig 4: Scatter Plots of Percentage of Market Capitalization/RGDP versus Policy and Non-Policy Variables

A perceptive analysis of panel J of Figure 4 and Panel D of Figure 3 indicates that oil price is more strongly linked to market capitalization than market turnover. Intuitively this may imply that acquisition of existing firm through mergers or establishment of new production facilities (Green field investment) is associated with rising income from oil price hike.

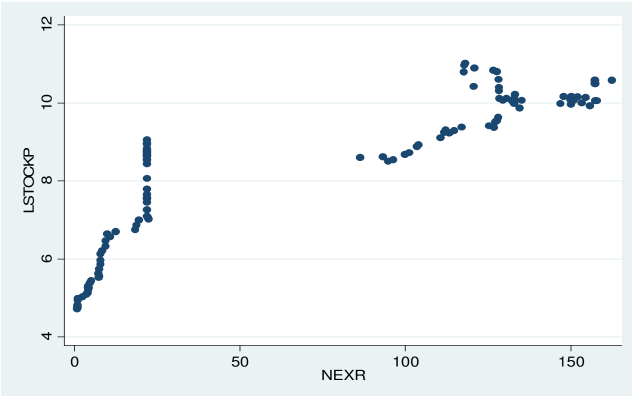
Figure 5 presents the scatter of All-Share Index (proxying stock prices, STOCKP) against policy and non-policy variables. Against a similar pattern emerges.



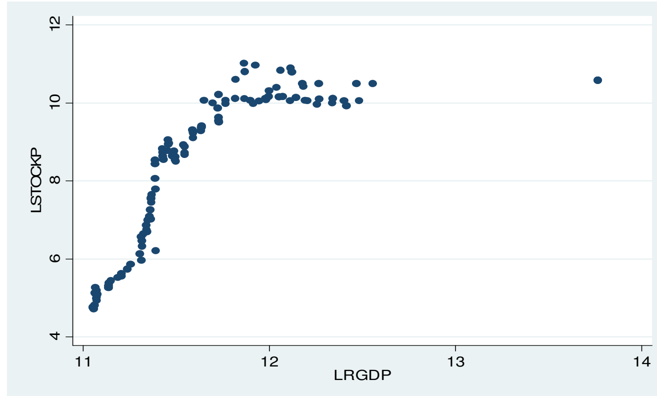
Stock price versus monetary policy rate (MPR)



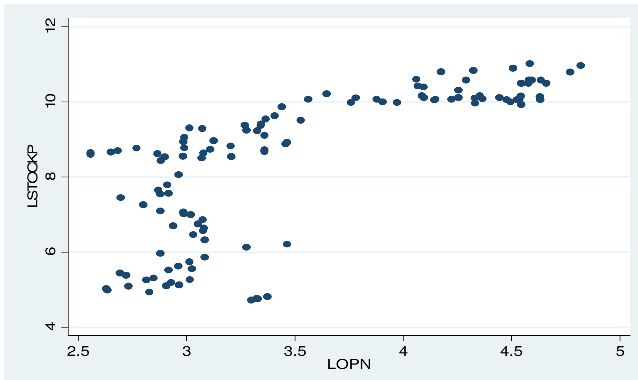
Stock price versus M2



Stock price versus NEXR



Stock price versus real GDP



Stock price versus Oil Price (OPN)

Source: Author

Fig 5: Scatter Plots of All-Shares Index (STOCKP) versus Policy and Non-Policy Variables

As is obvious from the Figure 5, there is a near linear relationship between stock prices and real GDP and an obvious positive relationship between stock prices and one of the policy variables, M2. On the contrary, there is no appreciable pattern between stock price and the balance of the policy variables (MPR and NEXR).

Overall, Figures 3, 4, and 5 suggest that market performance indicate exhibit similar pattern on their scatter plots with policy and non-policy variable. Broad money supply and real GDP show positive and more direct link with stock market performance than other macroeconomic magnitudes. In next section, we present the theoretical foundations underpinning our study.

3. Theoretical framework and literature review

The theoretical underpinning of this study is motivated by Cuthbertson and Nitzsche (2004) [13], Ioannidis and Kontonikas (2008) [24] and Galebotwe and TIhalefang (2012) [19]. In their contributions, the present value or discounted flow model offers some theoretical explanation of the link between monetary policy actions and changes in stock prices. It states that stock price equals the present value of future net cash flows. This means that expansionary monetary policy (decrease in interest rate and/or increase in money supply) is expected to increase future net cash flows or decrease the discount factors at which those cash flows are capitalized or valuated. This model is derived by assuming that investors are risk neutral and have two alternative investment outlets (stock or bond) over a one period horizon.

As Cuthbertson and Nitzsche (2004) [13] note, stock has expected gross return of $[E_t (S_{t+1} + D_{t+1})/S_t]$ whereas risk-free bond has constant nominal gross return of 1+R. Here, S_t is the stock price at time t, D_t is the dividend at time t, and E_t is the conditional expectation operator based on information available to market participants at time t and R is the rate of return used by market participants to discount future dividends. As noted by Ioannidis and Kontonikas (2008) [24], this model assumes that: (i) the discount factor used by market participants is generally linked to market rate of interest; and (ii) the central bank is able to influence market rate of interest. Given this assumptions, arbitrage[5] opportunities imply that for investors to be indifferent between the two alternatives, they must yield the same expected return, i.e.,

$$[E_t (S_{t+1} + D_{t+1})/S_t] = 1+R \qquad 1$$

Rearranging equation 1 yields the Euler equation (equation 2) that determines the stock price movement over time:

$$S_t = \delta (E_t S_{t+1} + E_t D_{t+1}) \qquad 2$$

Where $\delta = 1/(1+R)$.

Solving equation 2 by repeated forward substitution yields

$$S_t = \left[E_t \sum_j^k = 1 \left(\frac{1}{1+R}\right)^j D_{t+j} \right] + E_t \left(\frac{1}{1+R}\right)^j S_{t+k} \qquad 3$$

[5]Arbitrage means the simultaneous buying and selling of securities, currency or commodities in different markets or in derivative forms in order to take advantage of deferring prices/interest for the same asset.

