WEAK FORM MARKET EFFICIENCY IN BULL AND BEAR CYCLES: EVIDENCE FROM NIGERIA AND CHINA (1999-2014)

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BEING A DISSERTATION PRESENTED TO THE DEPARTMENT OF BANKING AND FINANCE, FACULTY OF MANAGEMENT SCIENCES, NNAMDI AZIKIWE UNIVERSITY, AWKA IN PARTIAL FULFILMENT FOR THE AWARD OF THE DOCTOR OF PHILOSOPHY (Ph.D.) DEGREE IN BANKING AND FINANCE

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DECLARATION

I hereby declare that this dissertation has been written by me and it is a report of my research work. It has not been presented in any previous application for diploma or degree of Nnamdi Azikiwe University, Awka or any other institution. All quotations are indicated and sources of information specifically acknowledged by means of reference.

Agbadua, O.B

APPROVAL PAGE

This dissertation titled Weak Form Market Efficiency in Bull and Bear Market Cycles: Evidence from Nigeria and China (1999-2014) meets the requirements and regulations governing the award of the degree of Doctor of Philosophy (Ph.D) in Banking and Finance of the School of Postgraduate Studies of Nnamdi Azikiwe University, Awka, Nigeria based on its contribution to knowledge and literary presentation.

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DEDICATION

This work is dedicated to the memory of my late eldest brother G.A. Agbadua.

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ABSTRACT

This study investigated the possibilities of the existence of weak form market efficiency in Nigeria and China Stock Markets. Unlike previous studies, we also investigated the existence of weak form efficiency under bull and bear market cycles. The data for this study comprises the monthly All Share Index returns, which were computed using percentage changes in monthly All Share Index obtained from the Nigerian Stock Exchange (NSE) webpage. It covered a period of 192 sampled months (i.e from January 1999 to December 2014). Data for China All Share Price Index was obtained from Fred economics webpage and it also covered 192 months (i.e from January 1999 to December 2014). The study, like other similar research on weak form efficiency in Nigeria and China adopted the popular and widely used statistical test and analysis. This includes the unit root test (ADF), Serial Autocorrelation Test, Autoregressive Test, Variance ratio test and the non-linear ARCH test. We also carried out descriptive statistical analysis to enable us understand and compare the unique statistical properties of stock return for bull and bear market cycles in Nigeria. Eview 8 econometric software was used in analysing the data. It was observed in the case of Nigeria that weak form efficiency was less pronounced under the full period of study and under the bull market cycle compare to the bear market cycle where the market tends to become more weak form efficient. Similar results were obtained in the case of china. The study therefore recommends that, since inefficiency exists in these markets, investors in both markets can take advantage of the arbitrage opportunities by buying and selling shares using the buy low and sell high profit rule.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The establishment of financial markets in developing countries including China has been greeted as beneficial and central to the domestic financial liberalization programmes of many of their governments (Yartey & Adjasi, 2007). Several International Institutions and organizations (e.g. International Monetary Fund, and World Bank) encourage and support stock markets development as it is expected to accelerate economic growth by providing a boost to domestic savings and increasing the quality and quantity of investment.

The efficiency of stock markets has been a major area of research in financial economics, particularly as it pertains to stock markets of developing economies (Rapuluchukwu, 2010). This is because of the implication of market efficiency to the functioning of the capital market, especially as it concerns investors' returns and thus stimulation of investors' interest in market activities. It is believed that the behaviour of stock prices is explained by the behaviour of investors. Stock market forecasting is marked more by its failure than by its successes since stock prices reflect the judgements and expectations of investors based on information available (Aguebor, Adewole and Maduegbuna, 2010).

Remarkably, efforts have been made to apply econometric modeling in the prediction of stock prices in a bid to demonstrate that the market fluctuations are essentially unpredictable (Brealey & Myers, 1996; Brummelhuis, 2005). Fama and French (1988) have argued that there are long-term pattern in stock prices with several years of upspring followed by more sluggish periods.

According to Fama (1965;1995), a stock market where successive price changes in individual securities are independent is by their definition, a random walk market. Specifically, stock prices following a random walk imply that the price changes are as independent of one another as the gains and losses. The independence assumption of the random walk hypothesis is valid as long as knowledge of the past behaviour of the series of price changes cannot be used to increase expected gains (Aguebor, et al 2010). More specifically, if successive price changes for a given security are independent, then there is no need in timing purchases and sales of the security. A simple policy of buying and holding the security will be as good as any more complicated mechanical procedure for timing purchases and sales (Fama, 1965; 1995). The stock market, more than ever before, is increasingly becoming one of the most popular investment outlets in recent times due to its high returns. The market has gradually become an integral part of the global economy to the extent that any fluctuation in it influences personal and corporate financial lives as well as the economic health of a country.

Furthermore, the stock market is crucial to the nation's economic development because it, among other functions, performs the vital function of financial intermediation in the economy by taking money from the surplus units in the economy and channeling same to the deficit units. However, the ability of the stock market to perform its role effectively and assure investors of fair returns is contingent on the extent to which it can be said to be efficient. This justifies the need to test stock market efficiency. If a market is not efficient then, behaviourally, stocks that outperform the market will inspire positive sentiments among investors while stocks that under-perform may induce panic. Consequently, stocks that under-perform at any given point in time relative to the market are more sensitive to new information (Lim, 2009). In other words, there is a negative relationship between the measure of price sensitivity to news and the stock's performance relative to the market. On the other hand, panic drives the price sensitivity to new information than the thrill of investing in a high-return stock does, or simply yet, the downside hurts investors more than the upside helps them (Lim, 2009).

In an active market made up of knowledgeable investors, securities will be fairly priced to reflect all available information (Fama, 1965). If a market is efficient then the security price, at any given time, will fully incorporate all available information and thus make it impossible for any investor to outperform the market.

Generally, the issue of stock market efficiency is categorized into three major areas: allocational efficiency, operational efficiency and informational efficiency (Ibenta, 2005). Thus, a stock market that is operationally efficient may not be informationally efficient and vice-versa. To be inefficient means that a stock market is either operationally or informationally inefficient. What it also means is that in whichever way the stock market becomes efficient (either operationally or informationally), the economy is better for it.

Olowe (1996) and Ibenta (2005) view capital market efficiency from the roles the capital markets are expected to play in an economy, which can be classified into three:

i. **Allocation Efficiency:** The role of capital market here is to optimally allocate scarce savings to productive investments in a way that benefits everyone. Thus, share prices are determined in a way that equates the marginal rates of return of all lenders (savers) and borrowers.

ii. **Operational Efficiency:** A market is said to be operationally efficient if intermediaries which provide the service of channeling funds from savers to investors do so at the minimum cost that provides them a fair return for their services.

iii. **Pricing or informational Efficiency:** This is a market where prices are used as signals for capital allocation. Forces of demand and supply set the prices. A market that is price efficient implies efficiency in the processing of information. The prices of capital assets anytime are based on the current evaluation of all information available at that time. Thus, in finance literature, the focus is more on pricing efficiency, although pricing efficiency implies in a limited sense operational and allocative efficiency. Formally, the study defines capital market – efficiency as a market where security prices quickly and fully reflect all available information. If a market is efficient, any/all devices intended to outperform the market will be rendered useless. No scheme devised by any individual should result in consistently higher returns than those realized on a buy and hold strategy. In an efficient market, the same rate of return for a given level of risk should be realized by all investors. The behaviour of any participant or group should not influence the price of a security in the market.

Over recent decades, there has been a large body of empirical research concerning the validity of the random walk hypothesis or weak-form efficient market hypothesis with respect to stock markets in both developed and developing countries. Empirical research on testing the random walk hypothesis has produced mixed results. For example, most early research is supportive of the weak and semi-strong forms of the efficient market hypothesis in developed capital markets (see, e.g., Osborne 1962; Granger and Morgenstern 1963; Fama 1965; Ball and Brown 1968). Research has reported that stock market returns are predictable (Poterba and Summers 1986; Fama and French 1988; Lo and MacKinlay 1988). The empirical evidence is also mixed for the developing countries. These studies on emerging stock markets can be divided into two groups depending on findings. Researchers who find the evidence to support the weak-form efficiency (e.g., Urrutia 1995; Ojah and Karemera 1999; Abrosimova et al. 2005; Moustafa 2004), and others show the evidence of predictability or rejection of the random walk hypothesis in stock returns (e.g., Huang 1995; Poshakwale 1996; Mobarek and Keasey 2002; Khaled and Islam 2005).

With regards to the above, discussion of bull and bear market cycles has attracted much attention in the literature, e.g., Pagan and Sossounov (2003), Yan, et. al (2007), Rutledge, Zhang and Karim (2008), Zhou, et al (2009), de Bondt, Peltonen and Santabarbara (2011), because cycles of bull and bear markets not only reflect the economic development and investors‟ confidence but has a significant impact on the whole economy and social welfare. This is important for all countries around the world especially for developing countries which have emerging financial markets and are more vulnerable to global economic fluctuations and understanding the puzzle of mixed results on market efficiency.

While testing for market efficiency has generated mixed results for developed, emerging and developing stock markets, there is some evidence that most studies in this area neglected the effect of different market cycles. Edward and Magee (1992) pointed out that trading activity tends to expand as price move to the direction of the positive trend and behave in the reverse for bear market. This means that in bull or bear market, trade volume and price move in a manner that generate pattern that can create questioning of the stock market efficiency. This therefore leaves us with the question of whether the results from weak stock market efficiency will be different under bull and bear market cycle for Nigeria and China.

1.2 Statement of the Problem

An efficient stock market results from the presence of numerous rational profit maximizing investors, who are actively competing with one another. It is a market where technical and fundamental analysis will not be able to make an investor have abnormal profit. In other words, market prices will reflect best estimates for the risk and expected returns from the assets based on all the information available as at the time of reference (Gupta and Basu, 2007).

Markets that are efficient tend to attract investors as they know that prices are not only fair but no individual investors can outperform the market. This situation will consequently lead to the development of the economies where there market exists. On the other hand, investors try to shy away from investing in inefficient markets as they are not assured of fair play in these markets. One of the consequences of this is apathy and possibly dislike for such markets. It is therefore pertinent to examine if a market is efficient or not.

Market efficiency has attracted many studies in literature, while many authors have alluded to the fact that Nigeria and China stock markets are indeed weak form efficient, others have countered this view by concluding that these markets are not efficient. Considering the theoretical and practical significance, the testable implications and conflicting empirical evidence of the random walk hypothesis motivates us to have a fresh look at this issue of weak form efficiency in the context of an emerging market (Nigeria) and a developing market like that of China.

The reference to china in this study is potentially interesting since China stock market is a developing capital market which shares most of the characteristics of a typical emerging market. Secondly, China is the largest economy in South East Asia (and second largest in the World) while Nigeria is the largest economy in Africa. This justifies the comparison.

In addition to the above, we observed from the theoretical and empirical literature that it seems that there are no much published works on testing for weak form market efficiency under different market cycles in Nigeria. This is therefore the major problem this study seeks to address. This is important, since discussion of bull and bear market cycles attract much attention in the literature, e.g., Pagan and

Sossounov (2003), Yan, etal (2007), Rutledge, Zhang and Karim (2008), Zhou, et al (2009), de Bondt, Peltonen and Santabarbara (2011) and because the cycles of bull and bear markets not only reflect distortion in market efficiency but if not considered in testing market efficiency can lead to conflicting results since investors behaviour are different under these two states of market cycle. In addition, we also observed that most studies use one or two statistical test but in this study, we attempt to use the most commonly used tests which are run test, serial correlation, unit root test, autoregressive model, variance ratio and GARCH Model. We intend to also compare the results for emerging and developing markets using Nigeria and China as case study.

1.3 Objectives of the Study

The general objective of this study is to test the weak form market efficiency in a bull and bear market cycle in Nigeria and China. The specific objectives are:

1. To find out if the Nigeria and China stock markets are weak form efficient under the bull and bear market cycles.
2. To investigate if the Nigeria and China stock markets are weak form efficient under the Bull market cycle.

3 To examine if the Nigeria and China stock markets are weak form efficient under the bear market cycle.

4 To compare the differences in weak form stock market efficiency in Nigeria and China using different statistical tests.

1.4 Research Questions

Following the above, the research questions we seek to answer in this study are:

(1) How efficient are the Nigeria and China stock markets under bull and bear market cycles?

(2) How efficient are the Nigeria and China stock markets in Bull market cycle?

(3) How efficient are the Nigeria and China stock markets in Bear market cycle?

(4) Is there any significant difference in weak form efficiency of the Nigeria and China stock market using different measurements?

1.5 Hypotheses

The hypotheses to be tested in this study are stated in null form as follows:

H1: Nigeria and China stock market are not weak form efficient under bull and bear market cycles.

H2: Nigeria and China stock market are not weak form efficient in Bull market cycles.

H3: Nigeria and China stock market are not weak form efficient in Bear market cycles.

H4: There is no significant difference in weak form stock market efficiency in Nigeria and China using different statistical tests.

1.6 Significance of the Study

The significance of this study is divided into two. The first is theoretical while the second is practical significance.

This study will provide more evidence on the conflicting empirical evidence of the weak form market efficiency, especially under different market cycles which many previous researched had ignored. It will be beneficial to the following major stakeholders.

Researchers: The study will be useful to researchers as it will provide empirical data and new research areas for further studies.

On the Practical side, we hope this study will be relevant to the following groups:

Potential Investors: This study will assist them in understanding why markets are efficient and what factors can make a market inefficient. This will therefore assist them in making better decisions especially under bull and bear market trends. The knowledge gained from this study will also enable investors identify whether abnormal profit opportunities exist in Nigeria and China stock markets and at the same time help investors avoid market sentiment and bias.

Government: This study will provide the needed information and strategy for Nigeria and China government to promote an efficient stock market that will not only attract foreign investors but spur growth.

Market Operators and Regulators: This group of people will also find this work not only interesting but also useful as it will provide empirical evidence and recommendations on actions to take to promote market efficiency.

1.7 Scope and Limitation of the Study

This study will focus on stock market efficiency. However, the existing market efficiency literature has become so extremely extensive, that even a careful survey of it is undoubtedly beyond the scope of this thesis. Consequently, we only provide a short discussion of central findings in the market efficiency literature regarding to random walk hypothesis or weak-form efficiency in order to provide a general picture of this study. The most important limitation of this study is that the empirical part of this study is restricted exclusively to weak-form efficient market hypothesis or return predictability using time series analysis of stock return behaviour. Accordingly, the statistical tests are only employed for testing market efficiency, therefore, technical trading rules or adjusting transactions cost such as bid-ask spread and time lag of settlement procedures is excluded in this study. In view of this fact, the study seeks to test for weak form of stock market efficiency for Nigeria and China (1999-2014) under two market cycles or regimes, namely: bull (average upward rise in prices) and bear (average fall in prices). The sub-sample period for Nigeria and China will be based on the availability of data and the choice of these periods was based on the definition that bull market cycle is the existence of positive annual average daily returns from all share market index and a bear market cycle as one with negative average daily returns. Finally, this study will use only daily data, even though this might lead to possible bias in empirical work since it will neglect weekly and monthly effect. We use a longer time-period under bull and bear market cycle, which may reduce this problem and increase the power of random walk test (Lo and MacKinlay 1988).

CHAPTER TWO

REVIEW OF RELATED LITERATURE

In this chapter we review literature in the areas of Nigeria and China stock Market, the concept of bull and bear market cycle, the concept of market efficiency, and empirical evidence on weak form stock market efficiency from developed, emerging and China unique stock market.

2.1 Conceptual Framework

2.1.1 Overview of Nigeria and China Stock Markets

A major engine of economic growth and development of any nation is its capital market. Until recently, the Nigerian and China capital markets were very attractive to many enlightened local and international investors. In this section of this study we provide a brief overview of Nigeria and China stock market.

CBN (2004) reveals that the Nigerian Stock Exchange (NSE) started operations in mid-1961 with limited stocks and equities; with merely about seven UK quoted companies on the stock exchange. At the commencement of operations, the NSE recorded shares worth ₦1.5m and the value continues to grow steadily to about ₦16.6m in 1970 (CBN, 2004). From 1970 to 1980s which marks the pre –

financial liberalization period and witnessed a high level of public participation as well as government securities dominating the trading floor in the capital market. In addition, prior to the deregulation of the Nigerian capital market in August 1995, Securities and Exchange Commission (SEC) took over the control of the pricing of new issues which was formerly determined by market forces. Following the abrogation of laws that prevent foreign investors from participating in the domestic capital market by way of liberalization of the market, most Nigerians and foreign investors were privileged and thus, accorded rights and opportunities to invest in securities in the Nigerian stock market. This resulted in influx of foreign investors with both foreign direct investment as well as portfolio investments in Nigeria. Record has shown that this singular act resulted in increased liquidity and development of the capital market. For example, with the introduction of the Central Security Clearing System (CSCS) which prompted Automated Trading System (ATS) commence operations in 1997, and the establishment of the Investors Protection Fund (IPF) in 2007 by SEC, investors' confidence was boosted. Although, in 2008, the Nigerian capital market crashed and suffered its heaviest loss which was partly caused by the global financial crisis coupled with insider abuse, share price manipulation, margin loans scandals and many other negative activities perpetuated by various operators of the market.

Amedu (2010), observed that for ten years (1999-2008) the stock market grew, soared and gained extreme strength. The market experienced a period of record expansion and boom. Investors, market operators, regulators and market analysts were all pleased with this development. The NSE All Share Index grew from 5,672.76 on January, 1999 to 58, 579.77 on January 2, 2008, 933% increase. The market hit a new high on March 5, 2008 when the NSE All Share Index hit a record 66, 371.20 points or an increase of 1070%. Then, the index started head down. The NSE All Share Index dropped by 45.8% or 26,537.44 points to close at 31,450.78 on December 31, 2008. From March 5, 2008, total return on most stock was over 1000%. The Nigerian stock market emerges as the world's best performing stock market in 2007 with a return of 74.73%. however, as at 31, December, 2008, it earned the enviable record as one of the world's worst performing stock market in 2008 after losing about N5.7 trillion in market capital and 46% in the NSE All share index, what could have gone so wrong that great stocks that sold for over N50 in less than a year were in the first quarter of 2009 struggling to keep above N10?

The current state of the Nigerian capital market brings to fore strong reign of bearish mood and the general perception of a falling market. The crash in the Nigerian stock market has been unprecedented in its historic evolution since 1960.

