STOCK MARKETS ANALYSIS

Effect of Stock Information on the Efficiency of the Nigeria Capital Market

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Abstract

The study empirically investigates the effect of Stock Information on the Efficiency of the Nigeria Capital Market. It examined the major participants (Nigeria Stock Exchange, Stock brokers, Professional accountants and Academics), Random Walk Theory of share price movement and levels of Efficient Market Hypothesis.

Survey Questionnaire was employed to collect data. A multi-stage sampling technique was used in a total sample size of eighty-two (82). This study used the descriptive statistics (frequency distribution and percentages) and the null hypothesis (H_0) was tested using the Chi-square (χ^2) and Analysis of Variance (ANOVA) with a 5% error term.

The study found out that Stock Information has contributed to the Efficiency of the Nigeria Capital Market to a great extent and that the differences in the mean values of the sample is not significant and has risen due to fluctuations in simple sampling. Analysis of Variance (ANOVA) of the data collected revealed that the level of efficiency of the Nigeria Capital Market is weak.

The Nigeria Capital Market should educate and enlighten the investors on the workings and technicalities of the market, introduce new products that will enhance liquidity, make sure that its rules are adequate, relevant and up-to-date and review all internal structures to improve efficiency and service delivery.

Keywords: Nigeria capital market; Nigeria Stock Exchange; stock brokers; descriptive statistics; stock information; liquidity

1 Introduction

1.1 Background to the study

Capital market is an integral aspect of the financial system that provides an efficient delivery mechanism for management to mobilize, allocates and distribute long-term funds. It is the interaction of financial institutions and infrastructure that mobilize and allocate long-term funds for the economy of a nation.

Stock market efficiency causes existing share prices to always incorporate and reflect all relevant information, hence, it is impossible for investors to "beat the market". According to the Efficient Market Hypothesis (EMH), Stocks always trade at their "fair value". This however made it impossible for investors to either purchase low or under- valued stocks or sell stocks at higher or inflated prices. As such, expert in stock selection or market timing is impossible to outperform the overall market (Investopedia, n.d.).

There are few assumptions for a market to be efficient: large number of investors to analyze and value securities for profit, Stock prices should reflect and adjust quickly to new and all available information and new information comes into the market independently from other news in a random fashion. However, financial theories are subjective. In other words, there are no proven laws in finance, but rather ideas that try to explain how the market works (Investopedia, n.d.). The idea behind the efficient market hypothesis or as it is also called random walk theory, is that, information is unpredictable and random. That is, stock prices moves unpredictably.

Let us assume that a formula with great confidence predicts that the share price of company which is currently one hundred Naira (N100), will rise dramatically in four (4) days to one hundred and twenty Naira (N120). We expect investors to take advantage of the forthcoming increase in the stock price and therefore, it will be hard to sell. The net effect would be an immediate jump in the stock price until it reaches the predicted price of N120. Thus, the forecast of a future price increase leads to an immediate price increase. In other words, the stock price will immediately reflect the "good news" implicit in the forecast and it leads to an improvement in the current performance, as all market participants get in on the action before the price increases. This notion that the price of stocks reflect all the publicly available information is referred to as the Efficient Market Hypothesis (EMH) or the Random Walk Theory.

Efficient Market Hypothesis was first developed by Eugene Fama in 1960. According to the theory, it is believed that the security markets are extremely efficient in reflecting all the available information about the individual stocks and about the stock market as a whole. Thus, as soon as the new information arises, it will be fully incorporated into the prices of the securities.

More dramatic responses to new information may be found in the intra-day price movement. For instance; stock price response to corporate dividend, earnings announcements, mergers, acquisitions, manipulation, etc. is found to distort market efficiency measures (such as market capitalization, value traded ratio and All-Share Index) and genuine traders are forced to exit the market to avoid possible trading. Such huge divestment and the subsequent financial risk weaken the ability of the Stock Exchange market to improve economic performance (Journal of Economic Structures, 2020).

There are three (3) major versions of Efficient Market Hypothesis: Weak, Semi-strong and Strong.

The Weak form of EMH claims that prices on traded assets (e.g. stocks, bonds or property) already reflect "past" publicly available information and price instantly change to reflect new public information. The Semi-strong form of the EMH ascertains both, that prices reflect all publicly available information and prices instantly change to reflect new public information. The strong form of the EMH additionally claims that prices reflect even hidden or "insider" information. It is pertinent to note that total number of traded values does not always determine market efficiency.

According to the Random Walk Theory, neither technical analysis, which is the study of the past stock prices in an attempt to predict the future prices, nor fundamental analysis, which is a study of the overall financial health of the economy, industries and the business of the companies, would enable an investor to outperform the market. Any attempts to outperform the market are essentially a "game of chance" rather than one of "skill".

However, the theory has met with a lot of opposition. However, critics have blamed the belief in rational markets for much of the late 2000s financial assets (Fox, 2009; Nocera, 2009). In response, proponents of the hypothesis have stated that market efficiency does not mean having no uncertainty about the future, that market efficiency is a simplification of the world which may not always hold

true, and that the market is practically efficient for investment purposes for most individuals (Lowenstein, 2009).