Where K is the investor's time horizon (stock holding period). The transversality condition implies that as the horizon K increases, the second term on the right-hand side of equation 3 vanishes to zero, (i.e. Lim $E_t\left(\frac{1}{1+R}\right)^j S_{t+k} = 0$; as K → ∞). This condition is called the no rational stock price bubbles assumption.

Therefore, in the limit, equation 3 reduces to the more familiar rational stock valuation formula for stock prices

$$s_t = \left[E_t \sum_{j=1}^{k} \left(\frac{1}{1+R}\right)^j D_{t+j} \right] \quad 4$$

From equation 4, it follows that change in monetary policy can affect stock returns in two ways: (i) there is a direct effect by altering the discount rate, R, used by market participants. Tighter monetary policy leads to increase in the rate at which firms' future cash flows are valuated/capitalized leading to decline in stock prices (ii) there is an indirect effect on firms' stock value by altering expected future cash flows, D_t. Given this theoretical foundation, we now review the theoretical and empirical literature on the subject matter.

Given this theoretical foundation, it may be noted that that try to explain the relationship between stock return(or stock price) and macroeconomic (policy and non-policy) variables have, therefore focused on how this macro variables transcend the real sector to influence stock return. In this regard, some of the them include theories on: (i) stock price- money supply relationship; (iii) stock price inflation relationship; and (iii) stock price and other macroeconomic variables relationship.

One of the earliest link between money supply and stock prices was due to Baks and Kramer (1999) [2] who provide support to the hypothesis that the link between stock price and money growth are positive. In their study of G7 countries using broad monetary aggregate, they conclude that an increasing G7 excess money growth (i.e., a rate of growth of money in excess of real GDP growth) leads to higher real stock returns and lower real interest rate. Another view on the link between stock returns and money is provided by Backshi and Chen (1996) [3] who build a monetary model in which the real stock prices is proportional to real GDP and real rate of return on stock is equal to the growth rate of real GDP**.** This model predicts that the covariance between real stock price and money growth (growth rate of money supply) is positive as long as monetary policy is pro-cyclical (i.e., as long as money growth and output growth are positively related). However, if the central bank pursues a counter-cyclical monetary policy, then money growth will be negatively related to real output which will result in a negative relation between money growth and stock returns.

In term of Stock price inflation relationship, the nexus has been anchored on Fisher's (1930) hypothesis, i.e., his view that in the long run (when adjustments has been completed), nominal interest rate increases one-for-one with inflation. Fisher's specification is stated as follows:

$$i = r + \prod\nolimits^e \quad 5$$

where i represents the nominal interest rate, r the real interest rate and $\prod^e$ the expected inflation rate.

Since in the long run, the real interest rate equals natural interest rate (r_n) and inflation equals the money growth (g_m), equation 6may be restated thus;

$$i = r_n + g_m \quad 6$$

Equation 6states that in the long run the nominal interest rate is equal to the natural real interest rate plus the rate of money growth. Equation 5 and 7could be regarded as the short-run and long-run Fisher's equations respectively. The two equations implies that a permanent money growth (increase in money supply in the long run) will lead to a one-for-one increase in inflation and nominal interest rate, leaving the real interest rate unchanged. This result – that, in the long run (when adjustment has been completed), the nominal interest rate increases one for one with inflation – is called the Fisher's effect or Fishers hypothesis, after Irving Fisher (Blanchard, 1989:322).

Thus, expected nominal rates should move one-for-one with expected inflation. By implication, if stock returns are claims on real assets, then investing in equity should provide a hedge against both expected and unexpected inflation. Thus, only nominal interest move one-for-one with inflation leaving real interest unchanged. Since real interest are unaffected by changes in inflation, real return on stock are also unaffected by inflation. Consequently, nominal returns on stocks should vary positively with inflation while real stock returns should be independent of inflation.

However, against the view that real stock returns should provide a hedge (insurance) against both expected and unexpected inflation, early studies provide large amount of evidence which suggest that the relation between real stock returns and inflation was in fact negative and not independent. For instance, Lintner (1975) [28], Bodie (1976) [7], Nelson (1976), Fama and Schwert (1977) and Fama (1981) [18] find negative relation between real stock returns and both expected and unexpected inflation. As Sousa (2004) [37] notes, these findings were considered a puzzle[6] given the previously held view that stocks should provide a good insurance against inflation. Expectedly, the empirical findings of a negative relationship between inflation and real stock returns have given rise to several explanations to rationalize the evidence.

One such explanation is that stock prices may be distorted by money illusion occasioned by inflationary pressure when the pricing of the stock is done with nominal interest rate rather than real interest rate (see Modigliani and Cohn, 1979) [29-30]. According to this argument, the use of nominal interest rate rather than real interest rate to discount future real earnings from stock may result in negative relationship between stock prices and inflation rate.

Focusing on the relationship between stock returns and other macroeconomic variables, Chen, Roll and Ross (1986) [8] studied broad stock market variables and their relationship to macroeconomic variables in the United States. They started their specification with the simple relation between stock returns and expected discounted dividend:

$$P = \frac{E(D)}{K} \quad 7$$

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[6]This finding may be a consequence of the liquidity puzzle; the finding than an increase in monetary aggregate – working through the money market equilibrium – is accompanied by an increase (rather than a decrease) in nominal interest rate. Price puzzle – the finding that a contractionary monetary policy (decrease in money supply) through positive innovations, i.e., unanticipated changes, in the interest rate seems to lead to an increase in prices (rather than a decrease in prices the Hicksian AS-AD framework undertook to give it). And yet, the exchange rate disconnect puzzle is the finding that an increase in interest rate is associated with depreciation (rather than appreciation) of local currency.

Where P represent the stock returns (proxyingstock prices), E(D) the expected dividend, and k the real discount rate. Equation 7indicates that the rate of return of stocks return depends positively on changes in expected dividends and negatively on changes in discount rate. Based on their formulation, the authors focused on how macroeconomic variables affect discount rate and dividends. They made use of expected level of industrial production, expected level of inflation and unexpected level of inflation as variables affecting the behaviour of dividends. As regards the effect of discount rate, they used real wealth, interest rates of different maturities, term structure spread and consumption changes. The major contribution of Chen, Roll and Rose (1986) [8] model to existing literature that link stock return to monetary policy is that it provide a broad framework for the analysis of several other linkages between stock/financial market variables and other macroeconomic variables. Our study, thus, focuses on the broadest measure of macroeconomic environment such as inflation, money supply and output given that these set of variable has important implication for stock prices.