Its market capitalization has nose-dived from an all-time high of N13.5 trillion in March, 2008 to about N7.89 trillion by the beginning of 2nd week of November, 2010. Besides, the All-share index (a measure of the magnitude and direction of general price movement) has slumped from about 66000 basis points to about 24,728 points in the same period. Also falling stock prices are sometimes a hard pill to swallow but long trend value investors most especially margin traders who are preached, the true test of courage comes when investors watch their holding nose-dive 5% consecutively for several weeks without any end in sight. Anyone who has experienced a bear market knows that it takes tremendous discipline and dedication to stick to one's guns while everyone else liquidates their holding.

In the case of the Chinese stock market, there are several unique features that made its rapid development unique and interesting. China's stock market has experienced tremendous growth and development in the ten years since the inceptions of the Shanghai Stock Exchange (December 19, 1990) and the Shenzhen Stock Exchange (December 1, 1990). The number of listed companies reached 1,160 at the end of 2001 — up from only 10 companies in the early 1990s — with a total market capitalization of 525.6 billion USD. In addition, more than 65 million investment accounts are on record as of the end of 2001.Absent of the knowledge of the key characteristics of the market it is difficult to understand operation and efficiency of the Chinese stock market. Dow Jones Indexes (2002) identified fourteen key features of Chinese stock market using Dow Jones Global Index and Dow Jones China Index as tools. Some of them, because of their relevance to explain efficiency of Chinese stock market, are discussed below. Chinese stock market displays unique performance since the inceptions of the two exchanges in the early 1990s. According to the Dow Jones Index report, Chinese stock delivered impressive returns during the eight-year period from 1994 to 2001, as measured by the Dow Jones China Index consisting of 549 stocks as of January 31, 2002.

Chinese stock market outpaced many of the world's leading indexes including Japan's Nikkei 225, Hong Kong's Hang Seng Index, the Dow Jones STOXX 600 covering Europe, as well as the Dow Jones World Emerging Markets Index covering eleven major emerging markets around the world. The performance, however, could be characterized as abnormal because it is not based on the performance of the listed companies and the China's economy as well. The report yet suggests that the historical performance of Chinese stock market is concentrated on a particular year, on particular days and within a particular segment of the market. (Dow Jones Indexes 2002) One even more special feature of the Chinese stock market is the variety of the types of stocks issued by the listed companies as mentioned earlier. Class A-shares are restricted to domestic investors. Class B-shares originally were only available to foreign investors have been open to local Chinese investors since 2001, but this performance has lagged far behind of the A-shore market. A total market value of B-share market is only about 2.4% of the A-share market.

According to the Jones Index report, market segregation and the foreign exchange control regime helped China to protect its economy and markets during the Asian financial crisis of 1997. However, in recent years the segregation is increasingly viewed as a barrier between Chinese capital markets and international investors (Dow Jones Indexes 2002). The depth and breadth of government ownership of publicly traded companies is also another unique feature of Chinese stock market. According to a DowJones survey, the average government ownership in Chinese stock was 45 percent, as of January 31, 2002, with maximum of 89 percent. Such a high percentage of government ownership does not exist in any other stock market in the world. (Dow Jones Indexes 2002) The government not only owns a major proportion of firms' assets but also is directly involved in many aspects of corporate management, including personnel, financing, and production. Firms may also have investments from other state-owned enterprises (SOE), resulting in an interlocked ownership structure for many Chinese firms.(Green 2003). Government ownership is seen as a serious obstacle to the healthy development of Chinese stock market (Yu et al. 2005).

Due to lack of regulatory experience, rule of law, and of fully developed market economy, Chinese stock market also possesses many of the features that are characteristics of emerging markets. First, China has many types of share classes that confuse investors. Besides A-shares and B-shares, there are also several additional classes available to global investors and denominated in free exchangeable currencies, such as H, N, L and S shares are listed in Hong Kong, New York, London and Singapore, respectively. Secondly, initial public offerings (IPO) are strictly regulated in China (Yu et al. 2005). China is identified by the Dow Jones report, as “China is the only country in which the government completely controls the size of the stock market, the pace of issue and the allocation of resources”. Thirdly, the market is predominated by small-cap stocks rather than blue-chip companies, in both absolute size and in relation to the rest of the world, due to the fact that most of China’s blue -chips are listed only on overseas exchanges and are not available to domestic investors. Fourthly, another unusual feature of Chinese stock market is dominance of retail investors. While in developed markets institutional investors tend to dominate markets, institutional investors are underdeveloped in Chinese stock market. Finally, contrary to the global trend of consolidating multi exchanges of a single jurisdiction into a single exchange structure, China has two exchanges of similar size, performing virtually the same functions on every aspect. However, the stocks traded on the two exchanges perform quite differently. (Dow Jones Indexes 2002) The characteristics of the market themselves, the multitude of government interventions, and the macroeconomic situation all greatly influence the Chinese stock market. (Yu et al. 2005) While as Eastern Europe's stock markets benefited from new politics and a general acceptance of privatization, and Asian's market grew up alongside the region's economic growth miracle, Chinese stock market was created in the midst of a large number of obstacles. It is alleged that stock market development in transitional countries is strongly correlated with low inflation, the existence of sizeable institutional investors and a legal framework that protects minority shareholders' rights. In the contrary, Chinese stock market coped with a Communist government, two very serious inflation in 1988-1989 and 1992-1993, few institutional investors and poor regulation combined with weak enforcement (Green 2003). Although the Chinese stock market has developed rapidly and has started its liberalization process recently, it still has a long way to go before they will compel international investors to commit significant amounts of capital. The investment opportunities in the market, especially for foreign investors, are still restrictive. Although most emerging markets have completely removed the ban on foreigners investing in their markets, China has not yet reached such a stage. The emergence of global companies like Samsung in South Korea, Nokia in Finland or Toyota in Japan would be an important factor in increasing the value of the Chinese stock market. At present China has no global company (Norges Bank 2006).

2.1.2 Bull and Bear Market Cycle

A stock market cycle or trend is a tendency of the market to move in a particular direction over time. These cycles are classified as (a) Secular for long time frames (b) Primary trend, which is a medium time frame and (c) Secondary for short time frames. The secular market cycle has duration of 5 to 25 years and consists of a series of primary trends. While the primary market cycle last for 1 to 2 years. A bull and Bear market could be secular or primary.

According to Faber (2009), Wiggns (1993), a bull market is one with a monthly average returns that is greater than zero while a bear market is one with negative returns. Fabozzi and Francis (1979) describe a substantial up (Bull) as one with a market returns that is 1.5 times higher than its standard deviation. Gwilym, Clare, Seaton and Thomas (2009) describe a bull market (positive returns market) and Bear market (negative returns) as one where the annual average daily returns is greater than one year moving average (MA) and returns less than one year moving average (MA). The Bull market cycle is associated with increasing investors' confidence and increasing investing in anticipation of future price increase and this may impact on stock market efficiency. In the case of Bear Market cycle, there is a general decline in the stock market over a period of time. It is a transition from high investor's optimism to widespread investors fear and pessimism. While it is easy to describe Bull and Bear market, it may be a little difficult in quantitative defining bull and bear Market cycle. In a simple manner, the Vaguard group (2000) describe a bull market as one with a 20% price up over a two-month period and a bear market as the opposite. Maheu, McCurdy and Song (2012) in their paper on the component of bull and bear market, classified a bull and bear market as one with average daily cumulative returns of above 10% and less than 10% respectively.

While the above simple method of using a single return benchmark to group a market into bull and Bear market cycle is well accepted, there are other advanced econometric techniques which are based on the use of Markov-Switching model. To investigate bull and bear markets. Hamilton (1989) first introduces the Markov-switching model to replicate the recessions and expansions of the U.S. economy as measured by the NBER. Subsequently, based on Hamilton (1989), there are a number of articles to investigate bull and bear markets, such as Durland and McCurdy (1994) and Maheu and McCurdy (2000). In this paper, rather than focusing on macroeconomic shocks or policy issues, we explore the bull and bear cycles from a new perspective, by studying the overlapping intervals of bull and bear cycles between stock and index data. Ryden, Terasvirta, and Asbrink (1998) have shown that the Markov-switching model is well suited to explaining the temporal and distributional properties of stock returns as the information set to the econometrician and agents are not necessarily assumed to coincide.

There are a number of articles discussing bull and bear markets for other emerging markets. For example, Assoe (1998) investigates regime-switching behaviour of nine emerging markets as these markets experienced significant changes in government policies and capital market reforms from December 1975 to

December 1997. He finds, based on Markov-switching models that these emerging market returns and volatilities change significantly over time in response to government policies and capital market reforms. This implies that booms and busts in emerging stock markets could be influenced by events such as monetary shocks and productivity switches, as these events could have an impact on traders' confidence. Similarly, following Bry and Boschans (1971) nonparametric approach, Biscarri and Gracia (2004) identify the bull and bear phases of Spanish stock market and discuss its characteristics. They find that the process of financial development, such as capital market opening, financial liberalization or integration processes, affect the Spanish stock market. The nine emerging markets are Argentina, Brazil, Chile, Greece, India, Korea, Mexico, Thailand, and Zimbabwe.

Based on these findings above, we came to the conclusion that there are two approaches for measuring bull and bear market cycle. These are the simple average returns method and the Markov-switching models. In this study we hope to use the simple average method to classify the Nigeria and China stock market into bull and bear market cycle since our focus is to use data for this two sub-periods or regime to test weak form efficiency rather than prediction as used in the context of Markov-switching models

2.1.3 The Bull and Bear Market Cycle in Nigeria and China

In Nigeria the only paper that attempted to empirically study market cycle was that of Adenola, Abdulrasshed, Babaita, Atanda and Salako (2011) who studied market bubble and crashes rather than bull and bear cycle. In their study they identify the period of October 2005 to march 2008 as bubble regime and April 2008 to September 2010 as market crash regime. While this study provides insight into Nigeria stock market trends, there were no attempt by the authors in discussing stock market efficiency under bull and bear market state. To the best of our knowledge, there are no well-known empirical study on bull and bear market cycle in Nigeria, there a number of studies in this area that was conducted for China. As found in Chen, Chong and Li (2011), the Chinese stock market has experienced a long period of bear cycle from early 2000 until 2006 and then it fluctuated greatly until 2010. However, the cyclical behaviour of stock markets during this period is less well-established. We may ask why the Chinese stock market experienced a long duration of bear market, and what industries would contribute to this cyclical behaviour, and whether firm size can determine the relationship between the firm stock cycles on the market cycles. By comparing the intervals of bull and bear markets between stocks and indices, this study will provide more explanation to the cycles of Chinese stock markets, and will contribute to the literature regarding the development of emerging markets.

Pagan and Sossounov (2003), Girardin and Liu (2003) use a Markov-switching model to investigate movements in capital gains and losses on the Chinese stock market from 1995 through 2002. Based on the index of the Shanghai A-share market, at a weekly frequency, they found that in overall, the Chinese stock market is like a "Casino" because, most of the time, an investor with a weekly horizon finds herself in the bear market and makes capital losses but also makes substantial capital gains in very short periods of "luck" to compensate her for the losses. Instead, using monthly stock index data from 1991 through 2006, Yan, et. al (2007) identify and describe cyclical regimes in the Shanghai and Shenzhen stock markets based on the algorithm developed by Bry and Boschan (1971). They identify bull and bear market regime-turning points using five-month average returns and show non-identical cycles for these two markets. In addition, they find that the return differences between bull and bear market regimes decrease recently reflecting a maturing of the Chinese market. Using monthly data from April 1999 to September 2009, de Bondt, Peltonen and Santabarbara (2011) examined Shanghai A-share price misalignments in bull and bear markets. They found that it can be reasonably well explained by some fundamentals, such as corporate earnings and the risk-free interest rate. In addition, they found that stock prices in booms and busts can be significantly influenced by some policy actions from the Chinese authorities, either in the form of low deposit rates, loose liquidity conditions or stock market liberalizations. This implies that bull or bear markets are not only closely related with economic fundamentals but also with a wide spectrum of policy instruments.

Further, Yao and Luo (2009) argued that due to some government policies, such as privatisation and strong state support for the state-owned commercial banks, investors can be over-optimistic about the Chinese future economic performance. Moreover, besides the change in interest rates, trade balances, exchange rates, employment and inflation, which could affect share prices, the poor psychological factors, such as greed, envy and speculation, could also help explain the Chinese stock market bubble and burst during 2005 and 2008.

There is some literature arguing that there exist bubbles in the Chinese stock market in bull phases as the average daily return jumps become much higher than previous periods. For example, using the Shanghai Composite Index obtained from the TX Investment Consulting Co., Ltd. from January 3, 2004 to December

31, 2007, Nishimura and Men (2010) find that the average daily return from December 2006 to October 2007 is much higher than that during January 2004 to November 2006. This result shows that the Chinese stock market entered a speculative bubble period after the second half of 2006.

By comparing the abnormal market returns of the Shanghai and Shenzhen A- and B-share markets, Lehkonen (2010) finds that the weekly data demonstrate bubbles but monthly data does not show bubbles for all of the Mainland Chinese stock markets. This implies that the duration dependence, a characteristic of the hazard function for duration times, is sensitive to the use of weekly versus monthly data and should be taken into account for bubble analysis. This also indirectly shows that there are no differences in terms of bubble existence between Chinese A- and B-share stock markets even though the A-shares are dominated by individuals and B-shares by more sophisticated institutional investors.

Rutledge, Zhang and Karim (2008) examine the relationship between firm size and excess stock returns in the Chinese stock exchange (Shanghai and Shenzhen) bull and bear market phases from 1998 to 2003. They found that small firms had greater positive excess returns during the bull market period but greater negative returns or no significant difference in returns (using float market value) during the bear market period. In contrast, large firms show greater or similar portfolio returns as compared to small firms during the bearish time period. This finding reflects that small stocks react stronger than large stocks to economic conditions and events.

Following the above, we came to the conclusion that there is an empirical literature gap for bull and bear market cycle studies in Nigeria while in China a number of studies have been conducted to investigate bull and bear market cycle but none focused testing weak form market efficient hypothesis under bull and bear market cycle. This study will therefore form a major contribution to empirical knowledge.

2.1.4 Concept of Market Efficiency

Efficiency in the context of capital market has been defined in many ways, but the most common way has been defined it in terms of what sort of information is available to market participants, and how they handle that information. According to this view, an efficient capital market is one where prices of financial assets accurately reflect all information and quickly adjusts to new information. According to (Dimson and Mussavian 1998), this definition is referred to informational efficiency. Nevertheless, the markets are also economic institutions that require resources and economic agents. Efficient markets in this wider economic sense are involved in allocating resources to their most profitable use and in cost effective ways. This is called allocative efficiency. Capital market can also be defined as operationally efficient, which also often appears in the finance literature. The concept of operational efficiency pertains to a market's ability to provide liquidity, rapid execution and low trading costs. (Sharpe et al. 1999, 92)

This study is concerned with the term of informational efficiency. Capital market efficiency is also used to refer to a perfect market. However, it is important to stress that an efficient market is not synonymous with a perfect market. A perfect market has a more restrictive definition. In such a market, all market participants are assumed to be rational and have immediate and simultaneous access to all relevant information. The information is supposed to be without costs. Furthermore, a perfect market is assumed to be frictionless, where there are no transaction costs, with fully dividable assets and without restrictive legislation. It is also characterized by open competition in product markets as well as in capital markets. In reality, markets are neither perfectly efficient nor completely inefficient. All markets are efficient to a certain extent, some more than others (Fama 1970; Sharpe et al. 1999, 92- 93).

The securities markets in developing countries are considered to be less efficient because of their operating characteristics such as size, market regulation, trading costs and nature of the investors and different participants may have varying amounts and quality of information. The perfect markets are efficient markets, but efficient markets are not necessarily perfect markets (Dickinson and Muragu 1994). Efficient Market asserts that in an efficient market, prices at all times fully reflect all available information that is relevant to their valuation (Fama, 1970). This means that stock prices at any point in time are an unbiased reflection of all the available information on its expected future cash flow. According to Peirson, Bird, Brown & Howard (1995), the Efficient Market states that in an efficient market, asset prices fully reflect all available information about the asset, and investors therefore cannot consistently earn abnormal returns. Proponents of the efficient market hypothesis argue that stock prices are essentially random and therefore, there is no chance for profitable speculation in the stock market. The efficient market hypothesis is based on the assumption that share prices follow a random walk and successive price changes are independent of each other (Rapuluchukwu, 2010).

This implies that no individual can make supernormal profit from trading in securities since the share prices are not mis-priced in any form of systematic or predictable way (Mishra, 2009). Samuels and Wilkes (1981) defined an efficient market as one in which prices of traded securities always fully reflect all publicly available information concerning those securities. Furthermore, Samuels and Wilkes (1981) identified necessary conditions for an efficient market to include accurate signals for investors' choices. This implies that today's price which reflects all publicly available information is the best estimate of tomorrow's price (Osaze, 2000).

An Efficient Stock market results from the presence of numerous, rational profit maximizing investors, who are actively competing with one another. Malkiel (2003) further reiterated that irrespective of the kind of analysis, whether technical analysis (study of past stock prices to predict future prices) or fundamental analysis (study of economy, industry and company related factors), no analyst can make abnormal profit; hence, market prices will reflect best estimates for the risk and expected returns from the assets based on all the information available as at the time of reference (Gupta and Basu, 2007). The "efficient market hypothesis" posits that investors adjust securities prices rapidly to reflect the effect of new information (Maku and Atanda, 2009).

According To Thian, Wan, Jessica and Zhao (2013), understanding the stock market efficiency is very important in helping investors make well informed investment decisions. In finance theory, the efficient market hypothesis is important due to the theoretical assumption of a perfect capital market and the rational behavior of investors. Jensen (1978) defines the efficient market as one where there is a zero-competitive equilibrium condition and it is impossible to make economic profit (the risk adjusted returns net of all cost) by trading on the available set of information present in time *t*. The information present at time *t* is all the information presently reflected in the current stock prices. The implication is that the stock price at time *t* is as a result of all the available information *t* and stock price in time *t+1* reflect all available information at *t+1* because when information infiltrates into the market it spreads quickly and it is incorporated into the stock prices immediately (Malkiel, 2003).