Considering other views on Efficiency Market Hypothesis; even though you believe that investors have access to all the available information, it may not be true that all investors perceive that information in precisely the same manner. This always leads to different growth predictions for the company and its share price.

More often than not, market participants get over optimistic or extremely negative when news hit them. It is this very difference of perception which causes companies to become undervalued and overvalued. Those who believe in value investing try to spot these opportunities and exploit the market inefficiencies.

1.2 Statement of the problem

The function of the Capital market in the transformation of an economy cannot be over-emphasized as the market forms the nucleus of a nation's growth process. The Capital market plays a vital role in the mobilization of long term funds and the optimal allocation of resources for investment and productive purposes, aimed at stimulating industrial and economic development. Thus, the ability of a nation to mobilize savings and transform such savings into investment depends on the kind of Capital market in existence in that country.

The Nigeria capital market has not witnessed obvious transformation over the years. However, the Nigeria Capital Market, since inception, has experienced lots of problems (e.g. paucity of tradable shares and global financial crisis), which had hindered its operational capabilities. More so, the extent of efficiency or inefficiency of this market is yet to be convincingly determined as previous studies in this regard employed methods that have been shown to have certain weaknesses. It is against this background that this study ascertained several options whether the efficiency level of the Nigeria Capital market is strong enough to lead to Nigeria's economic growth and development.

1.3 Aim and objectives

The purpose of the study is to examine the effect of Stock market information on the efficiency of the Nigeria Capital Market. Other Specific Objectives are to:

1. To determine whether investors use historical data as a tool for predicting future security prices;
2. To examine the speed of adjustment of stock prices to stock information; and
3. To evaluate the relationship between stock market performance and Nigeria economic growth.

1.4 Statement of hypotheses

The following hypotheses were formulated in the null form:

1. There is no significant and positive relationship between investors using historical data as a tool for predicting future security prices and market efficiency.
2. There is no significant and positive relationship between speed of adjustment of stock prices to stock information and ...
3. There is no significant and positive relationship between stock market performance and Nigeria economic growth.

1.5 Research questions

In order to achieve the objectives of this study, the following research questions were raised.

1. Is there any significant and positive relationship between investors using historical data as a tool for predicting future security prices and market efficiency?
2. Is there any significant and positive relationship between speed of adjustment of stock prices to stock information and ...?
3. Is there any significant and positive relationship between stock market performance and Nigeria economic growth?

1.6 Structure of the study

The paper is structured into five sections: the first section deals with the introduction, the second section reviews the literature, the third section presents the methodology, the fourth section presents the results and discussion, and the fifth section gives the conclusions and recommendations.

2 Literature review

This section deals with conception clarification, theoretical and the empirical issues. The theoretical framework enhances the overall framework of the research and deals with the theory that this study anchored on, and this is the Random Walk Theory and Efficient Market Hypothesis.

2.1 Conceptual issues

2.1.1 The evolution of the Nigeria capital market

Capital market activities in Nigeria can be said to have commenced in 1946 with the issuance of the first development stock of £300,000 (Three hundred thousand pounds sterling) by the then Colonial Administration. This took place even before the Central Bank of Nigeria (CBN) was established in 1958. The CBN and the Ministry of Finance later facilitated the establishment of the SEC and the other institutions of the Nigerian capital market. The Nigerian stock exchange came into being in 1960 as the Lagos stock exchange but started trading in 1961 with three equities, six Federal Government bonds and ten Industrial Loan making a total of nineteen listed stocks (nineteen stocks all together). It later changed its name and became the Nigerian Stock Exchange (NSE) in 1977. There are now over 200 securities listed on the NSE and the trading system has improved during this time from a manual call-over system to a screen based electronic trading system where traders transact business via the computer. The Securities and Exchange Commission (SEC) which is the apex regulator of the Capital market began in 1962. It started as the Capital Issues Committee at the CBN and later became the Capital Issues Commission in 1973 when the Capital Issues Commission Act was enacted. The name Capital Issues Commission was later changed to the Securities and Exchange Commission (SEC) in 1980 following the promulgation in 1979 of SEC decree no. 71. The law has severally been amended and it is now called the Investments and Securities Act (ISA) No. 29 of 2007. (Ifediba and Nwangene, 2022).

