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An Evaluation of the Financial Market Transmission Channel in Nigeria

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Abstract: *The increasing integration and interdependence of the money and capital market has been observed in developing economies like Nigeria as it has been in developed economy but the roles, importance, sizes, effects and signs of the linkages is crucial for policy debate. This study identifies and validates the existence of some channels of financial market transmission in the Nigerian context. Secondary data covering the periods of 1980 to 2013 was used to estimate the Vector Auto-regression (VAR) model. The cholesky dof adjusted method was employed to set the ordering of the variables and a standard deviation shock was given to the residuals in the VAR model to establish the transmission channel. The result shows that money market and capital market react to each other. Overall, the results underline the importance of the understanding of the financial market linkages and identify the existence of the credit and the asset price channel in the Nigerian context. Some of the policy recommendations are that policymakers should ensure (i) An improved institutional environment and encourage healthy competition in the banking sector. (ii) Loan contracts should be protected and financial intermediation should be conducted through the financial markets among others.*

Keywords*: Financial Market, Transmission Channel, Vector Auto-Regression, E-views, Nigeria.*
JEL Classification: G10, G17

1. Introduction

Financial markets comprising of the money and capital market, in less developed economy, are becoming increasingly integrated and interdependent as it has been observed in the developed economy. The mode of the interdependence and the channel of transmission of the effects are, however, still not well understood and researches

are ongoing to further provide evidence for the transmission channel. In the literature on financial market interdependence, a strand identifies the exclusive spillovers across different domestic capital markets, whereas another strand concentrates on money market spillovers.

Ehrmann and Fratzscher (2004) opined that the money and capital market are becoming more and more closely linked domestically and internationally. In the same vein, Tahir (2012) observed that monetary transmission mechanism is already a complex issue in closed economy but the openness of economies makes it a more complex phenomenon. The reason is simply because different channels of transmission work simultaneously and with varying lags. Despite these problems there is consensus among economist that monetary policy has at least a short term effect on consumption and investment (Taylor, 1997). It therefore seems important to model the transmission of financial market shocks not merely within money market and capital market variables, but also it is relevant to analyse the resulting domestic cross-financial-market transmission channel.

According to Ehrmann, Fratzscher and Rigobon (2004), the understanding of the role and importance of the transmission channels, their sizes and signs, is crucial for policy reasons, in particular for a better understanding of how monetary policy and other types of financial shocks can be transmitted not only domestically but also internationally. The identification of the channel is crucial because asset price changes may trigger very different, and possibly even opposite responses in other asset prices, depending on the ultimate origin of the shock. Therefore, in other to understand the workings of financial linkages, it is important to identify the source or cause of shocks that drive asset prices. In principle, a change in the price of an asset may be explained by three (3) factors: First, by relevant macroeconomic fundamentals, or common shocks that affect all asset prices; this is also known as the "fundamental based" financial hypothesis. Second, by a shock to another asset price; and third, by relevant information on the asset price itself. The second and the third channels are known as the "contagion" hypothesis also refers to as cross-market hedging (Kashyap & Stein, 1995; Kodres & Pritsker, 1999 and Mishra, Montiel & Spilimbergo, 2013).

In order for Central Banks to be able to implement stabilization policy, the policy instruments at their disposal must be effective in influencing aggregate demand. But for various reasons, the link between monetary policy instruments and aggregate demand – the monetary transmission mechanism – may be significantly weaker in low-income countries (Nigeria inclusive) than it is in advanced and emerging economies **(**Mishra & Montiel, 2012).

The financial structure of low-income countries suggests that the bank lending channel is likely to be the dominant channel of monetary transmission, but its effectiveness depends on the domestic institutional framework, structure of the banking system, and the internal stability of the domestic macroeconomic environment (Alfaro, Franken, Garcia, & Jara, 2003; Bordon

& Weber, 2010; Minella & Souza-Sobrinho, 2009; Mukherjee & Bhattachariya, 2011; Rigobon & Sac, 2003; among others). According to Li, Iscan and Xu (2007), stock markets are notoriously sensitive to changes in monetary policy. But this sensitivity may vary across different economies. Therefore, the exact financial market transmission channel and in particular any estimate of their quantitative impact are still subject to considerable uncertainty, thus placing primary responsibility for domestic macroeconomic stabilization on central banks may be misguided as such assessing the empirical evidence of the channel of transmission in financial market is an important topic for research.

As a result of the forgoing discussions, the objective of this paper is to investigate the nature of financial markets interdependence by finding the transmission channel between capital market and money market variables in Nigeria. The paper presents a framework through which shocks are transmitted in the Nigerian financial market, explains the quantitative findings (predictions) and shows where the existing theories fit within the Nigerian financial market framework for policy consideration and implementation.

Many of the studies seen so far laid emphasis on single financial market transmission channel by studying either the credit channel; the interest rate channel; the exchange rate channel or the asset price channel (Kashyap, 1995; Uchendu, 1996; Kumhof & Evan, 2005; Mishra, Montiel & Spilimbergo, 2010; among others). So the contribution of this study is; firstly, it takes into account two (2) channels simultaneously i.e the interest rate channel and the asset price channel and uses Vector Autoregression (VAR) to rank the financial market transmission. Secondly, this study uses money market variables and capital market variables; the reason is theoretical in nature, as it is to examine both the interest rate channel (money market) and the asset price channel (capital market) transmission in the Nigerian financial market.