The Weak Form Hypothesis: The weak-form hypothesis posits that stock prices already reflect all information that can be derived by examining market trading data such as the history of past prices, trading volume or short interest (Baiz et al, 1999: 331). To Cowles (2006:50), Weak form efficiency means that unanticipated return is not correlated with previous unanticipated returns. In other words, the market has no memory, knowing the past does not help to earn future returns. This version of EMH implies that trend analysis is fruitless. Past stock price data are publicly available and virtually costless to obtain. This version holds that if such data ever conveyed reliable signals about future performance, all investors would have learned already to exploit the signals. Ultimately, the signals lose their value as they become widely known because a buy signal, for instance, would result in an immediate price increase. In a weak form efficient market, past prices and volume data are already impounded in security prices and no amount of chart reading or any other trading device is likely to consistently outperform the buy and hold strategy.

The Semi-Strong Form Hypothesis: The version according to Demsetz (1981:186) states that stock prices already reflect not only historical information but all published information about the company whose securities are under consideration. Such information includes fundamental data on the firm's product line, quality of management, balance sheet composition, patents held, earning forecasts, and accounting practices.

Again, efforts to acquire and analyze such information from publicly available sources would confer no advantage. In a semi-strong efficient market, investors would have no publicly available source of information that could lead them to consistently beat the market. Of course, they could expect to make profit in the market, but their profit would be commensurate with the riskiness of the investment. However, such activities as analyzing financial statements forecasting earnings, and following advice of a popular investment newsletter would not contribute to increased investment returns and might even lower returns by increasing costs while not adding to profit (Dimson, 1989).

Strong Form Efficiency: Since the first event studies, numerous studies have demonstrated that early identification of new information can provide substantial profits. Insiders who trade on the basis of privileged information can therefore make excess returns, violating the strong form of the efficient markets hypothesis. Even the earliest studies by Cowles (1933, 1944), however, make it clear that investment professionals do not beat the market. While there was evidence on the performance of security analysts, until the 1960s there was a gap in knowledge about the returns achieved by professional portfolio managers. With the development of the capital asset pricing model by *Baiz (1961)* and *Demsetz (1964)* it became clear that the CAPM can provide a benchmark for performance analysis. The first such study was Basu (1965) article in *Harvard Business Review* on the performance of mutual funds, closely followed by Cowles (1966) rival article. The most frequently cited article on fund managers' performance was to be the detailed analysis of 115 mutual funds over the period 1955-64 undertaken by Ariel (1968). On a risk-adjusted basis, he finds that any advantage that the portfolio managers might have is consumed by fees and expenses. Even if investment management fees and loads are added back to performance measures, and returns are measured gross of management expenses (i.e. assuming research and other expenses were obtained free), Bainz concludes that "*on average the funds apparently were not quite successful enough in their trading activities to recoup even their brokerage expenses.*"

Fama (1991) summarizes a number of subsequent studies of mutual fund and institutional portfolio managers' performance. Though some mutual funds have achieved minor abnormal gross returns before expenses, pension funds have underperformed passive benchmarks on a risk-adjusted basis. It is important to note that the efficient markets hypothesis does not rule out small abnormal returns, before fees and expenses. Analysts could therefore still have an incentive to acquire and act on valuable information, though investors would expect to receive no more than an average net return. Cootner (1980) formalise this idea, showing that a sensible model of equilibrium must leave some incentive for security analysis. To make sense, the concept of market efficiency has to admit the possibility of minor market inefficiencies. The evidence accumulated during the 1960s and 1970s appeared to be broadly consistent with this view. While it was clear that markets cannot be completely efficient in the strong form, there was striking support for the weak and semi-strong forms and even for versions of strong form efficiency that focus on the performance on professional investment managers.

2.2 Theoretical Framework

The theoretical framework for this study is based on the development of the Random Walk Theory and the Theory of Efficient Market. The efficient market hypothesis is a concept of informational efficiency, and refers to market's ability to process information into prices. The idea of the efficient market hypothesis (EMH) emerged as early as the beginning of the twentieth century in the theoretical contribution of Bachelier (1900) and the empirical research of Cowles (1933).

As noted by Dimson and Mussavian (1998), whilst Bachelier (1900) first modeled the formulation for a Random Walk in security prices, it was not until the 1960s theoretical framework for the random walk developed by Samuelson (1965). Early statistical studies by Working (1934), Cowles and Jones (1937), Kendall (1953), Cootner (1962), Osborne (1962), Granger and Morgenstern (1963), Fama (1965), among others, performed tests on the random walk hypothesis and found a supportive evidence of the random walk hypothesis that successive price changes are independent (Ball 1994).

Consequently, past price movement cannot be used to predict future price movements. Brown (1953) tested this random walk theory by examining the behaviour of stock market prices over time to see if there was a recurrent determinable pattern in the prices. He found that there was none. Cootner et al (1989) stated that stock returns reflect new market level and firm level information, Osborne (1959) confirmed Cootners's result and posited that priced do follow a random walk process. De Bondt (1988) made it clear, the extent to which stocks move together depends on the relative amounts of firm level and market wide information capitalized into stock prices.

These empirical findings combined with the theory of Samuelson (1965), published in his influential paper *"Proof that Properly Anticipated Prices Fluctuate Randomly"*, led to the **theory of efficient market hypothesis (EMH)**. According to this hypothesis, in an informationally efficient market price changes must be unforecastable if they fully incorporate the expectations and information of all market participants. Since news is announced randomly, prices must fluctuate randomly. Consequently, it states that it is not possible to exploit any information set to predict future price changes. (Campbell et al. 1997).

Another influential paper Fama (1970) reviewed the theoretical and empirical literature on EMH to that date. Fama (1970) formalizes this hypothesis further and indicates that a market is called efficient if prices "fully reflect" all available information (Findlay and Williams 2000). Fama (1970) determines three sufficient conditions for the existence of capital market efficiency. Firstly, he names the absence of transactions costs. Secondly, he assumes all relevant information is available to all market participants without cost. Thirdly, on the implications of current information for the current price and distributions of future prices of each security, the current price of security should "fully reflect" all available information. These conditions ensure that investors possessing available information cannot earn above-competitive returns. A violation of any of the conditions does not necessarily imply inefficiency. The market “may be efficient if sufficient numbers of investors have ready access to available information” (Fama 1970). The violations of these conditions, however, may suggest impeding efficient adjustment of prices to information. (Ball 1994; Fama 1970) Crediting Roberts (1959). Fama (1970) also distinguishes three forms of the efficient market hypothesis. A market is called weak efficient, if all the information regarding past price movements is reflected in the current stock price. Under this form, the information set is just historical prices that should offer no prediction of future changes in prices.

The theoretical foundations for the efficient market hypothesis rest on the following three arguments:

1. Investor rationality. Investors are assumed to be rational, which means that they correctly update their beliefs when new information is available.
2. Arbitrage**.** Even if not all investors are rational, some rational investors use arbitrage to remove pricing errors, so the average investor would not matter; the marginal investor sets prices and

3. Collective rationality. The random errors of investors cancel out in the market. Some investors are not rational, they trade randomly and, consequently, their trades cancel each other without affecting the prices.

The EMH consequently involves defining an efficient market as one in which trading on available information fails to provide an abnormal profit. A market can be deemed to be efficient therefore, only if we posit a model for returns. Hence tests of market became joint tests of market behaviour and models of asset pricing. An important corollary of the EMH is the concept that stock prices following random walk implying stock prices change randomly and in an unpredictable manner. If prices are bid up to their levels with all available information, then any changes in prices must be in reaction to new information, and new information must in essence be unpredictable, thus stock prices that change in response to new information must also move unpredictably.

Based on the above discussion of the theoretical framework, our models and statistical test will be based on the random walk and weak efficiency market theories. That is, our entire statistical test will focus on testing the randomness of stock returns for Nigeria and China stock market under bull and bear market cycle.

2.3 Empirical Evidence of Efficient Market Hypotheses (EMH)

There are a number of empirical studies that focused on EMH and nearly all of the empirical studies have centred on whether prices “fully reflect” particular subset of available information (Fama 1970). Particularly, the empirical studies on this matter have been divided in tests on the weak, semi-strong and strong-form of efficient market hypothesis. Most early empirical works have presented evidence supporting the weak form of market efficiency.

The origin of these researches lay mainly in the random walk literature. Studies have attempted to test this hypothesis by examining the correlation between the current return on a security and the return on the same security over a previous period. If the random hypothesis were true, then correlation would expect to be zero. Cowles and Jones (1937) develop one of the first tests of the random walk hypothesis (RWH). The result of their study does not support the RWH because of the acknowledged error in their analysis. According to Fama (1970), earlier works of Kendall(1953), Workings (1934) and Roberts(1959), found series of speculative price changes to be linearly independent as measured by autocorrelation, and that these series may be defined by random walks. Similar results were found by Osborne (1959), Cootner (1962), Fama (1965), Fama and Blume (1966). (Dimson and Mussavian 1998).

Osborne (1959) attributed an economic rationale behind the independence of successive price changes. His rationale claims that the decisions of investors in an individual security are independent, which is one reason why we see independent price changes (Fama 1970). Cootner (1962) observes that price changes result from the emergence of new information. Since information is random in appearance, then stock price movements should follow a random walk, which indicates that they are statistically independent (Leroy 1989). Fama (1965) applies serial correlation test, runs test and Alexander's filter rule technique to daily data of 30 individual stocks quoted in the Dow Jones Industrial Average(DJIA) for the period from 1956 to 1962. He found a very small positive correlation, which was not statistically different from zero, while the number of runs was smaller than expected which indicates that there is positive correlation found by the serial correlation test. Both tests show that the independence in successive price changes is either extremely small or non-existent. The results of filter rule technique also show no profitability. Hence, Fama concludes the DJIA to be weak-form efficient.

Another strand of literature tests the weak-form efficiency by examining the gains from technical analysis. Alexander (1965) has shown that the certain filter strategies could not generate abnormal profits after transaction costs were taken into account. The results of Fama and Blume (1966) provide further evidence of no profitability of filters relative to buy-and-hold strategies. Until the 1990s, Fama and Blume (1966) remained the best-known and most influential paper on mechanical trading rules. Their results caused academic skepticism concerning the usefulness of technical analysis.

Testing semi-strong form of market efficiency was initially carried out in the form of event studies (Fama 1991). The empirical tests were concerned with speed and correctness of price adjustment to new events and or information such as stock splits or earnings announcements. The pioneers on this kind of study were Fama et al (1969). They studied the reaction of 32940 stocks to split announcements and concluded that market prices adjusted correctly to the information implicit in a split (Findlay and Williams 2000). Ball and Brown (1968) examined the effects of annual earnings announcements. They found that investors were unable to trade profitably on the basis of announcements since the relevant information had already been reflected in the stock prices by the time of an announcement. Since the first event studies, many other studies have continued to valuing a multitude of important news events such as dividend announcements, takeovers, repurchases, share issues and so on (Dimson and Mussavian 1998; Fama 1970). While evidence convincingly supports weak and semi-strong form efficiency, evidence for strong-form efficiency remains questionable.

Empirical tests of strong form efficiency are focused on two issues: whether insider trading results in abnormal returns or if professional investors, analysts and managers have profitable information. (Fama 1991, Fama 1970) Niederhoffer and Osborne (1966) have shown that the specialists on the NYSE evidently use their monopolistic access to information about unfilled limit orders to obtain superior returns. A similar result provided by Scholes (1972) also argues that officers of corporations might have monopolistic access to information about their firms (Fama 1970). Jaffe (1974) finds considerable evidence that insider trades are profitable. Jensen (1968) investigated fund managers' performance using 115 mutual funds over the period 1955-1964 and shows that funds on average were unable to outperform the naïve strategy (Dimson and Mussavian 1998). Later empirical work generated the results that were not much consistent with earlier findings. Since the late 1970s, a large number of studies have provided evidence, theoretical and empirical challenges to the efficient market hypothesis.

Contrary to the EMH predictions, recent empirical results have shown that stock returns are partially predictable and non-normally distributed. Recent literature reports evidence against the random walk hypothesis for stock returns (Poterba and Summers 1986; Fama and French 1988; Lo and MacKinlay 1988). A number of studies find the evidence of inefficiency consistent with the weak form of efficient market hypothesis; these researches include excess volatility (Shiller 1981), momentum effect (Lehman 1990; Jegadeesh and Titman 1993), overreaction (Debondt and Thaler 1979), mean reversion (Fama and French 1988; Poterba and Summers 1986), and anomalies (Lakonishok 1988; French 1980; Ariel 1990). Whereas major studies also show inefficiency consistent with semi-strong form of efficient market hypothesis, these studies concentrate such as on size effects and January effects (Fama and French 1993). (Fama 1991; Fama 1998; Malkiel 2003)

2.3.1 Empirical Evidence of Weak Form Efficiency

The earlier tests of the weak-form of efficient market hypothesis are concerned with the predictability power of past returns. It indicates that future returns cannot be forecasted from past returns data since the current returns are considered to contain all information that is incorporated in historic data. Following Fama's theory and comprehensive empirical work of efficient capital market a plethora of studies were devoted to testing validity of the weak form of the EMH. A large number of these researches have centred on developed, emerging and developing markets like that of china.

2.3.2 Evidence from Developed Stock Markets

Empirical studies test the EMH in terms of the null hypothesis that there is no serial correlation. In the short-run, when stock returns are measured over 34 periods of days or weeks, the general evidence against market efficiency is a presence of positive correlation in stock returns. However, recent studies on autocorrelation in stock returns have shown mean reversion in stock prices. (Engel and Morris 1991) Fama and French (1988) show that for the United States there is significant negative serial correlation in long horizon returns.

Similarly, Poterba and Summers (1986) find positive serial correlation at short horizons and negative serial correlation at long horizons in the United States and 17 other countries. Positive autocorrelation infers predictability of returns in the short horizon, whereas negative autocorrelation reflects predictability in the long horizon (Fama 1991).

Earlier empirical examinations of the EMH were mainly based on serial correlation and runs tests, more recent tests of market efficiency have used variance ratio test. Variance ratio test originated form the pioneering works of Lo and MacKinlay (1988) and Cochrane (1988). Using a simple specification test based on variance estimator Lo and MacKinlay (1988) examine 1216 weekly observations derived from the Center for Research in Security Prices (CRSP) daily returns file for the period September 6, 1962 to December 26, 1985. Their results reject the random walk hypothesis for the entire sample period (1216-week) and for all sub-periods (608-week) for returns indexes and size-sorted portfolios. In contrast to the negative serial correlation that Fama and French (1988) found for longer-horizon period, Lo and MacKinlay (1988) find significant positive serial correlation for weekly and monthly holding-period returns.

Fama and French (1988) show that long holding-period returns are significantly negatively serially correlated, indicating that 25 and 40 percent of the variation of longer-horizon return is predictable from past returns. On the other hand, similar to Poterba and Summers (1986) and Fama and French (1988) If share prices are mean reverting, then long-horizon returns are negatively autocorrelated (Lo and MacKinlay 1988).

Lo and MacKinlay (1988) find the evidence against the EMH in stock prices of small firms but not for large firms. Lo and MacKinlay (1988) also argue that the rejection of random walk hypothesis cannot be explained completely by infrequent trading or time varying volatilities, although the rejections are due largely to the behavior of small stocks. Contrary to results of Fama and French (1988), Lo and MacKinlay (1988) also assert that the rejection of random walk for weekly returns does not support a mean reverting model of asset prices.

Lee (1992) employs variance ratio test to examine whether weekly stock returns of the United States and 10 industrialized countries: Australia, Belgium, Canada, France, Italy, Japan, Netherlands, Switzerland, United Kingdom, and Germany follow a random walk process for the period 1967- 1988. He finds that the random walk model is still appropriate characterization of weekly return series of for majority of these countries. Choudhry (1994) investigates the stochastic structure of individual stock indices in seven OECD countries: the United States, the United Kingdom, Canada, France, Germany, Japan and Italy, the Augmented Dickey-Fuller and KPSS unit root tests, and Johansen's cointegration tests was used to test the log of monthly stock indices from the period 1953 to 1989. He concludes that stock markets in seven OECD countries are efficient during the sample period. Their result from both unit root tests show that all seven series seem to contain a stochastic trend (unit root) and they are non-stationary in levels. The result of

Johansen's cointegration test shows no support for a stationary long-run relationship between the seven stock series. Absence of long-run multivariate relationships also provides evidence of efficient markets. Using Phillips-Peron (PP) unit root and Johansen's cointegration tests.

Chan et al. (1997) tested for the weak-form and the cross-country market efficiency hypothesis of eighteen international stock markets. The markets included are Australia, Belgium, Canada, Denmark, Finland, France, Germany, India, Italy, Japan, Netherlands, Norway, Pakistan, Spain, Sweden, Switzerland, the United Kingdom, and the United States. Their data covers the period from January 1962 to December 1992, with 384 monthly observations for each of the stock series. In their studies, these markets were analyzed both individually and collectively in regions to test for the weak form efficiency. Chan et al. (1997) conclude that all stock market examined are individually weak form efficient and only a small number of stock markets show evidence of cointegration with others.

Huang (1995) examine efficiency of nine Asian stock markets: Hong Kong, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, Thailand and Taiwan by using the variance ratio statistic with both assumptions homoscedastic and heteroskedastic. His data consist of weekly stock returns of nine stock market indexes from the period 1988 to 1992. Excluding the market in Indonesia, Japan and Taiwan, the random walk hypothesis for the remaining markets is rejected. The result of variance ratio exceeds one in the markets of Korea, Malaysia, Hong Kong, Thailand and Philippines, indicating the presence of positive serial correlation. The hypothesis for markets of Korea and Malaysia is rejected for all holding periods, whereas the hypothesis for the Hong Kong, Singapore, and Thailand markets is also rejected but in using the heteroscedasticity-consistent variance ratio estimator.

Al-Loughani and Chappel (1997) examine the validity of the weak-form of efficient market hypothesis for the United Kingdom stock market using the Lagrange multiplier (LM) serial correlation, Dickey-Fuller unit root and Brock, Dechert and Scheinkman (BDS) non-linear tests. Their data include daily observations of Financial Times Stock Exchange (FTSE) 30-share index from the period June 30, 1983 to November 16, 1989, a period that they describe as free of changing government economic policy toward financial markets. The result of Dickey Fuller tests show that series are non-stationary in levels 37 and are stationary in first differences, which are consistent with random walk hypothesis. However, based on the BDS and serial correlation tests, they reject the random walk hypothesis finding autocorrelation and conditional heteroskedasticity in the FTSE 30 returns. Therefore, according to their results the series of FTSE 30-share index does not follow a random walk during the sample period. Groenewold (1997) examines both weak and semi-strong forms of the EMH for Australia and New Zealand using daily observations on the Statex Actuaries' Price Index for Australia and the NZSE-40 Index for New Zealand covering the full 1975-1992 sample period. Weak form efficiency tested using the Dickey -Fuller and Phillips-Peron unit root tests, variance ratio and autocorrelation tests, and semi-strong efficiency tested using both cointegration and Granger causality tests. The results of unit root tests show that both indexes were consistent with the non-stationary implications of the weak form of the EMH, whereas the autocorrelations provide evidence of return predictability. However, he finds that degree of predictability of returns is not high, that 24 lagged returns being only little over 5%. Moreover, the result of variance ratio does not reject the random walk hypothesis in both markets. Therefore, he argues that taken as evidence against the weak form of the EMH is not altogether clear. The two countries' indexes were found not to be cointegrated, which is consistent with market efficiency, but however, the Granger causality were enable to reject, which is evidence against the EMH. With regard to all results, Groenewold (1997) concludes that past returns in both countries might help to explain the current return in each, but the proportion of variation explained is still small.