2.1.2 The Nigerian financial system

The financial system is made up of two major markets namely: the money market and the capital market. The money market is the short-term funds and securities, including treasury bills, one year treasury certificates, Central Bank notes, negotiable certificates of deposit, commercial papers,

commercial and merchant bank savings and investment notes and other funds of less than one-year duration. On the other hand, the Capital Market is for longer term funds and securities whose tenure extends beyond one year. These include long- term loans, mortgage bonds preference stocks, ordinary shares, federal Government bonds, industrial loans and debentures. According to Osaze (2007), capital market is a complex institution and mechanism through which intermediate funds and long-term funds are pooled and made available to business, government and individuals and instrument already outstanding are transferred. The institutions that interact within the capital market are: Insurance companies, pension found Administrators, Central Bank of Nigeria, Nigerian Stock Exchanges, Professional bodies, Corporate Affairs commission, Financial Reporting council, Ministry of Finance, Investment and securities Tribunal, market intermediaries, Investors, media, etc. these institutions which traditionally play one role or the other in the transfer of funds from saving public to users include stock exchanges stock registrars, issuing houses, stockbrokers, underwriters and security and exchange commission. Impact of Commercial Banks: Following the full capitalization of banks to a minimum of N25billion, almost all banks utilized and accessed the capital market to raise funds. Within two years, plus, many of the banks besieged the capital market more than once, falling over one another in raising funds through mega offers in a single tranche. The banks competed to suck every liquidity from the Nigerian financial system, thus overheating it. Through enticing marketing strategies, the banks succeeded in their various offers, but left the capital market place bleeding and gasping for breath. The primary market seemed to experience a boom while the secondary market was sucked dry as many investors dumped their shares in the secondary market was sucked dry as many investors achieved through bewitching marketing efforts of banks and many others.

2.2 Theoretical issues

The Efficient Market Hypothesis (EMH) states that it is impossible to "beat the Market" because stock market efficiency causes prevailing share prices to always incorporate and replicate all relevant information. According to the EMH, stocks always trade at their fair value on stock exchanges, making it impossible for investors to either purchase undervalued stocks or sell stocks for inflated prices. As such, it should be impossible to outperform the overall market through expert stock selection or market timing, and that the only way an investor can possibly obtain higher returns is by purchasing riskier investments.

The market is assumed to be efficient, based on the following: A large number of investors analyze and value securities for profit. New information comes to the market independent from other news and in a random fashion. Stock prices adjust quickly to new information. Stock prices should reflect all available information.

Financial theories are subjective. In other words, there are no proven laws in finance, but rather ideas that try to explain how the market works (Investopedia, n.d.). The idea behind the random walk theory or as it is often called - the efficient market hypothesis, is that information is unpredictable and random and accordingly stock prices also move unpredictably. Let us for a moment assume that some formula with great confidence predicts that the share price of Company X which is currently at 100 Naira will rise dramatically in three days to reach 110 Naira. What would you expect the investors to do on confirmed news like this? Clearly, they would place buy orders to take advantage of the forthcoming increase in the stock price and it would be hard to find sellers. The net effect would be an immediate jump in the stock price until it reaches the predicted price of N110. Thus, the forecast of a future price increase leads to an immediate price increase. In other words, the stock

price will immediately reflect the "good news" implicit in the forecast and it leads to an improvement in the current performance, as all market participants get in on the action before the price increase.

2.2.1 Other views on the efficient market hypothesis

Even if you believe that investors have access to all the available information. It may not be true that all investors perceive that information in precisely the same manner. This always leads to different growth predictions for the company and its share price. More often than not, market participants get over optimistic or extremely negative when news hits them. It is this very difference of perception which causes companies to become undervalued and overvalued. Those who believe in value investing try to spot these opportunities and exploit these market inefficiencies. (Ifediba and Nwangene, 2022).

2.3 Degrees of the efficient market hypothesis

2.3.1 Weak-form efficiency

In weak-form efficiency, future prices cannot be predicted by analyzing prices from the past. Excess returns cannot be earned in the long run by using investment strategies based on historical share prices or other historical data. Technical analysis techniques will not be able to consistently produce excess returns, though some forms of fundamental analysis may still provide excess returns. Share prices exhibit no serial dependencies, meaning that there are no "patterns" to asset prices. This implies that future price movements are determined entirely by information not contained in the price series. Hence, prices must follow a random walk. This 'soft' EMH does not require that prices remain at or near equilibrium, but only that market participants not be able to systematically profit from market 'inefficiencies'.

2.3.2 Semi-strong-form efficiency

In semi-strong-form efficiency, it is implied that share prices adjust to publicly available new information very rapidly and in an unbiased fashion, such that no excess returns can be earned by trading on that information. Semi-strong-form efficiency implies that neither fundamental analysis nor technical analysis techniques will be able to reliably produce excess returns. To test for semi-strong-form efficiency, the adjustments to previously unknown news must be of a reasonable size and must be instantaneous. To test for this, consistent upward or downward adjustments after the initial change must be looked for. If there are any such adjustments it would suggest that investors had Interpreted the information in a biased fashion and hence in an inefficient manner.

2.3.3 Strong-form efficiency

In strong-form efficiency, share prices reflect all information, public and private, and no one can earn excess returns. If there are legal barriers to private information becoming public, as with insider trading laws, strong-form efficiency is impossible, except in the case where the laws are universally ignored. To test for strong-form efficiency, a market needs to exist where investors cannot consistently earn excess returns over a long period of time. Even if some money managers are consistently observed to beat the market, no refutation even of strong-form efficiency follows with hundreds of thousands of fund managers worldwide, even a normal distribution of returns (as efficiency predicts) should be expected to produce a few dozen "star" performers.