We are not the first to analyze empirically the effect of monetary policy changes on stock prices. Lee 1992 provides one of the pioneering works on the causal relationship between stock returns and short term interest rates (one-month Treasury Bill rate minus a measure of expected inflation), real economic activities (measured by industrial production growth) and inflation. Using a VAR model for the US, his findings indicate that shock to (innovations in) real stock return account for over 93% of 24 months forecast error variance in stock returns. Shocks to inflation explain 3% of variation in stock prices while innovations in industrial production and real short term interest rate accounted each for 2%.

Patelis (1997) [34] uses a VAR model with the following variables and ordering: changes in Fed funds rate, the portion of unborrowed reserve orthogonal to total reserve growth (an indicator of monetary policy that was proposed by Strongin, 1995), the real interest rate, the term spread, the dividend yield, and excess stock returns. In order to identify monetary policy shocks, Patelis (1997) [34] uses an identification procedure that is based on Cholesky decomposition which implies a recursive structure where monetary policy variables (e.g. M2, short term interest rate) precede financial variables (e.g. stock prices, dividend yield, and earning per share). This order of precedence is based on the usual assumption that shock to monetary policy will first be reflected in the financial market and not vice versa. Akin to the findings of Lee (1992), Patelis (1997) [34] found that 86% of variance in stock prices is due to financial variables while only a small part (3%) is due to monetary policy variables. Particularly, the dividend yield accounted for most of the explanatory power of the financial variables. Patelis concludes that dividend yield is a good predictor of stock returns because: (i) it is very persistent (ii) unexpected asset returns are dominated by changes in expectations regarding excess returns which dividend yield predicts well.

Thorbeke (1997) uses a VAR model that contain the following variables, ordered from the most exogenous to the most endogenous: growth rate of industrial production, inflation, the commodity price index, the federal funds rate, the log of non-borrowed reserves, the log of total reserves and stock returns. The use of the commodity price index follows from Christiano, Eichenbaum and Evans (1994) [9] who found that this variable is useful to remove price puzzle (i.e. the observation that a contractionary monetary policy shock leads to an increase in inflation rather than a decrease). Thorbeke (1997) found that an expansionary monetary policy shock increases stock returns both ex-ante and ex-post. He argues that this could be either because it increases cash flows or decreases the discount rate at which they are valued.

Sousa (2004) [37] uses the VAR model to study the effect response of real stock prices to shock in real output, the price level (P), the monetary aggregate (M), the call money rate or the central bank official rate (IR) and the world price level (expressed in domestic currency) for G7 countries (United Kingdom, United States, Germany, Canada, Japan, Italy and France). All variables were expressed in log form. He uses a non-recursive identification scheme to identify monetary policy shock. The findings indicates that: (i) different countries require different identification assumption to arrive at monetary policy shock that can be interpretated as representing monetary policy shocks (ii) from the forecast error variance, interest rate plays a relatively small role in explaining fluctuations in real stock prices in G7 countries.

An evaluation of the literature so far reviewed (on stock price-inflation nexus) indicates that the link seems to depend on the way monetary policy is implemented (whether the central bank pursue a pro-cyclical or countercyclical monetary policy) and on the shock hitting the economy. Against this background, the model followed here includes a broad set of variable that is sufficient to identify monetary policy shock and therefore explain the relation stock market variables and monetary policy actions.

3.1 analytical scheme: The baseline structural VAR model

The analytical framework deploy for this study is the structural vector autoregressive model. Though focusing on different variables, the specification of our reduced form VAR follows closely that of Blanchard and Quah (1989). On the other hand, our identification strategy follows an approach initially developed by Sims (1980) [35], elaborated in the ensuing literature by Christiano et al. (1999) [10] and Starr (2005) [38], and refined by Christiano et al. (2005). SVAR approach allows a researcher to separate the endogenous reaction of the monetary authorities to developments in the economy from exogenous monetary policy shocks.

In the monetary VAR literature, there are three major *methods* for identification. Each of the method is concerned with the effects of shocks (e.g. monetary, demand and/or supply shocks) on the endogenous variables. Their differences lie on the nature of the assumption made on how the shock affects the endogenous variables. The *methods* include: (i) Recursive VARs, which assume that contemporaneous interactions between the exogenous shocks and endogenous variables are characterized by a recursive ordering, i.e., Wold Causal Chain; (ii) Structural VARs with long run restrictions, which imposes the restriction that changes in money supply have no long-run effect on the real variables (Blanchard and Quah, 1989); and (iii) Structural VARs with short run restrictions, which imposes the restrictions on the contemporaneous effects of the shocks based on either *economic theory* (see for e.g., Bernanke, 1986) or *information* assumed to be available to particular economic agents (see for e. g. Sims, 1986) [36].

This study uses the recursive VAR approach which short-run restriction, which was originally proposed by Sims (1980) [35] and refined by Christiano et al. (2005), for the identification of monetary policy shock in Nigeria. The recursive VAR approach for identifying monetary policy also uses the so-called Choleski factorization of the variance-covariance matrix of innovations in SVAR, $\Sigma\varepsilon$. Our choice of recursive VAR is based on the usual assumption that the Central Bank cannot respond instantaneously to developments in the real economy[7] which imposes a recursive restriction on the reduced-form disturbances. Specifically, our assumption implies that monetary policy innovations are determined based on knowledge of current and past values on non-policy variable (including stock market variables), whereas, the non-policy variables respond to changes in the policy variable with a lag and not vice versa.one may note that stock price itself is a non- policy variable. This the use of recursive SVAR approach has the at least two major advantages. First, it helps to characterize the relationship between policy and non-policy variables. Second, it allows us to compare our findings with results from sister countries. It also helps to identify and interpret the relationship between the residuals of the SVAR model and the underlying innovations in monetary policy variables. Correct identification of the innovation is highly desirable because it is only then that we can generate impulse response functions that properly describe the time-dynamic effects of monetary innovations on stock price and other non-policy variables. As mentioned in the passing, this process of correctly identifying innovations is usually referred to as Choleski factorization. But how is it implemented? The Choleski factorization imposes 'n' normalization restrictions (diagonal elements of B_0 are restricted to 1) and restricts additional n(n-1)/2 elements of B_0 to zero. Thus, it imposes a total of n (n+1)/2 $[\equiv \frac{n(n-1)}{2} + n]$ restrictions on the system which just identifies the structural VAR. The Choleski factorization implies that the first variable in the VAR system is assumed to be contemporaneously exogenous to all the remaining variables (crude oil price constitute one such variable and there is employed in our study), and the second variable is contemporaneously exogenous to all except the first variable, and so on (Sims, 1980; Galebotswe and Tihalefang 2012) [19, 35]. This means that only one residual is included in the first equation (and n-1 zero restrictions), two residuals in the second equation (and n-2 zero restrictions), and three residuals in the third equation (and n-3 zero restrictions), and so on. This is reflected in the composition of the *generalized* reduced-form error term.

