IMPACT OF CENTRAL BANK COMMUNICATIONS ON STOCK PRICES IN NIGERIA

BY

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BEING A THESIS SUBMITTED TO THE POST GRADUATE SCHOOL, AHMADU BELLO UNIVERSITY, ZARIA, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER DEGREE OF SCIENCE IN ECONOMICS

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DECLARATION

I solemnly declare that the work in this thesis titled ***"IMPACT OF CENTRAL BANK COMMUNICATIONS ON STOCK PRICES IN NIGERIA"*** was written by me in the Department of Economics under the supervision of Dr. A.R Sanusi and Dr. P.P Njiforti. The information gleaned from the literature has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree or diploma at any university.

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CERTIFICATION

This thesis titled " ***IMPACT OF CENTRAL BANK COMMUNICATIONS ON STOCK PRICES IN NIGERIA"*** by Salisu Umar meets the regulation governing the award of the degree of Master of Science (M.Sc) in Economics, Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

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ABSTRACT

A significant transition towards greater Central Bank transparency occurred in the last two decades. As a result, a number of Central Banks both in advanced and advancing economies communicate most aspect of their monetary policy with the aim of influencing agents' decision for the effectiveness of monetary policy actions. It is however noted that the signals inherent in Central Bank communication instead of coordinating agents' expectation towards fundamentals, it sometimes coordinate it away. This study assessed the impact of communication by Central Bank of Nigeria (CBN) on stock prices in the Nigerian stock market from 2007 to 2011. Five day weekly data on the Nigerian Stock Exchange (NSE) All Share Index (ASI) from January 4th, 2007 to June 30th 2011 and Banking 10 Index(BINDEX) from February 2nd, 2009 to December 31st 2010 were collected and used for the study. The econometric tool of analysis used was the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) model. It was found that CBN's communication has significant impact on stock prices in Nigeria and as well reduces volatility in the Nigerian stock market. Our findings also suggest that CBN is transparent and credible. The study recommends that CBN should cautiously use communication as viable tool of monetary policy to coordinate agents' expectations and as a tool of managing stock price volatility in the Nigerian Stock market.

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ACRONYMS

ADF	Augmented Dickey Fuller test (a unit root test)
AIC	Akaike Information Criteria
ARCH	Autoregressive Conditional Heteroskedasticity
ASI	All Share Index (for the NSE)
BINDEX	Banking – 10 Index
BoE	Bank of England
CAPM	Capital Asset Pricing Model
CBC	Central Bank Communication
CBN	Central Bank of Nigeria
COMM	Communication
DCF	Discounted Cash Flow Model
DW	Durbin Watson Statistics (used to detect first order autocorrelation in a time series)
ECB	European Central Bank
EGARCH	Exponential GARCH
ES	Event Study Approach
GARCH	Generalized ARCH
GMM	Generalized Method of Moments
JSE	Johannesburg Stock Exchange (South Africa)
MP	Monetary Policy
MPC	Monetary Policy Committee of CBN
MPR	Monetary Policy Rate (in Nigeria's CBN)
NSE 30	Nigerian Stock Exchange Index for top 30 most capitalized stocks

NSE	Nigerian Stock Exchange
OECD	Organization for Economic Co-operation and Development
PP	Phillips-Perron (a unit root test)
r	Short – Term Rate of Interest
R	Long – Term Rate of Interest
RR	Discount Rate
SIC	Schwartz Information Criteria
SPs	Stock Prices (in NSE)
$\mathbf{S_t}$	Central Bank Signals
UK	United Kingdom
US Fed	Federal Reserve of the U.S.A (equivalent of Nigeria's CBN)
US/USA	United States of America

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

The practice of Central Banking and the act of monetary policy in Nigeria has being evolving. The Central Bank of Nigeria (CBN) practiced different monetary policy regimes since its establishment in 1959. The various regimes adopted ranges from the exchange rate targeting regime between 1959 – 1973, monetary targeting regime from 1974 to date, which involves direct monetary control (1974 – 1992) and indirect control – 1993 to date (Egbuna, 2008). To achieve the objectives of monetary policy, various tools are employed.

Over the recent past, communication policy has become an important instrument of monetary policy globally. The recognition of the effects of information asymmetries and uncertainties in financial variables has led Central Banks to attach greater weight to communication policy as an instrument of monetary policy. Also, there is wide consensus among academics and policy makers that monetary policy operates mainly via private agent's expectations. The widespread influence of the New Keynesian model is said to underpin the focus on expectations. Instead of presuming a close alignment between the monetary authority and the private agents as in the case of rational expectations hypothesis, the focus is now on how the alignment could be brought about in practice via Central Bank efforts. This is because deviations from long-run equilibrium are said to be located in market imperfections, especially price stickiness and information asymmetries in which clear Central Bank signals about monetary policy will play a vital role in eliminating (Dow *et. al.,* 2005 and Qvigstad, 2008).

As a result of the increased focus on the expectation channel of monetary policy, Central Bank communication is now an issue both in the academia and Central Banking circles. Thus, conventional wisdom in Central Banking has evolved from Central Banks refusal to communicate to the contention that effective communication enhance the efficacy of monetary policy, make policy decisions more predictable and as well helps in achieving macroeconomic objectives (Blinder *et. al.,* 2008). It is an obvious fact that the Central Bank of Nigeria (CBN) overtime communicates most aspects of its monetary policies to market agents, as well as the general public via various channels of communication. For instance, the Central Bank Governor holds a press conference immediately after the monetary policy committee (MPC) meeting where he briefed the press agents on the decision taken and the logic behind it. Also, the MPC communiqué is published on the bank's official site where decision reached and other vital information are presented and explained. This act of communication by apex banks has generated a lot of debate where some people believe that it influences financial variables in the expected direction, and others argue that it does not.

On this note, and in the absence of compelling evidence to ensure the robustness of these conclusions especially in Nigeria, this work attempt to find out whether communication by the Central Bank of Nigeria has significant impact on stock prices. The philosophy behind this is that stock markets are inherently characterized by asymmetric information which is an important source of volatility in the market in which corresponding Central Bank communication is expected to play an important role as a policy instrument. Also, stock price movement tends to be affected by news i.e. stock prices respond to news or information quickly which, in turn, affects the performance of

the financial sector significantly. Understanding the source of volatility and its spillover effects is of interest to policy makers and financial analysts. The aim of this work is to assess how Central Bank communication can be used to manage expectations by *"News Creation"* and *"Noise Reduction"* on the presumption that the aim of Central Bank communication is to raise signal-to-noise ratio. The issue of news creation involves how Central Bank Communication/signals affect private agents' expectations and move stock prices, while noise reduction occurs when Central Bank talk increases the predictability of Central Bank actions which should in turn reduce uncertainty/volatility in the stock market.

1.2 PROBLEM STATEMENT

A significant transition towards greater Central Bank transparency has occurred over the last two decades as regard to Central Bank's objectives, policy tools, decision making procedures and policy decisions. The development of Inflation Targeting frameworks in particular is said to change standard. Central Banks are now more open about most aspects of their monetary policy. The development is also in line with the idea that managing expectations is, at least in part, the essence of monetary policy, Greater Independence granted to many Central Banks which calls for accountability and thereby communication (Amato *et. al.,* 2003). The Central Bank of Nigeria (CBN) in its effort to make clear all aspects of its monetary policy, has overtime adopted various channels to communicate with market agents and the general public. The problematiqué is that inherent in Central Bank communication is *Signal* which exerts "*Announcement Effects*" on the financial market which could be beneficial or not. In other words, Central Bank communication sends signals to financial market which has either positive or negative

effects on stock prices and other financial variables. This has generated policy and academic debates as to whether Central Banks communication/signal move asset prices in the right or contrary direction. For instance, it is argued in Blinder *et. al.,* (2008), that Central Bank communication affects expectation of future short-term rate of interest which in turn affects long-term rates and other financial market prices (stock prices and exchange rate).

In essence, financial market variables react mostly to Central Bank signals. Empirical evidence can be found in Ehrmann and Frazscher (2011), Financial Stability Reports (FSRs, a particular type of communication) move stock market in the expected direction, where on the average, equity markets are moved by more than 1% in the subsequent months following communication and it tends to reduce market volatility. In somewhat a different view, Amato *et. al.,* (2003), argued that more and better communication is at times welfare reducing. This is because sometimes there is overreaction to public information by agents, so much so that unwarranted public news or mistaken disclosure may be damaging. Example, in October, 2000, the then President of the European Central Bank (ECB) Duisenberg, hinted an interviewer as to no further intervention by the bank to support the Euro and that led to the prompt depreciation of the Euro and heavy criticism of Duisenberg (Blinder *et. al.,* 2008).

In a more general note, most policy makers and academics believe that Central Bank communication influence expectation, move asset prices in the right direction and facilitate the prediction of monetary policy which in turn is said to cause volatility reduction in financial market. However, the expectation mechanism of monetary policy operates better if Central Bank is transparent and credible to an extent (Lamla and Lein,

2009). Also, Blinder (1998) and Bernanke (2004) cited in Egbuna (2008), show that communication can be an important tool for Central Banks to influence financial variables, if and only if, the Central Bank has acquired credible reputation. Furthermore, Sanusi (2011b) stated that credibility and transparency of Central Banks can become constraints to their ability of managing agents' expectation in the right direction. As a result of this, we include transparency and credibility to be part of our specific objectives.

In view of all the above contestations and in the absence of compelling evidence in developing economies, especially in Nigeria, this study assessed the impact of communication by Central Bank of Nigeria (CBN) on stock prices.

1.3 RESEARCH QUESTIONS

The work aims at providing answers to the following questions:

i. Is CBN transparent and credible?
ii. What is the impact of CBN's communications/signals on stock prices?
iii. Does CBN's pronouncement reduce volatility in the Nigerian stock market?
iv. Can CBN's communication be used as a tool of managing stock price volatility in Nigeria?

1.4 RESEARCH OBJECTIVES

The broad objective of the study is to examine the impact of CBN's communication/signal on stock prices in Nigeria. The specific objectives are as follows:

i. To determine if CBN is transparent and credible.
ii. To assess the impact of CBN's communication/signals on stock prices.
iii. To determine if CBN's pronouncement reduces volatility in the Nigerian stock market.

iv. To determine if CBN's communication can be used as a tool of managing stock price volatility in Nigeria.

1.5 RESEARCH HYPOTHESES

In line with the objectives of the study, we seek to test the following hypotheses:

Hypothesis One:

H_0: CBN is not transparent and credible

Hypothesis Two

H_0: CBN's communications/signals have no significant impact on stock prices

Hypothesis Three:

H_0: CBN's pronouncement does not reduce volatility in the Nigerian stock market.

1.6 SIGNIFICANCE OF THE STUDY

This study shall be of relevance to policy makers and academics both domestically and internationally. The results will provide information useful for policy purposes and as well extend the frontier of knowledge. It will inform the Nigerian Central Bank on how the stock market agents respond to their signals. It will help in providing empirical evidence that will ensure the robustness of the conclusion drawn by most works as to the announcement effects of Central Banks communication. As the relationship between monetary policy and asset prices is considered critical, obtaining reliable estimates of the response of the stock prices to Central Bank signals would be a critical step on the side of monetary policy makers to formulate an effective policy decisions. The transmission of monetary policy operates mainly via the influence of short-term

interest rates on other asset prices, and the movements in these other asset prices comprising longer-term interest rates and stock prices influence borrowing costs and changes in wealth, which in turn affect real economic activity. Players in the stock market are likely to equally benefit from the output of this study. This is because having an accurate estimate of the reaction of the stock prices to signals would form an important component of formulating effective investment and risk management decisions.

1.7 SCOPE OF THE STUDY

The scope of this work covers the period 2007 to 2011. The justification for choosing this period is simply because of the introduction of monetary policy rate (MPR) in December, 11 2006 to replace minimum rediscount rate (MRR). This marks the beginning of a new monetary policy framework (MPC Communiqué No.48). Also, this coincides with the period when the CBN established the monetary policy committee (MPC) by the CBN act of 2007. Also, the publication of the communication channel used in this study (MPC Communiqué) began with the establishment of the Nigerian Monetary Policy Committee (MPC) in 2007. This is in order to embrace the recent development in the modern view of monetary policy via communication. As a result, CBN experienced significant changes in its communication strategies.

1.8 ORGANIZATION OF THE STUDY

This study is organized into five chapters viz: Chapter One which presents the general introduction. Chapter Two deals with Literature Review and it comprises the Conceptual and Measurement Issues, Theoretical and Empirical Literature Review.

Chapter Three presents and describes the Methodology of the study. Chapter Four handles the Presentation, Analysis and Interpretation of Results. Finally, Chapter Five presents Summary of Findings, Conclusion and Recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This Chapter reviews the conceptual, theoretical and empirical literature, addressing the major research issues relating to the effects of Central Bank communication**.** Most of the literature reviewed, conclude that Central Bank communication contain news which manage agents' expectation and move financial variables (stock prices) in the expected direction. A number of them also hold to the belief that Central Bank communication reduces volatility in the financial markets. In essence, they concluded that Central Bank communication has significant impact on stock prices and reduces uncertainties/volatility in the financial markets.

2.2 CONCEPTUAL AND MEASUREMENT ISSUES

2.2.1 Central Bank Transparency

The concept of transparency is multi-dimensional in nature and as such defies definition across various works. For instance, Qvigstad (2008) defined it as openness about Central Bank intentions for future interest rate decisions. In another vain, Blinder *et. al.,* (2008), cited Faust and Svenson (2001), to have defined transparency as the ease with which the public can deduce Central Bank goals and intentions from observable data, i.e., Central Bank being fully transparent without making worded statement. Geraats (2002) looks at it as the absence of asymmetric information between monetary policy makers and other economic agents. However, this work regards transparency as given by Begg (2006), where transparency is defined as the provision of all relevant information

by the Central Bank to the general public and markets on its policy strategy, assessments of economic outlook and policy decisions in an open, clear and timely manner.

Eijffinger and Geraats (2006) distinguish five dimensions of Central Bank transparency relevant for monetary policy making:

i. **Political transparency**, which involves openness about formal objectives, qualitative targets and institutional arrangement

ii. **Economic transparency**, which involves openness about the economic information the Bank uses for monetary policy (data, models internal forecasts used for policy).

iii. **Procedural transparency**, which is about how monetary policy decisions are made (strategy, minutes and voting records and capturing how policy decisions are taken).

iv. **Policy transparency,** which refers to the prompt announcement and explanation of policy actions and inclination.

v. **Operational transparency,** which concerns error control, transmission disturbances and formal evaluation of policy outcome.

2.2.2 Central Bank Credibility

The issue of credibility in policy is said to centre on the perception of economic agents as regard to the commitment of policy makers to declared policy goals and objectives. It is considered relevant in a world where expectation formation is vital to policy effectiveness. The importance of credibility in government policy can be found in the concept of credibility effect which holds that anti-inflation policy will be more effective and necessitate less severe recession if economic agents believe policy makers

to be committed to tight money and fiscal restraint (Anyawu and Oiakhenan, 1995). On this ground, credibility of monetary policy can be defined as private agents' degree of confidence in the Central Bank determination and ability to conduct the monetary policy and achieve the objectives that it has announced (Loisel, 2007).