The empirical model used annual data over the periods of 1980-2013, consisting of minimum rediscount rate/monetary policy rate, average deposit rate and average lending rate as proxies for money market to capture the interest rate channel while average coupon on Government bond, average coupon on corporate bond and average yield on equity are used as proxies for capital market to capture the asset price channel.

The study employs the Vector Autoregression (VAR) and modeled the impulse response in the channel of transmission, after modifying the methodology developed in Ehrmann and Fratzscher (2004). In essence, the methodology used is based on identifying the impulse response and channel of transmission which enables us to identify separate channels, based on the behaviour of the underlying results, the movements of an individual financial market variable can be ascertained. The importance of such interdependence has been stressed in the literature on financial linkages (Engle 2002).

2 Review of Related Literature

2.1 Conceptual review

Literatures on financial linkages have identified two separate strands; one of these strands focuses on the *domestic* transmission and its determinants, the other focuses on *international* transmission. According to Mishra and Montiel (2012) transmission across financial markets is assumed to operate mostly through four mechanisms: the interest rate channel, the asset channel, the exchange rate channel, and the credit channel. The central bank policies aimed at changing bank reserves in the form of money-market rate affect the interest rate charged on lending by commercial bank, and arbitrage on the maturity horizon transmits the effects to the rate of return on long-term bonds. This represents the interest rate channel. The asset price channel comprises of the arbitrage between long-term bonds, equities and real assets, which affects stock market values and real asset prices, which in turn affect household wealth and consumer spending. The exchange rate channel is the arbitrage between assets denominated in domestic and foreign currencies and the effects on the real exchange rate, which alters the composition of consumption and investment spending between domestic and foreign goods. Lastly, the credit channel is about the frictions in credit market, created as a result of some borrowers having access to external funds only through bank credit, while other borrowers pay a premium over the risk-free rate depending on their net worth. Therefore, the credit channel comprises of the dual effects of changes in the supply of banking system reserves on aggregate demand as a result of changes in the terms on which bank customers have access to loans (the credit channel) as well as through changes in the external finance premium (the exchange rate channel).

Monetary policy is a developmental economic reform instrument applied to inject or mop-up liquidity in an economy with the aim of achieving price stability. Stock market is a market for equities and financial assets like bonds. Corporate organizations and governments at national, state and local levels can raise fund in the stock market to finance their businesses or developmental infrastructural projects. Tahir (2012) wrote that the relationship between stock prices and monetary policy cannot be over emphasized and has received attention in different countries. This is because no economy is stagnant and studies of this nature need to be done from time to time in order to follow up the changing behavior of these variables. This can be said to be important because of the implications of the findings on the effect of monetary policy on investors' portfolio and vice versa. Therefore, policy makers and participants in both money market and capital market should be aware of the relationship between monetary policy and stock market performance in order to have a good understanding of the effects of policy shifts.

2.2 Theoretical Review

According to Pritsker (2000), assets that are traded on the financial market of a country are claims on the cash flows of the real sector. In perfect markets, the price of the assets should depend only on how the cash flows co-vary with consumption, and there should be no

need for financial intermediaries. However, because there are market imperfections, intermediaries play an important role in lending funds (banks), underwriting security issues (investment banks), providing liquidity in markets (securities broker/dealers and market makers), and in spreading risks towards those investors most willing to bear them (Non-Bank Financial Market Participants (NBFMP) such as hedge funds and mutual funds) and assumed that the prices and liquidity of financial markets are potentially affected by the capital position of these intermediaries relative to their risks.

Kodres and Pritsker (1999) identify four separate channels of financial market contagion.

2.2.1 Correlated information channel: This channel identifies that if there are common macroeconomic influences that determine assets values in more than one country because of real linkages, then the real linkage causes financial markets to be linked. More specifically, if there is a publicly observable negative real shock in country *i* and through real linkages, this shock is transmitted to the real sector of country *j*, then the stock markets of countries *i* and *j* will respond to the real shocks. Though, country *i* can experience many types of real shocks; some publicly observable real shocks will affect country *i* and its stock market, but will not be transmitted to the real sector of country *j* or *j*'s stock market. Because of this, shocks in the real sector of country *i* that directly affect the real sector of country *j*, will be fully reflected in the financial markets of both countries, and shocks in *i* that have no implications for the real sector *j* will not be reflected in the prices of financial market *j*.

In an imperfect public information market, these illustrations are different. Suppose that real shocks in *i* are not publicly observable, but are privately observable to some financial market participants in country *i*. Then a negative real shock in country *i* will lower prices in *i*'s financial market, but financial market participants in market *j* will not be able to discern whether the price decline in market *I* reflects information that is relevant for market *j*, but because of the possibility that it is relevant, a price decline in market *i* will cause a price decline in market *j*. The information that market participants are trading on in country *i* might be relevant for country *j*; i.e. the information participants trade on in country *i* is unconditionally correlated with the value of real assets in country *j*. Thus, the contagion from the correlated information channel is consistent with the notion of contagion base on price movements that are excessive relative to full-information fundamentals.

2.2.2 Correlated liquidity channel: This is when a financial market participant experiences an idiosyncratic shock that forces the participant to liquidate his portfolio holding, and does so in a number of markets. In addition to this step, the participant might rebalance their portfolio across markets because they follow portfolio strategies that involve the chasing of price trends, regardless of beliefs about market fundamentals (feedback trading). Considered in a single market, feedback trading would occur if a participant makes buy/sell decisions based on past price movements, for example buying

after prices rise (low price), or selling after prices has fall (high price). In a multiple market setting, participants can possibly engage in cross-market feedback trading in which participants respond to a price change in one market by altering their positions in other markets, causing contagion.