Worthington and Higgs (2004) test for random walks in sixteen developed markets: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom, and four emerging stock markets: Czech Republic, 38 Hungary, Poland and Russian. They use daily returns of market value weighted equity indices in US dollars from period for sixteen developed markets from December 31, 1987 to May 28, 2003, and for four emerging stock markets from December 30, 1994 to May 28, 2003. Using various methods including serial correlation, runs, three types of unit root (Augmented Dickey-Fuller, Phillips-Perron and KPSS) and multiple variance ratio tests, they show that the random walk hypothesis is not rejected in major European developed markets. Worthington and Higgs (2004) find that Germany and Netherlands are weak form efficient under both serial correlation and runs tests, while Ireland, Portugal and the United Kingdom are efficient under one test or the other. Thus, rests of the markets do not follow a random walk. The ADF and Phillips-Perron unit root tests reject the null hypothesis in the all twenty emerging and developed markets, while the KPSS unit root tests fail to reject the null hypothesis excluding the Netherlands, Portugal and Poland. From the variance ratio test, the null hypotheses of homoscedastic and heteroskedastic are not rejected in the United Kingdom, Germany, Ireland, Hungary, Portugal and Sweden. The rejection of the null hypothesis of the homoscedastic but not the heteroskedastic random walk is found for France, Finland, Netherlands, Norway and Spain. The most restrictive notion of a random walk indicates that it is not possible to predict either future price movements or volatility on the basis of information from past prices is found to be in Germany, Ireland, Portugal, Sweden and the United Kingdom. France, Finland, Netherlands, Norway and Spain satisfy at least some of the requirements of a strict random walk. Among the emerging markets, only Hungary satisfies the strictest requirements for a random walk in daily returns.

The multiple variance ratio test proposed by Chow and Denning (1993) expanded the methodology based on Lo and MacKinlay’s single variance ratio test. They adjust focus of tests from the individual variance ratio for a specific interval to one more consistent with the random walk hypothesis by covering all possible intervals. Using variance ratio of Lo and MacKinlay and multiple variance ratio methods, Lima and Tabak (2004) find that the random walk hypothesis for Hong

Kong equity markets is not rejected, but for Singapore markets is rejected. Their data covers daily returns of the Hang Seng Index for Hong Kong and the Straits Time Index for Singapore from the period June 1992 to December 2000. Using variance ratio method Cheung and Coutts (2001) also confirm that Hang Seng follows a random walk hypothesis. They use daily closing prices of the Hang Seng Index from January 1985 to June 1997, giving 3561 observations.

Following the above, we came to the conclusion that there is also a mixed result from testing market efficiency in developed stock market and must of the studies also failed to capture the effect of bull and bear market cycle. This study will therefore form a major contribution to empirical literature. We therefore suggested that more studies be conducted on weak form market efficiency for bull and bear market in Nigeria as it is compared to developed stock market.

2.3.3 Evidence from Nigeria and other Emerging Stock Markets

Emerging stock markets have recently attracted increasing attention from both researchers and investors. The great interest is not surprising because during early nineties growth of emerging markets were remarkable. Besides its phenomenal growth, emerging market attracts their low correlation with major developed stock markets, and also stock returns in many emerging markets are noticeable more predictable than developed stock markets because of exhibiting systematic patterns.

In Nigeria, there has been a number of empirical studies that have attempted to test for weak form stock market efficiency and this include the work of Emenike (2008), which provide a comprehensive and detailed look at previous studies on Weak Form of Market Efficiency of the NSE, and the work of Samuel and Yacourt (1981) which was the first published empirical research on Weak Form of Market Efficiency in the NSE. They both used serial correlation tests to examine weekly price series of twenty one (21) listed Nigerian firms from July 1977 – July 1979. Their results showed that the stock price changes were not serially correlated but followed a random walk.

Anyanwu (1998) also investigated the Weak Form of Market Efficiency in the NSE by looking at the markets relationship to economic growth of the country. He used indices of stock market development, liquidity, capitalization and market size to construct an aggregate index of stock market development. His result concluded that the NSE was efficient to the extent that it affects the economic development of the country.

While other studies found the Nigeria stock market to be inefficient. This include the work of Olowe (1999), who tested for weak form efficiency in the NSE using correlation analysis on monthly returns of fifty – nine (59) individual stocks listed on the NSE over the period of January 1981 – December 1992 and found out that market was inefficient. A similar study done by Osamwonyi and Anikanmade (2002) also tested Weak Form of Market Efficiency in the NSE by conducting a run test analysis on closing stock prices of twenty – five (25) stocks for the period January 1990 – June 2002. Their results showed that stock prices in the NSE were non – random and therefore the NSE was not efficient in the weak form. Emenike (2008) in another study conducted his research on weak form efficiency in the NSE by using the All Share Indices of the Nigeria Stock Exchange (NSE) for the period January 1993 to December 2007. His result showed that the NSE is not efficient in the weak form.

Appiah-Kusi and Menyah (2003) tested out the weak-form efficiency of eleven African stock markets including Botswana, Egypt, Ghana, Ivory Coast, Kenya,Mauritius, Morocco, Nigeria, South Africa, Swaziland, and Zimbabwe by accounting for thin trading in the calculation of returns, and allowing for nonlinearity and time-varying volatility in the return generation process. They use weekly data of index prices in local currency for the period 1989-1995, and apply Miller et al. (1994) model, a logistic map and EGARCH-M model to test efficiency of all the eleven markets. Their results indicate that except the markets in Egypt, Kenya, Mauritius, Morocco, and Zimbabwe, rest of the six markets are found not to be consistent with weak form efficiency. In addition, they find that the return generation process is nonlinear in all the eleven markets, and in five of the market, investors demand a time-varying risk premium for the risks they bear. In particular, contrary to prior studies, they find Nigerian market not to be efficiently weak form. Yet their modelling approach produces a significant time-varying risk premium for the Nigerian markets that linear models would not have been able to capture. Consequently, they argue that efficiency test models that do not control for time-varying risk premium are likely to be using inappropriate models.

However, very recently Akinkugbe (2005) finds stock markets in Botswana to be weak and semi-strong form efficient. His data includes 738 weekly observations for the period June 1989 to December 2003. Autocorrelation, and Augmented Dickey-Fuller and Phillip-Perron unit root tests were used to investigate the weak form of EMH in Botswana stock exchange. In his study, autocorrelation test show evidence of no serial correlation and the results of both unit root tests indicate a stationary process for stock returns, therefore implying weak-form efficiency.

In the case of other emerging stock market, Harvey (1995) studied volatility and returns predictability of six Latin American, eight Asian, three European and two African emerging stock markets and found presence of strong serial correlation in the stock returns which cause them more predictable. Due to recent liberalization in many developing countries, increasing studies have focused on predictability of return behaviour and most of the studies are on examining the validity of random walk hypothesis in the emerging stock markets.

Laurence (1986) applies both the runs and autocorrelation test on the Kuala Lumpur Stock Exchange (KLSE) and the Stock Exchange of Singapore (SES). He uses price observations of the individual stock from the period 1973 to 401978 for both KLSE and the SES. The results of both tests suggest that both markets are not weak form efficient. Contrary to his results, Barnes (1986) finds KLSE to be weak form efficient. He conducted a similar method of testing applied to 30 companies and six sector indexes for the six years period ended 1980. Barnes (1986) concludes that the results of both tests show that the KLSE exhibit a high degree of efficiency in the weak-form.

Parkinson (1987) tested the validity of the weak-form efficiency of the Nairobi Stock Exchange using monthly prices of individual companies for the period 1974 to 1978. The result of the runs test show that the 50 companies in NSE, 49 exhibited fewer numbers of the runs that expected. Therefore, the hypothesis of random walk is rejected for these data. Dickinson and Muragu (1994) also examine Nairobi Stock Exchange using the autocorrelation and runs tests. The period of their data continues the work of Parkinson, starting in the 1979 and ending in the 1989. Their data include weekly prices of the 30 most actively traded stocks. Contrary to Parkinson (1978), Dickinson and Muragu (1994) find that the results support the weak-form of efficient market hypothesis in NSE.

Urrutia (1995) employs both variance ratio of Lo and MacKinlay (1988) and runs tests to investigate random walk for the four Latin American emerging markets. He uses monthly data of index prices in local currency from the period December 1975 to March 1991 for Argentina, Brazil, Chile, and Mexico. The variance ratio test rejects the random walk hypothesis for all the four markets, while runs test does not. Based on results from the runs test, he concludes that the four Latin American emerging stock markets are weak form efficient. Ojah and Karemera (1999) tested random walk for the same four Latin American markets as Urrutia

(1995) did. They apply single variance ratio of Lo and MacKinlay (1988), multiple variance ratio of Chow and Denning (1993), and runs tests to monthly national stock price indexes in U.S. dollar terms for the period December 1987 to May 1997.

Under the single variance ratio test, except Argentina, rest of the three markets including Brazil, Chile and Mexico do not follow a random walk. However, the result of multiple variance ratios indicates that all the four market follow a random walk, whereas the runs tests reject the random walk hypothesis for Chile, but not Argentina, Brazil and Mexico. Similar to Urrutia (1995), Ojah and Karemera (1999) conclude that four Latin American emerging markets are weak-form efficient. Karemera et al. (1999) examine the random walk hypothesis for fifteen emerging stock markets using similar statistical tests as Ojah and Karemera (1999) did. Their data comprises monthly national stock price indexes expressed in both local currency and the U.S. dollars for the period 1986 to 1997. They observe that local currency-based data provide different result compare with return series expressed in U.S. dollars. With U.S. dollar based data, results of ten of the fifteen emerging stock markets they examined are consistent with the random walk hypothesis under the multiple variance ratios, while five of the fifteen are consistent the random walk hypothesis under the single variance ratio.

With local currency-based data, results of ten (Indonesia, Israel, Jordan, Korea, Malaysia, Mexico, Philippines, Taiwan, Thailand, and Turkey) of the fifteen markets follow a random walk under the multiple variance ratios, while six (Israel, Jordan, Malaysia, Mexico, and Taiwan) of the fifteen follow a random walk under the single variance ratio.

However, results on Argentina, Brazil, Hong Kong, Indonesia, Mexico, Philippines, Singapore, Taiwan, and Turkey equity returns are not consistent under two different currency-based data. Their results of runs test show that the hypothesis of independence cannot be rejected at 5% level of significance for nine of the fifteen. Hereby six markets including Chile, Israel, Philippines, Singapore, Taiwan, and Thailand are not weak form efficient based on U.S. dollar data. Therefore, their results support the evidence provide by Urrutia (1995) who finds Argentina, Brazil 42 and Mexico to be weakly efficient. With local currency-based data, 12 of the 15 emerging markets are weak form efficient, only Argentina, Chile and Singapore are found not to be weak-form efficient.

Chang et al. (1996) tested the weak form of the EMH using monthly data on the Taiwan stock exchange from 1967 to 1993. Employing the Ljung-Box Q, the runs and the unit root tests, they observe that the Taiwan stock market is weak-form efficient. Using the variance ratio test, Chang and Ting (2000) also examine the validity of weak form efficiency of the Taiwan stock market for the period 1971-1996 and conform to the findings of Chang et al. (1996). Chang and Ting (2000) use the weekly, monthly, quarterly and yearly returns of the value-weighted stock price index. Their results reject the random walk hypothesis with weekly returns, but not with monthly, quarterly and yearly value-weighted market indexes. Antoniou et al. (1997) use daily stock prices of the ISE Composite Index for the period 1988 to 1993 to examine the weak form efficiency for the Istanbul Stock Exchange (ISE). Observing that thin trading may lead to serial correlation in the return series, Antoniou (1997) carry out the analysis for both unadjusted and adjusted for thinness returns using a method proposed by Miller et al. (1994). Thin or infrequent trading occurs when stock do not trade at every consecutive interval. Miller at al. (1994) model suggests that to remove the impact of thin trading a moving average model (MA) that reflects the number of non-trading days should be estimated and then returns be adjusted accordingly. Despite the improvement with adjusted returns, they find serial dependence in returns. Therefore, according to their results the ISE is weakly inefficient.

Recently Tas and Dursonoglu (2005) have confirmed the inefficiency result for Turkey using daily stock returns of ISE 30 indices from the period 1995 to 2004. Dickey-Fuller unit root and runs tests were used in their studies and the results of both tests reject random walk hypothesis in ISE. 43 In the Middle East, Butler and Malaikah (1992) examine weak-form efficiency for the Kuwait and Saudi Arabian stock markets by using autocorrelation test. Their data covers daily stock returns of two stock markets for the period 1985 to 1989. They find evidence of efficiency in Kuwait stock market, but not in the Saudi Arabian market. Similarly, Abraham et al. (2002) study weak-form efficiency in three major Gulf stock markets including Kuwait, Saudi Arabia, and Bahrain using the variance ratio and runs tests for the period October 1992 to December 1998. Their data consist of weekly index values for each of three Gulf stock markets. The results of both tests reject the random walk hypothesis in all markets. Taking into consideration on possible infrequent trading in all three markets, they apply a correction to the observed index by using decomposition of index returns introduced by Beverigde and

Nelson (1981). After the correction, they fail to reject the random walk hypothesis for the Saudi Arabia and Bahrain markets, but not for the Kuwait market.

Using a similar method as Antoniou et al. (1997), Hassan et al. (2003) observe that the Kuwait stock market (KSE) is weak-form inefficient. Taking into consideration possible thin trading and nonlinearity that characterize the Kuwait markets, they use method proposed by Miller et al. (1994) to correct for possible thin trading, and a logistic map model to account for possible non-linearity in the generating process of return. They also employ GARCH-M and EGARCH models to examine whether the pattern predictability is evident where a measure of time varying risk parameter is included in the model. Their data include series of daily stock price index for period 1995 to 2000. Their results do not support the null hypothesis of market efficiency for the whole sample period. According to them, possible reasons for inefficiency are because of thinly trading in the most of the stocks in Kuwait Stock Exchange.

Moustafa (2004) examines the behavior of stock prices in the United Arab Emirates (UAE) stock market using daily prices of 43 stocks included in the UAE market index for the period October 2, 2001 to September 1, 2003. He finds that the returns of the 43 stocks do not follow normal distribution. However, the results of runs tests show that the returns of 40 stocks out of the 43 are random at 5% level of significance. Although the UAE stock market is newly developed and it is still very small, also suffering from infrequent trading, according to his results, the UAE is found to be weak-form efficient.

Poshakwale (1996) examines weak form efficiency and daily of the week effect on the Bombay Stock Exchange in India using daily BSE national data for the period January 1987 to October 1994. He finds that the frequency distribution of the prices in BSE does not follow a normal distribution. Furthermore, his results of runs and serial correlation tests also provide evidence on non-random behaviour of stock prices in BSE. Poshakwale (1996) also finds evidence that the average returns are different on each day of the week, result show the returns achieved on Friday are significantly higher compared to rest of the days of the week. Consequently, he concludes that the Indian stock market is not weak-form efficient. Using the serial correlation, runs and unit root tests Abeysekera (2001) indicates that the Colombo Stock Exchange (CSE) in Sri Lanka is weak-form efficient. His data include daily, weekly and monthly returns of the Sensitive Share Index (based on market prices of 24 blue-chip companies listed on the CSE) and a 40-security value weighted index for the period January 1991 to November 1996. The results of three tests consistently reject the random walk hypothesis.

Abeysekera (2001) also examines a day-of-the-week and a month-of-the-year effect on the CSE, but neither effect found to be on the stock market in Sri Lanka. Mobarek and Keasey (2002) used the runs and autocorrelation tests to examine the validity of weak-form efficiency for the Dhaka stock market in Bangladesh. Their sample covers 2638 daily observations of daily price indices from the period 1988 to1997. The daily share price indices consist of all the listed companies stock. Based on the runs and the autocorrelation tests, he argues that returns of Dhaka stock market do not follow random walks.

Different results was found by Khaled and Islam (2005**)** on testing weak form efficiency of the Dhaka stock market using daily, weekly and monthly market prices from the period 1990 to 2001. Unit root and variance ratio tests were used to test for the random walk hypothesis in their studies. In addition, they examine the structural changes by applying the variance ratio test separately for the period before July 1996 when the Dhaka Stock Market boom started in July 1996 and for the period after March 1997 when crash in mid-November continued until March 1997. According to them, the hypothesis of market efficiency could not be rejected in the case of monthly data. For weekly data and daily data, however, market efficiency is rejected for the pre-boom period, not for the post-crash. In addition, they argue that by using heteroscedasticity of variance ratio test they find evidence in favor of short-term predictability of share prices in the Dhaka stock market before the 1996 boom, but not during the crash. Mobarek and Keasey (2002), however, find the market to be inefficient during the crash time.

Khaled and Islam (2005) argue that the reason is stem for the fact that Mobarek and Keasey (2002) used the Box- Pierce *Q* which is less powerful test of autocorrelation in the presences of heteroskedastic errors. Several other studies concentrate in European emerging markets. For example, Gilmore and McManus (2003) examine whether the stock markets in Central European countries including Czech Republic, Hungary and Poland are efficiently weak form using various tests including univariate methods (unit root, variance ratio, and autocorrelation), multivariate tests (Johansen and Granger causality) and model-comparison approach (Naïve, ARIMA and GARCH). They use weekly Investable and Comprehensive indexes from the International Financial Corporation (IFC) for the period July 1995 through September 2000.

Gilmore and McManus (2003) show that results of the ADF and PP unit root tests indicate that all series are integrated of the order. The Ljung-Box Qstatistics show that returns tend to be more significant for the Comprehensive series than for the Investable. They argued that might be derived from the possible differences in behavior of internationally versus domestically traded stocks. The result of Q-statistics also show that over time all three markets are moving in the direction of lower levels of autocorrelations in returns, indicating efficiency improvement in these markets.