2.4 Empirical review

Ewah et al. (2009) examined the effect of capital market efficiency on enhancing Nigerian economic growth. The study used time series data on interest rate, total market transaction, money supply, market capitalization, and government development stock from 1961–2004. Ordinary Least Square multiple regression estimation method was used. The study discovers that the Nigerian capital market has the what it takes to induce growth in the economy, but its contribution to the economic growth of Nigeria is minimal because of low absorptive capacity, misappropriation and illiquidity of funds, and low market capitalization. Ibi et al. (2015) assess the relationships between capital market and the development of Nigerian industrial sector. Duke and Nkamare (2015) tried in investigating the performance of the Nigeria capital market on the economic growth of Nigeria from 1986 to 2005. Secondary source of data was used for data collection. A multiple regression analysis using ordinary least squares estimation technique was employed to investigate the composite impact of capital market indices such as equities, industrial stocks, and government stocks on the development of the economy for the past twenty years. The findings further shows that none of the predictor variables, individually predicted Gross Domestic Product. Despite the ample opportunities created by the ongoing reforms and the booming economy, the capital market in Nigeria has performed below its expectation. Many attempts have been made by various scholars to examine the impacts of financial risks as well as stock market efficiency on economic growth (Batuo et al. 2018; Belcaid and El Ghini 2019; Boamah 2017; Kirikkaleli 2019; Kirikkaleli and Gokmenoglu 2019; Numapau 2018; Nyasha and Odhiambo 2017; Zhang et al. 2016). Bencivenga and Smith (1991) incorporated multiple assets into an endogenous growth model; the idea was to examine the reaction of economic growth indicators to every shift in financial intermediation levels. The authors asserted that an efficient stock market lessens socially unnecessary liquidation of capital, thereby creating a positive long-run effect on economic performance. Agarwal and Mohtadi (2004) reviewed 21 developing economies using a dynamic panel method over 21 years and reported a positive correlation between various stock market indicators (market capitalization ratio and shares traded ratio), and economic growth. Their results indicate that efficient stock markets improve private investment behaviours. In a similar vein et al. (2014) investigated the long-run association of Nigeria stock market performance and economic growth using the Vector Error Correction Model. The authors reported that stock market efficiency causes GDP growth but with feedback effect. By using ordinary least square (OLS) techniques et al. (2012) evaluated the role of Nigeria stock market efficiency on economic growth from 1994 to 2008. Their study adopted market capitalization as a proxy for stock market size and turnover ratio for market liquidity. Alajekwu and Achugbu found that market capitalization negatively correlates with economic growth while turnover ratio had a significant positive correlation with economic growth. The study of Onakoya (2013) examined the relative influence of stock market volatility on economic performance using Exponential Generalized Autoregressive Conditional Heteroscedasticity (EGARCH). Onakoya's study revealed that persistent volatility shock in the Nigerian Stock Exchange created a distortion between 1980 and 2010, and negatively impacted on economic growth. While existing empirical studies (Cournède and Denk 2015; Madsen and Ang 2016; Asteriou and Spanos 2019) may have adopted distinct approaches and measures to illustrate stock market–growth nexus, there appears to be a consensus in two particular areas. First, unlawful market practices widen financial risks in the stock market, in terms of market volatility, declined capitalization and equity volatility (Zhang et al. 2016). Secondly, stock market risk tolerance capacity plays a positive role in furthering economic growth (Zhang et al. 2016). Needless to say, that, the prevalence of unfair trading practices undermines risk tolerance capacity especially if detection and prosecution policies are unresponsive (Wei 2014). In this vein, financial risks ultimately translate into economic risks. In

effect, manipulation directly constitutes a financial risk and indirectly an economic risk, with a strong likelihood to impair economic performance during and after the manipulation period. Essentially, risk tolerance capacity mediates the ability of stock markets to trigger economic growth. It is not surprising, that well-developed markets (with robust risk tolerance capacity) achieve economic recovery rather quickly following economic crisis.

Given that stock market volatility is a good measure of stock market risk tolerance capacity, empirical studies (such as Lin and Huang 2012; Yeh et al. 2013; Huang et al. 2014) have prevalently examined the interaction between financial risk and economic growth by focusing on the volatility of financial structure. Huang et al. (2014), for instance, report the significant effect of financial development volatility on industrial growth instability. They found a positive association between the two variables. Similarly, the findings in Yeh et al. (2013) reveal that financial structure co-integrates with its volatility as well as economic growth. Rather than focusing on the financial structure volatility, Zhang et al. (2016) capture the effects of both the financial system and financial risk tolerance capacity on economic growth. The authors' panel unit root tests and co-integration analysis reveal a stable long-run association between financial risk tolerance capacity and economic growth. Also, using a two-step system Generalized Method of Moments (GMM), Zhang et al. (2016) find a negative effect of risk tolerance capacity on growth but a positive effect of the lagged risk tolerance capacity on growth. This finding is insightful and particularly suggests that a higher risk tolerance capacity energizes the economy to cushion economic risks. And this is a good pre-condition for growth. Based on the empirical findings above, this research will examine the following hypothesis; stock market efficiency has no significant impact on economic growth in Nigeria between 2002 and 2016, and stock market efficiency has a significant impact on economic growth in Nigeria between 2002 and 2016.