2.2.3 Central Bank Communication (CBC)

Central Bank communication can simply be referred to as the situation in which the Central Bank provides information to the general public and markets on its monetary policy objectives and strategy, the outlook of the economy and the outlook for future policy decisions. Communication by Central Banks is indirectly observable making it difficult to measure. However, content analysis was used in this study. This involves measuring the different types of Central Bank communications considered in this work, through communication dummy C_t^{MP}. Statements from the communication channel are to be classified into three, namely: Those indicating monetary policy tightening inclination, easing inclination and no inclination. We assigned a value of +1 to communication suggesting tightening inclination and -1 to communication indicating easing inclination. Also, 0 is to be assign to any communication suggesting no inclination. These communication events include decisions on Monetary Policy Rate (MPR) and policy inclinations as being provided in the MPC communiqués.

i. Types of Central Bank Communication

Communication by Central Bank is of different types. The major communication channels adopted by the CBN include: MPC Communiqué, press conferences/press releases, speeches and interviews by the governor, financial stability and economic

reports, minutes and voting records. However, the communication type considered in this work is the communiqué. This is because of its news content, clarity of information and timely release. It provides clearly two sets of information to the financial market. It contains information on the policy decision (i.e in the form of a change in MPR) and also it provides information that indicates the future inclination of monetary policy.

A Brief Description of the MPC Communiqué

The communiqués contain an explicit analysis of the domestic and international economic happenings or developments. The key domestic macroeconomic and financial markets developments are presented. The considerations of the committee, as well its decisions are clearly stated. Voting records and personal statements of committee's members are sometimes reported as an attachment at the end of the Communiqué. Every member now provides an explanation on the basis of their decisions in the voting process. Readers' attention regarding some current and future events that could change inflation and output dynamics is sometimes being drawn. The authority's commitments to tackling these events are usually indicated (Communiqué No.74 of the MPC meeting of January 24-25, 2011 and No.76 of the MPC meeting of May 23-24, 2011).This can have potential effects on private agents' expectation concerning the future behaviours of financial prices (Sanusi, 2011b). The MPC decisions as reported in Communiqué No.74 are as follows: The Committee is committed to maintaining price stability by pursuing the current policy thrust of monetary tightening in view of the perceived inflation risks in the near term. The Committee took the decision to further tighten monetary policy. This was a decision taken by a majority of 11:1. The following measures were approved:

i. Raise the MPR by 25 basis points from 6.25 per cent to 6.50 per cent with immediate effect (a majority vote of 11:1);

ii. Maintain the symmetric corridor of +/- 200 basis points by 7-5; 4 members voted for asymmetric corridor by 50 basis points increase in Standing Deposit Facility rate;

iii. Raise the Cash Reserve Requirement (CRR) Ratio by 100 basis points from 1.00 per cent to 2.00 per cent with effect from February 1, 2011 with a majority vote of 11:1; and

iv. With effect from March 1, 2011, raise the Liquidity Ratio (LR) by 500 basis points from 25.00 per cent to 30.00 per cent with a majority vote of 11:1.

ii. Communication Practices of Central Banks

Communication practices by Central Banks vary across countries. Many Central Banks possessing synonymous policy objectives follow different communication policies. That is the vector of Central Bank signals (s_t) takes different forms across time and places. However, Blinder *et. al.,* (2008) divide the vector by content (what to communicate) and by sender (how to communicate).

i. **Content (what to communicate)**: Most Central Banks provide information on at least four areas of their monetary policy. These are: Overall objectives, strategy of policy decisions, economic outlook and the outlook for future policy decisions.

ii. **Sender (how to communicate):-** Central Banks communication channels differ across Central Banks. But it occurs via two principal channels, that is, by the committee as a whole and by the individual committee members. Three types of committee are distinguished by Blinder et al. (2008): Individualistic, genuinely collegial and autocratically collegial. Individualistic committee is founded on the

principle of individual accountability which does not insist on achieving consensus. For genuinely collegial, the chairman is less dominant and in the case of autocratically collegial, the chairman dictates the consensus and other members fall in line.

iii. What Makes Central Bank Communication to Matter?

Central Bank communication can matter if any one of the following four conditions hold:

i. Non-stationarity of the economy or policy rule (instability of the economy or policy rule)
ii. Learning on the economy
iii. Non-rational expectations
iv. Asymmetric information between the public and the Central Bank.

In contrast to the world described in the standard theoretical models - rational expectations and general equilibrium models, these conditions do hold in reality. Central Bank communications should therefore matter.

2.2.4 The Nigerian Stock Exchange (NSE) Indices

The Nigerian Stock Exchange (NSE) published a stock index, the All Share Index (ASI) as far back as January, 1984. Even though the ASI is being regarded as well established, an issue that institutional investors have with it is the lack of liquidity in some of the smaller included stocks. As result of this, other indices as the NSE 30 and sectoral indices were recently introduced to run alongside the NSE All Share Index (ASI). The sectoral indices the NSE Banking -10 Index, NSE Insurance -10 Index, NSE Food/Beverage & Tobacco -10 Index and NSE Oil & Gas-5 Index (NSE fact book,

2009). A stock index is generally an indicator of the magnitude and price movement in the stock market (Adekunle, 2010). An explanation of these indices and their methodology is provided below.

i. All Share Index (ASI)

The All Share Index was the oldest index being published by the NSE. It has being in place since 1984. The ASI is an aggregate of the market capitalization of all the Industrial equities listed in the market. The NSE index formula is given below:

$$\text{ASI} = \frac{\text{Current Market Value (CMV)}}{\text{Base Market Value (BMV)}} \text{X } 100 = \frac{\sum_{i=1}^{n} P_a Q_a}{\sum_{i=1}^{n} P_b Q_b}$$

Where:

P_a = Current market price of an ordinary share.

Q_a= Current number of listed ordinary shares

P_b= Market price of an ordinary share as at the base year

Q_b= Number of listed ordinary shares as at the base date

i= 1, 2, - - -n

n = Number of constituents in the index

ii NSE 30 Index

The Nigerian Stock Exchange began publishing the NSE 30 Index in February 2009 with a base value of 1000 points. This index comprises 30 most capitalized and liquid companies in the NSE. It is a price index and weighted by adjusted market capitalization. The adjusted market capitalization of a listed company is the number of its

listed shares, multiplied by the closing price of that company, multiplied by a capping factor. Thus, the NSE 30 is calculated as the Current Market Value (closing price x number of listed shares x capping factor) of all constituent companies divided by a Base Market Value.

iii NSE Banking – 10 Index (BINDEX)

The NSE on 1st July, 2008 developed four sectoral indices one of which is the Banking Index. The sectoral indices, like the NSE 30, have a base value of 1000 points and they are designed to provide investable benchmarks to capture the performance of specific sectors. These sectoral indices include the Top 10 most capitalized and liquid companies in the Banking, Insurance and Food/Beverage & Tobacco sectors, and the Top 5 most capitalized and liquid companies in the Oil & Gas (Petroleum Marketing) sector. These were developed based on the market capitalization methodology. As a result, the four sectoral indices share same methodology and rules. But a slight difference is observed in the case of the NSE Oil & Gas where the number of stocks stood at 5, not 10 as in the case of the other indices. The rules and methodology of these indices are provided below:

i. The number of Stocks is fixed at 10, except for the Oil and Gas, which is fixed at 5.

ii. The eligible equity universe is the top 10 (or 5 in the case of Oil and Gas) most capitalized and liquid companies in the banking, Insurance, and Food/Beverages & Tobacco sectors.

iii. No single company can have a weighting of more than 50%.

iv. The indices are rebalanced on a semi-annual basis, on the first business day in January and in July.

2.3 THEORETICAL LITERATURE REVIEW

A number of studies in monetary economics have attempted in one way or the other to identify and measure the effects of monetary policy on the economy. The major responsibility of Central Banks worldwide has been the formulation and implementation of appropriate monetary policy. Monetary policy (MP) can be taken to mean the combination of measures designed to regulate the value, supply and cost of credit in an economy in line with the expected level of economic activity (Ajayi, 2007). Still in Ajayi, monetary policy aims at achieving a set of macroeconomic objectives such as price stability, full employment and economic growth, exchange rate stability, low interest rates and balance of payments equilibrium. Monetary policy thought to exert its influence on the economy through several channels. These channels through which monetary policy affects the economy are known as monetary policy transmission mechanisms. The commonly recognized channels include interest rate, exchange rate, asset price and credit (Omotor, 2007). The pass through from policy rates to financial asset prices is said to constitute the first step of the monetary policy transmission mechanism (Duran *et. al.,* 2010). To this end, it is obvious that the transmission of policy impulses to financial markets is an integral component of the monetary policy transmission mechanism. Given that Central Bank communication is being regarded as an important tool in modern days monetary policy making, its effects can be direct (via influencing the expectation formation process of the stock market agents) and indirect (via its effect on interest rate and discount rate).

2.3.1 Monetary Policy (MP) and Expectation

Expectations of private agents regarding future monetary policy actions play an integral role in the monetary policy transmission mechanism. This is however via their influence on long-term interest rates and asset prices. For instance, it is recently widely acknowledged that the ability of a Central Bank to affect the economy lies majorly on its ability to alter market expectations about the future path of overnight interest rates and not their current level. As enunciated in the theory of term structure of interest rate, the longer term rate of interest depends on the expected sequence of future overnight rates. An illustration of this could be found on equation 2.1 below (Blinder *et. al.,* 2008).

$$R_t = \alpha_n + (1/n)\,(r_t + r^e_{t+1} + r^e_{t+2} + - - - r^e_{t+n-1}) + E_{1t} \text{ -(2.1)}$$

Where:

R_t = Longer term rate of interest

α_n = Term premium

r_t = Current overnight rate

r^e_{t+1}= today's expectation of tomorrow's overnight rate and so on for $_{t+2}$,$_{t+3}$, - - $_{t+n}$.

E_1t = Error term implying that the term premium might be stochastic.

Amato *et. al.,* (2003) also attempted bringing out the link between agents expectation and monetary policy. The Central Banks generally have the control of only the overnight interest rate, an interest rate they regard as being irrelevant to economically interesting transactions. They went further to assert that monetary policy has significant macroeconomic effects only to the extent that it moves financial variables as long-term

rate of interest, stock prices and exchange rate. Therefore, the connection between the overnight rate and the financial market prices rely majorly upon market expectations. Owing to the fact that Central Bank's future course of action is vital in shaping market expectations, therefore monetary policy becomes more effective if market expectations are effectively coordinated. This argument cannot be unconnected with Woodford's (2001) claim, where he considered monetary policy to be an art that involves private agent's expectation management. To him, the success of monetary policy is not mainly about controlling the overnight rate but of affecting the evolution of market expectations. Although, Woodford's claim is said to be overemphasized, there is wide consensus among both policy makers and academics that monetary policy is at least in part about agents' expectation management (Blinder *et. al.,* 2008 and Morris *et. al.,* 2003). To this end, it becomes obvious that agents' expectations of Central Bank intentions are pertinent in the determination of prices of financial assets.

2.3.2 Monetary Policy (MP) and Communication

This is an important sub-component of this work. Several arguments are being put forward by both academics and policy makers as to the connectivity between Central Bank communication and the issue of monetary policy making. Evident from the year 1990, communication is being regarded as highly relevant to monetary policy making. It is considered a veritable tool of monetary policy.

Theoretical evidences as presented in Blinder *et. al.,* (2008) show that communication can be a strong and pertinent instrument in the Central Banks toolkit on the ground that it is capable of moving financial markets, enhancing the predictability of monetary policy and has the potentiality to fast track the achievement of Central Banks

macroeconomic objectives. The above claim is unconnected with the idea that shaping and managing market expectations is an integral part of monetary policy, a task, realization of which would not be a possibility in the absence of an efficient and effective communication with market agents. Also, greater independence granted to many Central Banks, the issue of the adoption of formal inflation targets by Central Banks and the significant importance attached to financial markets in most economies, where market prices are market agents' expectations driven make communications between the Central Bank and the market to become critical (Amato *et. al.,* 2003). The recognition of information asymmetries and uncertainties is said to be another factor or driven force that moved Central Banks to attach greater weight to communication policy as an instrument of monetary policy (Knutter *et. al.,* 2011). Furthermore, Egbuna (2008) established that a good policy communication helps in strengthening the institutional independence of Central Banks and as well enhances the effectiveness of monetary policy. In essence, there exists a wide convergence both in academia and Central Banking circle, that Central Bank communication is an important and strong instrument of monetary policy through which expectations can be shaped and properly managed.

However, some strands of literature are not in consensus with the idea that Central Bank communications coordinate market expectations in the right direction. As argued in Amato *et. al.,* (2003), if effective communication has the potential to be beneficial, it also has the potential to do bad, provided expectations are coordinated away from the fundamentals. That is, anything advantageous, other things being equal, is disadvantageous at the same time. Poorly designed or executed communications might exert negative effects than a positive one. What Ehrmann and Fratzscher (2005) called

communication dispersion (communication disagreement across monetary policy committee members as well as across statements by individual committee members with those by the committee) might exert a negative effect. They argued that higher degree of dispersion concerning committee member's inclination of monetary policy harms the ability of financial markets to anticipate future policy decisions and raises the degree of uncertainty in the market. This argument is in line with the problem of cacophony identified by Blinder (2004) and cited in Blinder *et. al.,* (2008). The basic argument is that too many disparate voices might end up confusing market agents instead of enlightening them, especially if the messages are in conflict. He further asserts that poorly done, uncoordinated group communication might in actual sense reduce signal-to-noise ratio instead of uplifting it.

Also, there are circumstances in which communication by Central Banks appear unnecessary and harmful. Most Central Banks observe what is known as the purdah or blackout period prior to subsequent policy meeting (i.e. certain number of days before each meeting or other important events as testimonies or reports in the case of US during which no external communication to the public is taking place). Communication during the blackout period has been proved to cause excessive volatility in the market (Ehrmann and Fratzscher, 2008, cited in Blinder *et. al.,* 2008). There are also cases where agents overreact to public information and thus any unwarranted public news or mistaken disclosure may be detrimental or increase market volatility. There are no robust conclusions as regard to the limit or optimal level of transparency. Too much transparency might lead to confusion and also much communication by Central Banks may be detrimental for the effectiveness of monetary policy.

A simple macroeconomic framework as shown in Blinder *et. al.,* (2008), demonstrates the role of Central Bank communications, which is denoted by the vector $\boldsymbol{s_t}$ for signals.

Given **r,** and **R** as defined in equation (2.1), aggregate demand depends on **r, R**, expected inflation $(\boldsymbol{\pi_t^e})$**,** and a lot of other factors that requires not to be explicitly stated:

$$Y_t = D\,(r_t - \pi_t^e,\ R_t - \pi_t^e, \ldots.) + E_{2t} \quad \text{---------- (2.2)}$$

The aggregate supply function could but not necessarily represent something like the New Keynesian Philips Curve.

$$\pi_t = Be\,(\pi_{t+1}) + \gamma\,(Y_t - y^*_t) + E_{3t} \quad \text{---------- (2.3)}$$

Where:

$\boldsymbol{\pi_t}$ implies inflation and $\mathbf{Y_t}$ and $\mathbf{Y_t^*}$ mean actual and potential real output respectively.

The model could be closed by adding a Central Bank reaction function (Taylor rule).

$$r_t = G\,(Y_t - Y_t^*,\ \pi_t,\ \pi_t^*, \text{-----}) + E_{4t} \quad \text{----------(2.4)}$$

Where:

$\boldsymbol{\pi_t^*}$ denotes inflation target of the Central Bank.

Central Bank communication and learning are inextricably intertwined. The feedback effect of learning on the economy can lead to unstable or indeterminate outcomes which effective communication by the Central Bank can help to avoid. This link could be captured by equation (2.5):

$$r^{e}_{t+j} = H_j (Y_t, R_t, r_t, \ldots., s_t) + E_{5t} \text{ ----------(2.5)}$$

Where:

$\mathbf{r^{e}_{t+j}}$ = Stands for interest rate expectations

$\mathbf{s_t}$ = vector of Central Bank signals.

Note:

The vector of Central Bank signals $\boldsymbol{s_t}$ can be taken to range from announcing a numerical inflation target to some of the Central Bank's words. Equation (2.5) can imply varieties of possibilities for learning.