The variance ratios under the assumption of heteroscedasticity fail to reject random walk hypothesis for either index for any of the three markets. The multivariate tests, however, show mixed evidence, with the Johansen cointegration test indicate the absence of a cointegration relationship between these markets, while Granger-causality were found to be running from the Czech and Hungarian market to the Polish exchange. They assert that the differences in privatization methods and economic environments in the three countries may explain lack of cointegration during the period, and the Granger-causality may be due to the higher levels of foreign investment in the Czech and Hungarian markets, which would then influence the Polish market. In contrast with the univariate method findings, they find that model comparison approach provides strong evidence against the random walk hypothesis for these markets. They conclude that these three markets are not yet weak-form efficient.

The idea of a model-comparison approach is that if stock prices follow a random walk, then a random walk (NAÏVE) model should not be out-predicted by other models (Gilmore and McManus 2003). Smith and Ryoo (2003) investigate the random walk behavior in five European emerging markets using variance ratio tests. They employ weekly data of index prices in local currency for the period April 1991 to August 1998. According to their results, in four of the markets, Greece, Hungary, Poland and Portugal, the random walk hypothesis is rejected because returns have autocorrelated errors. The positive autocorrelation is found be in four of the markets, while in Turkey, the Istanbul stock market is found to follow a random walk. They claim that this might be deriving from the fact that the Istanbul stock market being larger and liquid compared with the other four markets.

However, evidence from other studies, which use variance ratio tests, suggests that relatively large size on its own is neither necessary nor sufficient for a market to follow a random walk. Small markets, which are examined to follow a random walk, for example Argentina (Urrutia 1995; Ojah and Karemera 1999) and Indonesia (Huang 1995), and large market do not: Hong Kong and Korea (Huang 1995) and Mexico (Urrutia 1995). Abrosimova et al. (2005) tested for weak-form efficiency in the Russian stock market using daily, weekly, monthly Russian Trading System (RTS) index time series from September 1995 to May 2001. Unit root, autocorrelation and variance ratio tests are employed to test null hypothesis of the random walk in their study. They also use model-comparison approach. With the ADF and the PP unit root tests, the RTS index series are found to be stationary difference. Results of both autocorrelation and variance ratio tests reject the null hypothesis of the random walk for the daily and weekly, but not for the monthly data. For monthly data, the variance ratio under the assumption of heteroscedasticity increments, the null hypothesis of random walk cannot be rejected. Therefore, they study linear and non-linear dependence in the daily and weekly data using ARIMA and GARCH models. They find that none of the analyzed models outperformed others. They end up with evidence that support weak-form efficiency in the Russian stock market. Hassan et al. (2006) conduct a test of efficiency in seven European emerging stock markets. They use International Finance Corporation's weekly stock index data for the period December 1988 through August 2002. Several methods used in their studies including Ljung-Box Q-statistic, runs, and variance ratio tests. According to their results, except Greece, Slovakia, and Turkey, markets in Czech Republic, Hungary, Poland and Russia are found to be unpredictable. Overall, empirical results from both the developed and developing markets show contrasting evidence on weak form efficiency.

Although recent studies have found developed markets not to be completely consistent with weak-form efficiency compare with early results, we can still make a conclusion about the fact that major empirical studies of developed markets support the random walk hypothesis and markets are mostly conclude to be at least weak-form efficient. However, a similar conclusion cannot make in the case of emerging stock markets. The results of whether or not emerging markets follow random walks are rather conflicting. Mixed results from literature on emerging stock market efficiency are not surprising since it is observed that emerging stock markets are generally less efficient than developed markets. Emerging markets differ from developed countries in various ways. In comparative terms, while the developed markets with well-established institutions are characterized as having high level of liquidity and trading activity, substantial market depth and low information asymmetry, the emerging market are observed to exhibit more information asymmetry, thin trading and shallow depth because of their weak institutional infrastructure. (Khaled and Islam 2005)

Despite the fact that emerging markets are characterized by these imperfections mentioned above, not all of the emerging markets are necessarily entirely inefficient. In fact, some researchers have found some of the larger and even smaller stock markets in developing countries to be weak-from efficient.

Following the above, we came to the conclusion that there is also a mixed result from testing market efficiency in Nigeria and emerging stock market. These studies like the ones done in developed stock market also failed to capture the effect of bull and bear market cycle. This study will therefore form a major contribution to empirical literature for emerging stock market. We therefore suggested that more studies be conducted on weak form market efficiency for bull and bear market cycle in Nigeria with reference to emerging or developing stock market like China. This therefore form the justification for reviewing empirical literature on China stock market.

2.3.4 Evidence from China developing Stock Market

Since the early 1990's, rapid financial development in China has attracted attention from both researchers and investors. As more data become more available, various researches have taken more interest in studying the financial characteristics of Chinese equity markets. Some of these studies have concentrated on the efficiency of the stock markets in China.

One of the earliest studies on Chinese stock markets can be contributed to Bailey (1994). Bailey (1994) examines the early evolutionary stage of both the Shanghai and Shenzhen stock markets return and risk. He used share prices of nine companies listed in Shanghai and Shenzhen exchanges and found that B-share display no or little correlation with international index returns. His results suggest that B-share can be considered good diversification investment for foreign investors and confirms the effectiveness of market segmentation in A-share and B-share markets.

Wu (1996), examine efficiency in both Chinese stock markets, on the early stage of development in Shanghai and Shenzhen stock exchanges. Using the serial correlation test on eight and twelve individual shares for the period from June 1992 to December 1993, he finds Chinese stock markets to be weak form efficient (Seddighi and Nian 2004). Liu et al (1997) examine daily closing prices on the

Shanghai and Shenzhen stock exchanges using the ADF unit root and cointegration tests from the period May 21, 1992 to December 18, 1995. The ADF unit root test was used to test for randomness in each stock exchange share price index, and cointegration and causality tests are used to examine relationship between the two share price indexes. Their results suggest that the random walk for both the Shanghai and Shenzhen is accepted, indicating that each market is individually efficient. Results of the Engle-Granger two-stage and Johansen cointegration test find a stationary long-run relationship between two stock prices. In addition, the causal relationship between the Shanghai and Shenzhen stock indexes is found to be bidirectional. Consequently, both the cointegration and causality test results suggest that the both Chinese stock market are inefficient collectively.

Laurence et al. (1997) test for weak-form efficiency in the Shanghai and Shenzhen stock exchanges, and causality among these Chinese stock markets with each other and with the U.S. and Hong Kong stock markets. Their data include 1000 daily observations for Shanghai A-share, Shanghai B-share, Shenzhen A-share and Shenzhen B-share indices, Hong Kong stock exchange index and the Dow Jones industrial average for the U.S. from the period March 1993 to December 1996.

Laurence et al. (1997) show that the Ljung-Box test statistics indicate the presence of significant serial correlation in daily return series in all four Chinese stock shares, whereas the run test results show the presence of negative serial correlations in A-shares and positive serial correlations in B-shares for both stock exchanges. They also find that except for Shanghai B-shares, the magnitude of serial correlation in the remaining three share decreases after the year 1994, indicating that the Chinese stock market are gradually moving to becoming efficient. Based on Granger causality test, Laurence et al. (1997) also observe a causal relationship between Shanghai B-share to other three Chinese stock markets and from Shanghai A-share and Shenzhen B-share back to Shanghai B-share. According to them, the causal relationship between B-share stock markets to the A-share stock markets imply that foreign markets exert a significant influence on the markets open only to Chinese nationals. In addition, they find a weak causal effect from Hong Kong to the four Chinese stock markets, and a strong causal effect from U.S stock market to all four Chinese stock markets and Hong Kong stock market. Based on the results, they argue that Chinese stock markets are gradually becoming more integrated into the global economy.

Mookerjee and Yu (1999) test the efficiency of Chinese stock markets from the period December 19, 1990 to December 17, 1993 for the Shanghai stock exchange and from the April 3, 1991 to December 17, 1993 for the Shenzhen stock exchange. Their data include 759 daily closing prices for the Shanghai exchange and 727 daily closing prices for the Shenzhen exchange. Employing the serial correlation and the runs tests, they observe that there are significant inefficiencies present on both exchanges. Their study also tests for the presence of seasonal anomalies on both exchanges. They find significant weekend and holiday effects, but no January effects. Their results show that both exchanges are characterized by a statistically significant negative weekend and positive holiday effect. Particularly, their result suggests that Friday and holidays contain significant exploitable news for market participants. Mookerjee and Yu (1999) argue that their empirical findings also provide indirect support for the tax loss hypothesis and the small firm effects. According to them, the reasons for inefficiency in Chinese equity markets are derive from several factors. These reasons include the restricted supply of stocks; the fact that state and institutional entities hold a large percentage of stocks, and excessive volatility due to abrupt policy changes by the authorities. Moreover, they argue that inadequate infrastructure, both physically and legally, a shortage of expertise and geographical segmentation of markets could contribute to the inefficiency results as well.

Darrat and Zhong (2000) use the variance ratio test of Lo and MacKinlay (1988) and a model-comparison method to examine whether or not stock prices in both Chinese markets follow a random walk. They concentrated their investigation of the market behavior on daily data of the A-share closing index prices of the Shanghai exchange from December 20, 1991 to October 19, 1998 and the Shenzhen exchange from April 4, 1991 to October 19, 1998. Their results from variance ratio and model-comparison tests indicate that A-share indices on both Chinese stock markets do not follow a random walk. Their results also show that prices of A-share indices exhibit positive autocorrelation, implying the potential for predictability.

Darrat and Zhong (2000) further suggest that the inefficiency probably arise from thin trading and asymmetric information. They also claim that market imperfection such as ineffective legal structures and lack of transparency that prevents the smooth transfer of information, which typically characterized emerging markets, are also another explanation for inefficiency in Chinese stock markets.

Lee et al. (2001) investigate time-series features of stock returns and volatility in four of Chinese stock exchanges. They use daily returns of Shanghai A-share and B-share and Shenzhen A-share and B-share indices for the period 1990 to 1997. Applying the variance ratio test, they observe that Chinese stock market do not follow a random walk hypothesis. Their results indicate that stock returns are not independent and identically distributed in Chinese stock market. Moreover, they find the presence of negative serial correlation in return series indicating the possible mean reversion in returns. They suggest that mean reversion in Chinese stock returns is likely stem from thin trading.

Ma and Barnes (2001) examine the weak-form efficiency hypothesis for both the Shanghai and Shenzhen exchanges using serial correlation, runs and variance-ratio tests. They employ the daily, weekly and monthly returns of the six indices and four individual shares from December 1990 to April 1998 for the Shanghai market, and from April 1991 to April 1998 for the Shenzhen market. Indices tested in their study include the Shanghai Stock Exchange Index, Shanghai A-share and B-share, the Shenzhen Stock Exchange Index, and Shenzhen A-share and B-share. Individual share data consists of 375 Shanghai A-shares, 49 Shanghai B-shares, 348 Shenzhen A-shares and 5156 Shenzhen B-shares. They observed that the daily returns on indices of the two markets are highly correlated, and the weekly returns and monthly returns on the indices are correlated as well, but not as significantly as the daily returns. They also find that the daily behaviour of individual A-shares and B-shares of the Shanghai market and individual B-shares of the Shenzhen market do not follow a random walk. They observed that individual shares generally display more evidence of market efficiency than indices and there is more evidence of market efficiency for the Shenzhen than for the Shanghai market.

Furthermore, the behaviour of B-shares is found to exhibit more violations of the random walk hypothesis than of A-shares, indicating that B-shares' prices are more predictable than A-shares. They argue that thin trading is the most likely reason for inefficiency of B-shares. Ma and Barnes (2001) further claim that by Fama's (1965) standard Chinese stock markets can be argued to be weak-form efficient, but a comparison of their results with those of other countries suggest that Fama's (1965) benchmark is not strict enough. As the result, they conclude Chinese stock markets are not to be weakly efficient.

Seddighi and Nian (2004) study daily returns of the Shanghai Security Index and eight shares listed in the Shanghai stock exchange from the period January 2000 to

December 2000. In their studies, eight companies selected randomly from eight sectors, i.e. financial institutions, metal product, manufacturers, oil, gas and related services, information technology, automobile manufactures, agriculture, construction, and retailers. They employed three kinds of methods: the Lagrange Multiplier test is for autocorrelation and the Dickey-Fuller test is for unit root and ARCH test to examine whether the residuals contain some hidden, possibly non-linear structure, and fit a GARCH-M (1, 1) model to the first difference if the ARCH effect is found to be present in the share prices. They find that in the Shanghai Security Index, six of the companies' autocorrelation is not present, and all of the series have a unit root, which supports the random walk. However, they observe that autocorrelation is present in one of the company is series, and two of the companies, there is no unit root in its series. The results of the ARCH test indicate that the ARCH effect exists in the series of three other companies. Therefore, they employ a GARCH-M (1, 1) model to fit for each of these three companies series. As the results there is noGARCH-M (1, 1) effects found in three of this series. They conclude that Chinese stock prices do not follow a random walk.

Lima and Tabak (2004) test the random walk hypothesis for the Shanghai and Shenzhen stock exchanges using daily returns from the period June 1992 to December 2000 for both A-share and B-share indices. Employing the single and multiple variance ratio tests, the random walk hypothesis is rejected for B-shares for the Shanghai and Shenzhen exchanges, but not for A-shares for both exchanges. They suggest that A-shares in Chinese stock exchanges are weak-form efficient. They suggest that liquidity and market capitalization may play a role in explaining results they find from tests of the random walk hypothesis. B-share markets have been illiquid and less active than A-share markets and its account for less than 5 percent of the total market capitalization.

Gao and Kling (2005) examine calendar effects in Chinese stock markets, particularly monthly and daily effects. Using individual stock returns on Shanghai and Shenzhen stock markets, they observe that Shanghai and Shenzhen stock markets exhibit daily and monthly calendar effects. They argued that China has two features related to calendar effects, which differ from other markets. One aspect is that the year ends in February; therefore, a January effect cannot be expected, and second is that tax-loss selling is not relevant since there are no taxes for capital gains. Their results show that the year-effect was strong in 1991, but disappeared later. As Chinese year-end is in February, they suggest that the highest returns can be achieved in March and April. They also find that the day-of-the-week effect follows a different pattern compared to other markets, as Mondays are considerably weak and Fridays show significantly positive average returns. Overall, there is widespread but not unambiguous and contradictory evidence of departures from market efficiency in emerging markets and Chinese stock market as well.

Based on these empirical findings, it can be stated that there is weak evidence for a Random Walk Hypothesis or weak-form efficient in both Chinese Stock Exchanges. The above facts about the evidence on the Chinese stock market efficiency suggest the following general conclusions:

- Similar to other emerging stock markets, Chinese stock market exhibits information asymmetry, thin trading and weak institutional infrastructure, which all together could cause market inefficiency.
- China also differ along many dimensions from most emerging markets, such as segmentation of two share, and uncertainty in Chinese business and political environment which also could contribute to the inefficiency results.

- Contrary to other developed and emerging stock markets where generally market efficiency improve over time, evidence on Chinese stock market efficiency show that market is found to be weak-form efficient in early stages but not in recent times.
- The different series or shares used and the different sample periods over which the data were measured provide conflicting evidence on weak form efficiency of the Chinese stock market.
- The evidence suggests that both Chinese stock markets are predictable, but inefficient with Shenzhen being a lesser degree.
- The behaviour of B-shares displays more violations of the random walk hypothesis than A-shares in both Chinese stock markets.
- Similar to developed and emerging markets, Chinese stock markets also exhibit calendar effects, such as day of the week effects is found to be present in both Chinese markets.

2.4 Summary

The Table below highlights a sample of the major studies and findings on stock market efficiency with emphasis on Nigeria and China.

Date	Author	Place(s) Studied	Period Studied	Statistical Test Used	Major Findings
1988	Lo and Mackinlay	USA	1962-1985 Weekly and Monthly returns	Variance Ratio Test	1. Their result reject the random – wall hypothesis. 2. Found significant positive serial correlation for weekly and monthly holding period.

1992	Lee	USA Australia Belgium Canada France Italy Japan Netherland Switzerland United Kingdom Germany	1967-1988	Variance Ratio Test	Follows a random walk
1994	Choudhry	USA United Kingdom Canada France Germany Japan Italy	1953-1989 Monthly returns	Augumented Dickey – Fuller KPSS Unit Root Tests Johansen's Cointegration Test	He concluded that the market is efficient.
1995	Huang	Hong Kong Indonesia Japan Korea Malaysia Philippines Singapore Thailand Taiwan	1988-1992 Weekly returns	Variance ratio	Excluding markets in Indonesia, Japan and Taiwan, the random walk hypothesis for the remaining market is rejected.

1997	Al-Longhani and Chappel	United Kingdom	1983-1989 Daily data Dickey-Filler Unit Root, Brock, Dechert and Scheink Man BDS Non-Linear test	Lagrange Multiplier	According to their results the series of FTSE 30 – share index does not follow a random walk.
1997	Groeneworld	Australia New-Zealand	1975-1992 Daily returns	Dickey-Fuller and Phillips-Peron unit root test variance ratio and autocorrelation tests	Concludes that past returns in both countries might help to explain the current return in each, but the proportion of variation explained is still small.