$$u_t = B_0^{-1}\varepsilon_t = \begin{pmatrix} 1 & 0 & 0 & \cdots & 0 \\ b_{21} & 1 & 0 & \cdots & 0 \\ b_{31} & b_{32} & 1 & \cdots & \vdots \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ b_{n1} & b_{n2} & b_{n3} & \cdots & 1 \end{pmatrix}^{-1} \begin{pmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \\ \varepsilon_{3,t} \\ \vdots \\ \varepsilon_{n,t} \end{pmatrix} \quad 8$$

In Choleski decomposition, all that the modeler needs is to decide on the ordering of the variables. Thus, it has the advantage of reducing the investigators' discretion and the scope of data-mining. We order the policy variable in the SVAR after the non-policy variables with crude oil price coming first, based on the assumption that it is determine outside the Nigeria economy (strictly exogenous). Output, represented by real GDP was ordered second based on the assumption that it adjusts most sluggishly relative to other macroeconomic variables employed in the study. This ordering technique is an aberration from the usual ordering used for developed economies where prices are assumed to be most sluggish, and hence, entering first (see e.g. Starr, 2005) [38]. Nonetheless, reversing this order is likely to us more appropriate for Nigeria where prices are relatively flexible and the rigidity of production techniques makes output most inelastic. We follow Thorbeke (1997), Patelis (1997) [34], Sousa (2004) [37], Gali and Gambetti (2013) to order both policy and non-policy variables as follows:

[LOPN LRGDP INF LM2 NEXRMPR *LSTOCKP*]
[LOPN LRGDP INF LM2 NEXR MPR*VTMC*]
[LOPN LRGDP INF LM2 NEXR MPR *MCRGDP*]

to reflect their respective likely degrees of endogeneity. This ordering implies that variables[8] to the left are assumed to be more exogenous and adjust slowly that those to their right. In fact, oil price is assumed to be strictly exogenous, as has been noted. We order financial market variables (STOCKP, Market Turnover, and MCRGDP) last because they react to other macro variables (including monetary policy variables, i.e. M2 and MPR) but, by assumption, do not influence these macro variables. See Table 1 for definitions of variables. This ordering is also consistent with the efficient market hypothesis (EMH) suggested by Chen, Roll and Ross (1986) [8] which shows that the stock market reacts sensitively to shocks in macro variables. Oil price is placed first because Nigeria, as a small open economy, is not expected to influence world oil price. We estimate the SVAR taking the true lag length to be two.

The implementation of VAR involves five major i. First, the functional form of the monetary policy reaction function (feedback rule), the variables in the rule, and the policy instruments are specified. The reaction function links monetary policy action, i_t, to a set of information variables ($\prod t$) that characterize the state of the economy.

$$i_t = f(\prod t) + ðiε_t^i \quad 9$$

where $f(\prod t)$is a linear function describing the central bank's reaction function; $ε_t^i$ is the exogenous component of the monetary policy rule followed by the central bank; and $ð_i$ is the standard deviation of the monetary policy shock. Second, this central bank's reaction function is estimated in a reduced-form VAR model that includes other macroeconomic variables like stock market indicators, inflation and output gaps, monetary aggregates, oil prices, and commodity prices. Third, in the reaction function, identification restrictions are placed on the parameters of the estimated VAR to identify the monetary policy shocks. Fourth, the impulse response functions are then constructed to trace out the dynamic responses of the system's variables (policy and non-policy variables) to the monetary policy shock. The IRF should be such that they 'resemble' a monetary policy shock, i.e., the macroeconomic variables should react in line with what is predicted in the economic literature. In this regard, Christano et al. (1999) argues that the following impulse responses constitute the consensus viewpoint in the literature as to the

[7] This is due to the time lag required for the collection of required data used for policy formulation, a feature that is rife in a developing country like Nigeria.

[8] The variables are as defined in Table 1

expected response of interest rate, prices and output to a contractionary monetary policy (decrease in monetary aggregate):

(i) interest rate should rise initially;
(ii) price level should decline; and
(iii) output level do not increase.

In this study, the first criterion is verified by definition since we have assumed that the major monetary policy instrument used by monetary authority in Nigeria is monetary policy rate or sometimes short term interest rate, Treasury Bill Rate

4. Methodology

As has been noted, we rely on the structural vector autoregressive model to analyze of the objective of this paper, i.e, to determine the dynamic responses of stock market performance to monetary policy shock in Nigeria. In this regards, our econometric methodology begins with the specification of the empirical/estimable SVAR model. This followed by preliminary model diagnostic checks and then the presentation and discussion of results.

Let us consider a structural moving average (MA) of a vector of variables X_t and an equal number of structural shocks, ε_t, so that:

$$X_t = A_0\varepsilon_t + A_1\varepsilon_{t-1} + A_2\varepsilon_{t-2} + \cdots = \sum_{i=0}^{\infty} A_i\varepsilon_{t-i} \ldots\ldots\ldots..10$$

Recall that a moving average stochastic process (MA) is simply a linear combination of white noise innovations (shocks) (Gujarati, 2004:839).