3 Methodology

3.1 Design of the study

This study used the Survey and Descriptive Statistics which involves:

1. Gathering data from member of a sample that represent the target population
2. Obtaining data directly from subject respondents
3. Using of questionnaire and interviews to collect primary data
4. Using secondary information to confirm some details

The descriptive statistical tools used were frequency distributions, percentages and tables. The null hypotheses were analyzed using Chi-square (χ^2) and Analysis of Variance (ANOVA) for measuring the effect of capital market in business organizations in Nigeria.

3.2 Research population

The population comprised of key players in the Nigerian Stock Market industry. A multi-stage sampling technique was used to select four categories of people and firms relevant to the study. They are the Nigeria Stock Exchange (NSE), Stock Broking firms, Professional accountants, and Academicians. These included twenty-seven (27) staff from Nigerian Stock Exchange, eighteen (18) from Stock Broking firms, twenty-five (25) from Professional Accountants, and thirty-six (36) from the academia making a total population of one hundred and six (106).

3.3 Sample size and sampling technique

The sampling size is eighty-two (82) (Table 2). A multi-stage sampling technique was used to select four categories of people and firms relevant to the study.

3.4 Sources of data

The data of this study were gathered from both the top management staff and the junior staff of the Nigerian Stock Exchange. It comprises of key players in Nigerian stock market industry. They are the Nigeria Stock Exchange (NSE), Stock Broking firms, Professional accountants, and Academicians. Data were collected through primary and secondary sources.

The primary data were collected through (a) questionnaires, (b) personal interviews and (c) observation. The secondary data are relevant information extracted from journals, literature, Central Bank bulletins and other publications of the Nigerian Stock Exchange.

3.5 Research instrument

The instrument for data collection was the questionnaire and interviews comprising face-to-face and telephone.

3.6 Questionnaire design

Fixed response semi structured questionnaire that contained close and open-ended questions were put forward to the respondents. A self-administered questionnaire was used to collect data from the listed organizations as data collected from such facilitates data analysis and estimation of the validity and reliability indices of the instrument.

3.7 Questionnaire distribution and collection

Questionnaires were administered to a wide range of randomly selected individuals' employees of the Nigerian Capital market. A total of 106 questionnaires were administered and 82 were collected from the various respondents. The questionnaires administered and the respondents are shown in Tables 1 and 2.

Table 1. Questionnaires administered.

Organisation	Population
NSE	27
Stock broking firms	18
Professional accountants	25
Academia	36
Total	106

NSE, Nigerian Stock Exchange.

Table 2. Questionnaire respondents.

Organisation	Sample
NSE	22
Stock broking firms	12

Organisation	Sample
Professional accountants	17
Academia	31
Total	82

NSE, Nigerian Stock Exchange.

3.8 Method of data analysis

3.8.1 Chi-square test

The chi-square (χ^2) statistic is calculated as:

$$\chi^2 = \sum \frac{\left(O - E\right)^2}{E} \quad (1)$$

where O refers to the observed frequencies and E to the expected frequencies. The expected frequencies are calculated as:

$$E_{ij} = \frac{RT \times CT}{N} \quad (2)$$

where RT is the row total for the row containing the cell, CT is the column total for the column containing the cell, N is the total number of observations, and ij denotes the intersection of rows and columns.

The chi-square is calculated with v degrees of freedom, $v = (r - 1)(c - 1)$, where r is the number of rows and c the number of columns, at a level of significance of 5%. To test the hypothesis, the calculated χ^2 is compared with the tabulated χ^2 for the given degrees of freedom at the specified level of significance.

If at the stated level (generally 5% level is selected), the calculated value of Chi-square (χ^2) is more than the table value of Chi-square (χ^2), the difference between theory and observation is considered to be significant, i.e. it could not have arisen due to fluctuations of simple sampling. Hence H_o accepted.

If, on the other hand, the calculated value of Chi-square (χ^2) is less than the table value of Chi-square (χ^2), the difference between theory and observation is not considered as significant, i.e. it is regarded as due to fluctuations of simple sampling and hence ignored. Hence, H_0 is ignored. Therefore, H_1 accepted.

3.8.2 Analysis of variance

In the analysis of variance (ANOVA), data are classified according to only one criterion (one-way classification). The hypotheses are:

H_0: the arithmetic means of the populations from which the k samples were randomly drawn are equal to one another, i.e. $\mu_1 = \mu_2 = \mu_3 = \ldots = \mu_k$.