2004	Worthington and Higgs	Australia Italy Belgium Denmark Finland Greece Spain, Swedan Portugal Norway Switzerland United Kingdom Ireland France Netherlands Germany and Four emerging Stock Market (Zech Republic, Hungary, Poland Russia	1987-2003 Daily returns 1994-2003 Daily returns	Augumented Dickey-Fuller, Phillips – Peron and KPSS; Multiple variance ratio tests	Shows that random walk hypothesis is not rejected in major European developed markets. They also observed that Germany and Netherlands are weak form efficient. Also, Ireland, Portugal and United Kingdom are efficient under one test or the other. Among the emerging markets, only Hungary satisfies the strictest requirements for a random walk.
2001	Cheung and Coults	Hong Kong	1985-1997 Daily returns	Variance ratio	They concluded that Hong Kong follows a random walk hypothesis.
1981	Yacourt	Nigeria	1977-1979	Serial correlation test	Results showed that the stock prices changes were not serially

					correlated but followed a random walk.
2008	Emenike	Nigeria	1977-1979	Serial correlation test	Results also showed that stock prices changes were not serially correlated but followed a random walk.
1999	Olowe	Nigeria	1981-1992 Monthly returns	Correlation analysis	Concluded that the market was inefficient.
2002	Osamwonyi and Anikanmade	Nigeria	1990-2002 Monthly returns	Run test	Their results showed that stock prices in the Nigeria Stock Exchange (NSE) were non-random and therefore the NSE was not efficient in the week form.
2003	Appiah-Kusi And Menyah	Botswana, Egypt Ghana, Ivory Coast, Kenya, Mauritias, Morocco, Nigeria, South Africa, Swaziland, Zimbabwe	1989-1995 Weekly Data	EGARCH-M	Their results indicate that except the markets in Egypt, Kenya, Mauritias, Morocco and Zimbabwe, the rest six markets are found not to be consistent

					with weak form efficiency. In particular, contrary to prior studies, they find Nigerian market not to be efficiently weak form.
2002	Akinkugbe	Botswana	1989-2003	Autocorrelation, Augumented Dickey-Fuller and Phillip – Peron Unit Root Test	They found that the Botswana stock market is weak form efficient.
1996	Wu	China Shanghai and Shenzhen markets	1992-1993 Daily returns	Serial correlation test	Found that both markets are weak form efficient.
1997	Liu et al	China: Shanghai and Shenzhen markets	1992-1995 Daily returns	Augumented Dickey-Fuller and Cointegration test	Their results suggest that random walk for both market is accepted, indicating that each of the markets is efficient.
1997	Laurence et al	China: Shanghai and Shenzhen	1993-1996 Daily returns	Ljung-Box and run test	Found that the markets are
1999	Mookerjee and Yu	China: Shanghai and Shenzhen	1990-1993 Daily returns	Run test serial correlation	They observe that there are significant inefficiencies present on both

					exchange
2001	Ma and Barnes	China: Shanghai and Shenzhen	1990-1998 Daily, Weekly and Monthly	Serial correlation run and variance ratio test	Their results indicate that stock returns are not independent and identically distributed in Chinese stock market.

From the above Table, it is obvious that in testing for market efficiency, the following factors can possibly affect the outcome: the statistical test adopted; the period of the study and the data employed. Most of the studies used daily, weekly and monthly data. This has effect on whether such studies followed a random walk pattern or not.

Also, there seem to be mixed (conflicting) results as to the efficiency of some markets.

Unfortunately, not many studies have taken into consideration market cycles. Market cycles like the bull and bear cycle are very important as an investor's behaviour is different in these markets which could have effects on the efficiency of the market.

This study therefore seeks to fill this gap in literature.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Research Design

The study is ex post facto in nature. Therefore, the research design is investigative. We tested weak form efficiency for Nigeria and China stock markets by dividing the sample period of our study into Bull and Bear Period. The Bull market cycle are years when the average annual daily stock returns for the entire market is positive and above 10% while the bear market is the years when the average annual daily stock is negative or below 10%. This simple approach of classifying stock market cycle into bull and bear is similar to the approaches of Wiggins (1993), Cooper el at (2004), Faber (2007, 2009), Gwilym, Clare, Seaton and Thomas (2013).

The study used returns data for Nigeria and China Stock Markets and the return data is calculated using the log-difference of the index. This is shown below;

$$r_t = \ln\left(\frac{p_t}{p_{t-1}}\right)*100 \qquad \text{……………………………………..(3.1)}$$

Where P was the closing price and r was the all share returns. This method for computation of stock returns is common in financial literature. The Bull and Bear market cycles for Nigeria and China was obtained from computing the daily annual average returns from Nigeria all share index for Nigeria and the China Dow Jones Index which consist of the two stock exchanges in China.

3.2 Source of Data

The nature of this study necessitated the use of secondary data. These data which are majorly all share prices (i.e. changes in all share price index) were sourced from Securities and Exchange Commission (SEC) and Nigerian Stock Exchange (NSE) official daily trading documents for Nigeria. In the case of China, the China Dow Jones average stock prices index which represents both stock exchanges in China will be sourced from Yahoo finance and Dow Jones Website.

3.3 Population, Sample Size and Sampling Techniques

The population of this study is the available trading days for Nigeria and China stock exchanges since their year of establishment. Given the non-availability and the purpose of our study to focus on bull and bear market cycles for Nigeria and China stock market in recent times, we adopted a sample period of 1999 to 2014. The choice of this sampled period for Nigeria and China is based on the fact that it is long enough to identify yearly bull and bear market. The sample period data collected exclude non-trading days and public holidays. The sampling technique for this study is convenience sampling rather random since our population was historical time period rather than items.

3.4 Method of Data Collection

The study made use of publicly available data on the all share price index. These data which are majorly published by stock exchange in official daily trading documents are often loaded in some website. In Nigeria we used the Nigerian Stock Exchange website and Cashcraft Asset management website. While for China, the Chinese Dow Jones average stock prices index was sourced from Yahoo finance and Dow Jones Website.

3.5 Method of Data Analysis

This study like other similar researches on weak form efficiency in Nigeria and China, we adopted the popular and widely used statistical test and analysis. This will include the unit root test (ADF and PP test), run test, random walk test, serial autocorrelation test, autoregressive test, variance ratios and the non-linear GARCH test.

The following statistical tests or models are theoretically expressed as follows;

3.5.1 Unit Root Test Model

Theoretically, a time series that contains a unit root are often characterized as non-stationary processes that have no tendency to return to a long-run deterministic path. The variance of the series is said to be time-dependent and goes to infinity as time evolves. Non-stationarity is a necessary condition for a random walk and therefore, in this study, the Augmented Dickey Fuller (1979) is applied to all variables to verify stationarity. The ADF test equation is specified below.

$$\Delta R_t = \rho_0 + \rho_1 R_{t-1} + \sum_{t=1}^{n} \rho_2 \Delta R_{t-1} + \varepsilon_t \quad \text{......................................3.2}$$

The dependent variable R is the return from Nigeria and China stock markets. The null hypothesis for the test is that the variables are non-stationary or have a unit root. This means that there is weak form efficiency.

3.5.2 Autocorrelation Model

Theoretically, the autocorrelation test is also used to detect the random walk of stock returns. Autocorrelation (serial correlation coefficient) measures the relationship between the stock return at current period and its value in the previous period. It is given as follows:

$$\rho_k = \frac{\sum_{t-1}^{N-K}(r_t - \bar{r})(r_{t+k} - \bar{r})}{\sum_{t-1}^{N}(r_t - \bar{r})^2} \quad \text{..3.3}$$

where ρ_k is the serial correlation coefficient of stock returns of lag ; is the number of observations; r_t is the stock return over period t; r_{t+k} is the stock return over period $t + k$; r is the sample mean of stock returns; and *k* is the lag of the period. The test aims at determining whether the serial correlation ρ_k coefficients are significantly different from zero. Statistically, the hypothesis of weak-form efficiency should be rejected if stock returns (price changes) are serially correlated is significantly different from zero). To test the joint hypothesis that all autocorrelations are simultaneously equal to zero, the Ljung–Box portmanteau statistic (*Q*) is used. The Ljung–Box *Q*statistics are given by:

$$Q_{LB} = N(N+2)\sum_{j=1}^{k} \frac{\rho_{j^2}}{N-j} \quad \text{.....................................3.4}$$

ρ_j is the jth autocorrelation and *N* is the number of observations. Under the null hypothesis of zero autocorrelation at the first *k* autocorrelations $(\rho_1 = \rho_2 = \rho_3 = \ldots = \rho_k = 0)$, the Q-statistic is distributed as chi-squared based on selected degrees of freedom.

3.5.3 The Random Walk Model

Another model for testing weak form efficiency is the random walk model. This approach of testing weak form efficiency is based on the assumption that price change at time *t* should be independent of the sequence of price changes in previous time periods. And this is in consonance with the postulations of the weak-form version of the EMH that technical analysis, based on historical price information, is worthless since current prices always adjust to all historical information. Like the EMH, the Random Walk Model also is in three variants. Random walk 1 (*RW1*) implies that successive price increments are *independently and identically distributed (IID)*, and represents the strictest version of the random walk model. Thus the stock price at time *t* is computed as:

$$R_t = \mu + \alpha \sum_{t=i}^{n} R_{t-1} + \varepsilon_t \quad \ldots\ldots 3.5$$

ε_t ~ IID (0, σ2)

Where *Pt* represents stock price at time *t*; μ, the expected price change or drift, and*; IID (0,* σ2*),* denotes that the successive price changes, ε_t *are* independently and identically distributed with a zero mean and a constant variance.

Considering that financial time series, over long periods, display time-varying volatility and deviations from normality (Lo, 1997), the random walk 2 model (*RW2*) allows for unconditional heteroskedasticity in the successive price changes, such that:

$$R_t = \mu + \alpha \sum_{t=i}^{n} R_{t-1} + \varepsilon_t \text{ .... 3.5(a)}$$

ε_t ~ INID (0, σ2) (2)

Where *INID* denotes that the successive price changes are *independently but not identically distributed* with a zero mean and a constant variance. Nevertheless, the major definitional property implied by the *RW1* remains unchanged; that is "any arbitrary transformation of future price increments [cannot be forecast] using arbitrary transformation of past price increments" (Campbell *et al.,* 1997:33).On the other hand, the weakest version of the random walk model, random walk 3 (*RW3*), relaxes the assumption of independence to accommodate dependent but uncorrelated increments. A case in which RW3 will hold but not RW1 and RW2 is any process where *Cov* (e*t,* e*t*+*k*) = 0 for all *k*, but where *Cov* (e*t,* e*t*+*k*) ≠ 0 for some *k*, in both cases k ≠ 0. While the increments are uncorrelated, they are not independent owing to the fact that the squared increments are correlated (Campbell *et al*, 1997).

3.5.4 Autoregressive Model

The use of autoregressive test for weak form hypothesis is based on the use of regression model. In this model we assume that the natural logarithm of returns *Rt* = *In Rt*. Thus the equation is expressed simply as:

$InRt = a1 + a2\ InRt\text{-}1 + ut$ ……………………………………3.7

Which require us to test for α2 equal to one (Law, 1982).

3.5.5 Variance Ratio Model

The Variance Ratio test which was introduced by Lo and Mackinlay (1988) is another commonly used tool for investigating the randomness of stock returns. When the random walk hypothesis is rejected and VR (q) > 1, returns are positively serially correlated for emerging markets positive serial correlation in returns could simply describe market growth. When the random walk hypothesis is rejected and VR (q) < 1, returns are negatively serially correlated. The situation is often described as a mean reverting process and consistent. Under null hypothesis the variance ratio should be approximately equal to 1. If the value is not equal to one then it means that the series is auto correlated in first-order and the variance ratio is sum of first-order autocorrelation coefficient estimator. Lo and MacKinlay (1988) examine the RWH by testing the null-hypothesis that the variance ratio is given by:

$$VR\ (n) = \frac{1}{n}\frac{VARS(S_t - S_{t-n})}{VARS(S_t - S_{t-1})} = 1$$

……………………3.8

According to Ajayi and Karemera (1996), this hypothesis is tested under both homoscedastic and heteroscedastic specifications of the variances. If the variance ratio is less than one, it indicates the presence of negative serial correlation, which is consistent with a mean-reverting behaviour in the series. A variance ratio greater than one indicates the presence of positive serial correlation. Lo and MacKinlay (1988) derive an asymptotic standard normal test statistic, Z(n), which provides the statistical significance of the variance ratio, as well as an alternative statistic, Z*(n), which is robust to heteroscedasticity and non-normal disturbances,

$$Z(n) = \frac{VR\ (n) - 1}{[\phi(n)]^{1/2}},$$

……………………………3.9

1which follows a standard normal distribution where φ is the homoscedasticity variance ratio and

$$Z(n) = \frac{VR\ (n) - 1}{[\phi^{*}(n)]^{1/2}},$$

………………………3.10

Which follows a standard normal distribution where φ * is the heteroscedasticity variance ratio. This study investigates the weak form efficiency of the Finnish and Swedish stock markets by using the Variance ratio test proposed by Lo and

Mackinlay (1988), which is demonstrated to be more reliable and more powerful than the traditional models. A study by Berglund, Wahlroos and Ornmark (1983) on the Finnish and Scandinavian markets reveals the Finnish stock market as the most inefficient of all the markets explored. In the case of Swedish market, Frennberg and Hansson (1993) concludes that within a period of seventy-two years (1919-1990) the Swedish stock market did not follow a random walk as there were strong evidence of positive autocorrelated returns for short investment horizons.

3.5.6 GARCH Model

In testing for weak form efficiency using returns and in situations where there is non-linearity and volatility. The GARCH is the most appropriate. The *GARCH (1,1)* model for the series of the returns (r_t) can be written as:

Mean Equation

$$r_t = \theta + \varepsilon_t \quad \text{..................} 3.11$$

Conditional Variance Equation

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 \sigma_{t-1}^2 \quad \text{..................} 3.12$$

where r_t is the stock market return, and ε_t is a Gaussian innovation (white noise) is normally distributed with zero mean, θ implies the constant parameter as indicated in the general assumptions of ordinary least square (OLS), that is, the intercept, and a time-varying conditional variance σ_t^2 in equation (3.3). The coefficients α and β are non-negative constants. The coefficient α in the variance equation measures the reaction of volatility on market movements. Higher values for this coefficient would generate more "spiky" diagram of returns, i.e. conditional volatility would show large reaction and low persistence. The coefficient β in the variance equation measures the persistence of volatility or market efficiency in the context of volatility. Higher values for this coefficient means that innovations to conditional variance will take longer to die out, i.e. conditional volatility would show low reaction and large persistence.

The justification for using all these methods is to ensure reliability of our findings and same time to check for conflicting results based on the use of different statistical tests. We will also carry out descriptive statistics (Mean, Standard Deviation, Skewness, Kurtosis and JB test) to enable us understand and compare the unique statistical properties of stock returns for bull and bear market cycle. Finally, the above statistical test for weak form efficiency will be performed using daily returns for bull and Bear period separately. In conducting all our analysis we will use Microsoft Excel 2013 and EViews 8 econometric software.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

In this study we investigate the possibilities for the existence of weak form market efficiency in Nigeria and China stock markets but unlike previous studies we investigated the existence of weak form efficiency under bull and bear market cycles. The data for this study comprise of the monthly All Share Prices Index returns (R), was computed using percentage changes in monthly All Share Prices Index for Nigeria and China. The All Share Price Index data for Nigeria was obtained from the Nigerian Stock Exchange (NSE) webpage and it covered a period of 192 sampled months (i.e from January 1999 to December 2014) while data for China All Share Price Index were obtained from Fred Economics Webpage and it also covered 192 months (i.e from January 1999 to December 2014). The selection of this period was based on the availability of data and the need to capture the periods of both bear and bull markets cycle in Nigeria and China.

This study, like other similar researches on weak form efficiency in Nigeria and China. We adopted the popular and widely use statistical test and analysis which include the unit root test (ADF and PP test), random walk test, serial autocorrelation test, autoregressive test, variance ratios and the non-linear ARCH test. The justification for using all these methods is to ensure reliability of our findings and same time to check for conflicting results based on the use of different statistical test.

In this study we also carry out descriptive statistics (Mean, Median, Standard deviation, Maximum, Minimum and Skewness) to enable us understand and compare the unique statistical properties of stock returns for bull and bear market cycles in Nigeria and China.

Finally, the statistical test for weak form efficiency will be performed using monthly returns for Bull and Bear period separately. In conducting all our analysis we will use Microsoft Excel 2013 and EViews 8 econometric software. The descriptive statistics obtained in study are presented and analyzed below.

4.1 Descriptive Statistics

Table 4.1, provides a full description of the statistical properties of Nigerian and China all share price index returns (R) for the full period under study (1999-2014) and the identified Bull and Bear Market Cycles for Nigeria and China. The Bull and Bear Market Cycles were selected based on average monthly positive returns (Bull) and Negative returns (Bear). The results based on this approach of measuring bull and bear market cycle identified two bull market cycles for Nigeria (2000-2007 and 2012-2013) and two bull market cycles for China (1999-2000 and 2006-2007). In the case of Bear Market cycle, we identified one bear market cycle for Nigeria (2008-2009) and three bear market cycle for China (2001-2002, 2004-2005 and 2010-2012). In analyzing the descriptive statistics as presented in Table 4.1, Firstly, the full period results of Nigeria and China for the period of 1999-2014 show that the mean returns for both bull and bear market cycle in Nigeria and China stock market were 0.012 and 0.007 respectively. This means that investors that invested in Nigeria from 1999 to 2014 would make average monthly returns of about 1.2% as against China 0.7%. This means that Nigeria stock market was more profitable to investors when compared with China. The numerous bear market cycle that occur in China could be attributed to the relative returns poor performance of China stock market when compared to Nigeria. The standard deviation of 7% and 6% for Nigeria and China respectively for the period of 1999 to 2014 shows that the risk (Volatility) in both markets was not significantly different. This means that investors in China bear more risk for lower returns when compared with Nigeria.

Table 4.1 Descriptive Statistics for Bull and Bear Market Cycle for Nigeria and China

	Mean	Median	Stdev	Max	Min	Skewness	N
BULL & BEAR							
Nigeria (1999-2014)	0.012	0.005	0.07	0.38	-0.30	0.27	192
China (1999-2014)	0.007	0.002	0.06	0.32	-0.15	1.11	192
BULL							
Nigeria (2000-2007)	0.026	0.025	0.054	0.203	-0.12	0.256	192
Nigeria (2012-2013)	0.030	0.027	0.049	0.145	-0.04	0.680	192
China (1999-2000)	0.026	0.017	0.070	0.279	-0.06	1.862	192
China (2006-2007)	0.067	0.053	0.080	0.213	-0.08	0.185	192
BEAR							
Nigeria (2008-2009)	-0.034	-0.049	0.131	0.382	-0.306	1.185	192
China (2001-2002)	-0.014	-0.021	0.049	0.085	-0.111	0.073	192
China (2004-2005)	-0.010	-0.018	0.046	0.105	-0.077	0.821	192
China (2010-2012)	-0.010	-0.016	0.043	0.089	-0.126	-0.183	192

Correlation (Nigeria and China) **0.0008**

Source: Author (2015)

Secondly, the Bull market period results for Nigeria and China show that the mean returns were all positive. This confirms that positive returns as a measure of bull market was well captured in our data. A look at the results shows that a 2.6% and 3.0% monthly return was witnessed in Nigeria 2000- 2007 and 2012-2013 bull market cycle. In the case of China we observed 2.6% and 6.7% monthly returns for the period of 1999-2000 and 2006-2007. This result clearly shows that returns during bull market cycle for Nigeria and China may not be significantly different from each other. This in other words means that investors can make almost similar returns from investing in Bull Run opportunities in both markets. In terms of risk during bull market, we observed that the standard deviation for China (7% for 1999-2000 and 8% for 2006 to 2007) was marginally higher when compared to Nigeria (5.4% for 2000-2007 and 4.9% for 2012-2013).