In matrix form, equation 1 can be written as

$$X_t = A(L)\varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

Where:

$X_{t1} = [\Delta LOPN_t, \Delta LRGDP_t, \Delta INF_t, \Delta LM2_t, \Delta NEXR_t, \Delta MPR_t, \Delta LVTMC_t]'$

$X_{t2} = [\Delta LOPN_t, \Delta LRGDP_t, \Delta INF_t, \Delta LM2_t, \Delta NEXR_t, \Delta MPR_t, LMCRGDP_t]'$

$X_{t3} = [\Delta LOPN_t, \Delta LRGDP_t, \Delta INF_t, \Delta LM2_t, \Delta NEXR_t, \Delta MPR_t, \Delta LSTOCKP_t]'$

comprising log of world crude oil price denoted by $LOPN_t$, log of domestic real GDP denoted by $LRGDP_t$, inflation rate denoted by INF_t, log of broad money supply denoted by$LM2_t$, nominal naira-dollar exchange rate denoted by$NEXR_t$, monetary policy rate denoted byMPR_t, log of value of stock market turnover denoted by LVTMC, log of value of market capitalization as a percentage of real GDP denoted by LMCRGDP, and log of All-Shares Index (proxying stock prices) denoted by$LSTOCKP_t$. It might interest one to note that X_{t1}, X_{t2}, and X_{t3} are not functional equations. Instead, they are a set of identities indicating the ordering of the variables in in equation 11when market turnover, capitalization-real GDP and stock prices are treated as most endogenous variables respectively in separate systems of equations of the SVAR model (equation 11).

Where:
Equation 11 = estimable *SVAR model*

If we define equation 11solely in terms of X_{t3} wherein stock price is treated as most endogenous variable while oil price is treated as most exogenous variable, the A = an 7 * 7 matrix that defines the *impulse response* coefficients of endogenous variables to structural shocks, $\varepsilon_t = [\varepsilon_t^O, \varepsilon_t^R, \varepsilon_t^{INF}, \varepsilon_t^{m2}, \varepsilon_t^E, \varepsilon_t^{MPR}, \varepsilon_t^P]'$ consisting of world crude oil price shocks (ε_t^O), real output shock (ε_t^R), inflationary shock (ε_t^{INF}), monetary shock (ε_t^{m2}), exchange rate shock (ε_t^E), monetary policy rate shock (ε_t^{MPR}),and stock price shock (ε_t^P), respectively. The Impulse Response Function (IRF) traces the dynamic effects of a one-time (or a one-standard deviation or a one cholesky's factor) shock to one innovation (or shock to one endogenous variable) on the current and future values of the other variables in the SVAR (Eviews 5.0 User Guide, p.715);

L = n *n matrix of contemporaneous interactions between the endogenous variables.

A parallel analogy applies to X_{t1}andX_{t2}.

We assume that the structural shocks (ε_t) are serially uncorrelated and orthonormal. The assumption that ε_t is orthonormal implies that the covariance matrix is normalized to the identity matrix such that:

$$E[\varepsilon_t . \varepsilon_t'] = 1.$$

By computing impulse responses of stock market performance indicators to shock from the policy variables, we can evaluate the dynamic effect of monetary policy variables (monetary policy rate and money supply) on the performance of the Nigerian stock exchange. This is important for appropriate choice of policy tools, design of policy measures, and overall implementation of pre-emptive strategies.

Preliminary Diagnostics

In the sequel of the data diagnostic checks reported in section 2 (trend analysis and scatter plots), this sub-section discusses some preliminary model diagnostic checks that reliy on the ADF and Phillips Perrons Unit root tests and the Johansen and Juelius (1990) co-integration test. Our choice of a battery of unit root tests is informed by the low power of test often associated with individual traditional test of integration. The co-integration test is employed here to guide our choice between unrestricted or restricted VAR models and to establish the appropriateness of either of them. One may note that whereas unrestricted VAR models are more appropriate for models without long-run relationship, restricted VAR such as Vector error correction and structural VAR are appropriate for co-integrating models.

5. Results

We first present the result from the model preliminary diagnostic checks, namely: the unit root result and co-integration result. Thereafter, we analyze the impulse response functions (IRFs) of each of the three popular measures of stock market performance (market turnover, All-Shares Index, and percentage capitalization-GDP ratio) to innovations in policy and non-policy variables. Table 2presents the result of the Augmented Dickey Fuller and Philip Peron's tests. We test the null hypothesis of a Unit root against the alternative hypothesis of a stationary process. The decision rule is as follows: taken in absolute terms, if the computed test statistic is greater that the critical (table) value, we reject the H_0 of a unit root, and, therefore, accept the H_1 of no unit root.

Table 2: Result of Unit Root Test

VAR	ADF Statistics			PP statistics			Final conclusion
	Lev	1st Diff	Conclu	Lev	1st Diff	Conclu	
OPO	-2.8	-5.11*	I(1)	-2.61	-5.16*	I(1)	I(1)
OPN	-2.69	-4.83*	I(1)	-2.63	-5.35*	I(1)	I(1)
RGDP	-0.01	-7.48*	I(1)	-0.12	-7.33*	I(1)	I(1)
INF	-2.44	-5.51*	I(1)	-2.69	-10.77*	I(1)	I(1)
M2	-4.23*	-2.82	I(0)	-4.86*	-2.81	I(0)	I(0)
NEXR	-2.09	-1.44	inc	-1.81	-1.58	inc	inc
MPR	-0.16	-5.47*	I(1)	-0.02	-5.47*	I(1)	I(1)
TB	-0.67	-5.46*	I(1)	-0.62	-5.47	I(1)	I(1)
VT	-1.88	-5.10*	I(1)	-1.99	-5.11*	I(1)	I(1)
STOCKP	1.72	-1.12	inc	4.96*	-1.56	I(0)	I(0)
VTMC	-2.45	-10.77	I(I)	-2.33	-12.4	I(1)	I(1)
MCRGDP	-0.6	-10.87	I(1)	-0.61	-10.87	I(1)	I(1)

Source: Author's computation.

Note: 'Drift' or 'intercept' is assumed across the battery of Unit Root Tests; the respective critical values (CV) are ADF (2.93), and PP (2.93). * indicates significance at 5% LOS. The variables were examined in their level form, taking cognizance of the fact that taking log of variable is one way of inducing stationarity in data. The critical values changes when we assume 'Drift' 'Drift and Trend' or 'none'. Inc stands for inconclusive. The variables are arranged from top (more exogenous) to bottom (more endogenous) in similar way we order them in the SVAR model. Direct integration test results, which Table 5 summarizes, are included in the appendix.