H_1: the arithmetic means of the populations from which the k samples were randomly drawn are not equal to one another, i.e. $\mu_1 \neq \mu_2 \neq \mu_3 \neq \ldots \neq \mu_k$.

The steps in carrying out the analysis are as follows.

Step 1. Calculate the variance between the samples: (a) calculate the mean of each sample, $\bar{X}_1$, $\bar{X}_2$, $\bar{X}_3$, etc.; (b) calculate the grand average:

$$\bar{\bar{X}} = \frac{\bar{X}_1 + \bar{X}_2 + \bar{X}_3 + \cdots}{N} \tag{3}$$

(c) calculate the differences between the means of the various samples and the grand average, ($\bar{X}_1 - \bar{\bar{X}}$), ($\bar{X}_2 - \bar{\bar{X}}$), ($\bar{X}_3 - \bar{\bar{X}}$), etc.; (d) square these differences and obtain the total, which is the sum of squares (SS) between the samples:

$$SS = \sum \left(\bar{X}_1 - \bar{\bar{X}}\right)^2 + \sum \left(\bar{X}_2 - \bar{\bar{X}}\right)^2 + \cdots + \sum \left(\bar{X}_k - \bar{\bar{X}}\right)^2 \tag{4}$$

(e) divide the total obtained in step (d) by the degrees of freedom, $v = k - 1$, where k is the number of samples.

Step 2. Calculate the variance within the samples (SSE), which measures the differences due to chance only:

$$SSE = \frac{\sum_{j=1}^{k} \sum_{i=1}^{n} \left(X_{ij} - \bar{X}_j\right)^2}{v} \tag{5}$$

where the degrees of freedom are $v = n - k$, k is the number of samples and n the total number of observations.

Step 3. Calculate the ratio F:

$$F = \frac{\text{between-column variance}}{\text{within-column variance}} = \frac{S_1^2}{S_2^2} \tag{6}$$

If there is no real difference from group to group, any sample difference will be explainable by random variation and the variance between groups should be close to the variance within groups. However, if there is a real difference between the groups, the variance between groups will be significantly larger than the variance within groups.

Step 4. Compare the calculated value of F with the table value of F for the degrees of freedom at the chosen level of significance (generally 5%). If the calculated value of F is greater than the table value, the difference in sample means is significant, i.e. it could not have arisen due to fluctuations of simple sampling; in other words, the samples do not come from the same population. If the calculated value of F is less than the table value, the difference is not significant and has arisen due to fluctuations of simple sampling.

3.9 Hypothesis

The following null hypothesis was formulated and tested:

H_0: Information has not greatly contributed to the efficiency of the Nigerian capital market.

4 Results and discussion

4.1 Data presentation

106 questionnaires administered and 82 responded: representing 22 staff from the Nigerian Stock Exchange (NSE), 12 stock brokers, 17 from professional accountants and 31 academicians involved in stock market. The findings are summarized from primary and secondary sources, presented in tables, frequencies, mean, percentage and Chi-square Likert scale analysis.

The demographic features are presented using simple frequencies, showing respondents' years of participation and sex of respondents. Cross tabulations were used on the demographics. They strictly and simply give us an insight into the nature of our sample. But do not in any way answer our research objectives.

4.2 Response rate

The response rate is shown in Table 3.

Table 3. Response rate of respondents.

Item	Value
Questionnaires distributed	106
Questionnaires collected	82
Response rate (%)	77.36

Source: primary data.

4.3 Distribution of respondents by gender

The distribution of the respondents by gender is shown in Table 4.

Table 4. Frequency distribution of respondents by gender.

Gender	Frequency	Percentage	Cumulative percentage
Male	61	74.39	74.39
Female	21	25.61	100.00
Total	82	100.00	

Source: primary data.

Majority of respondents were male (74.39%), indicating the need to bring more women on board participate in the growing financial sector and more specifically the Stock Exchange Industry.

4.4 Years of participation in the stock market

The years of participation of the respondents in the stock market are shown in Table 5.

Table 5. Frequency distribution of years of participation of respondents.

Years of participation	Frequency	Percentage	Cumulative percentage
Less than 5 years	23	28.05	28.05
6–10 years	38	46.34	74.39

Years of participation	Frequency	Percentage	Cumulative percentage
Above 10 years	21	25.61	100.00
Total	82	100.00	

Source: primary data.

A majority of the respondents (46.34%) stated that they had participated in the Nigerian Stock Market for 6-10 years. This reveals that there is reasonable growth in the commercial stock exchange in Nigeria due to government commitment.

4.5 Analysis of data according to the research questions

The respondents' views on the efficiency of the Nigerian capital market are shown in Table 6.

Table 6. Frequency distribution of respondents' views on the efficiency of the Nigerian capital market.

Response	Frequency	Percentage
Yes	46	56.10
No	36	43.90
Total	82	100.00

Source: field survey, 2015.