Thirdly, the Bear market period results for Nigeria and China show that the mean returns were all negative. This confirms that negative returns as a measure of bear market cycle was well captured in our data. A look at the results shows that a -3.4% monthly return was witnessed in Nigeria bear market cycle in 2008-2009. In the case of China we observed the Chinese’s stock market witnessed more bear market cycle when compared to Nigeria. In 2001-2002 the Chinese bear market recorded average negative monthly returns of -1.4% while in 2004-2005 and 2010-2012 it recorded -1.0% and -1.0% respectively. This result clearly shows that investors in Nigeria are more likely to suffer more capital gain loss during bear market trends than investors in China. In terms of risk during bear market, we observed that the standard deviation for Nigeria (13% for 2008-2009) was largely higher when compared to China (4.9% for 2001-2002, 4.6% for 2004-2005 and 4.3% for 2010-2012). This result also confirms that Nigeria investors are more likely to overreact to downward market trends than Chinese investors.

Finally, the different results found under bull and bear market cycles under our descriptive statistics clearly shows that investors in Nigeria and China are expected to react differently to upward and downward market trends and this could influence statistical results for testing weak form efficiency. This therefore justified our need to study weak form efficiency under bull and bear market cycle for Nigeria and China. In testing for the relationship between Nigeria and China Stock Markets we used the Pearson correlation value of 0.0008 as found in Table 4.1. The result shows that both Nigeria and China stock market are weakly correlated. This can be attributed to the low exposure of Nigeria stock markets to China stock market and the low investment of Chinese investors into Nigerian Capital Market.

4.2 Weak Form Efficiency under Bull and Bear market cycles in Nigeria and China (1999-2014)

Following the descriptive statistics, we tested for weak form efficiency for Nigeria and China using monthly returns from 1999 to 2014. This was done to allow us test our hypothesis one ***(H1) which states that Nigeria and China stock markets are not weak form efficient under bull and bear market cycles***. The result obtained from the series of statistical test are presented and discussed as follows;

4.2.1 Bull and Bear market cycle Nigeria (1999-2014)

In the testing for weak form efficiency for the full period under study, we first present the results for Nigeria (Table 4.2) based on the Unit root test, Variance ratio, serial correlation, autoregressive test and the ARCH heteroskedasticity test.

Table 4.2: Bull and Bear market cycle Nigeria (1999-2014)

	Coefficient	Sig value	Lag	Joint Test	N

Unit root test	-0.882	(-12.2) [0.00]	1	149.2 (0.0)	191_{months}
Variance Ratio	0.511	(-3.37) [0.00]	2	3.37 (0.00)	191_{months}
	0.311	(-2.76) [0.00]	4		
Serial Correlation	0.10	(1.48) [0.14]	1	4.21 (0.12)	192_{months}
	0.09	(1.25) [0.21]	2		
Autoregressive model	0.11	(1.63) [0.10]	1	2.66 (0.10)	191_{months}
Heteroskedasticity test	0.03	(0.50) [0.6]	1	5.43 (0.06)	190_{months}
(ARCH)	0.16	(2.26) [0.02]	2		

*1%, **5% and ***10% level of significance
Source: Authors (2015)

Firstly, the results of unit root test which is based on the Augmented Dickey-Fuller (ADF) test as found in Table 4.2 shows that there is no unit root in the monthly return series of Nigerian stock market for the period of 1999 to 2014. The ADF test statistic value was - 12.21 which in absolute term exceed the MacKinnon tabulated value of -3.465. Furthermore the p-value is also smaller than alpha (i-e. 0.05). So we accept the null hypothesis (i-e Nigeria stock monthly return series has no unit root for both bull and bear market cycle). This means that the ADF unit root test provide sufficient evidence for us to conclude that Nigerian monthly stock return series for the period of 1999 to 2014 did not follow the random walk hypothesis, which therefore means that the weak form did not hold for Nigeria stock market under the period of 1999 to 2014.

Secondly, the results of Variance Ratio Test as shown in Table 4.2, presents the variance ratios based on monthly return series of Nigeria stocks for the period of 1999 to 2014. The estimates are given for each interval of 2 and 4 lag. Also shown are the corresponding Z statistics for the Null hypothesis that a ratio has a value of 1. For each lag period sampled in table 4.2, if the data support the random walk hypothesis, VR (q)s has values close to 1 for the value of q assigned. It is important to note here that the estimates given for each interval of 2 and 4 returns lags as shown on the results indicate tendency towards persistency (VR < 1) and where statistically significant at 1% which means that Nigeria stock prices does not follow a random walk. Also, based on the Z test the Null hypothesis is accepted for all joint and individual tests at 1% significant level. According to these results, the monthly stock returns of Nigeria for the period of 1999 to 2014 did not witness a martingale process that is; stock prices did not follow a random walk which means that Nigeria stock market is not efficient in weak form.

Thirdly, the result of serial correlation was also presented in Table 4.2. As noticed in the literature, autocorrelation test is the most commonly used tool to test weak form efficiency. The Autocorrelation test measures the correlation between series of returns and lagged series and tests whether the correlation coefficients are significantly different from zero. This means that the returns of both stock markets are tested whether returns can be characterized by serial dependence. Based on the result in table 4.2 for Nigeria stock market for the period of 1999 to 2014, the autocorrelation coefficient is positive for both lag one (1.48) and lag two(1.25). The Positive autocorrelation indicates predictability of returns in short period, which is general evidence against market efficiency, whereas negative autocorrelation indicates mean reversion in returns. Thus, it shows that at the above lags the returns cannot be significantly predicted and weak form of efficiency did not hold

Fourthly, the autoregressive (AR) model which is a representation of a type of random process was also presented in Table 4.2. The result indicates that the one period lag of monthly stock returns in Nigeria had a positive coefficient (1.63) which is significantly different from zero at 10%. This implies that the returns on Nigeria stock market for the period of 1999 to 2014 were related and not independent. This therefore means that the weak form efficiency does not hold for Nigeria.

Lastly, the use of Heteroskedasticity test (ARCH) test was also conducted to test for weak form efficiency under condition of return volatility. The general notion is that efficient market is void of persistent volatility. Hence, the judgment based on this notion is that volatility clustering/pooling is a signal of inefficiency or anomaly in a market. The ARCH-effect is present if the coefficient of the lagged value of residual squared (U2t-1) is positive and if the estimate is statistically significant. From the results in Table 4.2, the coefficient of lag two (U2t-1) is positive (2.21) and statistically significant at 5%. This means that the time-varying volatility of the Nigeria's stock market returns is persistent. In other words, a shock to the Nigeria's stock market volatility will last long. That is, there is a mean reverting variance process which means that the random walk hypothesis is not followed and the market is not weak form efficient.

Following the above analysis, we therefore conclude that our hypothesis one ***(H1) which states that Nigeria stock market are not weak form efficient under bull and bear market cycle should be accepted*** as majority of our statistical tests found weak form market inefficiency . We also suggest that our hypothesis four (H4) which states that ***there is no difference in weak stock market efficiency using different statistical tests*** should be rejected as we observed a little difference in the results of the Serial correlation test when compared with other test.

4.2.2 Bull and Bear market Cycle China (1999-2014)

In analyzing the case of China stock market for the period of 1999 to 2014, we presented the results in Table 4.3.

Table 4.3: Bull and Bear market cycle China (1999-2014)

	Coefficient	Sig value	Lag	Joint Test	N
Unit root test	-0.6298	(-9.3232) [0]	1	(0.0)	191_{months}
Variance Ratio	0.6606	(-2.99) [0.00]	2	3.53 (0.00)	191_{months}
	0.3416	(-3.532)[0.00]	4		
Serial Correlation	0.354	(4.869) [0]	1	15.2 (0)	192_{months}
	0.044	(0.601) [0.54]	2		
Autoregressive model	0.370	(5.48) [0]	1	30.033 (0)	192_{months}
Heteroskedasticity test	0.053	(0.72) [0.46]	1	0.371(0.690)	192_{months}
(ARCH)	-0.036	(-0.49) [0.62]	2		

*1%, **5% and ***10% level of significance.
Source: Authors (2015)

In the testing for weak form efficiency for the full period under study for China, we first present the results of the Unit root test, Variance ratio, serial correlation, autoregressive test and the ARCH heteroskedasticity test.

Firstly, the results of unit root test which is based on the Augmented Dickey-Fuller (ADF) test as found in Table 4.3 shows that there is no unit root in the monthly return series of China stock market for the period of 1999 to 2014. The ADF coefficient value was -0.62 which is statistically significant at 1%. This therefore clearly shows that the China stock monthly return series did not follow a random walk process for both bull and bear market cycles for the period of 1999 to 2014. This means that the ADF unit root test provides sufficient evidence for us to conclude that China monthly stock return series for the period of 1999 to 2014 was not efficient in weak form.

Secondly, the results of Variance Ratio Test for China as shown in Table 4.3, presents the variance ratios based on monthly return series of China stocks for the period of 1999 to 2014. The estimates are given for each interval of 2 and 4 lags. Also shown are the corresponding Z statistics for the Null hypothesis that a ratio has a value of 1. For each lag period sampled in Table 4.3, if the data support the random walk hypothesis, VR (q)s has values close to 1 for the value of q assigned. It is important to note here that the estimates given for each interval of 2 and 4 returns lags as shown on the results indicate tendency towards persistency (VR < 1) and were statistically significant at 1% which means that China stock prices does not follow a random walk. Also, based on the Z test the Null hypothesis is rejected for all joint and individual tests at 1% significant level. According to these results, the monthly stock returns of China for the period of 1999 to 2014 did not witness a martingale process that is; stock prices did not follow a random walk which means that China stock market is not efficient in weak form under the period of 1999 to 2014.

Thirdly, the result of serial correlation test for China was also presented in table 4.3. Based on the result in table 4.3 for China stock market for the period of 1999 to 2014, the autocorrelation coefficient is positive for both lag one (0.354) and lag two(0.044). The Positive autocorrelation in lag one which was statistically significant at 1% level, indicates predictability of returns in short period, which is general evidence against market efficiency, thus, it shows that at lags one, the returns can be predicted and weak form of efficiency do not hold for China.

Fourthly, the autoregressive (AR) model which is a representation of a type of random process was also presented for China in Table 4.3. The result indicates that the one period lag of monthly stock returns in China had a positive coefficient (5.48) which is significantly different from zero at 1%. This implies that the returns on China stock market for the period of 1999 to 2014 are related and not independent. This therefore means that the weak form efficient does not hold for China in the period of 1999 to 2014.

Lastly, the Heteroskedasticity test (ARCH) test was also conducted to test for weak form efficiency under condition of return volatility for China. From the results in table 4.3, the coefficient of lag one and two were positive (0.053) and negative (-0.036) and both was statistically insignificant even at 10%. The means that the time-varying volatility of the China's stock market returns is not persistent. In other words, a shock to the China stock market volatility will not last long. That is, under condition of volatility the Chinese stock market is weakly efficient as compared to Nigeria that was not weak form efficient.

Following the above analysis for China under the period of 1999 to 2014, we therefore conclude that our hypothesis one ***(H1) which states that China stock market are not weak form efficient under bull and bear market cycle should be accepted*** since majority of our statistical test indicated absence of weak form efficiency. We also suggest that our hypotheses four (H4) which states that ***there is no difference in weak form stock market efficiency using different statistical test*** should be rejected as we observed a difference in the results of the ARCH Test when compared to other test.

4.3 Weak Form Efficiency under Bull market cycle in Nigeria and China

In testing our hypothesis two (H2) which states that Nigeria and China stock markets are not weak form efficient in Bull market cycle. We presented the results of Nigeria Bull market cycle which include 2000-2007 Nigeria Bull market cycles and 2012-2013 Nigeria Bull market cycles while in the case of China we presented results for 1999-2000 China Bull market cycles and 2006-2007 China bull market cycle. The results are presented and discussed as follows;

Table 4.4: 2000-2007 Nigeria Bull Market Cycles

	Coefficient	Sig value	Lag	Good Fit	N
Unit root test	-0.75101	(-7.5132) [0.0]	1	0.378	95
Variance Ratio	0.669	(2.4381) [0.014]	2	-	95
	0.349	(2.9174) [0.004]	4		
Serial correlation	0.2612	0.012 [0.0135]	1	0.06	96
	-0.0507	2.518 [0.6282]	2		
Autoregressive	0.2489	(2.491) [0.0145]	1	0.018	95
Heteroskedasticity test (ARCH)	0.1251	1.20278 [0.232]	1	0.024	96
	-0.1088	-1.0469 [0.298]	2		

Source: Authors (2015)

The Table 4.4 represents a bull market cycle in Nigeria for the period of 2000 to 2007. In testing our hypothesis two (H2) under this period we conducted several test and the results are discussed as follows;

Firstly, the results of unit root test which is based on the Augmented Dickey-Fuller (ADF) test as found in table 4.4 shows that there is no unit root in the monthly return series of Nigerian stock market for the long Bull market cycle that happened between the periods of 2000 to 2007. The ADF coefficient value was -0.72 which is statistically significant at 1%. This therefore clearly shows that the Nigerian stock monthly return series under the 2000 to 2007 Bull market cycle did not follow a random walk process. This means that the ADF unit root test provide sufficient evidence for us to conclude that Nigeria monthly stock return series under the 2000 to 2007 long Bull market cycle was not efficient in weak form.

Secondly, in table 4.4, we also presents the variance ratios based on monthly return series of Nigeria monthly stocks returns under the 2000 to 2007 Bull market cycle. It is important to note here that the estimates given for each interval of 2 and 4 returns lags as shows on the results indicate tendency towards persistency (VR < 1) and was statistically significant, which means that Nigerian stock prices did not follow a random walk under the 2000 to 2007 Bull market cycle. According to these results, the monthly stock returns of Nigeria for the 2000 to 2007 Bull market cycle did not witness a martingale process that is;

stock prices did not follow a random walk which means that Nigeria stock market was not efficient in weak form under the 2000 to 2007 Bull market regime.

Thirdly, the result of serial correlation test for Nigeria stock market under the 2000 to 2007 Bull market cycle was also presented in table 4.4. Based on the result in Table 4.4, the autocorrelation coefficient was positive for lag one (0.2612) and was also statistically significant at 1% level, this means that there is the existence of predictability of returns in short period, which is general evidence against market efficiency, thus, it shows that at lags one, the returns can be predicted and weak form of efficiency did not hold for the 2000 to 2007 Nigeria Bull market cycle.

Fourthly, the autoregressive (AR) model which is a representation of a type of random process was also presented in Table 4.4. to test for weak form efficiency under the 2000 to 2007 Bull market trend in Nigeria stock market. The result indicates that the one period lag of monthly stock returns in Nigeria under this period had a positive coefficient (0.24) which was significantly different from zero at 1%. This implies that the returns on Nigerian stock market for the Bull market period of 2000 to 2007 were related and not independent. This therefore means that the weak form efficiency did not hold for Nigeria stock market under the 2000 to 2007 bull market run. Lastly, the Heteroskedasticity test (ARCH) test was also conducted to test for weak form efficiency under condition of return volatility for Nigeria under the 2000 to 2007 bull market cycle. From the results in table 4.4, the coefficient of lag one and two were positive (0.1251) and negative (-0.1088) and both was statistically insignificant even at 10%. The means that the time-varying volatility of the Nigeria stock market returns was not persistent under the 2000 to 2007 bull market cycle. That is, under condition of volatility the Nigeria stock market was weakly efficient during the 2000 to 2007 bull market cycle.

In addition to the above, we also conducted the series of statistical test for another bull market cycle in Nigeria for the period of 2012 to 2013. The results obtained are presented and discussed as follows;

Table 4.5: 2012-2013 Nigeria Bull Market Cycles

	Coefficient	Sig value	Lag	Good Fit	N
Unit root test	-1.1690	(-5.41076) [0.00]	1	0.582	23
Variance Ratio	0.4719 0.1780	(-1.891) [0.05] (-1.736) [0.004]	2 4	-	23
Serial correlation	0.1843 -0.0852	(0.84) [0.4109] (0.387) [0.702]	1 2	0.0351	24
Autoregressive	-0.1690	(-0.782) [0.442]	1	0.028	23

Heteroskedasticity test (ARCH)	-0.07073 -0.21242	-0.31625 [0.232] -0.94566 [0.298]	1 2	0.3562	22

The Table 4.5 represents a Bull market cycle in Nigeria for the period of 2012 to 2013. In testing our hypothesis two (H2) under this period we conducted several test and the results are discussed as follows;

Firstly, the results of unit root test which is based on the Augmented Dickey-Fuller (ADF) test as found in table 4.5 shows that there is no unit root in the monthly return series of Nigerian stock market for the Bull market cycle that happened between the periods of 2012 to 2013. The ADF coefficient value was -1.1690 which is statistically significant at 1%. This therefore clearly shows that the Nigerian stock monthly return series under the 2012 to 2013 bull market cycle did not follow a random walk process. This means that the ADF unit root test provide sufficient evidence for us to conclude that Nigeria monthly stock return series under the 2012 to 2013 Bull market cycle was not efficient in weak form.

Secondly, in table 4.5, we also presents the variance ratios based on monthly return series of Nigeria monthly stocks returns under the 2012 to 2013 Bull market cycle. It is important to note here that the estimates given for each interval of 2 and 4 returns lags as shows on the results, indicate tendency towards persistency (VR < 1), which means that Nigerian stock prices follow a random walk under the 2012 to 2013 bull market cycle. According to these results, the monthly stock returns of Nigeria for the 2012 to 2013 Bull market cycle witness a martingale process that is; stock prices follow a random walk which means that Nigeria stock market was in a weak form efficient state under the 2012 to 2013 bull market regime.

Thirdly, the result of serial correlation test for Nigeria stock market under the 2012 to 2013 bull market cycle was also presented in table 4.5. Based on the result in table 4.5, the autocorrelation coefficient was positive for lag one (0.1843) and was also statistically insignificant at 1% level, this means that there is absence of predictability of returns in short period, which is not a general evidence against market efficiency, thus, it shows that at lags one, the returns cannot be predicted and weak form of efficiency did hold for the 2012 to 2013 Nigeria bull market cycle.