2.2.3 Cross-market hedging channel: This channel occurs as result of investor's response to shocks by readjusting their hedges to macroeconomic risks. Cross-market hedging can transmit shocks between two countries whose macroeconomies share no macroeconomic risk factors in common provided, that both countries share risk factors with a third country.

2.2.4 Wealth shocks channel: If investors experience shock to their wealth, it may be optimal to alter their portfolio holdings. For example, investors with decreasing relative risk aversion may optimally choose to move their portfolios toward less risky assets as their wealth declines. This behavior can cause contagion that is analogous to a correlated liquidity shock. The main difference is that investors responding to the wealth shock choose to liquidate, whereas investors responding to the correlated liquidity shock are forced to liquidate.

2.3 Empirical review

Ioannidis and Kontonikas (2006) opined that monetary authority is faced with the dilemma of whether to react to stock price movements or the standard response to inflation and output developments. This provides an impetus as to the importance of studying monetary policy and stock market transmission channel.

In a study by Rigobon and Sack (2003a), used the VAR method noted that monetary policy responds to information in equity markets, in another work by Bernanke and Kuttner (2004), Ehrmann and Fratzscher (2004) also used VAR methodology asserted that equity prices react strongly to monetary policy shocks in the United States. In a simultaneous analysis by Rigobon and Sack (2003b) employed the Granger causality methodology, used bond prices, short-term interest rates and equity prices noted that causality of the transmission process may run in several directions, giving an instance, the correlation between United States short-term interest rates and equity prices may change from positive to negative depending on the dominant asset price in the particular periods.

Gudmundsson (2007) used Vector Error Correction Model (VECM), the result indicated some evidence of weakening of interest rate channel and overburdening of exchange rate channel exists. In another study by Catao and Pagan (2010) using expectation-augmented Structural Vector Auto-Regression (SVAR) noted that bank credit channel plays an important role in the financial market. Furthermore, the study also added that the impact of monetary policy in Brazil and Chile are quite similar to that of the advanced economies. Mukherjee and Bhattacharya (2011) conducted a study for 9 industrial and 17 emerging and developing countries concluded that adoption of inflation targeting did not significantly alter the traditional Keynesian interest rate channel in inflation targeting emerging market economies.

According to Patelis (1997), stocks are claims on future economic output therefore, if monetary policy has any real economic effects, then stock markets should be influenced by monetary policy position. Osuagwu (2009), employed Vector Error Correction Model (VECM) noted that changes in stock market index are largely influenced by monetary policy variables in the long run and the short run. In another study, Jensen et al. (1996), asserted that monetary environment affects investors' required returns and that predictable variation in stock returns depends on monetary policy as well as business conditions, with expected stock returns higher in tighter monetary policy periods than in ease monetary policy periods.

A study which looks at the dynamic long run relationship between stock returns, inflation and interest rates in Nigeria using Error Correction Model (ECM) technique by Ogbulu (2010) concluded that there is positive long run significant relationship between inflation and interest rate, negative long run significant relationship between inflation and stock returns and a negative long run relationship between interest rates and stock returns in Nigeria. Another study by Okpara (2010) showed that a change in the central bank of Nigeria's rediscount rate (MRR/MPR) can affect other short term interest rates, long term interest rates, foreign exchange, and stock prices, and that monetary policy is a significant determinant of long run stock market returns in Nigeria. Thorbecke (1997) noted that expansionary monetary policy have large statistical significant positive effect on monthly stock returns.

Ajayi (2007), used the impulse response functions from the estimated Vector Auto-regressions (VAR) asserted that monetary policy transmission channel differs in different economies because the channel depends partly on the institutional structures. However, the differences are minimal and involve the importance of different channels and not the existence of the channels themselves. Giovannetti and Velucchi (2013) used a synthetic index, volatility spillover balance that distinguishes between volatility "creators" and "absorbers" of United States, United Kingdom and China financial market on African financial market, the findings revealed that South Africa and United States' financial market shocks statistically and significantly affects African financial markets, and that China has recently become more interconnected to the African financial market. Also, while United States, Kenya and Tunisia are "net creators" of volatility spillovers, South Africa and China are net "absorbers". Ishioro (2013) used Granger causality approach concluded that three channels is functional in Nigeria; the interest rate, exchange rate and the credit channels.

Finally, from the various works reviewed, it can be deduced that studies on financial market transmission have different objectives as specified in their models and this can be seen in the variables for the measurement been different from studies to studies. However, the objective of this paper is to investigate the nature of financial markets linkages by finding the transmission channel between capital market variables and money market variables in Nigeria, this will inform the

policy measures to be adopted by monetary policy managers and capital market authority, and predict the transmission findings for policy consideration and implementation.

3 Methodology

In this section, the paper discusses the empirical strategy employed for assessing the channel of transmission in the Nigerian financial market on a range of financial market variables from the capital and money market. It start with the section that outlining the dataset, in particular the variables that will be used to test the transmission channel in the Nigerian financial market.