The five equations (2.1- 2.5) attempted bringing out the channels through which the total effect of any Central Banks action works.

Firstly, direct response of aggregate demand to the overnight interest rate (short-term rate) which is modest.

Secondly, the direct response of expected future short-term rate of interest to Central Bank signals.

Thirdly, the response of the entire sequence of future short rates to changes in the short rate through equations (2.1) and (2.5), and their consequent feedback onto long rates, $\mathbf{R_t}$ and therefore onto demand $\mathbf{(D_R)}$.This channel is said to be surely influenced by the Central Bank's signals. Based on the above presentation, it is argued that any account of monetary policy that does not incorporate Central Bank communication is said to be seriously deficient.

2.3.3 Monetary Policy, Central Back Communication (CBC) and Stock Prices

Market agents' expectations play a key role in providing a link between monetary policy and the stock market in general. For instance, an expansionary monetary

policy decreases the rate of interest and increases output. The effect of this on the stock market lies on whether or not the expansion is being anticipated in the market. The stock market will not respond to anticipated expansionary monetary policy because such changes had already been incorporated in setting the prevailing prices. Expectations will not be affected since the policy action has already being anticipated, i.e. nothing changes and stock prices will remain constant. If the expansionary policy actions is at least partly unanticipated (say, in quantum or coverage), the stock prices will increase, because an expansionary monetary policy entails lower rate of interest for some time and also implies higher output sometimes, thus higher dividends (Blanchard, 2006). Movements in interest rates implying monetary policy changes may directly affect the equity cost of capital as well as the expectations of corporate profits, thus leading to swings in stock prices. An increase in money supply which raises inflationary expectations causes a decline in the future real value dividends paid to stock holders, making the stocks less attractive and hence reduction in prices (Berument and Kutan, 2007). In some what a similar view, Duran *et. al.,* (2010), identify the transmission of policy decisions to financial markets as an integral component of monetary policy transmission mechanism in the sense that the greatest impact of monetary policy is on the share prices of the financial sector firms. They assert that communicating an increase in the policy rate results to a reduction in stock prices.

In the words of Patelis (1997), stocks represent claims on future economic output and so if monetary policy has real economic effects; it then follows that stock markets should be influenced by monetary conditions. Hence, Central Bank communication contains news about future path of monetary policy, future path of output and inflation,

agent's expectation in the stock market are altered, and hence stock prices respond. Therefore, Central Bank communication has effect on stock prices. As argued in Born *et. al.,* (2011), communication by the apex banks has significant impact on financial sector prices. Specifically, Financial Stability Reports (FSRs) a particular type of communication creates news which move the stock market in the appropriate direction and also reduce noise (uncertainties) in the stock market. Kohn and sack (2003) provide evidences to show that a Central Bank pronouncement has important repercussion on the volatility of various assets price (shares, interest rate and exchange rate). They claimed that the volatility of asset prices in general, respond significantly to statement by U.S Federal Open Market Committee (FOMC and its members). In some what a similar vein, Bernanke *et. al.,* (2004), show that FOMC statements alter the variance of financial market variables and that asset prices moved in the expected direction following communication.

2.4 THEORETICAL MODELS FOR STOCK PRICE VALUATION

These are models considered in our study to provide the direct and indirect link between Central Bank communication, and stock prices. As indicated above, Central Bank communication can affect stock prices either indirectly via its effect on monetary policy outcome, or directly via affecting stock market participants' (traders') expectations about the future path of the stock prices themselves. In the following models of price determination, the entry points of communications are highlighted.

2.4.1 Discounted Cash Flow Model (DCF)

Ioannidis and Kontonikas (2006) used a model to present a theoretical link between monetary policy and the stock market. The model is the discounted cash flow or

present value model which provides an important insight on the stock market effects of monetary policy changes. To this model, the stock price represented by (SP_t) is the present value of *expected* future dividends denoted by (D_{t+j}). Under the assumption of time varying discount rate (RR) not constant as assumed in Ioannidis and Kontonikas, it can be shown that:

$$SP_t = E_t\left[\sum_{j-1}^{k}\left(\frac{1}{1+RR}\right)^j D_{t+j}\right] + E_t\left[\left(\frac{1}{1+RR}\right)^k SP_{t+k}\right] \text{---------- (2.6)}$$

Where:

E_t = conditional expectations operator based on information available to the markets participant at time t.

RR = Discount rate used by market participants to discount future dividends.

K = Investors time horizon (stock holding period).

The transversality condition signifies that as the horizon K increases, the second term in the right hand side of equation (2.6) vanishes to zero (no rational stock price bubbles), i.e.:

$$\lim_{k\to\infty} E_t = \left[\left(\frac{1}{1+RR}\right)^k SP_{t+k}\right] = 0 \text{ ---------- (2.7)}$$

Therefore, the familiar version of the present value model is obtained as follows:

$$SP_t = E_t\left[\sum_{j=1}^{k}\left(\frac{1}{1+RR}\right)^j D_{t+j}\right] \text{---------- (2.8)}$$

Monetary policy easing is expected to increase the overall level of economic activity and the stock price responds in a positive way (expecting higher cash flows in the future).The DCF via equation (2.8) indicates that changes in monetary policy can exert influence on stock prices in two ways. Firstly, a ***direct effect*** on stock returns by altering expected future cash flow which in turn affects stock prices. Secondly, an ***indirect effect*** on stock returns via altering the discount rate used by market agents to discount expected future dividends. For instance, when CBN is signaling policy easing, this would directly alter agents' expectation which in turn would change their investment decision. Agents would have a positive perception about the economy. This would encourage investment in stocks which will also encourage demand. Increase in demand would cause increase in stock prices. It would have an indirect effect through altering the discount rate. Policy easing is usually accompanied by lowering MPR and when MPR is lowered, interest and discount rates would also fall, stocks would become more attractive, this would encourage demand for stocks and rise in demand for stocks would cause stock prices to increase.

2.4.2 Capital Asset Pricing Model (CAPM)

This is an economic model developed independently by Sharpe and Treynor for valuing stocks, securities, derivatives and/or assets by relating risk and expected return. To this model, the valuation of a security in a well diversified portfolio of assets is not only contingent on its own returns, but also on its contribution to overall risk (Black, 2003). It is based on the idea that investors demand additional expected return (called the risk premium) if they are asked to accept additional risk. The model regards expected return demand by investors as equal to the rate on a risk free security plus a risk

premium. If the expected return does not meet the required return the investors will not invest and the investment should not be undertaken (Value Based Management,n.d). In essence, CAPM describes the relationship between risk and expected return. The expected return on a security in this model is the risk-free rate plus a premium based on the systematic risk of the security. A systematic risk is simply the variability of return on stocks or portfolios associated with changes in return on the market as a whole. It is a portion of risk that cannot be reduced through diversification and it is also called market risk as it affects all securities in the market (Kurfi, 2003). This type of risk include changes in economic policies by government (i.e changes in policy rate or exchange rate)

The CAPM formula is as follows:

$$SR^e = Rf + \beta (MP^e) \text{ or } SR^e - Rf = \beta (Rm^e - Rf) \text{ ---------- (2.9)}$$

Where:

SR^e = expected rate of return on a stock.

MP^e= Rm – Rf = Expected market premium

Rf = Rate of return on a risk free investment (Riskless return or risk free rate) accrued by government securities like treasury bills and treasury certificates.

Rm^e = Expected rate of return on a market portfolio.

Under this model, the risk associated with an asset is measured in relation to the risk of the market as a whole which is expressed as the stock's beta or correlation to the market average. If an asset has a beta less than 1, it will have an average movement in return less extreme than the overall market, whereas those with beta greater than 1, they will display average movements in return more than the overall market.

Central Bank communication/signal about policy changes affects the expected return on stocks. In this model, policy signals influence the determination of stocks return

in two ways. At first instance, it has a direct influence on stocks return through altering agents' expectation about future cash flows. Secondly, signaling policy changes can have an indirect effect on stock returns via altering the risk free rate. Example, in the contest of the indirect effect, if CBN signals policy tightening, MPR is usually raised, this would drive up the risk free rate since it is assumed they are tied and this would lower future cash flow (expected return). Lower expected return would discourage investment and this would drive down prices. Therefore, signaling policy tightening will affect the rate of return on the risk free investment typically treasury bills, as well as the expected rate of return on a market portfolio **(Rm^e)**. This would affect the demand for shares negatively and therefore decline in stock prices.

After the CAPM was developed, several empirical tests were conducted to test the validity and suitability of the model using proxies for the different variables on both developed and emerging stock markets.

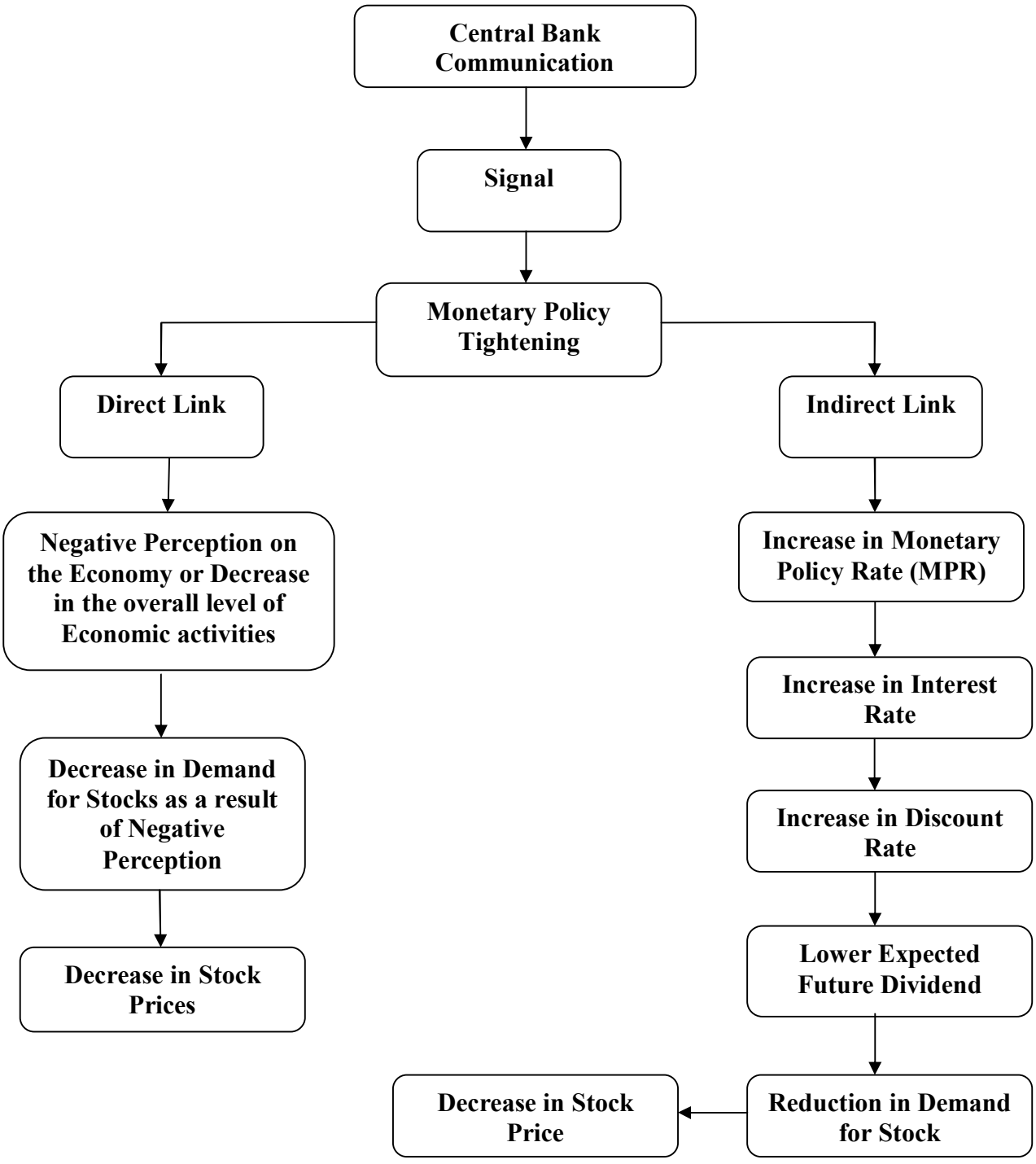
i. Application of CAPM in Advanced Stock Markets

Arduino (2002) conducted an empirical study to assess the explanatory power of the CAPM in comparison with the Arbitrage pricing theory (APT), using the Italian stock market. Another empirical test was conducted by Taylor (2005) to determine the validity of the CAPM using the standard and poor (S & P 500) index. Taylor's conclusion was that CAPM was fairly successful in predicting the price of individual assets. Also Belke and Polleit (2005) employed the CAPM to model the impacts of money policy on stock returns using Germany's stock market data.

ii. Application of CAPM in Emerging Stock Markets

The CAPM was applied by Michailidis *et. al.,* (2006) for the Greek stock market, using weekly stock returns of 100 companies quoted on the Athens stock exchange over the period January, 1998 to December, 2002. Christopher *et. al.,* (2008) and (2009), using the case of Nigeria, carry out a theoretical investigation to examine the suitability of the CAPM in modeling asset prices in an informational inefficient market. Other works conducted to examine the validity of the model using the case of emerging stock market include;Wakyiku (2010) which examines the validity of the CAPM on the Ugandan stock market, employing monthly stock returns from 10 out of 11 companies listed on the Uganda stocks exchange (USE) covering the period 1st March, 2007 to 10th November, 2009 and Raddy and Thomson (2011) where they test the validity of the CAPM for the south African stock market, using total returns on quarterly basis for 10 sectoral indices quoted on the Johannesburg Stock Exchange (JSE) for the period 30th June, 1995 to 30th June, 2009. It is important to note that both DCF and CAPM were used in this work to provide a theoretical framework for our analysis. They provide a medium via which the effect of communicating change in monetary policy will pass through. The two models; DCF and CAPM are based on the fundamentalists approach for predicating the behavior of share prices, which asserts that at any point in time individual stock posses an intrinsic or true value which is the present value of future receipts accruing to the stock holder. However, we extend their analysis by incorporating the element of the technicalist/chartist approach in our model. The technical theory is of the view that future movement of stock prices are repetitions of similar price movement that occurred in the past. To capture this, we include the lagged value of the stock prices in our model.

Figure 2.1: Framework for Linking Central Bank Communication and Stock Prices



Source: **Author's Conceptualization**

Figure 2.1 above is designed to illustrate how Central Bank Communication can affect stock prices via two principal channels-*Direct* and *Indirect* channels. We assumed that the signal identified from CBN Communication is that of monetary Policy tightening, the effect of this on stock prices is as follows:

i. Direct Channel- When a Central Bank signals policy tightening, market agents usually have a negative impression about future economic performance. That is agents expectations about future cash flows are altered. They would expect a lower return for their investment under this condition. This would discourage them from buying more stocks or cause demand for stocks to fall and fall in demand would then lead to a decline in the stock prices.

ii. Indirect Channel-The indirect channel involves the effect of communication signals on stock returns via altering the discount rate used by market agents. Signaling policy tightening by CBN is usually accompanied by raising the monetary policy rate (MPR). Increase in MPR would imply increasing the market rate of interest, when market rate of interest is high, the discount rate used by market agents to discount expected future dividends would also be high, this would make the stocks less attractive, when the stocks becomes less attractive, demand for stocks would be discouraged and decrease in demand would result to decline in stock prices.