From Table 6, 56.10% of the respondents said the Nigerian capital market is efficient while 43.90% said it is not. The respondents' views on the level of efficiency are shown in Table 7.

Table 7. Frequency distribution of respondents' views on the level of efficiency of the Nigerian capital market.

Level	Frequency	Percentage
Weak form	55	67.07
Semi-strong form	20	24.39
Strong form	7	8.54
Total	82	100.00

Source: field survey, 2015.

From Table 7, 67.07% of the respondents are of the opinion that the level of efficiency of the Nigeria capital market is the weak form, while 24.39% and 8.54% of the respondents said it is the semi-strong form and strong form, respectively.

4.6 Test of hypothesis

H_0: Information has not contributed to the efficiency of the Nigerian capital market to a great extent.

4.6.1 Chi-square calculation

The observed frequencies of the responses on the effect of information on operational, allocational and pricing efficiency are given in Table 8.

Table 8. Responses on the effect of information on the efficiency of the Nigerian capital market, taking into consideration operation, allocation and pricing.

Response	Operational	Allocation	Pricing	Total
Strongly agree	28	33	40	101
Agree	31	25	24	80
Not sure	10	11	8	29
Disagree	7	9	6	22
Strongly disagree	5	1	2	8
Total	81	79	80	240

The chi-square statistic is calculated with equations (1) and (2), with $N = 240$. From Table 8, for example, $E_{11} = (81 \times 101)/240 = 34.0875$ and $E_{12} = (79 \times 101)/240 = 33.2458$. The expected frequencies are given in Table 9 and the calculation of χ^2 in Table 10.

Table 9. Expected frequencies.

Response	Operational	Allocation	Pricing
Strongly agree	34.0875	33.2458	33.6667
Agree	27.0000	26.3333	26.6667
Not sure	9.7875	9.5458	9.6667
Disagree	7.4250	7.2417	7.3333
Strongly disagree	2.7000	2.6333	2.6667

Table 10. Calculation of the chi-square statistic.

O	E	$(O - E)^2$	$(O - E)^2/E$
28	34.0875	37.0577	1.0871
33	32.2458	0.5688	0.0176
40	33.6667	40.1107	1.1914
31	27.0000	16.0000	0.5926
25	26.3333	1.7777	0.0675
24	26.6667	7.1113	0.2667
10	9.7875	0.0452	0.0046
11	9.5458	2.1147	0.2215
8	9.6667	2.7779	0.2874
7	7.4250	0.1806	0.0243
9	7.2417	3.0916	0.4269
6	7.3333	1.7777	0.2424
5	2.7000	5.2900	1.9593
1	2.6333	2.6677	1.0131

O	E	$(O - E)^2$	$(O - E)^2/E$
2	2.6667	0.4445	0.1667
Total			$\chi^2 = 7.5691$

From Table 10, the calculated $\chi^2 = 7.5691$. The degrees of freedom are $v = (r - 1)(c - 1) = (5 - 1)(3 - 1) = 8$, where $r = 5$ rows and $c = 3$ columns. At the 5% level of significance and $v = 8$, the tabulated $\chi^2_{0.05} = 15.5$.

4.6.2 *Chi-square decision rule*

If at the stated level (generally 5% level is selected), the calculated value of χ^2 is more than the table value of χ^2, the difference between theory and observation is considered to be significant, i.e. it could not have arisen due to fluctuations of simple sampling. Hence H_0 accepted.

If, on the other hand, the calculated value of χ^2 is less than the table value, the difference between theory and observation is not considered as significant, i.e. it is regarded as due to fluctuations of simple sampling and hence ignored. Hence, H_0 is ignored. Therefore, H_1 accepted.

The calculated value of χ^2 (7.6) is less than the table value (15.5). The null hypothesis is ignored. Therefore, the alternative H_1 is accepted. Hence, information has contributed to the efficiency of the Nigerian capital market to a great extent.

4.7 Analysis of variance

ANOVA is used to test whether the means of more than two quantitative populations are equal. It is determined whether the given classification is important in affecting the results. It provides us with meaningful comparisons of sample data which are classified according to two or more variables.

The purpose is to test the significant of the differences among sample means using Ƒ-test mechanisms. In this way, the significant values of Ƒ indicate that the means are significantly different from one another.

The ANOVA was carried out on the data in Table 8 to test the null hypothesis H_0: $\mu_1 = \mu_2 = \mu_3 = \ldots = \mu_k$ against H_1: $\mu_1 \neq \mu_2 \neq \mu_3 \neq \ldots \neq \mu_k$.

4.7.1 *Step 1: Variance between the samples*

The calculation of the variance between the samples is shown in Table 11 (Op, operation; Alloc., allocation; Pric., pricing).

Table 11. Calculation of the variance between the samples.