3.1 Data

To ascertain the transmission channel, secondary data were sourced and extracted from the Central Bank of Nigeria (CBN) statistical bulletin (2013) and the Nigerian Stock Exchange fact book (2010 & 2013). The time period covered in the dataset range is 1980 to 2013 using a set of six (6) financial market variables from both the money and capital market of the Nigerian financial system. The variables are Minimum Rediscount Rate / Monetary Policy Rate (MRR), Average Lending Rate (ALR) and Average savings Deposit Rate (ADR) all as proxies for money market while Average Coupon of listed Government Bonds (ACGB), Average Coupon of listed Corporate Bond (ACCB) and Average Dividend Yield on Equities (ADYE) all as proxies for capital market.

3.2 Model Specification

Studies in the literature have utilized the Vector Auto-Regressive (VAR) model or its variant as the basis for estimating financial market transmission channel (Ajayi, 2007; Catao & Pagan, 2010; Ioannidis & Kontonikas, 2006; Mishra, Montiel, Pedroni, & Spilimbergo, 2014; Rigobon & Sack, 2003a; Saxegaard, 2006; Uanguta & Ikhide, 2002; among others). Therefore, to evaluate the transmission channel in the Nigerian financial market, the following Vector Auto-Regresion (VAR) model is developed to show the relationship and identify the link and direction of financial market variables response in Nigerian context.

$$ACCB = \beta_1 + \beta_2 ACGB_{t-i} + \beta_3 ADR_{t-i} + \beta_4 ADYE_{t-i} + \beta_5 ALR_{t-i} + \beta_6 MRR_{t-i} + \beta_7 ACCB_{t-i} + \mu_1$$
$$ACGB = \beta_8 + \beta_9 ACCB_{t-i} + \beta_{10} ADR_{t-i} + \beta_{11} ADYE_{t-i} + \beta_{12} ALR_{t-i} + \beta_{13} MRR_{t-i} + \beta_{14} ACGB_{t-i} + \mu_2$$
$$ADR = \beta_{15} + \beta_{16} ACCB_{t-i} + \beta_{17} ACGB_{t-i} + \beta_{18} ADYE_{t-i} + \beta_{19} ALR_{t-i} + \beta_{20} MRR_{t-i} + \beta_{21} ADR_{t-i} + \mu_3$$
$$ADYE = \beta_{22} + \beta_{23} ACCB_{t-i} + \beta_{24} ACGB_{t-i} + \beta_{25} ADR_{t-i} + \beta_{26} ALR_{t-i} + \beta_{27} MRR_{t-i} + \beta_{28} ADYE_{t-i} + \mu_4$$
$$ALR = \beta_{29} + \beta_{30} ACCB_{t-i} + \beta_{31} ACGB_{t-i} + \beta_{32} ADR_{t-i} + \beta_{33} ADYE_{t-i} + \beta_{34} MRR_{t-i} + \beta_{35} ALR_{t-i} + \mu_5$$
$$MRR = \beta_{36} + \beta_{37} ACCB_{t-i} + \beta_{38} ACGB_{t-i} + \beta_{39} ADR_{t-i} + \beta_{40} ADYE_{t-i} + \beta_{41} ALR_{t-i} + \beta_{42} MRR_{t-i} + \mu_6$$

Where $ACCB_{t-i}$ is the period(s) lag of Average Coupon on Corporate Bond, $ACGB_{t-i}$ is the period(s) lag of Average Coupon on Government Bond, ADR_{t-i} is the period(s) lag of Average savings Deposit Rate, $ADYE_{t-i}$ is the period(s) lag of Average Dividend Yield on Equities, ALR_{t-i} is the period(s) lag of Average Lending Rate, and MRR_{t-i} is the period(s) lag of Minimum Rediscount Rate/Monetary Policy Rate. The lag length will be determined by adopting lag lengh criterion such as the Akaike Information Criterion (AIC), Final Prediction Error (FPE), Hannan-Quinn Information Criterion (HQ), etc. μ_1, μ_2, μ_3, μ_4, μ_5, and μ_6 are the residuals of the models and they are used to measure

the responses of the variables in the system to establish the channel of transmission.

The Vector Auto-regression (VAR) model is employed to show the response of the variables to a unit standard deviation shock to the error terms. It can be deduced from the Vector Auto-regression (VAR) system above that a unit shock in μ_1 will affect the Average Coupon on Corporate bond (ACCB) and all other ACCB in the system will in turn affects the dependent variables. In the same vein, any innovation in μ_2 will affect Average Coupon on Government Bond (ACGB) and ACGB in other models will in turn affect the dependent variables in the system. Therefore, a shock or change in μ_1, μ_2, μ_3, μ_4, μ_5, and μ_6 will affect the whole Vector Auto-regression (VAR) system meaning that a shock in the residuals of the Nigerian financial market will affect the whole financial system.

There is contentious issue of whether to estimate Vector Auto-regression (VAR) using the data at level or difference. In literature there are three options; (i) To transform the data to stationary by taking the difference, (ii) Follow the Sims et al. (1990) who posit that "The common practice of attempting to transform data to stationary form by difference or co-integration operators whenever it appear likely that data are integrated in many cases is unnecessary" (pp-136) that is, converting the data to stationary is not so important, the data can be used at level, (iii) Use Vector Error Correction Model (VECM) by applying co-integration technique. Sims et al. (1990), Bernanke and Blinder (1992), Sims (1992), Levy and Halikias (1997), Peersman and Smet (2001), Tahir (2012) estimate Vector Auto-regression (VAR) at level. Monticelli and Tristani (1999), use stationary variables in the VAR model. The use of stationary or non-stationary data in a Vector Auto-regression (VAR) model is a debatable point. This study will estimate Vector Auto-regression (VAR) using the data at level. Needless to say that differencing brings the loss in information; secondly, by estimating Vector Auto-regression (VAR) model at level allow for implicit co-integration in the data as explained by Peersman and Smet (2001).