2.5 EMPIRICAL LITERATURE

Several attempts have been made by different scholars in different countries to provide empirical evidences concerning the impact of Central Bank communication on financial variables. Empirical evidences on the impact of Central Bank communication

on stock prices had barely begun. To the knowledge of the researcher, the few empirical works carried out to examine directly the impact of CBC on stock prices are mostly done in advanced economies, thereby signifying the absence of empirical works as regard to the impact of Central Bank communication on stock prices in developing economies like Nigeria. As result of this and also the linkage between MP and stock prices, we begin this sub-section by providing empirical evidences on the links between monetary policy and stock prices. Knowing that monetary policy and stock prices are linked, we can also argue that communication and stock prices are also linked. The reason is simply because, theoretical evidences as earlier reviewed, established that CBC and MP are connected and since communication and monetary policy, are connected, a connection also exists between monetary policy and stock prices, it then follows that communication is indirectly connected to stock prices (Egbunna, 2008 and Ehrmann and Fratzscher, 2005). Having shown that linkage, we then provided the few works we come across that established the impact of Central Bank communication on stock prices.

2.5.1 Monetary Policy (MP) and Stock Prices (SPs)

Laurenceson and Hui (2011) investigated whether monetary policy exerts an influence on asset prices using data from China. Using Structural Vector Auto Regression (SVAR) modeling technique, their results show that monetary policy has significant impact on asset prices particularly share prices and more pronounced than on general goods and services prices. They however assert that the wealth effect which politically transmits asset price fluctuations to real economy appears modest. This is in line with Blinder's contention that interest rate and asset prices affect the economy gradually. Also, Duran *et. al.,* (2010) provided empirical evidence on the impact of monetary policy on

asset prices. They employ the Heteroskedasticity-based estimation technique to estimate the impact of monetary policy on the Turkish bond, currency and stock markets. Their results indicate that, consistent with the theory, a rise in policy rate leads to a decrease in stocks prices, and stressed that the monetary policy impact is greatest on the share prices of the financial sector firms.

Kholodilin *et. al.,* (2008) employ the Rigobon (2003) Heteroskedasticity based approach to assess the impact of the European Central Bank's monetary policy on the stock market. They found that tighter monetary policy exerts a heterogeneous effect on the Euro Area Sectors on the day monetary policy is announced to the public. They went further to give statistical evidence against the adoption of the event study approach when assessing the impact of monetary shocks on the stock market as the given assumptions can be rejected for the stock market aggregate and for most of the sectoral stock market indices. Maskay (2007) use a two-stage regression model to analyze the effects of change in money supply on stock prices. The model 1 results show that a positive nexus exist between changes in money supply and stock prices which support the real activity theorist's argument as presented in the paper, i.e., a rise in money supply, increases stock prices and vice versa. The model 2 results show that both anticipated and unanticipated changes in the money supply are directly related with stock prices. The conclusion reached from the model is that, contrary to the theory, anticipated changes in money supply matter more than unanticipated changes.

Another empirical work conducted to examine the impact of monetary policy on stock prices is that of Ioannidis and Kontonikas (2006). They investigate the impact of monetary policy on stock returns using thirteen OECD Countries over the 1972 – 2002

periods. Using descriptive statistics, their result suggests that periods of tighter monetary policy is associated with contemporaneous declines in stock market value in 80% of the countries under review.

Rezessy (2005), carry out an empirical investigation to estimate the immediate impact of Hungarian monetary policy shocks on three forms of asset prices-the exchange rate of the forint in relation to the Euro, spot and forward government bond yields and the index of the Budapest stock exchange. He employs the Heteroskedasticity based technique as described by Rigobon and Sack (2004) as analytical technique. The results indicate a significant impact on the exchange rate in one day i.e. a rise in the policy rate leads to an appreciation of the domestic currency. Monetary policy exerts a positive effect on spot yields, which dies out gradually in longer horizons. It also indicate a positive impact on short term forward yield and negative effect on long-term forward yields showing a situation of rotation in the forward curve as a result of a surprise change in policy rate. The method does not provide interpretable and significant results for the stock exchange index. Rigobon and Sack (2004) used the Heteroskedasticity based generalized method of moments (GMM) and instrumental variables method (IV) as an alternatives to the event study (ES) approach, given their requirement for weaker assumptions when compared to the event study approach. The results obtained from these techniques in Rigobon and Sack, suggest that policy rate increases result to a decrease in stock indices.

2.5.2 Central Bank Communication (CBC) and Stock Prices (SPs)

In this sub-section, we provide empirical works conducted to investigate the impact of Central Bank communications on stock prices as well on their volatility.

Because of the fact that empirical literature on the impact of CBCs on financial variables in Nigeria are still at infant stage, most of the evidences we reviewed here are conducted abroad. The two empirical works we come across were not on stock prices but on some types of interest rates. They were Sanusi (2011a and b). Sanusi (2011a) majorly finds out if CBC in Nigeria can be used as a tool of monetary policy. He estimated the signaling and the cost -of- fund effects of MP in Nigeria for the period 2009 – 2011. He indicates that CBC is a viable tool of monetary policy making and practice in Nigeria. On the other hand, Sanusi (2011b) estimates the effects of monetary policy signals on the Nigerian interbank offer rates. This also suggests CBC to be a viable tool of monetary policy in Nigeria.

Born *et. al.,* (2011), provides empirical evidence to show the stock market respond to three types of Central Bank communications-Financial Stability Reports (FSRs), speeches and interviews. They generally assess the reaction of stock markets to over 1000 releases of FSRs and speeches by 37 Central Banks over the past 14 years. Their results indicate that FSRs exert a significant and potentially long-lasting effect on stock market returns and also lead to volatility reduction in financial market, hence raising the signal-to-noise ratio. Speeches and interviews are said to have modest effect on market returns and do not reduce volatility during tranquil times but had a substantial effect during the recent global financial crises of 2007 – 2010. Knutter *et. al.,* (2011) conducted a research that brings out systematized empirical evidences on the effects of Central Bank communication on financial markets and eventually on financial stability. Their systematic review features a wide range of different communication channels, including minutes and voting records, statements and press conferences, speeches,

interviews and written reports. Their survey is based on empirical evidences in the Euro area, U.S and U.K. Their results suggest a pronounced effect of Central Bank communication on financial market variables, with statements and press conferences being the most effective channel in influencing the financial variables. Written reports are said to exert influence on asset prices but in multiple markets. To draw these conclusions, they studied 34 works published between 2000 and 2010 that examine the effects of press conferences on financial stability. Majority of these works conclude that those communication channels exert positive influence on asset prices in general. However, a short-term increase in volatility is observed in most cases (twenty seven out of thirty four). Nineteen of these works focus on Euro Area, and the remaining fifteen U.S., EGARCH methods was used (eleven times), OLS (ten times) and event studies (6 times). Furthermore, other method used include (these methods were used once): Method of Moment Estimation, Tobit regression, Non Parametric Tests, Ordered Probit Regression, Univariate Regression and the ARFIMA (Auto Regressive Fractionally Integrated Moving Average) model.

Hayo *et. al.,* (2011), analyze the influence of U.S. monetary policy actions and communications on price volatility of commodities over the period 1998 – 2009. Using GARCH model, their findings suggest that communication reduce volatility of commodities prices. Also, Hayo *et. al.,* (2010), examine the impact of U.S. CBC on European and Pacific equity markets, using a pooled GARCH. Their findings suggest that communication has significant statistical impact on European and Pacific equity market returns. Ranaldo and Rossi (2010), analyze the reaction of assets markets to Swiss National Bank Communication, using Ordinary Least Squares and parametric tests. Their

results indicate that speeches and interviews have significant impact on equity market. Ehrmann and Sondermann (2009), analyze the effect of reception of public signals in U.K financial market. Using EGARCH model, their result indicate that conditional volatility declines in response to inflation reports. Furthermore, Ehrmann and Fratzscher (2007a), Using evidence from Euro area, U.K. and U.S. and employing the EGARCH model, show that speeches and interviews are statistically significant in moving financial markets as measured by the volatility of stock market returns and exchange rate.

Some strands of the literature indicate that the volatility of some asset prices increase in the short-run in response to some types of CBC. Also, little or no significant impact is observed in some studies. For instance, Born *et.al,* (2010), examine the effect of CBC on stock market returns across 35 Central Banks, mainly in advanced Countries. Using Event study approach, their findings suggest that speeches and interviews have modest effect on stock market markets and evidence of volatility increase was observed. Also, Hayo *et.al,* (2008), shows that statements and monetary policy reports by U.S. Federal Reserve exert a negative effect on volatilities of stocks and other financial variables (Bonds and Forex). Fay and Gravelle (2008), Using OLS as estimation technique, indicate that market do not react to the publication of monetary policy reports in Canada as measured by the volatility of interest rates. Also, Reeves and Sawicki (2007), employing OLS technique their result indicate that speeches and interviews have little impact on market prices in the U.K area. Kohn and Sack (2004), Using Event study approach, show that speeches have no significant on financial prices in U.S. Finally, Clare and Courtenay (2001), employing OLS technique, indicate that minutes increase volatility of most asset prices in U.K.

In essence, despite the potential negative effects of Central Bank communication, it is broadly agreed that clear and effective communications by Central Banks affects a variety of asset prices in significant magnitude, and as well as in the right direction. Although the response of financial market depend on the details of the communication, for instance news content and their timeliness, Central Bank pronouncement contain news which is quickly incorporated into asset prices. As presented earlier in the theoretical literature, Central Bank communication ***(CBC)***/signals ***(s_t),*** influence expectations of future short-term rates ***(r^e_{t+j})***, which in turn influence other asset prices and macro variables as inflation ***(π_t)*** and output ***(Y_t).*** Furthermore, many factors other than monetary policy exert influence on macro variables as π_t and Y_t, but over the short period as shown in many empirical works, financial variables react mainly to Central Bank signals. This would therefore justify the fact that communication affects monetary policy and this also affects stock prices indirectly, given that monetary policy affects stock prices.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 THEORETICAL FRAMEWORK

There are theoretical models guiding the valuation of stocks. These models provide basis on which the study would be anchored. The more suitable and relevant one(s) would either be adopted or adapted depending on whether we are to make changes in the model or use it as already developed. In this study, the relevant theoretical models reviewed are the Discounted Cash flow (also known as Present Value) Model and the Capital Asset Pricing Model. These two models provided the basic theoretical framework for our analysis.

3.2 ANALYTICAL FRAMEWORK AND THE MODELS

Firstly, to measure monetary policy transparency of the Central Bank of Nigeria, we adopted the Eijffinger and Geraats (2006) index. They developed a single metric index which captures the five dimensions of transparency. In their approach, a questionnaire is developed on monetary policy issues and answered by the researchers based on the information extracted from various Central Bank documents such as reports on the state of the economy, monetary policy statements, and Central Bank official's speeches. We therefore intend to adopt this approach in our study. The questionnaire is organized to contain fifteen questions, with three questions each on the five dimensions of transparency, viz: political, economic, procedural, policy and operational transparency. A score of 0 or 1 is awarded to six questions containing 2 options. A score of 0, ½, or 1 is awarded to nine questions having 3 options, depending on whether they satisfy certain

criteria. The minimum score obtainable from the index is 0 and the maximum score is 15.

The formulation of the transparency index is provided in Table 3.1 below:

TABLE 3.1: TRANSPARENCY INDEX

S/N	TRANSPARENCY DIMENSIONS	QUESTIONS	RESPONSE
(1)	POLITICAL TRANSPARENCY	(a) Is there a formal statement of the objective(s) of monetary policy, with an explicit prioritization in case of multiple objectives?	No formal objective(s) =0. Multiple objectives without prioritization=1/2. One primary objective, or multiple objectives with explicit priority=1.
		(b) Is there a quantification of the primary objective(s)?	No=0. Yes=1.
		(c) Are there explicit institutional arrangements or contracts between the monetary authorities and the government?	No Central Bank, contracts or other institutional arrangements=0. Central Bank without explicit instrument independence or contract=1 /2. Central Bank with explicit instrument independence or Central Bank contract (although possibly subject to an explicit override procedure) =1.
(2)	ECONOMIC TRANSPARENCY	(a) Is the basic economic data relevant for the conduct of monetary policy publicly available? This focus on the release of data for the following five variables: money supply, inflation, GDP, unemployment rate and capacity utilization.	Quarterly time series for at most two out of the five variables=0. Quarterly time series for three or four out of the five variables=1/2. Quarterly time series for all five variables=1.

		(b) Does the Central Bank disclose the formal macroeconomic model(s) it uses for policy analysis?	No=0. Yes=1.
		(c) Does the Central Bank regularly publish its own macroeconomic forecasts?	No numerical Central Bank forecasts for inflation and output=0. Numerical Central Bank forecasts for inflation and/or output published at less than quarterly frequency=1/2. Quarterly numerical Central Bank forecasts for inflation and output for the medium term (one to two years ahead), specifying the assumptions about the policy instrument (conditional or unconditional forecasts)=1.
(3)	**PROCEDURAL TRANSPARENCY**	(a) Does the Central Bank provide an explicit policy rule or strategy that describes its monetary policy framework?	No=0. Yes=1.
		(b) Does the Central Bank give a comprehensive account of policy deliberations (or explanations in case of a single Central Banker) within a reasonable amount of time?	No, or only after a substantial lag (more than 8 weeks) =0. Yes, comprehensive minutes (although not necessarily verbatim or attributed) or explanations (in case of a single Central Banker), including a discussion of backward- and forward-looking arguments=1.

		(c) Does the Central Bank disclose how each decision on the level of its main operating instrument or target was reached?	No voting records, or only after substantial lag (more than eight weeks) =0. Non-attributed voting records=1/2. Individual voting records, or decision by single Central Banker=1.
(4)	**POLICY TRANSPARENCY**	(a) Are decisions about adjustments to the main operating instrument or target promptly announced?	No, or after a significant lag=0. Yes, at the latest on the day of implementation=1.
		(b) Does the Central Bank provide an explanation when it announces policy decisions?	No=0. Yes, when policy decisions change, or only superficially=1/2. Yes, always and including forward-looking assessments=1.
		(c) Does the Central Bank disclose an explicit policy inclination after every policy meeting or an explicit indication of likely future policy actions (at least quarterly)?	No=0. Yes=1.
(5)	**OPERATIONAL TRANSPARENCY**	(a) Does the Central Bank regularly evaluate to what extent its main policy operating targets (if any) has been achieved?	No, or not very often (at less than annual frequency) =0. Yes, but without providing explanations for significant deviations=1/2. Yes, accounting for significant deviations from target (if any); or, (nearly) perfect control over main operating instrument/target=1.

		(b) Does the Central Bank regularly provide information on (unanticipated) macroeconomic disturbances that affect the policy transmission process?	No, or not very often=0. Yes, but only through short-term forecasts or analysis of current macroeconomic developments (at least quarterly)=1/2. Yes, including a discussion of past forecast errors (at least annually) =1.
		(c) Does the Central Bank regularly provide an evaluation of the policy outcome in light of its macroeconomic objectives?	No, or not very often (at less than annual frequency) =0. Yes, but superficially=1 /2. Yes, with an explicit account of the contribution of monetary policy in meeting the objectives=1.

SOURCE: Eijfinger and Geraat, (2006).