As the integration result clearly shows, except for quarterly series of three variables; broad money supply (M2), nominal naira-dollar exchange rate (NEXR) and stock prices (STOCKP), the ADF and PP tests indicate that all other variables are stationary at first differencing. The result for inflation rate (INF) is insightful as it clearly shows that quarterly series of inflation is I*(1).* When we tested the annual INF series, we also found it to be I (*1*) in line with past studies (chuku 2009; Ekong and Onye 2012; Ekong and Onye 2015) [12, 15, 16]. Since we stopped at first differencing of the data in order to avert the problem of data mining, the integration test of NEXR shows inconclusive result. Nonetheless, as has been noted, the study employs logging of variables in addition differencing in order to standardize the data, induce stationarity and, therefore, obtain robust regression results. In what follows, we report the result of test of long run relationship between the regression variables, the so-called co-integration test.

As Table 3presents the unit root result. As is clear from the maximum Eigen value and Trace statistics, the result indicates at least two co-integration vectors.

Table 3: Johansen and Juselius (1990) co-integration Result

Date: 11/11/15 Time: 22:08
Sample (adjusted): 1986Q2 2014Q4
Included observations: 115 after adjustments
Trend assumption: Linear deterministic trend
Series: LOPN LRGDP INF LM2 NEXR MPR LVTMC LMCRGDP LSTOCKP
Lags interval (in first differences): 1 to 4

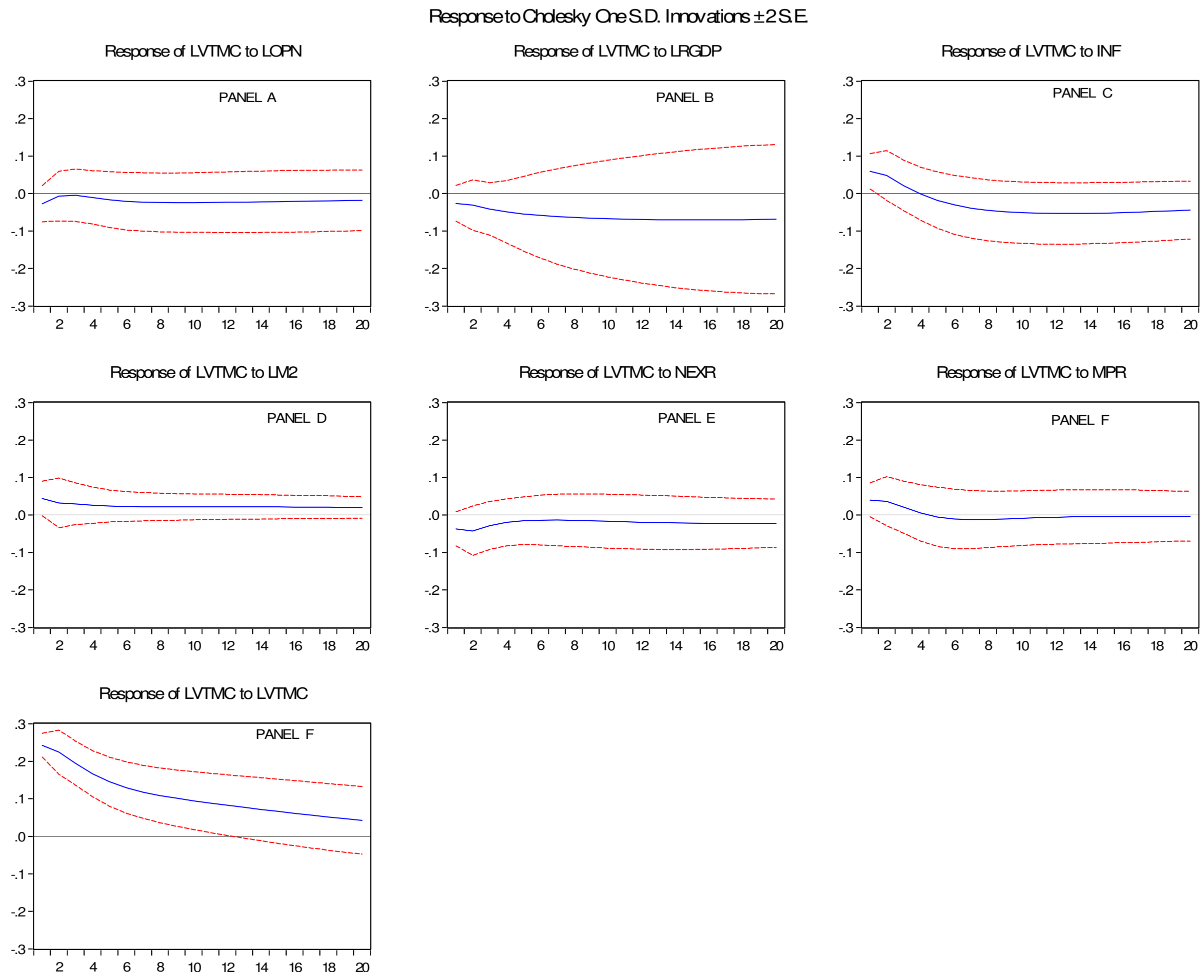
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.473827	237.2626	197.3709	0.0001
At most 1 *	0.288677	163.4182	159.5297	0.0301
At most 2	0.268382	124.2458	125.6154	0.0604
At most 3	0.240976	88.30866	95.75366	0.1457
At most 4	0.186871	56.60067	69.81889	0.3542
At most 5	0.140488	32.81114	47.85613	0.5673
At most 6	0.076706	15.40123	29.79707	0.7535
At most 7	0.047281	6.223330	15.49471	0.6691
At most 8	0.005664	0.653246	3.841466	0.4190

Trace test indicates 2 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

This result indicates the possibility of long-run relationship. We confirmatory test may be given by the error correction model (ECM). Nonetheless since we are interested in estimating the dynamic responses of stock market performance to shock in monetary policy, we analyze the impulse response functions (IRFs) of the estimated SVAR model. The co-integration test serves here to establish the appropriateness of choice of a restricted VAR model, namely, the SVAR model rather than an unrestricted VAR. The latter is appropriate for models that are not co-integrated.