4. Empirical Findings

This section presents the findings from the Vector Auto-regression (VAR) model as indicated in the methodology section to estimate the financial market transmission channel in Nigeria. The result is expected to show the direction and the size of responses to positive shock by the variables in the financial market by applying a unit standard deviation shock to the variables. This method of measuring responses of the variables implies that the effects of shock can be estimated and predicted. This section will consists of the lag selection criteria, the VAR model result, the model appropriateness test and the transmission result.

4.1 Lag selection

Table 1: VAR Lag Order Selection Criteria

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-511.866	NA	13040610	33.4107	33.6883	33.50118
1	-423.567	136.721	468282.9	30.0366	31.9794*	30.66988
2	-386.728	42.7809	588788.6	29.9824	33.5905	31.15859
3	-320.108	51.5768*	196329.5*	28.0070*	33.2803	29.7259*

*indicates lag order selected by the criteria
***SOURCE**: Eviews output run by the author, 2015*

The issue of lag selection is important when using the Vector Auto-Regression (VAR) model because different lag selection criteria provide different lag order. In this study, the VAR lag order selection criteria (Table 1) indicates that the sequential modified Likelihood Ratio (LR) test, the Final Predictor Errors test (FPE), the Akaike Information Criterion (AIC) and the Hannan-Quinn Information Cretion (HQ) suggests 3 lags, while the Schwarz Information Criterion (SIC) suggest 2 lags. Based on the lag order selection criterion, 3 lag is used for this study.

4.2 Model appropriateness tests

There are some features that the VAR model should satisfy before it can be used for prediction, such conditions includes normality of the residuals, absence of autocorrelation, and no serial correlation, among others. These tests were conducted on the residuals to decide if this model is robust. The residual tests adopted for this study are the serial correlation test, normality test and the auto correlation test.

4.2.1 Serial correlation test

Table 2: VAR Residual Serial Correlation LM Tests

Lags	LM-Stat	P Value
1	50.154	0.058
2	83.139	0.000
3	47.904	0.089

Probs from chi-square with 36 df
***SOURCE**: Eviews output run by the author, 2015*

The serial correlation test according to Tintner (1965) in Gujarati and Porter (2009) is the lag correlation between two different series. That is, correlation between $\mu_1, \mu_2, \mu_3, \mu_4, \mu_5$ and μ_6.

The result (Table 2) indicates that the P value at 3 lag is more than 5% meaning that null hypothesis cannot be rejected. Therefore, the result indicates that the residuals are not serially correlated and this is desirable for an appropriate VAR model.

4.2.2 Normality test

Table 3: VAR Residual Normality Tests

Component	Skewness	Kurtosis	Jarque-Bera
1	0.15**	2.18**	0.98**
2	0.64**	3.88**	3.15**
3	-0.14**	4.02**	1.46**
4	-0.33**	2.34**	1.27**
5	-0.24**	2.61**	0.49**
6	1.04*	5.49*	13.60**
Joint	8.80**	12.01**	20.81**

*indicate significant at 5%

**indicate significant at 10%

***SOURCE**: Eviews output run by the author, 2015*

The normality test ascertains if the residuals are normally distributed. In this paper, the Jaque-Bera test statistics is used, which is a joint hypothesis of the skewness and kortosis at 0 and 3 respectively, under the null hypothesis that the residuals are normally distributed.

The skewness of the variables (Table 3) indicates that individually the residuals are normally distributed with their P values of more than 5% except component six (6), but jointly they are multivariate normal with a joint P value of more than 5%. In the same vein, the P values of the kurtosis also shows that all the components are individually normal except component six (6), but jointly they are multivariate normal with a P value is more than 5%. The skewness and kortosis indicates that the null hypothesis cannot be rejected showing that the residuals are normally distributed.

Finally, the Jarque-Bera statistics which combines the skweness and kortosis shows that the P values of the components are individually more than 5% which mean that the null hypothesis cannot be rejected, indicating that the residuals of the component individually are normally distributed. Again the joint P value is also more than 5%, indicating that the residuals are multivariate normal which is desirable for the VAR model.

4.2.3 Autocorrelation test

The auto correlation test shows the lag correlation of a given series with itself, lagged by a number of time units (Tintner (1965) in Gujarati and porter (2009)). That is, one period lag correlation between μ_1, μ_2, μ_3, μ_4, μ_5 and μ_6.

The graphical representation of the autocorrelation test (see Appendix, Figure 1) with 3 lags shows that just a few of the spikes in the graphs are lying outside the margin at the top and bottom of the graphs. This indicates that the residuals of the Vector Auto-regression (VAR) model do not have autocorrelation.

Therefore, from the three (3) tests conducted to ascertain the appropriateness of the Vector Auto-regression (VAR) estimate of the model, all the tests indicates that the model is

appropriate to measure the transmission channel and the response of the financial market variables to one another in the Nigeria financial system.