The concept of credibility forms part of our first objective which is difficult to measure or assess objectively. However, to determine whether CBN is credible, we based our findings on transparency ground. This is simply because of the strong association between credibility and transparency. A higher degree of transparency is said to be beneficial for Central Bank credibility. Therefore, we assume CBN to be credible if found to be strongly or highly transparent (Mackiewicz- Lyziack, 2002). To him, transparency makes it easier for the private sector to infer the true intentions of the monetary policy makers. Also, Blinder (1999) asserts that one way of establishing credibility is being open and transparent. Moreso, the linkage between transparency and credibility was discussed in several studies. Mackiewicz-Lyziack (2002) cited a number of studies that suggested the link. They include: Cukierman and Meltzer (1986), Faust and Svensson (2001), Geraats (2001), Jensen (2002), Cecchetti and Krause (2002), Lewis

et. al., (2004), Van der Cruisen and Dermertizis (2005), Geraats *et. al.,* (2006) and Gurkaynak *et. al.,* (2006). As a result of the connection between transparency and credibility suggested by several important articles, this study based its credibility measurement on transparency ground. In essence, if our transparency index reveals that CBN is highly transparent, we would then assume that it is as well credible. In addition, communication has been claimed in Fratzscher (2004) to have an important influence on credibility. More so, Sanusi (2011b) stated that transparency or communication can enhance credibility via demonstrating to the market the political independence of any monetary policy decision. In line with this, we also assume CBN to be credible if its communication sends signal that affects financial variables significantly. That is, CBN is assumed to be credible if its communication proves to be significant in influencing stock prices in the expected direction. As such, the result obtained regarding our second objective, would be helpful in this respect.

Secondly, to achieve our second objective which involves assessing the impact of Central Bank communication/signal on stock prices, and also the third one which has to do with determining if CBN's talk reduces volatility in the Nigerian Stock Market, we employed the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) model as suggested by Nelson 1991 used in Cornolly and Kohler (2004). This is because it is use in testing the leverage effect (asymmetric news impact on volatility). The exponential form would allow for asymmetry in the responsiveness of stock prices to the sign of positive or negative shock arising from policy change. It is being specified in log form, hence making the estimated daily conditional variance

always positive (non imposition of the non negativity constraints) on parameters (Njiforti and Chidiogo, 2008).

Lastly, to determine if Central Bank communication can be used as a tool of managing stock price volatility in Nigeria, we refer to the result of our second objective. If the result clearly and convincingly suggests that Central Bank signals move stock prices in the expected direction and also provides evidence of volatility reduction in the stock market, we can then conclude that Central Bank communication/signal can be used as a tool of managing stock price volatility in Nigeria.

3.2 MODEL SPECIFICATION

3.2.1 EGARCH Model

This is used to assess the effects of CBN'S communication/signal on stock prices and investigate if CBN pronouncements reduce volatility in the Nigerian stock market.

i. Mean Equation

The mean equation for changes in the stock prices, $\Delta \boldsymbol{SP_t}$, is specified in equation (3.1).

$$\Delta SP_t = \alpha_0 + \sum_{a=1}^{j} \alpha_a \Delta SP_{t-a} + \beta_0 RR_t + \sum_{b=1}^{k} \beta_b C_t^{MP} + E_{6t} \text{ ---------- (3.1)}$$

Where:

$\Delta \boldsymbol{SP_t}$ = Changes or movement in stock prices in the current period proxied by All Share Index (ASI) and Banking -10 Index (BINDEX).

$\Delta \boldsymbol{SP_{t-a}}$ = Stock price in the previous period.

$\boldsymbol{RR_t}$ =Discount rate used by market agents to discount expected future dividends at time *t*, But MPR is used instead since it is assumed they are tied.

$\boldsymbol{C_t^{MP}}$ = Different types of Central Bank signals or policy inclination gleaned from CBN'S communiqués.

E_{6t} = Stochastic disturbance term

$\alpha_0, \alpha_a, \beta_0, \beta_b$ = Parameters to be estimated.

i. Variance Equation

The conditional variance of the EGARCH model is as follows:

$$\ln h^2 = \varphi_0 + \sum_{W=1}^{q} \varphi_w C_t^{MP} + \sum_{x=1}^{n} \left(\varpi_x v_{t-x} + \theta_x \left| v_{t-x} \right| \right) + \sum_{y=1}^{p} \lambda_y 1nh_{t-y}^2 \partial \text{ ---------- (3.2)}$$

Where:

$Inh_t^2 = log\sigma_t^2$, which implies that the conditional variance σ_t^2 is always non negative irrespective of the possible negative parameter values. To model ARCH effects, the model presume that the residuals from the mean equation (3.1) can be modeled as a function of the standard deviation of the residuals h_t and an independently and identically distributed (i.i.d) term v_t, such that $\mathbf{E_t = v_t h_t \sim (0, h_t^2)}$, and $\mathbf{v_t}$ which is also known as the standardized residuals is $\mathbf{V_t} = \frac{E_t}{h_t} \sim$ iid (0,1). The variance of the residuals, h^2_t, is modeled as a function of its own past values and past errors from the mean equation. The ARCH in the residuals is to be addressed by appending lags of the absolute value standardized residuals $/v_{t-x}/$ and lags of the logged conditional variance terms $\mathbf{In}(h^2_{t-y})$. The asymmetric responsiveness to shock could be addressed by including the lags of the standardized residuals V_{t-x}.

1.7 TYPES AND SOURCES OF DATA

Secondary (time series) data on a 5-day weekly basis for *some* of the share indices of the Nigerian Stock Exchange (NSE) are used in this study. For instance the Nigerian Stock Exchange (NSE), publishes a number of indices on daily basis ranging from the

most oldest index, the All Share Index (ASI), down to the most recently developed NSE 30 Index and the four sectoral indices comprising the NSE Banking - 10 Index, Insurance – 10 Index, NSE Food/Beverages & Tobacco – 10 Index and NSE Oil & Gas – 5 Index. The Indices adopted for this work are the ASI (proxy for stock prices of all the listed companies) and the Banking Index (proxy for stock prices of all the banks listed in the NSE). Daily share indices [i.e All Share Index (ASI) & Banking – 10 Index] of the Nigerian Stock Exchange were collected on a 5 day weekly basis from January 4th, 2007 to June 30th, 2011. However, the period covered in the case of the Banking Index (BINDEX for brevity) is from February 2nd, 2009 to December 31st, 2010. This is because data obtainable at the point of compiling our report were only for that period. In essence, the observations used in this study are 1108 for ASI and 474 for BINDEX.

The data for ASI were obtained from the Asset Management of Nigeria via the website, www.cashcraft.com, whereas we obtained data for the Banking Index (BINDEX) from NSE daily official list for 2009 and 2010. The data for communication variables were extracted from the decisions reached by the Monetary Policy Committee (MPC) as contained in their communiqué and minutes of their meetings via content analysis. This is obtainable from CBN website, www.cenbank.org. The rationale for choosing the ASI is because it is an index that captures the performance of all quoted companies from all sectors of the economy while the reason for the Banking Index is because stocks of the banking sector are potentially more responsive to news than other sectors when it comes to sectoral consideration. Furthermore, the recent improvements achieved in the all share index and market capitalization in the Nigerian Stock Exchange

which is a sign of gradual recovery is mainly as a result of the increases in the share prices of the banking sector (MPC Communiqué No.76).

CHAPTER FOUR

PRESENTATION, ANALYSIS AND INTERPRETATION OF RESULTS

4.1 INTRODUCTION

In this chapter, we present, analyze and interpret the results and findings of our study. We present and interpret the results of the line graphs on the different series. A descriptive statistics on the series, unit root test, transparency/credibility results and the EGARCH models results are also presented, interpreted and analyzed. The ARCH LM Diagnostic Robustness Test was conducted to further ascertain the appropriateness of the models. The result of the ARCH LM tests is also presented in the Chapter.

4.2 EVENTS IN THE NIGERIAN STOCK EXCHANGE (2007-2011)

In this component of the work, we present major happenings in the NSE within the sample period. We do this by identifying periods of large upward or downward movements as shown by our graphical plots and we compare it with meetings days /weeks.

It is observed that, there were no wide swings throughout the year 2007. The overall picture of the economy in 2007 reflected an improved stability in general economic activities and general prices. As such, stock prices were also found to be stable, i.e large changes were not experienced. The MPC noted with satisfaction an orderly functioning of the domestic financial markets throughout the year (Communiqué No. 53). A very wide swing is witnessed in the first quarter of the year 2008. The ASI rose sharply around 25th February, 2008, about 3 weeks after the MPC meeting (the MPC met on 5th February, 2008). The outcome of the meeting indicates that the prospect for the first quarter of 2008 was generally good, the macroeconomic environment and investment

outlook were favorable as indicated in Communiqué No. 54. This was expected to boost investors' confidence, thereby leading to growth in the domestic financial market. Another major event occurred around 18th August, 2008. A downward swing was experienced about 2 weeks after MPC met on 5th August, 2008. The outlook for the second and third quarter was associated with uncertainties. Therefore, the downward fluctuation was maintained up to the first quarter of 2009. For instance, another major downward swing was witnessed around 12th March 2009. This was about 4 weeks after the MPC meeting which holds on 9th February, 2009. The outcome of this meeting also points to uncertain future outlook and investment climate. This is a negative signal that can discourage investors, thereby leading to fall in stock values. This was attributed to the panic on the global financial markets which is integrated into our own stock market as foreigners also had their investment in the NSE (Communiqué No. 57).

However, an improvement was achieved around 28th May, 2009, where an upward swing is witnessed. This occurs 3 weeks after the MPC meeting which holds on 8th April, 2008. This meeting provides positive information that is expected to move the market in a positive direction. The MPC noted a rebound in the international financial markets and is expected to have a positive impact on the domestic financial market (stock market). The committee also noted that the financial conditions in the Country remain robust. They were committed to ensuring the continuation of banking and financial sector stability and soundness. The recovery process was continued up to the year 2010 (Communiqué No.68). Another upward shoot was experienced at around 30th March, 2010, which was exactly 4 weeks after the MPC met (they met on 1-2 March, 2010). The

process was continued and maintained up to the 1st and 2nd quarter of 2011, which marks the end of our scope.

4.3 STOCHASTIC PROPERTIES OF THE DATA

4.3.1 Line Graphs

To examine whether our series have trend, intercept or both, we plot the line graph of the series. The graphical evidence suggests that there are no linear trends, but only intercepts in the series ASI, BINDEX, MPR. The graphical plots are presented in figures 4.1, 4.2 and 4.3 below:

Figure 4.1: Line Graph of the Series ASI

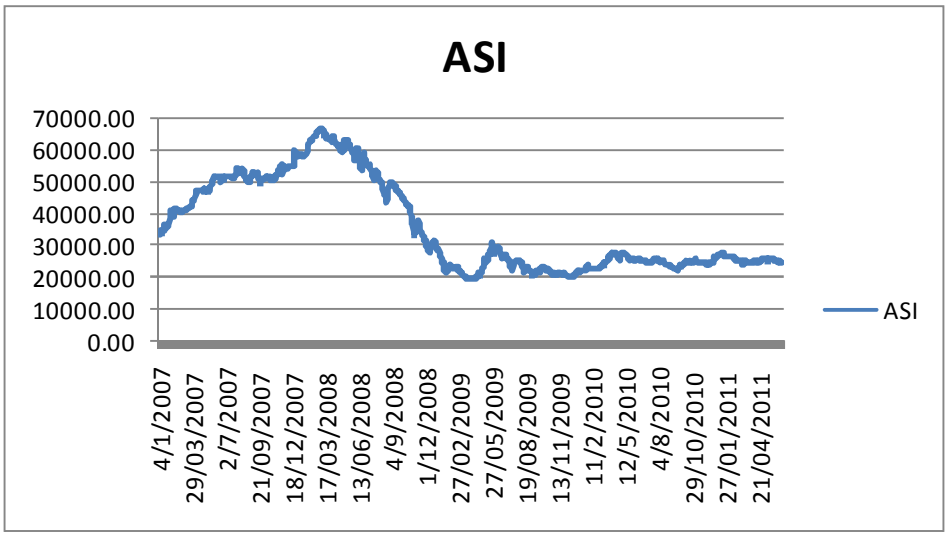


Figure 4.2: Line Graph of the Series BINDEX

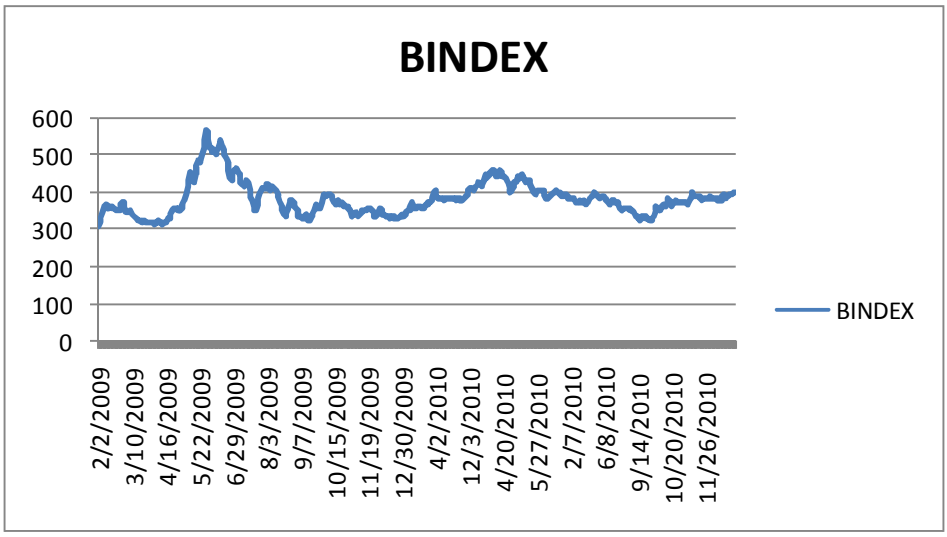
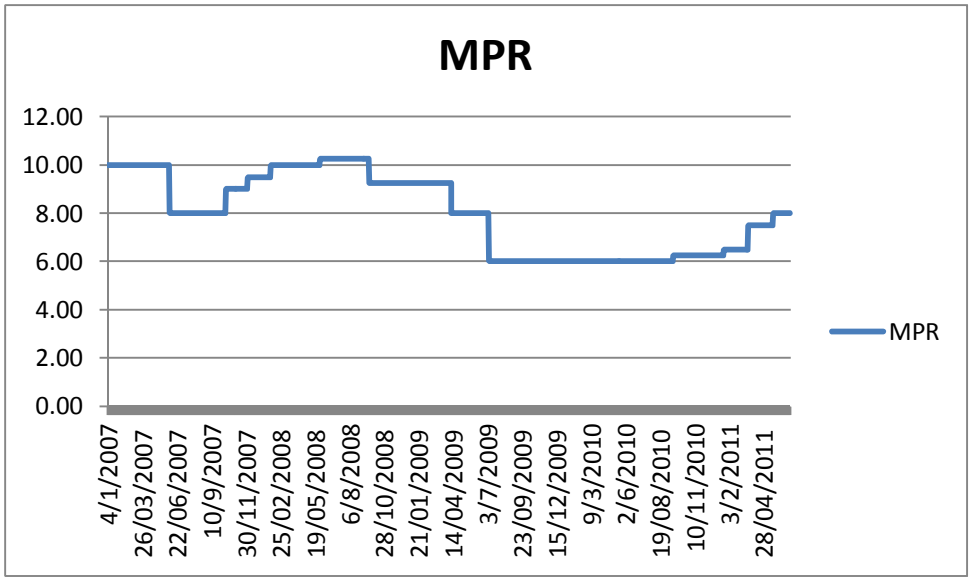


Figure 4.3: Line Graph of the Series MPR



4.4 UNIT ROOT TESTS

Before the application of a standard econometric tool or technique, it is required that variables should be stationary. As a result, we carry out the stationary test on the variables: ASI, BINDEX, and MPR. The reason is simply to avoid the chance of committing type II error. Non-stationary series usually result to producing a spurious regression results. Making inferences from this kind of models may be misleading. As such, one may temp to accept instead of rejecting a particular hypothesis. A number of stationary or unit root test exist, but the traditional one employed in this work are the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests. The results of the ADF and PP tests are reported in Table 4.1:

TABLE 4.1: UNIT ROOT TESTS RESULTS

	Levels		**First Difference**		
Variable	**ADF**	**PP**	**ADF**	**PP**	**Comment**
ASI	**-0.6030**	**-0.4690**	**-17.4502*** **	**-25.6603*** **	**I(1)**
	(-3.4390)	*(-3.4390)*	*(-3.4391)*	*(-3.4390)*	
	(2.8646)	*(2.8646)*	*(2.8646)*	*(2.8646)*	
	(-2.5684)	*(-2.5684)*	*(-2.5684)*	*(-2.5684)*	
BINDEX	**-3.2794****	**-2.5674**	**-13.4543*** **	**-12.7478*** **	**I(1)**
	(-3.4464)	*(-3.4464)*	*(-3.4465)*	*(-3.4464)*	
	(-2.8680)	*(-2.8680)*	*(-2.8680)*	*(-2.8680)*	
	(-2.5702)	*(-2.5702)*	*(-2.5702)*	*(-2.5702)*	
MPR	**-1.4544**	**-1.4543**	**-23.4828*** **	**-33.2354*** **	**I(1)**
	(-3.4390)	*(-3.4391)*	*(-3.4391)*	*(-3.4390)*	
	(-2.8646)	*(-2.8646)*	*(-2.8646)*	*(-2.8646)*	
	(-2.5684)	*(-2.5684)*	*(-2.5684)*	*(-2.5684)*	

Note: (***), (**) and (*) suggest the rejection of unit root at 1%, 5% and 10% respectively. The critical values are presented in parentheses in the above order of the significance levels.
Source: Authors Computation Using E-views 4.0

The results of the ADF and PP tests as shown in Table **4.1** indicate that all the variables are not stationary at levels, except BINDEX which proved stationary at 5% level of significance. We know this by comparing the absolute values of both ADF and PP test statistics with the critical values (in absolute terms) of the test statistics at 1%, 5% and 10% level of significance. Because the ADF and PP test statistics are less than the Mackinnon critical values at 1%, 5%, and 10% with the exception of BINDEX which proves significant at 5% level of significance, we therefore, accept the null hypothesis and conclude that there is presence of unit root in the variables at levels. As a result of this, we differenced all the series once in the case of both the ADF and PP tests. The variables became stationary after being differenced once. We therefore, conclude that the variables (ASI, BINDEX and MPR) are integrated of order one, I(1) at all level of significance.