Response	Op (X_1)	Alloc. (X_2)	Pric. (X_3)	$(\bar{X}_1 - \bar{\bar{X}})^2$	$(\bar{X}_2 - \bar{\bar{X}})^2$	$(\bar{X}_3 - \bar{\bar{X}})^2$
Strongly agree	28	33	40	43.56	38.44	40.96
Agree	31	25	24	43.56	38.44	40.96
Not sure	10	11	8	43.56	38.44	40.96
Disagree	7	9	6	43.56	38.44	40.96
Strongly disagree	5	1	2	43.56	38.44	40.96
Total	81	79	80	217.80	192.20	204.80

Response	Op (X_1)	Alloc. (X_2)	Pric. (X_3)	$(\bar{X}_1 - \bar{\bar{X}})^2$	$(\bar{X}_2 - \bar{\bar{X}})^2$	$(\bar{X}_3 - \bar{\bar{X}})^2$
Mean	16.2	15.8	16.0			

The grand average is $\bar{\bar{X}} = (16.2 + 15.8 + 16)/5 = 48/5 = 9.6$. The total sum of squares (SS) between the samples is 217.80 + 192.20 + 204.80 = 614.80, with $v = k - 1 = 3 - 1 = 2$ degrees of freedom ($k = 3$ samples). The mean sum of squares between the samples (columns) is 614.80/2 = 307.4.

4.7.2 Step 2: Variance within the samples

The sum of squares within the samples (rows) (SSE) measures the differences due to chance only; its calculation is shown in Table 12.

Table 12. Calculation of the variance within the samples.

Response	Op	Alloc.	Pric.	$(X_1 - \bar{X}_1)^2$	$(X_2 - \bar{X}_2)^2$	$(X_3 - \bar{X}_3)^2$
Strongly agree	28	33	40	139.24	295.84	576.00
Agree	31	25	24	219.04	84.64	64.00
Not sure	10	11	8	38.44	23.04	64.00
Disagree	7	9	6	84.64	46.24	100.00
Strongly disagree	5	1	2	125.44	219.04	196.00
Total	81	79	80	606.80	668.80	1000.00
Mean	16.2	15.8	16.0			

The degrees of freedom are $v = n - k = 15 - 3 = 12$, where k is the number of samples and n the total number of observations. The sum of squares within the samples is SSE = 606.80 + 668.80 + 1000.00 = 2275.60, and the mean sum of squares within the samples is 2275.60/12 = 189.63. The results are summarised in Table 13.

Table 13. Analysis of variance.

Source of variation	Sum of squares	Degrees of freedom	Mean square
Between samples	614.80	2	307.40
Within samples	2275.60	12	189.63
Total	2890.40	14	497.03

4.7.3 Step 3: Ratio F

F = between-column variance/within-column variance = 614.80/2275.60 = 0.27.

If there is no real difference from group to group, any sample difference will be explainable by random variation and the variance between groups should be close to the variance within groups. However, if there is a real difference between the groups, the variance between groups will be significantly larger than the variance within groups.

4.7.4 Step 4: Comparison with the table value of F

The table value of F for $v_1 = 2$ and $v_2 = 12$ at the 5% level of significance is 3.89. Here, the calculated value of F (0.27) is less than the table value (3.89); hence the difference in the mean values of the

samples is not significant and has arisen due to fluctuations of simple sampling, i.e. the samples could have come from the same population.

4.8 Limitations of the study

Some respondents feared to disclose information to the researchers for they are not always aware of the purpose of the information required. Some respondents did not provide the information which was vital to the study. This was overcome by getting an introductory letter from National Mathematical Centre (NMC) which assured the respondents that this was a typically academic research. Hence information was availed with minimum fear.

There was insufficient time provided for an in-depth study. As a result of limited time, the researcher was not able to get all the would-be respondents. However, this was solved by prioritizing this research until it is accomplished compared to other tasks.

Non-response: some companies and individuals had no time to answer the questionnaires especially if they thought it was time consuming. This was solved by designing questionnaires in a manner that prompted fast response.

5 Conclusions and recommendations

5.1 Conclusions

The following conclusions were reached from the findings of the study:

1. The results of the study are consistent with the reports of Adelegan (2008) which disclosed that the Nigeria Capital Market is in the weak form level of efficiency. This is premised on the following:

Operations of the market are not transparent. There are instances of insider tradings, deceptions, complacencies by NSE officials in enforcing rules, delay in issuance of certificates and in dividend declarations, exploitative fees by brokers and other market makers (Anonymous, 2008).

There are instances of stocks over-valuation and 'cooked' accounting books as in the case of Cadbury Nigeria Plc. (Oluba, 2008, Ryan, 2006).

2. Information has a helpful effect on the efficiency of the Nigeria Capital market. A market is said to be efficient when security prices fully reflect all available information. This means that the price stock is directly proportional to the influx of information.
3. An efficient market holds profound implications for investors, companies and regulators.

5.2 Recommendations

To enhance the efficiency of the Nigeria Capital Market, it is recommended that the Nigeria Capital Market should educate and enlighten the investors on the workings and technicalities of the market, introduce new products that will enhance liquidity, make sure that its rules are adequate, relevant and up-to-date and review all internal structures to improve efficiency and service delivery.

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