4.3 Transmission channel

In other to measure the transmission channel of financial market variables used in this paper, the impulse response function is adopted. The cholesky dof adjusted method is used to set the ordering of the variables and a positive shock of one standard deviation is given to the residuals in the Vector Auto-regression (VAR) model to see the reactions of the variables. The model is forecasting for 5 periods response of the variables.

Figure 2 in the Appendix depicts the impulse response of the variables to a standard deviation shock in μ_1, μ_2, μ_3, μ_4, μ_5, and μ_6. When a standard deviation shock is applied to μ_1 as a measure of the response of ACCB indicates an identical response to ACGB and ADR with a positive response, the response to ADYE is negative for the first two periods and positive in the third period then become negative in the fourth and fifth periods. The response to ALR is positive in the first two periods and become zero in the third period and thereafter become negative and the response to MRR is negative throughout the periods.

This shows that an increase in MRR will lead to a decline in ACCB to attract investible funds to corporate bond, while an increase ACGB and ADR will lead to an increase in ACCB which is not appropriate for corporate bond attractiveness to investors. Response of ACCB to an Increase in ADYE will be negative for only a slight positive in the third period, which may be as a result of the same company participating in the bond market and equity market. Increase in ALR will lead to an increase in ACCB for the first two periods and then start to decline afterwards as a result of investors taking the advantage of the increase in coupon of corporate bond and then opting out in subsequent years to reduce their portfolio risk.

The transmission channels of shock from ACCB, ADR, ADYE and ALR to ACGB which is a measure of shock in μ_2 are identically positive except for negative in the fourth period from ACCB, third period from ADR and the first two periods in ADYE but positive through the periods for ALR. The response to MRR is negative for first three periods and positive in the fourth and fifth periods.

This shows that an increase in MRR will lead to a decline in ACGB for first three periods and then increase afterwards in order for government bond to be attractive to investors or the reaction of the bond market participants. Increase in ACCB, ADR, ADYE and ALR will lead to a similar transmission or relatively positive response from ACGB may be as a result of the risk free nature of government bond.

The transmission channel of shock in the residual (μ_3) to ADR is positive from ACCB, negative from ACGB, negative in the first three periods from ADYE then positive in the fourth period and become zero in period five. The transmission is negative from both ALR and MRR.

This shows that increase in MRR and ALR will lead to a decrease in ADR because the ADR do not always respond to movement in MRR and ALR in the Nigeria banks. Increase in ACCB will

lead to increase in ADR as a result of the activities of the banks to mobilize deposit, while an increase in ACGB will lead to a decline in ADR as a result of investor's preference for government bond. An increase in ADYE will lead to a decline in ADR except for the fourth period because equity investment is attractive than deposit from investor's perspective.

When an innovation is introduce to the variables through μ_4, the response of ADYE is positive to ACCB, negative to ACGB, while the response is negative in the first period but become positive and zero afterwards to ADR. The response is negatively constant to ALR and the response is positive for the first two periods to MRR, negative in the third period and positive again in the fourth and fifth periods.

This shows that an increase in MRR and ACCB will lead to an increase in ADYE may be because the corporate firm is also listed in the equity market and the equity market participant is responding to the MRR. An increase in ACGB will lead to a decline in ADYE because of investor's preference for government bond and risk free nature. Increase in ADR will lead to a fluctuating response of negative and near zero in ADYE, this may be as a result of the risky nature of the equity market and the less risky nature of deposits in the bank. Increase in ALR will lead to decrease in ADYE because an increase in ALR will not encourage borrowing for investment in the equity market.

The response of ALR to changes in μ_5 is negative to ACCB in the first year but become positive in the second year and remains positive throughout the years. The response to ACGB is negative, while the response to ADR is positive in the first year and zero response in the second and third year, negative in the fourth year and zero in the fifth year. The response to ADYE is negative in the first year then become positive in the second year and become zero afterwards while the response to MRR is slightly above zero for the first three years and positive in the fourth and fifth years.

This shows that an increase in MRR will lead to an increase in ALR this may be as a result of the relationship between MRR and ALR. Increase in ACCG will initially lead to a decrease in ALR but begin to increase afterwards; this may be as a result of investors' attitude to study the cause of event in the corporate bond before responding. An increase in ADR will lead to no significant response from ALR for most of the period and this shows the insensitivity or the disparity between the ADR and ALR in Nigerian banks. Increase in ADYE will lead to almost no significant change in ALR this may be as a result of the disconnection between the time horizon of bank lending (short term) and equity investment (long term).

The transmission channel from μ_6 to MRR is positive from ACCB, negative from ACGB, positive in the first two periods from ADR and negative in the third period then become positive in the fourth period and negative in the fifth period. The response to ADYE is negative for the first two periods and positive in the third and fourth periods then become negative in the fifth period. The response to ALR is positive and constant from the second period throughout.

This shows that an increase in ACCB will lead to an increase in MRR while

an increase in ACGB will lead to a decline in MRR this may be as a response of the regulatory authority's response to control the flow of investment between corporate bond and government bond. Increase in MRR will lead to an initial increase in ADR and then a fluctuating response follows this may be as result of banks trying to make savings attractive in order to ward-off the effect of an increase in MRR in the economy. Increase in ADYE will lead to a fluctuating response in MRR for two (2) alternate periods starting with a decline. Increase in ALR will lead to a constantly positive response from the MRR this is as result of the direct relationship between ALR and MRR.