4.5 MODELLING VOLATILITY OF THE SERIES

To know whether communication affects stock prices significantly and as well reduces volatility in the Nigerian stock market, we used EGARCH model (Table 4.3 and 4.4 presents the EGARCH result for both the ASI and BINDEX respectively). The simple reason is that the EGARCH model allows capturing differences in the way good and bad news affect the variance of the series where the patterns of volatility tend to be asymmetric.

4.5.1 DESCRIPTIVE STATISTICS ON THE SERIES

When examining volatility, especially under the assumption that the series exhibits volatility clustering, it is necessary to examine some general features of the series that

may suggest the presence of heteroskedastic ARCH disturbances. We carry out this by examining some descriptive statistics as done in Bova (2009). The statistics are presented in Table 4.3 below:

TABLE 4.2: Descriptive Statistics of ASI, BINDEX and MPR

STATISTICS	ASI	BINDEX	MPR
Mean	10.41099	5.941224	7.979919
Median	10.21000	5.930918	8.000000
Maximum	11.10000	6.341346	10.25000
Minimum	9.890000	5.730554	6.000000
Std. Dev.	0.379347	0.113251	1.645665
Skewness	0.402838	0.864586	-0.002704
Kurtosis	1.540578	3.905675	1.384039
Jarque-Bera	128.2984	75.25304	120.5577
Probability	0.000000	0.000000	0.000000
Sum	11535.38	2816.140	8841.750
Sum Sq. Dev.	159.3021	6.066639	2997.991
Observations	1108	474	1108

Source: Authors Computation Using E-views 4.0

As illustrated in Table 4.2, the series are non normal. This is because a normal or symmetric distribution is expected to have a skewness value not different from zero, a kurtosis value of 3 and a very high probability value for the Jarque Bera test. But in our case the series have a very low probability for the Jarque Bera test. Also the kurtosis value for all the series is different from 3. We found a value less than 3 in the case of ASI and MPR, indicating that they are flat (Platykurtic) relative to normal. But for BINDEX, the kurtosis value lies above 3, suggesting that the series are peaked to the left of its mean (Leptokurtic) relative to normal. Both the Platykurtic and leptokurtic series are typical of ARCH disturbances.

Furthermore, for ASI and BINDEX, the skewness coefficient suggest that they are positively skewed (have a long right tail), but for MPR, the coefficient indicates that it is negatively skewed (has a long left tail)

4.5.2 EGARCH ESTIMATION

We used the EGARCH as an estimation technique to assess the impact of CBN's communication/signal on stock prices using Nigerian Stock Exchange All Share Index (ASI) and Banking - 10 Index (BINDEX). The model also informed us as to whether the signals show evidence of volatility reduction in the Nigerian Stock Market. We report the results of two models (model 1 and model 2). Model 1 reports the result of an estimated EGARCH (3 3) model for the ASI, while model 2 is the result of the estimated EGARCH (1 1) for the BINDEX. These models are chosen based on the selection criteria discussed in sub-section 4.6. We carried out the Lagrange multiplier (ARCH LM) tests to test whether the standardized residuals exhibit additional ARCH. If the variance equation is

Table 4.3 EGARCH (3 3)RESULT FOR ∆ASI

Mean Equation				
Dep. Var. ∆ASI				
	Coefficient	**Std. Error**	**z-Statistic**	**Prob.**
C	**-0.000483**	**0.000330**	**-1.460185**	**0.1442**
D [ASI (-1)]	**-0.268320**	**-0.033789**	**7.941048**	**0.0000**
D (MPR)	**-0.000385**	**0.005014**	**-0.076835**	**0.9388**
Variance Equation				
C	**-7.849371*** **	**1.158578**	**6.775004**	**0.0000**
ARCH(1)	**0.033276^{NS}**	**0.055899**	**0.595288**	**0.5517**
ARCH(2)	**0.434760*** **	**0.036023**	**-12.06903**	**0.0000**
ARCH(3)	**0.588800*** **	**0.051642**	**11.40154**	**0.0000**
GARCH(1)	**0.416728*** **	**0.043515**	**9.576596**	**0.0000**
GARCH(2)	**0.276627*** **	**0.044062**	**6.278112**	**0.0000**
GARCH(3)	**0.282849*** **	**0.053461**	**5.290796**	**0.0000**
Lev. Effect(1)	**0.024936^{NS}**	**0.028605**	**0.871736**	**0.3834**
Lev. Effect(2)	**0.025876^{NS}**	**0.026088**	**0.991870**	**0.3213**
Lev. Effect(3)	**-0.112632*** **	**0.036216**	**-3.109999**	**0.0019**
C_t^{MP}	**-0.403793*** **	**0.133971**	**-3.014039**	**0.0026**

Notes: ***, **, * Indicate significance at the 99%, 95%, and 90% levels respectively and ^{NS}indicates not significant.

Source: Authors Computation Using E-views 4.0

correctly specified, there should be no ARCH left in the standardized residuals. The result of the ARCH LM tests is presented in Table 4.5.

Table 4.3 above, presents the results of model 1, which suggest that the estimated coefficient of the communication dummy, C_t^{MP} is negative (-0.40) and statistically significant at 1% level of significance as it has 0.0026% probability value. This means that communication by Central Bank of Nigeria has significant impact on the Nigerian stock market All Share Index and also reduces volatility in the market as informed by the negative sign of the coefficient. Our finding is in line with Born *et. al.,* (2011) and Blinder *et. al.,* (2008), in which communication by Central Banks create news which coordinate agents' expectation and move stock prices in the appropriate direction and as well reduces noise which in turn reduces uncertainty/volatility in the stock market. The results of other variables included are also reported in the model; MPR indicates an inverse relationship with ΔASI but statistically insignificant as shown by the high probability value of 0.93%. The lagged value of ΔASI was found to be highly significant in determining its current value, with probability value of 0.00%, the Akaike (AIC) and Schwarz (SIC) values are -5.94 and -5.88 respectively. These are observed to be lower than the AIC and SIC values of the other estimated EGARCH models for the series ASI (See Appendices A1.1, A1.2 and A1.3). The leverage effect term was different from zero, indicating the existence of leverage effect in the ASI during the sample period.

The result of the second model is presented in Table 4.4 below:

TABLE 4.4: EGARCH (1 1)RESULT FOR ΔBINDEX

Mean Equation				
Dep. Var. ΔBINDEX				
	Coefficient	**Std. Error**	**z-Statistic**	**Prob.**
C	**0.000349**	**0.000680**	**0.513530**	**0.6076**
D [BINDEX (-1)]	**0.530107**	**0.048641**	**10.89843**	**0.0000**
D [BINDEX (-2)]	**-0.190720**	**0.049610**	**-3.844384**	**0.0001**
D (MPR)	**0.004251**	**0.009413**	**0.451611**	**0.6515**
Variance Equation				
C	**-0.464339****	**0.209060**	**-2.221080**	**0.0263**
ARCH(1)	**0.957258*****	**0.022781**	**42.02016**	**0.0000**
GARCH(1)	**0.127903*****	**0.049007**	**2.609891**	**0.0091**
Lev. Effect(1)	**0.047182***	**0.027235**	**1.732407**	**0.0832**
$\mathbf{C_t^{MP}}$	**-0.339955***	**0.195006**	**-1.743305**	**0.0813**

Notes: ***, **, * Indicate significance at the 99%, 95%, and 90% levels respectively.
Source: Authors Computation Using E-views 4.0

Table 4.5 above shows the result of the second model. The estimated coefficient for the communication dummy, C_t^{MP} is negative (-0.33) and statistically significant at 10% level of significance, given that its probability value stood at 0.08%. Base on this, one can conclude that CBN's communication has significant impact on the Banking Index (BINDEX) too. Also, the result indicates the evidence of volatility reduction in this series which is in line with the result obtained in the case of the ASI. The lagged values of ΔBINDEX were also found to be significant in explaining variation in its current value. The ΔMPR is also negatively related to ΔBINDEX but statistically insignificant as obtained in the case of model 1. The AIC and SIC values obtained for the chosen EGARCH (1 1) model is found to be lower than that of estimated EGARCH (2 2) and EGARCH (3 3) models for the series BINDEX. In essence, C_t^{MP} was insignificant in the case of the estimated EGARCH (2 2) and EGARCH (3 3) models at all levels of significance. The leverage effect term, is also different from zero as obtained in model 1. This also indicates the existence of leverage effect in BINDEX during the sample period.

Based on this, we claim that there is presence of leverage effect on stock prices during the sample period.

From the result of models 1 and 2, we can claim that communication by CBN has significant on stock prices in the Nigerian stock market since affects both the All Share Index (ASI) and the Banking – 10 Index (BINDEX) significantly. These indices are indicators of the magnitude and movement of stock prices in the Nigerian stock market (Adekunle, 2010). The negative sign of the coefficients in both the ASI and BINDEX indicates evidence of volatility reduction. The EGARCH results are useful in achieving our fourth objective. This involves determining if communication can be used a tool of managing stock price volatility. Since it is found in our study, that communication reduces volatility in the Nigerian stock market, it then follows that CBN can use communication as a tool of managing stock price volatility in the Nigerian stock market.

TABLE 4.5: ARCH-LM TESTS

	ALL SHARE INDEX (ASI)	**BANKING -10 INDEX (BINDEX)**
F-statistics	**0.175322**	**0.147200**
Prob.	**0.675506**	**0.701400**
Obs*R-squared	**0.175612**	**0.147782**
Prob.	**0.675171**	**0.700664**

Source: Authors Computation Using E-views 4.0

The diagnostic test presented in Table 4.5 illustrates that the models have been correctly specified as no additional ARCH is left in the standardized residuals. That is there is no extra ARCH effects or no extra Heteroskedasticity needs to be accounted for.

4.6 MODEL SELECTION CRITERIA USED

Several criteria are usually available in choosing among competing models or to compare models in order to choose a better one among them. These criteria include among others; economic and statistical criteria. The economic criterion used involves the use of empirical facts to select models. The statistical criteria include; R^2, Adjusted R^2 ($=R^{-2}$), Akaike's Information Criterion (AIC), Schwarz's Information Criterion (SIC), Mallow's CP Criterion. Using the information criteria to compare or choose between two or more competing models, the model with the lowest value of AIC and SIC is usually preferred. We based the selection of our models on information criteria, i.e using AIC and SIC.

4.7 TRANSPARENCY RESULTS

Table 4.6 shows the result obtained from the transparency index presented in Table 3.1 on page 42. By this, we are able to determine whether CBN is transparent and as well credible.

TABLE 4.6: TRANSPARENCY INDEX SCORES

TRANSPARENCY DIMENSION	QUESTION NUMBERS	SCORES OBTAINABLE	SCORES OBTAINED
POLITICAL TRANSPARENCY	(a)	0, ½ & 1	1
	(b)	0, & 1	0*
	(c)	0, ½ & 1	1
ECONOMIC TRANSPARENCY	(a)	0, ½ & 1	1
	(b)	0, & 1	0
	(c)	0, ½ & 1	0
PROCEDURAL TRANSPARENCY	(a)	0, & 1	1
	(b)	0, & 1	1
	(c)	0, ½ & 1	1
POLICY TRANSPARENCY	(a)	0, & 1	1
	(b)	0, ½ & 1	1
	(c)	0, & 1	1
OPERATIONAL TRANSPARENCY	(a)	0, ½ & 1	1
	(b)	0, ½ & 1	0*
	(c)	0, ½ & 1	1
TOTAL		15	11

*No scores awarded for question (b) in the case of both political and operational transparency due to unavailability of information.

Source: Author's Computation

Table 4.6 presents the scores obtained for CBN's transparency base on the transparency index earlier explained and presented in Table 3.1. The scores obtainable and scores obtained for each dimension of transparency is shown respectively by 3rd and 4th columns. CBN is more transparent procedure and policy wise with 3 scores for each of them. It is less economically transparent with only 1 score. The total score obtained is 11 out of 15 points. Therefore, we consider CBN to be highly transparent. We based our analysis by looking at information published in various CBN documents ranging from communiqué, monthly & quarterly economic reports, statistical bulletin, etc and by sending a copy of the index to the research department of CBN headquarter for grading and was successfully graded and returned. Having obtained a very high score, which is an indication of higher degree of transparency, we consider CBN to be highly transparent.

Based on this, we as well consider CBN to be credible, this is because as earlier mentioned in sub- section 3.1, a high degree of transparency entails credibility. Also, from model 1, we found communication to be significant in influencing stock prices. By implication, this also entails credibility (Frazscher, 2004).

4.8 TEST OF HYPOTHESES

The tests of hypotheses outlined earlier in this study are summarized in Tables 4.7 (Hypothesis one), 4.8 (Hypothesis two) and 4.9 (Hypothesis three) below:

TABLE 4.7: Summary of Hypothesis One

HYPOTHESIS		COMMENT	REASON
HYPOTHESIS ONE	**H_O:** CBN is not Transparent & credible	**H_O:**Rejected	A score of 11/15 is obtained from the transparency index. This indicates a high degree of transparency. As such, we consider CBN to be highly transparent. Base on this, we as well assume CBN to be credible, this is because as earlier mentioned; a high degree of transparency entails credibility. Also, from hypothesis two, we found communication to be significant in influencing stock prices. By implication, this also entails credibility (Frazscher, 2004 and Mackiewicz-Lyziak, 2002).
	H_1:CBN is transparent & credible	**H_1:**Accepted	

Source: Author's Computation

Table 4.7 shows that the null hypothesis has been rejected while the alternative accepted. This implies that CBN is considered transparent and credible in this study.