Figure6 shows the impulse responses of stock market turnover to shocks in policy and non-policy variables.

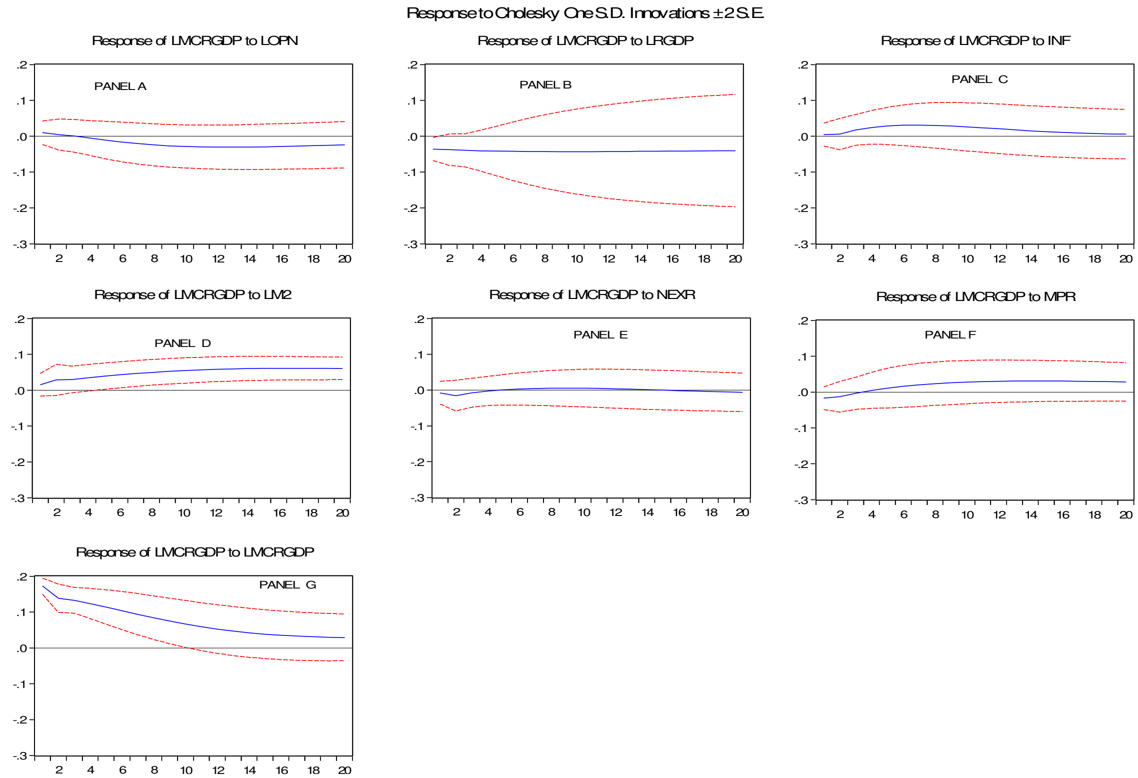


Source: Author

Fig 6: Impulse Responses of Market Turnover (VTMC) to All Variables in Model 1

As can be seen from Figure 6, market turnover responded negatively to shock to inflation as expected. Contrary to expectation however, it was virtually neutral to innovations in broad money supply, nominal naira-dollar exchange rate and monetary policy rate in the last 8 quarters of the 20-quarter time horizon under analysis. In the first four quarter, interest rate market turnover responded negatively to positive shock in policy rate indicated that contractionary monetary policy (interest rate hike) may have an initial (short run) depressive effect on stock market turnover.

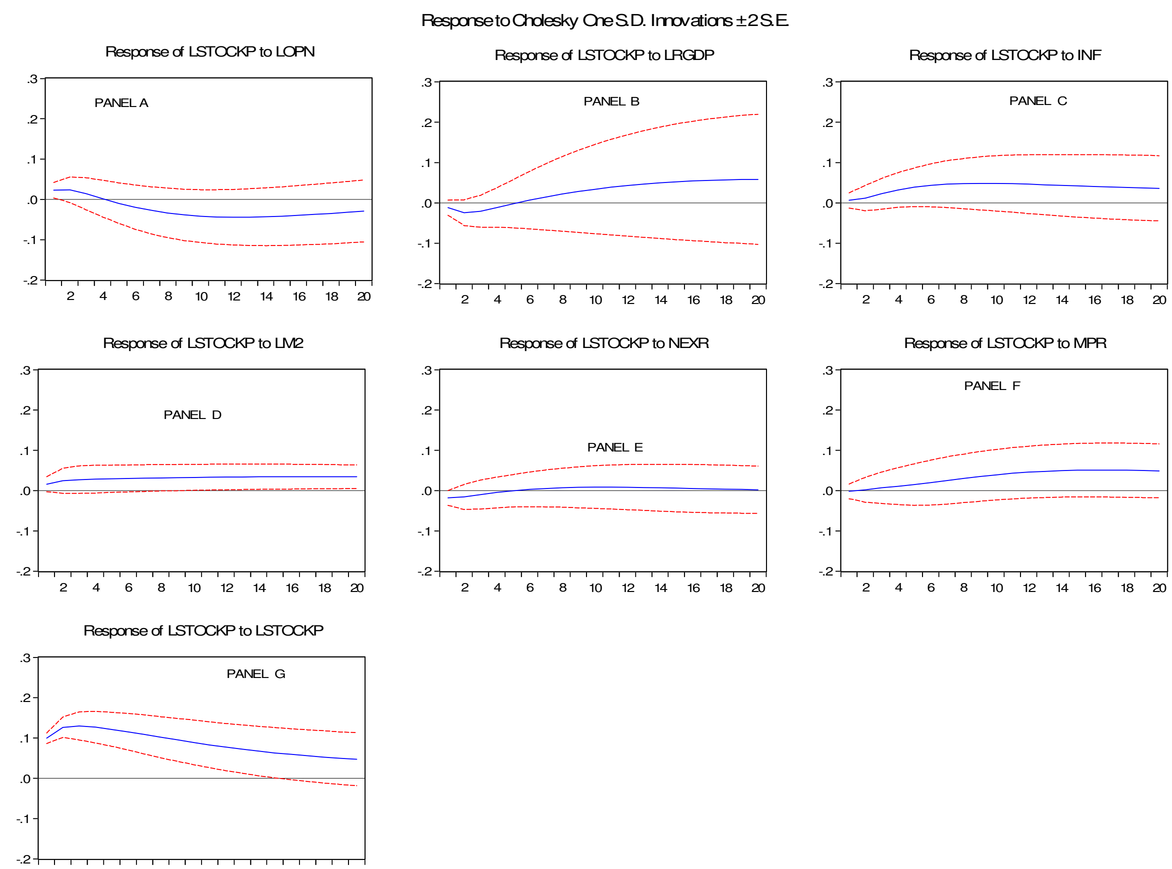
Turning to the impulse response function of percentage capitalization-GDP ratio, Figure 7indicates that broad money supply has a persistent positive effect on market capitalization as a percentage of real GDP (MCRGDP). Contrary to expectation, inflation has an initial positive impact on MCRGDP over the first eight quarter which, however, fizzles out in the last 12 quarters. The response of MCRGDP to positive shocks to interest rate contrary to the 'conventional viewpoint', i.e., the view that hike in interest rate will help to dampen any episode of asset price inflation, the so-called 'leaning against the wind' monetary policy strategy. Nonetheless the positive response of MCRGDP to innovations in interest rate can be explained by the theory of rational asset price bubbles.