The transmission of and response to shock in the variables are of different magnitude in relation to the financial market variables but the transmission are shown to exist over the period which is in support of Bernanke and Kuttner (2004), Ehrmann and Fratzscher (2004), Mishra, et al (2010), Mishra et al (2014), Rigobon and Sack (2003b), Saxegaard (2006). Ranking the responses and the magnitude of transmission, the Average Lending Rate (ALR) has the highest response at 10 basis point, Minimum Rediscount Rate/Monetary policy Rate (MRR) and Average savings Deposit Rate (ADR) is next with 4 basis point, Average Coupon on Corporate Bond (ACCB) and Average Coupon on Government Bond (ACGB) has 3 basis point while Average Dividend Yield on Equity (ADYE) has the least response at 2 basis point.

In conclusion, this paper has shown that there exist channels of transmission between the financial markets variables with different direction in respect to the variables used. It has also establish that the credit and the asset price channel exist in the Nigerian system, therefore for any policy formulation to contrast or expand the financial market, this paper provide a glimpse of what direction and responses of financial market variable movement can be over a period of time.

5 Concluding remarks

The paper seeks to assess the responses of the Nigeria's financial market to innovations using data over a period of 1980 to 2013. The financial market variables used are the Average Coupon on Corporate Bond (ACCB), Average Coupon on Government Bond (ACGB) and Average Dividend Yield on Equities (ADYE) as proxies for capital market while Average savings Deposit Rate (ADR), Average Lending Rate (ALR) and Minimum Rediscount Rate/Monetary Policy Rate (MRR) all as proxies for money market. The study employs the Vector Autoregression (VAR) methodology.

The paper provides a glance of the response or the transmissions of shock in the financial market from one variable to the other in the financial system. For example, the system model of Average Coupon on Corporate bond for instance shows that Average Coupon on Corporate bond will be in the positive region moving up then reducing but still positive as a response to shock affecting Average coupon on Government Bond. The Average Coupon on Corporate bond will exhibit a similar response to shock affecting Average Deposit Rate but at a lower rate compare to Average Coupon on Government Bond. The Average Coupon on Corporate bond will respond

negatively to shock affecting Average Dividend Yield and Monetary Policy Rate but respond positively to shock in Average Lending rate for the first two periods and then become negative. Responses of other variables to shocks can be read from the response function as shown in figure 2.

The study found that the Average Lending Rate shows the highest response to shocks in the system followed by Average Deposit Rate and Minimum Rediscount Rate / Monetary Policy Rate followed by Average Coupons on Government and Corporate Bonds with same response while Average Dividend Yield response is the lowest. The natural interpretation of this finding is that Nigeria has weaker institutional environments, less developed financial structures, reduced role of securities markets, and less competitive banking system where monetary policy shocks do not get transmitted to interest rates as a result of non-stable asset prices, low level of savings and lending to investors, this is consistent with the findings of Mishra, et. al (2012), Mishra, et.al (2014) and Saxegaard (2006), Uanguta and Ikhide (2002) that those links should operate primarily through the bank lending channel.

This study has shown that the credit channel and the asset price channel of financial market transmission exert serious impact in the Nigerian financial market. The result is in contrast with the findings of Abaenewe and Ndugbu (2012) that monetary policy has not made significant influence over the prices of stocks in Nigeria and that there appears to be a disconnection in the Nigerian financial market. However, the result is in line with Omotor (2007) and Ishioro (2012) that financial transmission channel exist in Nigeria and that policy target at the financial market should fundamentally aimed at achieving stable asset prices, enhance savings and lending to investors is essential for the purpose of economic growth.

The results underline the existence of domestic spillovers within asset classes in the financial market. A key finding of the paper is that there are substantial domestic financial market linkages which underline the argument that a better understanding of the linkages requires the modeling of financial market linkages, which so far has been scanty in the literature.

The paper has addressed the issue of how to model financial market linkages and, in particular, how to address the endogeneity of financial market variables in the Nigerian financial market context as well as the identification of the transmission channels of financial market shocks. This analysis is important in order understand the role, sizes and sign of the different financial market transmission channels for policy purposes, in particular for a better understanding of how monetary policy and financial shocks are transmitted domestically in the Nigerian financial market.

Still, lots of open questions and avenues for further research remain though, especially in obtaining a better understanding of the underlying economic factors, and possible time variations in financial linkages, which are only briefly touched in this paper, are important issues for further research.

One key policy implication is that monetary policy may not be a reliable instrument with which to pursue macroeconomic stabilization in Nigeria because of the poor institutional environment, less developed financial structures, reduced role of securities markets, and less competitive banking system where monetary policy shocks do not get transmitted to interest rates as a result of non-stable asset prices, low level of savings and lending to investors, this give rise to the question of how the Central Bank of Nigeria (CBN) should operate in such an environment.

This paper also shows that asset price is an important element of the financial market transmission mechanism. This provides a rationale for why financial market authorities should also pay attention to the asset prices in the conduct of policy. The major issue here is that asset price fluctuations depends on the nature of the shocks to asset prices and the degree of permanence of the shocks.