TABLE 4.8: Summary of Hypothesis Two

HYPOTHESIS		COMMENT	REASON
HYPOTHESIS TWO	**H_O:** CBN Comm./Signal has no significant impact on stock prices	**H_O:**Rejected	Probability value for C_t^{MP} which is the signals dummy is 0.026. This indicates significance at all levels for ASI. The probability value for BINDEX is 0.08 which is also significant but at 10% only.
	H_1: CBN Comm./Signal has significant impact on stock prices	**H_1:**Accepted	

Source: Author's Computation

Table 4.8 shows that the null hypothesis has been rejected while the alternative accepted. This implies that CBN communication/signal has significant impact on stock prices in Nigeria.

TABLE 4.9: Summary of Hypothesis Three

HYPOTHESIS		COMMENT	REASON
HYPOTHESIS THREE	**H_O:** CBN's signal does not reduce volatility in the Nigerian stock market	**H_O:**Rejected	A negative value is obtained for the communication/signal dummy in the case of both ASI and BINDEX as presented in Table 4.3 and 4.4. This indicates volatility reduction.
	H_1: CBN's signal reduces volatility in the Nigerian stock market	**H_1:**Accepted	

Source: Author's Computation

Table 4.9 shows that the null hypothesis has been rejected while the alternative accepted. This implies that CBN communication/signal reduces volatility in the Nigerian stock market. Base on this finding, the third objective of this study is achieved. We can imply that communication can be use as a tool of managing stock price volatility in the Nigerian stock market.

Tables 4.7, 4.8 and 4.9 show the summary of all the hypotheses tested in this study. All the null hypotheses are rejected, thereby leading to the acceptance of the alternative hypotheses. To this end, we can claim that all the objectives of this study have been achieved.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

This study generally aimed at finding out the impact of Central Bank of Nigeria's Communication/Signal on stock prices in Nigeria during the period 2007 to 2011. We assessed the impact on the basis of the two theoretical notions of *"News Creation"* and *"Noise Reduction"*. *News Creation* implies that the Central Bank's signals can be used to coordinate or manage economic agent's expectations, and therefore move stock prices. *Noise reduction* suggests that Central Bank's communication/signal increases the predictability of monetary policy actions which should, in turn, reduce uncertainty/volatility in the stock market.

The (dependent) variables we considered for the stock market are the daily observations of the All Share Index (ASI) and Banking - 10 Index (BINDEX). For the independent variables, we used communication/signals and, because it is not directly observable, we used a dummy denoted by; $\boldsymbol{C_t^{MP}}$**.** Content analysis is used to extract signals from all the Communiqués of the MPC meetings during the period under review. Other independent variables considered were MPR and lag values of ΔASI and ΔBINDEX. The ASI and BINDEX were log-transformed and their stochastic properties were examined. They were found to be integrated of order one (I(1)). We then estimated the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) models to determine if Central Bank communication/signal has significant impact on stock prices, and whether it reduces volatility in the Nigerian stock market. We also constructed the so-called transparency index of Eijffinger and Geraat (2006) for the CBN in order to determine if CBN is transparent and credible during the sample period.

This study reveals that CBN's communication/signal has significant impact on stock prices, in the case of both ASI and BINDEX. That is, its affects the ASI and BINDEX significantly. It is significant at all levels in the case of the ASI but at 10% in the case of the BINDEX. Also, evidence of volatility reduction is observed in these series as shown by the negative coefficient of the communication dummy, C_t^{MP}. We also found that CBN is transparent and credible as given by the transparency index scores.

5.2 CONCLUSION

The results of the EGARCH models estimated in this work indicate that communication/signal by Central Bank of Nigeria has significant impact on stock prices [proxied by the All Share Index (ASI) and Banking-10 Index (BINDEX)] in Nigeria during the period under review. These indices are indicators of the magnitude and movement of stock prices in Nigeria. The ASI is an index used to capture the stock prices of all the listed companies in the Nigerian Stock Exchange (NSE). Whereas the Banking - 10 Index (BINDEX), is an index used to capture the stock prices of only the Banking sector. In both cases, the ASI and BINDEX results suggest the evidence of volatility reduction in the Nigerian stock market. Having found that CBN's communications *"Create News"* and *"Reduce Noise"*, In other words, communication by CBN *"Create News"* which manage market agents expectations and move stock prices in the expected direction, and "*Reduces Noise*" which has to do with increasing the predictability of Central Bank actions, which in turn reduces uncertainty/volatility in the stock market, We conclude that CBN's communication/signal moves stock prices in Nigeria in the desired direction. In other words, it raises the signal to noise ratio. Our transparency results, also led us to conclude that CBN is transparent and credible.

Having found that CBN's communication creates news and moves the stock market in the appropriate direction, the implication of this finding is that CBN can deliberately use communication policy as an important instrument of monetary policy in Nigeria. Also, since CBN's communication helps in increasing the predictability of monetary policy actions and reduces uncertainties, it then follows that it can be use by CBN to anchor market agents' expectation and in reduction of uncertainties/volatility in the Nigerian Stock Exchange (NSE) market. This would help market agents to make better expectation of the future market conditions. That is, the manner in which news about policy actions are disseminated to the market is good because it reduces uncertainties and helps agents to make better expectations.

5.3 RECOMMENDATIONS

Having found that communication/signal has significant effect on stock prices and reduces volatility in the Nigerian stock market, we proffer the following recommendations:

i. We recommend that CBN should cautiously use communication as a viable tool of monetary policy in Nigeria. It can be used in coordinating agents' expectation and for reduction of uncertainties/volatility in the Nigerian Stock Exchange market. That is, CBN can use communication as a tool of managing stock price volatility in the Nigerian stock market.
ii. Having found that CBN'S communication has the ability of shaping agents expectation and moving stock prices in the desired direction, we recommend that CBN should use other communication channels in a coordinated manner as done in advanced economies. The most coordinated communication channel of CBN is the

communiqué and such other channels like speeches and interviews should also be used in a coordinated manner to target the stock market agents. Speeches and interviews were found to exert significant impact on financial variables but most of the evidences are in advanced financial markets. So it would be necessary if such developments are found in advancing economies like Nigeria. Also, financial stability report (FSR) is another important type of Central Bank communication that is obtained in some works to be significant in moving stock prices. However, FSRs in the case of Nigeria are not forward looking and are also published at a very low frequency. CBN should increase the frequency of its FSRs and also make it forward looking. Publication of voting records, written reports, statements and press conferences are also found to be effective channels of Central Bank communication (Knutter *et. al.,* 2011). CBN has recently started publishing the voting records, as well as personal statements of MPC members. However, we realized that CBN is inconsistent as regard to the publication of the voting records; therefore, we encourage CBN to maintain the voting records issue consistently. Such communication channels of CBN as monthly and quarterly economic reports can be redesigned to carry forward looking information/outlook on the economy.

5.4 SUGGESTIONS FOR FURTHER STUDIES

i. Our studies make use of NSE All Share Index (ASI) and the Banking-10 Index among other tradable indices. The banking index (BINDEX) was launched in the first quarter of 2009 together with other tradable indices as NSE 30 Index, NSE Insurance 10 Index, NSE Food/Beverage 10 Index and NSE Oil/Gas 5 Index. The data available for the BINDEX up to when we are compiling our report was from 2009 to 2010, that is data

were not available for the year 2011. So, it is only in the case of the ASI that the data obtained cover the period 2007 to 2011. We recommend that further researches should update their data in order to have a wider scope or coverage in the case of the banking 10 index (BINDEX). We also recommend that other Sectoral/Tradable indices should be employed. For instance, the NSE 30 Index, NSE Insurance 10 Index, NSE Food/Beverage 10 Index and the NSE Oil/Gas 5 Index as this would help us in knowing whether the impact of CBN's communication/signals is on stock prices of all the sectors of the economy.

ii. We also recommend that subsequent works that aims at finding out the factors that affects stock price movement should also take communication into cognizance.

REFERENCES

Adekunle, P.A. (2010), **"Impact of Banking Sector Reforms on the Nigerian Capital Market,"** *CBN Bullion,* Volume 34, No.4, October-December, 2010.

Ajayi, M. (2007), **"Monetary Policy Transmission Mechanism in Nigeria,"** *CBN Economic and Financial Review*, Volume 45/4, December, 2007.

Amato, J.D., Morris, S., and Shin, H.S. (2003), **"Communication and Monetary Policy,"** Cowles Foundation Discussion paper No. 1405.

Anyawu, J.C. and Oiakhenan, H.E., (1995), **"Modern Macroeconomics: Theory and Applications in Nigeria**," Onitsha, Joanee Education Publishers Limited.

Arduino, C. (2002), **"Capital Asset Pricing Model and Arbitrage Pricing Theory in Italian Stock Market: An Empirical Study,"** Edinburgh, Management School of Business and Economics, CFMR/02.01. (http://hdl.handle.net/1842/1821).

Begg (2006), **"Economic Policy and Institutional Transparency: The European Central Bank,"** European Institute, London School of Economics and Political Science.

Bernanke, B., Reinhart, V.R., and Sack, B.P., (2004) **"Monetary Policy Alternatives at the Zero Bound: An Empirical Assessment,"** Brookings Papers on Economic Activity, 2011 – 100.

Berument, H. and Kutan, A.M, (2007), **"The Stock Market Channel of Monetary Policy in Emerging Markets: Evidence from the Istanbul Stock Exchange,"** *Scientific Journal of Administration Development,* Volume, 5.

Black, J. (2003), **"Oxford Dictionary of Economics,"** New York, Oxford University Press, Inc.

Blanchard, O. (2006), **"Macroeconomics"** 4th Edition; New Jersey, Massachusetts Institute of Technology, Pearson Prentice Hall.

Blinder, A.S. (1999), **"Central Bank Credibility: Why do we Care? How do we Build it?"** National Bureau of Economic Research (NBER), Working Paper series No.7161(http://www.nber.org/papers/w7161).

Blinder, A.S., Ehrmann, M., Frazscher, M., De-Haan, J. and Jansen, D.J. (2008), **"Central Bank Communication and Monetary Policy: A Survey of Theory and Evidence,"** European Central Bank Eurosystem, Working paper series No. 898/May 2008.

Bohl, M.T. (2007), **"Do Central Banks Reacts to the Stock Market?** Indian Council for Research on International Economic Relations, 10 July, 2007.

Born, B., Ehrmann, M., and Fratzscher, M. (2010), **"Macroprudential Policy and Central Bank Communication,"** C.E.P.R. Discussion Paper, No.8094.

Born, B., Ehrmann, M., and Fratzscher, M., (2011), **"Central Bank Communication on Financial Stability,"** European Central Bank, Eurosystem, Working Paper Series No. 1332/April 2011.

Bova, E (2009), **Is the Zambian Kwacha A Commodity Currency? The Co-Movement between Copper Prices and the Exchange Rate,"** NCCR Trade Regulation, Swiss National Centre of Competence in Research, Working Paper No.2009/11, March 2009.

Central Bank of Nigeria (CBN), **"MPC Communiqués"** No. 39-79.

Chirinko, R.S., and Curran, C. (2010), **"Greenspan Shrugs: Formal Pronouncements, Bond Market Volatility and Central Bank Communication,"** American Economic Association Meeting.

Christopher, S.R.O., Rufus, A.I. and Ezekiel O. J. (2008), **"Asset Pricing in an Informational Inefficient Market: How suitable is Capital Asset Pricing Model?"***Eurojournals Inc*, (http:// www.eurojournals.com/ejsr.htm)

Christopher, S.R.O., Rufus, A.I. and Ezekiel O. J. (2009), **"A Model for Pricing of Equity in an Environment Characterized by Information Asymmetry-A case of an Emerging Market,"** *Eurojournals Publishing, Inc.*

Clare, A. and Courtenay, R. (2001), **"Assessing the Impact of Macroeconomic News Announcements on Securities Prices, Under Different Monetary Policy Regimes,"** Bank of England (BoE), Working Paper Series, No.125.

Connolly, E. and Kohler, M. (2004), **"News and Interest Rate Expectations: A Study of Six Central Banks,"** *The Future of Inflation Targeting*, Sydney, Reserve Bank of Australia, pp. 108-134.

Dow, S., Klaes, M., and Montagnoli, A. (2005), **"Monetary Policy by Signal,"** *SUERF and Bank of Finland Joint Conference;* "Open Market Operations and the Financial Market, Holsinei 22 – 23 September, 2005; Revised Paper submitted to Conference Proceedings, 26 October, 2005.

Duran, M., Ozcan, G., and Unalmis, D. (2010), **"Measuring the Impact of Monetary Policy on Asset Prices in Turkey,"** Central Bank of the Republic of Turkey, working paper No. 10/17.

Econometric view (Eviews 4), **"User's Guide"**

Egbuna, E. N, (2008**), "Central Bank Communication and Monetary Policy-The Case of the Central Bank of Nigeria,"** Central Bank of Nigeria Bullion, No. 4, Vol. 32, October/December, 2008: 12 – 18.

Ehrmann, M. and Frazscher, M. (2005), **"How should Central Banks Communicate,"** ECB working paper Series No. 557/November, 2005.

Ehrmann, M. and Fratzscher, M., (2007a), **"Communication and Decision-Making by Central Bank Committees - Different Strategies, Same Effectiveness."** *Journal of Money, Credit and Banking*, 39 (3), pp. 509-541.

Ehrmann, M. and Frazscher, M. (2008), **"Purdah – On the Rationale for Central Bank Silence Around Policy Meetings,"** *Journal of Money, Credit and Banking*.

Ehrmann, M. and Sondermann, D., (2009), **"The Reception of Public Signals in Financial Markets – What if Central Bank Communication Becomes Stale?"** ECB Working Paper No. 1077, European Central Bank.

Ehrmann, M. and Fratzscher, M. (2011), **"Central Bank Communication on Financial Stability**" ECB working paper series, No. 1332/April 2011.

Eijffinger, S.C.W. and Geraat, P.M. (2006), **"How Transparent are Central Banks?"***European Journal of Political Economy*.www.sciencedirect.com

Emmanuel, D.E. and Samuel, A.O. (2009**), "An Impact Analysis of Real Gross Domestic Product, Inflation and Interest Rates on Stock Prices of Quoted Companies In Nigeria,"** *Eurojournals Publishing, Inc.*

Fratzscher, M. (2004), **"Communication and Exchange Rate Policy,"** ECB Working Paper No. 363, European Central Bank.

Geraats, P.M. (2000), **"Central Bank Transparency,"** *The Economic Journal*, 112 (484): 532 – 65.

Gujarati, D.N. and Porter, D.C (2009) **"Basic Econometrics"** fifth edition, New York: Mc Graw Hill Companies Inc.

Hayo, B., Kutan, A., and Neuenkirch, M., (2008), **"Communicating with Many Tongues: FOMC Speeches and U.S. Financial Market Reaction,"** *MAGKS Joint Discussion Paper Series in Economics* 08-2008.

Hayo, B., Kutan, A., and Neuenkirch, M., (2010), **"The Impact of U.S. Central Bank Communication on European and Pacific Equity Markets**," *Economics Letters,* 108, pp. 172-174.

Hayo, B., Kutan, A., and Neuenkirch, M., (2011), **"Communication Matters:U.S Monetary Policy and Commodity Price Volatility,"** *MAGKS Papers on Economics 2011*, Philipps-Universität Marburg, Faculty of Business Administration and Economics, Department of Economics.

Ioannidis, C. and Kontonikas A. (2006), **"The Impact of Monetary Policy on Stock Prices,"** School of Management, university of Bath, Bath, UK.

Kholodilin, K. Montagnoli, A. Napolitano, O. and Siliverstous B. (2008), **"Assessing the Impact of the ECB's Monetary Policy on the Stock Markets,"** A Sectoral View, Kof Working paper.