Source: Author

Fig 7: Impulse Response of LMCRGDP to Policy and Non-Policy Variables

In Figure 8, we present the impulse responses of All-Share Index (proxying Stock prices) to positive innovations in policy and non-positive variables.



Source: Author

Fig 8: Impulse Responses of All-Share Price Index to Policy and Non-Policy Variables

Panel A of Figure 8shows the response of stock price to an expansionary shock in money supply (measured by broad money supply, M2). Here, stock price rises in the first two quarters, stabilizes within the third to fifth quarters and continues to rise over the rest of the ten quarters. This response is consistent with our a priori expectations as discussed within the context of the traditional IS-LM model and the Mundel-Flemming-Dornbush model. The time dynamics reveals gradual but consistent increase in stock prices in response to positive innovations in money supply. This result is not surprising since positive monetary shock is expected to influence stock price through a transmission channel that transcend the real sector. Thus, positive shock to money supply may at first lead to increase in income, increase in the demand for stocks and progressively to rise in stock prices. This finding is consistent with that of Rapach (2001) for the United States and Sousa (2004) [37] for major G7 Countries, including United Kingdom, Japan and Germany. Normally, economic agents are expected to adjust their spending and investment habits moderately and gradually in response to increased supply of fund rather than abruptly.

In Panel B, we observe that innovations in nominal naira-dollar exchange rate corresponding to increase in exchange rate (depreciation of the domestic naira currency) lead to positive response of stock prices. This is consistent with the theoretical prediction of the effect of unanticipated local currency devaluation (positive shock to exchange rate or increase in exchange rate) on stock price. The devaluation of local currency is expected to lead to increase export, income and progressively to rise in stock price. Here, stock price rises quickly and significantly from a negative value in the first four quarters to an all-time positive value over the rest of the 10 quarters. Thus, difference between the theoretical postulates and empirical findings on the effects of exchange rate on macroeconomic variables – the so-called exchange rate disconnect puzzle (Obstfeld and Rogoff, 2000) [32] – does not apply to Nigeria over a relatively longer time horizon. When compare with our granger causality result which shows that exchange rate policy is not an immediate viable policy tool to stabilize stock prices, we find that exchange rate policy may become viable stabilization tool over a relative longer period. The central bank may have to focus of financial and real sector stabilization policies as a prelude to exchange rate stabilization, and over a longer time horizon, deploy exchange rate management policies to stabilize stock price. The positive effect of exchange from the fourth quarter indicates that depreciation of the naira may over a relatively longer time-horizon make local tradable goods more competitive, increase demand for local goods, increase income, increase demand for stocks, and hence, rise in prices of stocks.

Turning to the effect of shock to interest rate on stock price, Panel C show that a positive innovationin monetary policy rate (unanticipated increase in monetary policy rate) which corresponds to a contractionary monetary policy has initial zero effect on stock price that continues to trails at zero from the first through the sixth quarters, with stock price becoming positive and slightly bullish after the sixth quarter. The time dynamics of response of stock price to interest rate for Nigeria is startling. It is inconsistent with the theoretical a priori expectations as presented in the traditional Keynesian IS-LM model and the Mundel-Fleming-Dornbush model, in which a contractionary monetary policy (defined here as increase in interest rate) is expected to lead to decline in stock price. in other words, it is inconsistent with the conventional view (propagated by Khon, 2008; Santos Martin and Ventra, 2012; scularick and Taylor, 2012) that central bank should 'lean against the wind' (increase interest rate) when stock price is rising in order to dampen the rise and reduce fluctuations since continuous rise in stock prices inevitably lead to crash. Instead the result supports the 'new view' (lead by Gali and Gambetti 2013; Gali 2014) [20-21] that the effect of interest rate increase0020szon stock price depends on whether the bubbles component of stock price outweighs the fundamental component or vice versa. Overall the impulse response function indicates that broad money supply and real GDP has more direct and positive link to the performance of the Nigerian stock market.

6. Recommendation and conclusion

There results from this study provide a reliable guide for good monetary policy implementation in Nigeria and other developing countries that share similar features. Since stock prices are found to respond quickly and positively to shock in real GDP, boasting real economic activities becomes a fundamental way of stabilizing stock market and improving its performance. The government should, therefore, make concrete and committed efforts the fix infrastructure problems in Nigeria. The starting-point is to solve the power problem. Rapid economic progress can be made only when power is near constant in Nigeria. But these require an 'intelligent' government that Nigeria sadly seems to lack. Since money supply proved to have the most influential impact on stock prices, Central Bankers should place more emphasis on the quantity-based nominal anchor for stabilization the stock market. In this regard, the central bank should implement contractionary monetary policy to mob up excess liquidity in the system when stock prices become persistently bullish, since the later indicates sign of stock price bubble. This also implies that effective monetary policy should focus on manipulating instruments like the liquidity ratio, reserve ratio, and transaction on Treasury Bills and Repurchase Agreements (REPOS) which directly affect monetary aggregate, M2

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