In order to answer the questions and issues raised above, the Nigerian financial market environment should be characterized by some of these recommendations as provided by Mishra, et al (2010):

(i) A strong institutional environment where loan contracts can be protected and financial intermediation should be conducted through the financial markets.
(ii) The Central Bank of Nigeria should be independent in its true sense in order for it to perform its monetary and developmental roles effectively
(iii) A well-functioning and highly liquid interbank market for reserves should be encouraged and monitored by the independent Central Bank of Nigeria
(iv) A well-functioning and highly liquid secondary market for government securities should be encouraged and investors should be attracted to the market.
(v) Well-functioning and highly liquid markets for equities, commodities and real estate should be established and properly monitored by the Securities and Exchange Commission to boost capital inflow.
(vi) A high degree of international capital mobility financial environment for profitable and secure investment should be encouraged.
(vii) A floating exchange rate regime where market forces determine the value of currency should also be encouraged not a managed foreign exchange market.

Other policy implications are that since financial market participants buy in for surprises or shocks in monetary policy pronouncements as shown by the responses of the tree (3) money market variables (Average Lending Rate, Average Deposit Rate and the Monetary Policy Rate), therefore, policymakers should declare realistic and achievable monetary targets.

Policies should also be targeted at maintaining a low lending rate that will lead to low level of inflation through a realistic and robust inflation target framework that will increase output and employment.

Since capital market responses are found to exist after the money market responses, investors (local and international) should be encouraged to

invest in the capital market because the market has low transaction cost, large access to securities and low information asymmetries, and this will improve liquidity in the capital market.

Investors' confidence should be boosted by putting in place a transparent legal framework and adequate implementation without fear or favour in both the money market and the capital market.

Therefore, for the efficiency and effectiveness of policies, target at the financial market, variables that are implicitly or explicitly related to the credit channel and asset price channel should be adequately incorporated in order to stimulate sectoral structural reorientation and economic growth. These will go a long way in promoting stability and confidence desired in the financial market.

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Appendix

Figure 1: Autocorrelation Graphical Representation

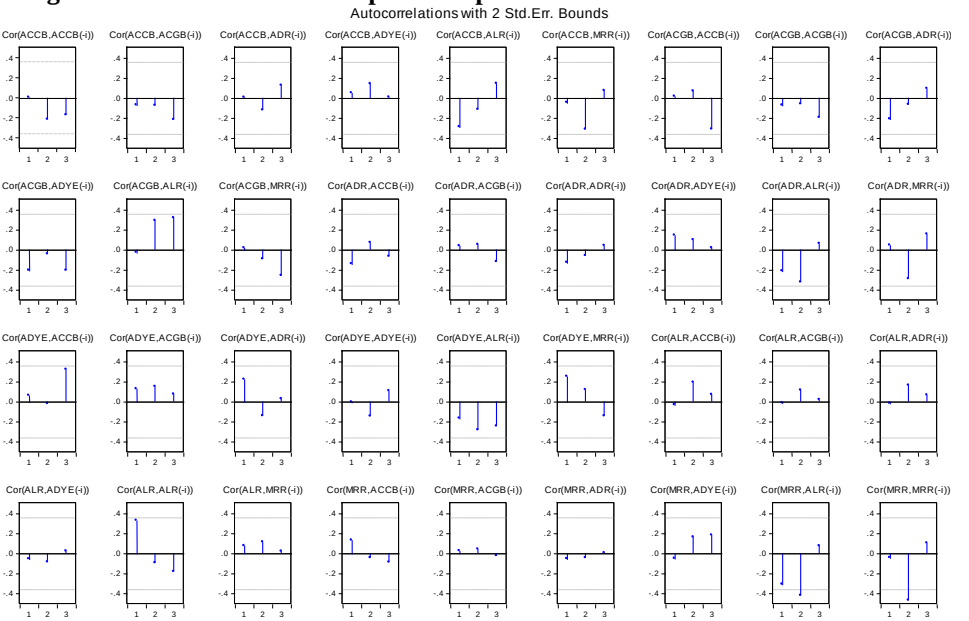
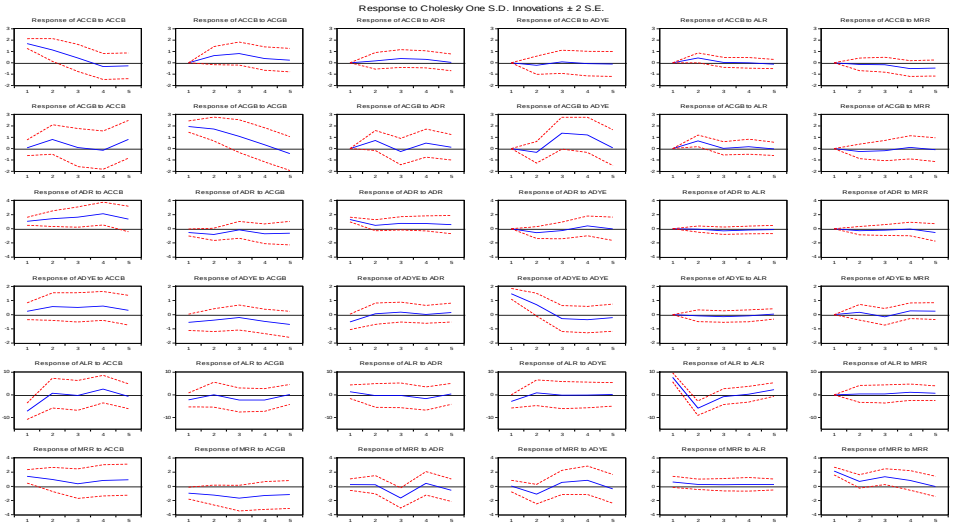


Figure 2: The Impulse Response Functions of the Variables



***Source**: Eviews output run by the author, 2015.*