Kurfi, A.K. (2003), **"Principles of Financial Management"** first edition, Kano: Benchmark Publishers Limited.

Lamla, M.J. and Lein, S.M (2009), **"What Matters When? The impact of ECB Communication on Financial Market Expectation,"**

Mackiewicz-Lyziak, J., (2002), **"Central Bank Credibility: Determinants and Measurement, A Cross – Country Study."**

Maskay, B. (2007), **"Analyzing the Effect of Change in Money Supply on Stock Prices,"** Illinois Wesleyan University.

Michailidis, G. Tsopoglou, S. Papanastasiou, D. and Mariola, E. (2006**), "Testing The Capitals Asset Pricing Model: The Case of Emerging Greek Securities Market**," *International Research Journal of Finance and Economics.*

Mitchel, B. and Howells, P. (2007), **"Central Bank Communication, Transparency and Interest Rate Volatility: Evidence from the U.S.A,"** School of Economics, University of the West of England.

Njiforti, P.P. and Chidiogo, A. (2008), **"Speculative Bubble and the Nigerian Stock Market,"** *Journal of Social Science*,vol.1, No. 2, December, 2008 KASU, Page 214 - 232.

Qvigstad, J.F (2008), ***"*Transparency and Central Bank Communication,*"*** Speech by Mr Jan F Qvigstad (Deputy Governor) Norges Bank (Central Bank of Norway), at a seminar at the Bank of Italy, Rome, 4 November 2008.

Ranaldo, A., and Rossi, A., (2010), **"The Reaction of Asset Markets to Swiss National Bank Communication,"** *Journal of International Money and Finance*, vol. 29(3), pp. 486-503.

Reeves, R. and Sawicki, M., (2007), **"Do Financial Markets React to Bank of England Communication?"** *European Journal of Political Economy*, 23 (1), pp. 207-227.

Reddy, T.L. and Thomson R.J. (2011), **"The Capital Asset Pricing Model: Tests in Real Terms on a South African Market Portfolio Comprising Equities and Bonds,"** *November 8, 2011, South African Actuarial Journal.*

Rezessy, A. (2005), "**Estimating the Immediate Impact of Monetary Policy Shocks on the Exchange Rate and other Asset Prices in Hungary,"** MNB Occasional Paper, No. 2005/38

Rigobon, R. and Sack, B. (2004**), "The Impact of Monetary Policy on Asset Prices,"** *Journal of Monetary Economics*, Volume 51, Pp. 1553 – 1575.

Sahminan, S. (2008), **"Effectiveness of Monetary Policy Communication in Indonesia and Thailand,"** BIS Working Paper No. 262, Bank for International Settlements.

Sanusi, A.R. (2011a), **"Signaling Vs Cost - of - Fund Effects of Monetary Policy in Nigeria: Evidence from the Post Banking Sector Consolidation Data"** Presented at the 2011, Annual Conference of the Faculty of Administration, Nassarawa State University, Keffi, Nassarawa State, Nigeria, Between 17th -19th May, 2011.

Sanusi, A.R. (2011b), **"Signaling Effects of Monetary Policy in Nigeria: Evidence from the New Central Bank of Nigeria's Communication Regime:2005 - 2011"** Presented at the 52nd, Annual Conference of Nigerian Economic Society, Held at Covenant University, Ota, Ogun State, Nigeria Between September 13-15, 2011.

Taylor, B. (2005). **"An Evaluation of the Capital Asset Pricing Model,"** December 8, 2005. (http://economice.fundamentalfinance.com)

Vahamaa, S. and Aijo, J. (2010), **"The Fed's Policy Decisions and Implied Volatility,"** Department of Accounting and Finance, University of Finland.

Value Based Management (n.d), **"Capital Asset Pricing Model (CAPM),"** Retrieved September 13, 2011, from http: // www. Value based management. Net

Wakyiku, D. (2010), **"Testing the Capital Asset Pricing Model on the Uganda Stock Exchange,"** December 31, 2010, African Institute for Mathematical Sciences, South African Actuarial Journal.

APPENDIX I

A1.1 ESTIMATED EGARCH (1 1) RESULT FOR ΔASI

Dependent Variable: D(ASI)
Method: ML - ARCH (Marquardt
Date: 12/19/11 Time: 17:25
Sample(adjusted): 3 1108
Included observations: 1106 after adjusting endpoints
Convergence achieved after 52 iterations
Variance backcast: ON

	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.000539	0.000346	-1.556951	0.1195
D(ASI(-1))	0.291452	0.032522	8.961686	0.0000
D(MPR)	-0.000448	0.008050	-0.055687	0.9556
Variance Equation				
C	-4.076854	0.396266	-10.28817	0.0000
|RES|/SQR[GARCH](1)	0.413282	0.033311	12.40667	0.0000
RES/SQR[GARCH](1)	0.020526	0.023980	0.855942	0.3920
EGARCH(1)	0.567858	0.043156	13.15824	0.0000
C_t^{MP}	-0.347909	0.209264	-1.662533	0.0964

R-squared	0.059017	Mean dependent var	-0.000253
Adjusted R-squared	0.053018	S.D. dependent var	0.013750
S.E. of regression	0.013381	Akaike info criterion	-5.920212
Sum squared resid	0.196599	Schwarz criterion	-5.883984
Log likelihood	3281.877	F-statistic	9.837773
Durbin-Watson stat	2.170505	Prob(F-statistic)	0.000000

A1.2 ESTIMATED EGARCH (2 2) RESULT FOR ΔASI

Dependent Variable: D(ASI)
Method: ML - ARCH (Marquardt)
Date: 12/19/11 Time: 11:27
Sample(adjusted): 3 1108
Included observations: 1106 after adjusting endpoints
Convergence achieved after 33 iterations
Variance backcast: ON

	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.000579	0.000351	-1.650371	0.0989
D(ASI(-1))	0.286746	0.032472	8.830562	0.0000
D(MPR)	-0.000461	0.009042	-0.050934	0.9594
Variance Equation				
C	-2.299760	0.605179	-3.800132	0.0001
|RES|/SQR[GARCH](1)	0.364152	0.030615	11.89467	0.0000
RES/SQR[GARCH](1)	0.071533	0.024870	2.876217	0.0040
|RES|/SQR[GARCH](2)	-0.146784	0.063470	-2.312669	0.0207
RES/SQR[GARCH](2)	-0.094856	0.024330	-3.898679	0.0001
EGARCH(1)	1.178990	0.155681	7.573111	0.0000
EGARCH(2)	-0.423849	0.107947	-3.926462	0.0001
C_t^{MP}	-0.307141	0.175655	-1.748548	0.0804

R-squared	0.059246	Mean dependent var	-0.000253
Adjusted R-squared	0.050655	S.D. dependent var	0.013750
S.E. of regression	0.013398	Akaike info criterion	-5.918424
Sum squared resid	0.196551	Schwarz criterion	-5.868611
Log likelihood	3283.889	F-statistic	6.895983
Durbin-Watson stat	2.159593	Prob(F-statistic)	0.000000

A1.3 ESTIMATED EGARCH (3 3) RESULT FOR ΔASI

Dependent Variable: D(ASI)
Method: ML - ARCH (Marquardt)
Date: 12/19/11 Time: 12:41
Sample(adjusted): 3 1108
Included observations: 1106 after adjusting endpoints
Convergence achieved after 100 iterations
Variance backcast: ON

	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.000483	0.000330	-1.460185	0.1442
D(ASI(-1))	0.268320	0.033789	7.941048	0.0000
D(MPR)	-0.000385	0.005014	-0.076835	0.9388
Variance Equation				
C	-7.849371	1.158578	-6.775004	0.0000
|RES|/SQR[GARCH](1)	0.416728	0.043515	9.576596	0.0000
RES/SQR[GARCH](1)	0.024936	0.028605	0.871736	0.3834
|RES|/SQR[GARCH](2)	0.276627	0.044062	6.278112	0.0000
RES/SQR[GARCH](2)	0.025876	0.026088	0.991870	0.3213
|RES|/SQR[GARCH](3)	0.282849	0.053461	5.290796	0.0000
RES/SQR[GARCH](3)	-0.112632	0.036216	-3.109999	0.0019
EGARCH(1)	0.033276	0.055899	0.595288	0.5517
EGARCH(2)	-0.434760	0.036023	-12.06903	0.0000
EGARCH(3)	0.588800	0.051642	11.40154	0.0000
C_t^{MP}	-0.403793	0.133971	-3.014039	0.0026

R-squared	0.060695	Mean dependent var	-0.000253
Adjusted R-squared	0.049513	S.D. dependent var	0.013750
S.E. of regression	0.013406	Akaike info criterion	-5.945688
Sum squared resid	0.196248	Schwarz criterion	-5.882289
Log likelihood	3301.966	F-statistic	5.427845
Durbin-Watson stat	2.118929	Prob(F-statistic)	0.000000

APPENDIX II

A2.1 ESTIMATED EGARCH (1 1) RESULT FOR ΔBINDEX

Dependent Variable: D(BINDEX)
Method: ML - ARCH (Marquardt)
Date: 12/19/11 Time: 13:18
Sample(adjusted): 4 474
Included observations: 471 after adjusting endpoints
Convergence achieved after 37 iterations
Variance backcast: ON

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.000349	0.000680	0.513530	0.6076
D(BINDEX(-1))	0.530107	0.048641	10.89843	0.0000
D(BINDEX(-2))	-0.190720	0.049610	-3.844384	0.0001
D(MPR)	0.004251	0.009413	0.451611	0.6515
Variance Equation				
C	-0.464339	0.209060	-2.221080	0.0263
|RES|/SQR[GARCH](1)	0.127903	0.049007	2.609891	0.0091
RES/SQR[GARCH](1)	0.047182	0.027235	1.732407	0.0832
EGARCH(1)	0.957258	0.022781	42.02016	0.0000
C_t^{MP}	-0.339955	0.195006	-1.743305	0.0813

R-squared	0.283760	Mean dependent var	0.000403
Adjusted R-squared	0.271358	S.D. dependent var	0.018471
S.E. of regression	0.015767	Akaike info criterion	-5.513848
Sum squared resid	0.114858	Schwarz criterion	-5.434456
Log likelihood	1307.511	F-statistic	22.87943
Durbin-Watson stat	1.858866	Prob(F-statistic)	0.000000

A2.2 ESTIMATED EGARCH (2 2) RESULT FOR ΔBINDEX

Dependent Variable: D(BINDEX)
Method: ML - ARCH (Marquardt)
Date: 12/19/11 Time: 13:20
Sample(adjusted): 4 474
Included observations: 471 after adjusting endpoints
Convergence achieved after 77 iterations
Variance backcast: ON

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.000566	0.000701	0.807789	0.4192
D(BINDEX(-1))	0.536921	0.048153	11.15024	0.0000
D(BINDEX(-2))	-0.194544	0.050056	-3.886517	0.0001
D(MPR)	0.004363	0.007758	0.562342	0.5739
Variance Equation				
C	-0.868683	0.374062	-2.322297	0.0202
|RES|/SQR[GARCH](1)	0.115280	0.067549	1.706610	0.0879
RES/SQR[GARCH](1)	-0.017504	0.050024	-0.349902	0.7264
|RES|/SQR[GARCH](2)	0.128331	0.070893	1.810208	0.0703
RES/SQR[GARCH](2)	0.104344	0.044990	2.319255	0.0204
EGARCH(1)	0.074690	0.111223	0.671527	0.5019
EGARCH(2)	0.845690	0.113681	7.439174	0.0000
C_t^{MP}	-0.497566	0.264393	-1.881916	0.0598
R-squared	0.284253	Mean dependent var		0.000403
Adjusted R-squared	0.267100	S.D. dependent var		0.018471
S.E. of regression	0.015813	Akaike info criterion		-5.508936
Sum squared resid	0.114778	Schwarz criterion		-5.403080
Log likelihood	1309.354	F-statistic		16.57165
Durbin-Watson stat	1.872512	Prob(F-statistic)		0.000000

A2.3 ESTIMATED EGARCH (3 3) RESULT FOR ΔBINDEX

Dependent Variable: D(BINDEX)
Method: ML - ARCH (Marquardt)
Date: 12/19/11 Time: 13:23
Sample(adjusted): 4 474
Included observations: 471 after adjusting endpoints
Convergence achieved after 117 iterations
Variance backcast: ON

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.000362	0.000691	0.524196	0.6001
D(BINDEX(-1))	0.552589	0.048280	11.44543	0.0000
D(BINDEX(-2))	-0.194745	0.048185	-4.041650	0.0001
D(MPR)	0.006059	0.007153	0.847005	0.3970
Variance Equation				
C	-0.707755	0.393791	-1.797288	0.0723
|RES|/SQR[GARCH](1)	0.095763	0.074474	1.285856	0.1985
RES/SQR[GARCH](1)	0.089251	0.045832	1.947366	0.0515
|RES|/SQR[GARCH](2)	0.123231	0.069919	1.762488	0.0780
RES/SQR[GARCH](2)	0.029695	0.056914	0.521741	0.6019
|RES|/SQR[GARCH](3)	-0.004633	0.066851	-0.069303	0.9447
RES/SQR[GARCH](3)	-0.029064	0.049234	-0.590324	0.5550
EGARCH(1)	0.802250	0.060541	13.25135	0.0000
EGARCH(2)	-0.736149	0.074903	-9.827974	0.0000
EGARCH(3)	0.870827	0.058973	14.76664	0.0000
C_t^{MP}	-0.402880	0.170104	-2.368438	0.0179

R-squared	0.285595	Mean dependent var	0.000403
Adjusted R-squared	0.263662	S.D. dependent var	0.018471
S.E. of regression	0.015850	Akaike info criterion	-5.511419
Sum squared resid	0.114563	Schwarz criterion	-5.379098
Log likelihood	1312.939	F-statistic	13.02096
Durbin-Watson stat	1.909198	Prob(F-statistic)	0.000000

APPENDIX III

A3.1 ARCH LM TEST RESULT FOR MODEL 1 (ASI)

ARCH Test:

F-statistic	0.175322	Probability	0.675506
Obs*R-squared	0.175612	Probability	0.675171

Test Equation:
Dependent Variable: STD_RESID^2
Method: Least Squares
Date: 12/19/11 Time: 02:51
Sample(adjusted): 4 1108
Included observations: 1105 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.993499	0.076193	13.03917	0.0000
STD_RESID^2(-1)	0.012607	0.030108	0.418715	0.6755

R-squared	0.000159	Mean dependent var	1.006176
Adjusted R-squared	-0.000748	S.D. dependent var	2.323398
S.E. of regression	2.324266	Akaike info criterion	4.526494
Sum squared resid	5958.641	Schwarz criterion	4.535558
Log likelihood	-2498.888	F-statistic	0.175322
Durbin-Watson stat	2.000492	Prob(F-statistic)	0.675506

A3.2 ARCH LM TEST RESULT FOR MODEL 2 (BINDEX)

ARCH Test:

F-statistic	0.147200	Probability	0.701400
Obs*R-squared	0.147782	Probability	0.700664

Test Equation:
Dependent Variable: STD_RESID^2
Method: Least Squares
Date: 12/19/11 Time: 02:51
Sample(adjusted): 5 474
Included observations: 470 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.015781	0.079366	12.79873	0.0000
STD_RESID^2(-1)	-0.017735	0.046226	-0.383666	0.7014

R-squared	0.000314	Mean dependent var	0.998022
Adjusted R-squared	-0.001822	S.D. dependent var	1.396407
S.E. of regression	1.397679	Akaike info criterion	3.511749
Sum squared resid	914.2408	Schwarz criterion	3.529420
Log likelihood	-823.2610	F-statistic	0.147200
Durbin-Watson stat	1.999244	Prob(F-statistic)	0.701400