Fourthly, the autoregressive (AR) model which is a representation of a type of random process was also presented in Table 4.5. To test for weak form efficiency under the 2012 to 2013 bull market trend in Nigeria stock market.

The result indicates that the one period lag of monthly stock returns in Nigeria under this period had a negative coefficient (-0.1690) which was insignificantly different from zero at 1%. This implies that the returns on Nigerian stock market for the Bull market period of 2012 to 2013 were not related and are independent. This therefore means that the weak form efficiency did hold for Nigeria stock market under the 2012 to 2013 Bull market run.

Lastly, the Heteroskedasticity test (ARCH) test was also conducted to test for weak form efficiency under conditions of return volatility for Nigeria under the 2012 to 2013 bull market cycle. From the results in table 4.5, the coefficient of lag one and two were negative (-0.0707) and (-0.2124) and both was statistically insignificant even at 10%. The means that the time-varying volatility of the Nigeria stock market returns was not persistent under the 2012 to 2013 bull market cycle. That is, under condition of volatility the Nigeria stock market was weak form efficient during the 2012 to 2013 bull market cycle.

Following the above analysis for Nigeria Bull Market Cycles we therefore conclude that our hypothesis two ***(H2) which states that Nigeria stock market are not weak form efficient under Bull market cycle should be accepted*** since most of our statistical test indicated that the market under bull cycle was more likely to be inefficient in weak form.

In addition to the above, we also conducted the series of statistical test for China bull market cycle. The results obtained are presented and discussed as follows;

Table 4.6: 1999-2000 China Bull Market Cycles

	Coefficient	Sig value	Lag	Good Fit	N
Unit root test	-0.8553	(-3.984) [0.000]	1	0.43	23
Variance Ratio	0.6505	(-1.054) [0.292]	2	-	23
	0.5275	(-0.911) [0.362]	4		
Serial correlation	0.1556	(0.71) [0.483]	2	0.025	24
	-0.0699	(-0.31) [0.753]	4		
Autoregressive	0.1446	(-0.674) [0.507]	1	0.0211	24
Heteroskedasticity	-0.0692	-0.3031[0.765]	1	0.0181	22
test (ARCH)	-0.1204	-0.5272 [0.604]	2		

The Table 4.6 represents a bull market cycle in China for the period of 1999-2000. In testing our hypothesis two (H2) under this period we conducted several tests and the results are discussed as follows;

Firstly, the results of unit root test which is based on the Augmented Dickey-Fuller (ADF) test as found in Table 4.6 shows that there is no unit root in the monthly return series of Nigeria stock market for the Bull market cycle that happened between the periods of 1999 to 2000. The ADF coefficient value was -

0.8553 which is statistically significant at 1%. This therefore clearly shows that the china stock monthly return series under the 1999 to 2000 bull market cycle did not follow a random walk process. This means that the ADF unit root test provide sufficient evidence for us to conclude that china monthly stock return series under the 1999 to 2000 long bull market cycle was not efficient in weak form.

Secondly, in table 4.6, we also presents the variance ratios based on monthly return series of china monthly stocks returns under the 1999 to 2000 bull market cycle. It is important to note here that the estimates given for each interval of 2 and 4 returns lags as shows on the results indicate tendency towards persistency (VR < 1) but was statistically insignificant at 5% which means that china stock prices follow a random walk under the 1999 to 2000 bull market cycle. According to these results, the monthly stock returns of china for the 1999 to 2000 bull market cycle witness a martingale process that is; stock prices follow a random walk which means that China stock market was in a weak form efficient state under the 1999 to 2000 bull market regime.

Thirdly, the result of serial correlation test for china stock market under the 1999 to 2000 bull market cycle was also presented in table 4.6. Based on the result in table

4.6, the autocorrelation coefficient was positive for lag one (0.1446) and was also statistically insignificant at 1% level, this means that there is no existence of predictability of returns in short period, which is general evidence for market efficiency, thus, it shows that at lags one, the returns cannot be predicted and weak form of efficiency hold for the 1999 to 2000 china bull market cycle.

Fourthly, the autoregressive (AR) model which is a representation of a type of random process was also presented in Table 4.6. to test for weak form efficiency under the 1999 to 2000 bull market trend in china stock market. The result indicates that the one period lag of monthly stock returns in china under this period had a positive coefficient (0.1446) which was insignificantly different from zero at 1%. This implies that the returns on china stock market for the Bull market period of 1999 to 2000 were not related and independent. This therefore, means that the weak form efficiency holds for China Stock market under the 1999 to 2000 Bull market run.

Lastly, the Heteroskedasticity test (ARCH) test was also conducted to test for weak form efficiency under condition of return volatility for china under the 2000 to 2007 bull market cycle. From the results in table 4.6, the coefficient of lag one and two were negative (-0.0692) and (-0.1204) and both was statistically insignificant even at 10%. The means that the time-varying volatility of the china stock market returns was not persistent under the 1999 to 2000 bull market cycle. That is, under condition of volatility the china stock market was weakly efficient during the 1999 to 2000 bull market cycle.

In 2006 to 2007, the China stock market also witnessed another bull market cycle. The results obtained from analyzing this cycle are presented and discussed as follows;

Table 4.7: China 2006-2007 (Bull)

	Coefficient	Sig value	Lag	Good Fit	N
Unit root test	-0.7666	(-3.472) [0.00]	1	0.364	24
Variance Ratio	0.8665	(-0.950) [0.342]	2	-	23
	0.2935	(-2.121) [0.004]	4		
Serial correlation	0.2812	1.3753 [0.1835]	1	0.1996	24
	-0.4503	-1.9809 [0.0608]	2		
Autoregressive	0.2333	(1.056) [0.302]	1	0.0504	23
Heteroskedasticity	-0.101	-0.4783 [0.637]	1	0.139	24
test (ARCH)	-0.425	-1.7324 [0.0994]	2		

The Table 4.7 represents a bull market cycle in china for the period of 2006 to 2007. In testing our hypothesis two (H2) under this period we conducted some tests and the results are discussed as follows;

Firstly, the results of unit root test which is based on the Augmented Dickey-Fuller (ADF) test as found in table 4.7 shows that there is absence of unit root in the monthly return series of china stock market for the Bull market cycle that happened between the periods of 2006 to 2007. The ADF coefficient value was -0.7666 which is statistically insignificant at 1%. This therefore clearly shows that the china stock monthly return series under the 2006 to 2007 bull market cycle did follow a random walk process. This means that the ADF unit root test doesn't provide sufficient evidence for us to conclude that china monthly stock return series under the 2006 to 2007 long bull market cycle was not efficient in weak form. Secondly, in Table 4.7, we also presents the variance ratios based on monthly return series of Nigeria monthly stocks returns under the 2006 to 2007 bull market cycle. It is important to note here that the estimates given for each interval of 4 returns lags as shows on the results indicate tendency towards persistency (VR < 1) and was statistically significant at 5% which means that china stock prices did not follow a random walk under the 2006 to 2007 bull market cycle in China.

Thirdly, the result of serial correlation test for china stock market under the 2006 to 2007 bull market cycle was also presented in Table 4.7. Based on this result, the autocorrelation coefficient was positive for lag one (0.2812) and was also statistically insignificant at 1% level but became significant at 5% under lag two, this means that there is the existence of predictability of returns in a two month interval, which is a general evidence against market efficiency, thus, it shows that at lags two, the returns can be predicted and weak form of efficiency did not hold for the 2006 to 2007 China bull market cycle.

Fourthly, the autoregressive (AR) model which is a representation of a type of random process was also presented in Table 4.7. To test for weak form efficiency under the 2006 to 2007 bull market trend in china stock market. The result indicates that the one period lag of monthly stock returns in china under this period had a positive coefficient (0.2333) which was insignificantly different from zero at 1%. This implies that the returns on china stock market for the Bull market period of 2006 to 2007 were not related and independent. This therefore means that the weak form efficient hold for china stock market under the 2006 to 2007 bull market run.

Lastly, the Heteroskedasticity test (ARCH) test was also conducted to test for weak form efficiency under condition of return volatility for the china market under the 2006 to 2007 bull market cycle. From the results in Table 4.7, the coefficient of lag one and two were both negative (0.101) and (-0.425) and lag one was statistically insignificant while lag two was significant. The means that the time-varying volatility of the china stock market returns was persistent under the 2006 to 2007 bull market cycle. That is, under condition of volatility the china stock market was weakly efficient during the 2006 to 2007 bull market cycle.

Following the analysis for China Bull Market Cycles we therefore conclude that our hypothesis two ***(H2) which state that China stock market are not weak form efficient under bull market cycle should be accepted*** since there is evidence of market inefficiency in some of our statistical test.

4.4 Weak Form Efficiency under Bear market cycle in Nigeria and China

In testing our hypotheses three (H3) which state that Nigeria and China stock market are not weak form efficient in Bear market cycle. We presented the results of Nigeria Bull market cycle which include 2008-2009 Nigeria Bear market cycles, 2001-2002 China Bear market cycles, 2004-2005 *China* Bear market cycle and 2010-2012 China bear market cycle. The results obtained from analyzing theses bear market cycles are presented and discussed as follows;

Table 4.8:2008-2009 (Bear) Nigeria Bear market cycles

	Coefficient	Sig value	Lag	Good fit	N
Unit root test	-1.0581	(-4.8596)[0.000]	1	0.529	23
Variance Ratio	0.473	(-1.9687) [0.049]	2	-	23
	0.405	(-1.2842)[0.199]	4		
Serial correlation	-0.057	(-0.264)[0.794]	1	0.0034	24
	0.009	[0.0423)[0.966]	2		
Autoregressive	0.0581	(-0.266) [0.792]	1	0.003	24
Heteroskedasticity test (ARCH)	0.0578	-0.2583 [0.798]	1	0.0069	22
	-0.0625	-0.258 [0.7986]	2		

Source: Authors (2015)

The Table 4.8 represents a bear market cycle in Nigeria for the period of 2008 to 2009. In testing our hypothesis two (H3) under this period, several test were conducted and the results are discussed as follows;

Firstly, the results of unit root test which is based on the Augmented Dickey-Fuller (ADF) test as found in Table 4.8 shows that there is no unit root in the monthly return series of Nigerian stock market for the bear market cycle that happened between the period of 2008 to 2009. The ADF coefficient value was -1.0581 which is statistically significant at 1%. This therefore clearly shows that the Nigerian stock monthly return series under the 2008 to 2009 bear market cycle did not follow a random walk process. This means that the ADF unit root test provide sufficient evidence for us to conclude that Nigeria monthly stock return series under the 2008 to 2009 bear market cycle was not efficient in weak form.

Secondly, in Table 4.8, we also presents the variance ratios based on monthly return series of Nigeria monthly stocks returns under the 2008 to 2009 bear market cycle. It is important to note here that the estimates given for each interval of 2 returns lags as shows on the results, indicate tendency towards persistency (VR < 1) and statistically significant at 5% which means that Nigerian stock prices did not follow a random walk under the 2008 to 2009 bear market cycle. This means that Nigeria stock market was not weak form efficient under the 2008 to 2009 bear market regime.

Thirdly, the result of serial correlation test for Nigeria stock market under the 2008 to 2009 bear market cycle was also presented in table 4.8. Based on the result, the autocorrelation coefficient was negative for lag one (-0.057) and was also statistically insignificant at 1% level, this means that there is absence of the existence of predictability of returns in short period, which is a general evidence for market efficiency, thus, it shows that at lag one, the returns can be not predicted and weak form of efficiency hold for the 2008 to 2009 Nigeria bear market cycle.

Fourthly, the autoregressive (AR) model which is a representation of a type of random process was also presented in Table 4.8. to test for weak form efficiency under the 2008 to 2009 bear market trend in Nigeria stock market. The result indicates that the one period lag of monthly stock returns in Nigeria under this period had a positive coefficient (0.0581) which was insignificantly different from zero at 1%. This implies that the returns on Nigerian stock market for the Bear market period of 2008 to 2009 were not related and independent. This therefore means that the weak form efficiency hold for Nigeria stock market under the 2008 to 2009 bear market.

Lastly, the Heteroskedasticity test (ARCH) test was also conducted to test for weak form efficiency under condition of return volatility for Nigeria under the 2008 to 2009 bear market cycle. From the results of table 4.8, the coefficient of lag one and two were positive (0.0578) and negative (-0.0625) and both was statistically insignificant even at 10%. The means that the time-varying volatility of the Nigeria stock market returns was not persistent under the 2008 to 2009 bear market cycle. That is, under condition of volatility the Nigeria stock market was weakly efficient during the 2008 to 2009 bear market cycle.

Following the analysis for Nigeria Bear Market Cycles we therefore conclude that our hypothesis three ***(H3) which states that Nigeria stock market are not weak form efficient under Bear market cycle should be accepted*** since there was evidence of market inefficiency in some of our statistical test. When compared to the bull market cycle, we discovered that the likelihood of the market becoming efficient increased under the bear market cycle in Nigeria.

In a similar manner, we also conducted the same test for China bear market cycles and the results obtained are presented and discussed as follows;

Table 4.9: 2001-2002 China Bear market cycles

	Coefficient	Sig value	Lag	Joint Test	N
Unit root test	-0.8215	(-3.8136) [0.001]	1	0.409	24
Variance Ratio	0.7352	(-1.0820) [0.279]	2	-	23
	0.3789	(-1.4915)[0.1358]	4		
Serial correlation	0.2040	(0.942)[0.3566]	1	0.056	24
	-0.1635	[-0.747][0.4632]	2		
Autoregressive	0.1784	(0.8281) [0.4169]	1	0.03	23

Heteroskedasticity test (ARCH)	-0.381 -0.1122	-1.6647 [0.1124] -0.4923[0.6281]	1 2	0.1275	22

The table 4.9 represents a bull market cycle in China for the period of 2001 to 2002. In testing our hypotheses three (H3) under this period we conducted several test and the results are discussed as follows;

The results of unit root test which is based on the Augmented Dickey-Fuller (ADF) test as found in Table 4.9 shows that there is no unit root in the monthly return series of china stock market for the long Bear market cycle that happened between the period of 2001 to 2002. The ADF coefficient value was -0.8215 which is statistically significant at 1%. This therefore clearly shows that the china stock monthly return series under the 2001 to 2002 bear market cycle did not follow a random walk process. This means that the ADF unit root test provide sufficient evidence for us to conclude that china monthly stock return series under the 2001 to 200 bear market cycle was not efficient in weak form.

Secondly, in Table 4.9, we also presents the variance ratios based on monthly return series of china monthly stocks returns under the 2001 to 2002 bear market cycle. It is important to note here that the estimates given for each interval of 2 and 4 returns lags as shows on the results, indicate tendency towards persistency

(VR < 1), which means that china stock prices follow a random walk under the 2001 to 2002 bear market cycle. According to these results, the monthly stock returns of china for the 2001 to 2002 bull market cycle witness a martingale process that is; stock prices follow a random walk which means that china stock market was in a weak form efficient state under the 2001 to 2002 bear market regime.

Thirdly, the result of serial correlation test for china stock market under the 2001 to 2002 bear market cycle was also presented in table 4.9. Based on the result in table 4.9, the autocorrelation coefficient was positive for lag one (0.2040) and was also statistically insignificant at 1% level, this means that there is no existence of predictability of returns in short period, which is general evidence for market efficiency, thus, it shows that at lags one, the returns can be no be predicted and weak form of efficiency hold for the 2001 to 2002 china bear market cycle. Also, the autoregressive (AR) model which is a representation of a type of random process was also presented in Table 4.9. To test for weak form efficiency under the 2001 to 2002 bear market trend in china stock market. The result indicates that the one period lag of monthly stock returns in china under this period had a positive coefficient (0.1784) which was insignificantly different from zero at

1%. This implies that the returns on the china stock market for the bear market period of 2001 to 2002 were not related and independent. This therefore means that the weak form efficient hold for china stock market under the 2001 to 2002 bear market.

From the results in table 4.9, the coefficient of lag one and two were both negative (-0.381) and (-0.1122) and both was statistically insignificant even at 10%. This means that the time-varying volatility of the china stock market returns was not persistent under the 2001 to 2002 bear market cycle. That is, under condition of volatility the china stock market was weakly efficient during the 2001 to 2002 bear market cycle.

In addition, we also conducted the series of statistical test for another China Bear market cycle and the results obtained are presented and discussed as follows;

Table 4.10:* 2004-2005 *China Bear Market Cycle

	Coefficient	Sig value	Lag	Good Fit	N
Unit root test	-0.7014	(-3.697) [0.0013]	1	0.394	24

Variance Ratio	0.8130 0.5453	(-0.8316) [0.4057] (-1.0786)[0.2807]	2 4	-	23
Serial correlation	0.3557 -0.1741	(1.6271)[0.1186] [-0.7933)[0.4365]	1 2	0.115	24
Autoregressive	0.2985	(1.5736) [0.1305]	1	0.105	23
Heteroskedasticity test (ARCH)	-0.0453 -0.1978	-0.207 [0.1124] -0.988[0.6281]	1 2	0.05	22

The Table 4.10 represents a bear market cycle in china for the period of 2004 to 2005. In testing our hypothesis three (H3) under this period we conducted several test and the results are discussed as follows;

Firstly, the results of unit root test which is based on the Augmented Dickey-Fuller (ADF) test as found in Table 4.10 shows that there is no unit root in the monthly return series of china stock market for the Bear market cycle that happened between the periods of 2004 to 2005. The ADF coefficient value was -0.7014 which is statistically significant at 1%. This therefore shows that the china stock monthly return series under the 2004 to 2005 bear market cycle did not follow a random walk process. This means that the ADF unit root test provide sufficient evidence for us to conclude that china monthly stock return series under the 2004 to 2005 bear market cycle was not efficient in weak form.

Secondly, in Table 4.10, we also presents the variance ratios based on monthly return series of china monthly stocks returns under the 2004 to 2005 bear market cycle. It is important to note here that the estimates given for each interval of 2 and 4 returns lags as shows on the results indicate tendency towards persistency (VR < 1) and was statistically insignificant at 5% which means that the china stock prices follow a random walk under the 2004 to 2005 bear market cycle. According to these results, the monthly stock returns of china for the period of 2004 to 2005 bear market cycle witness a martingale process that is; stock prices follow a random walk which means that china stock market was in a weak form efficient state under the 2004 to 2005 bear market regime.

Thirdly, the result of serial correlation test for China stock market under the 2004 to 2005 bear market cycle was also presented in table 4.10. Based on the result in table 4.4, the autocorrelation coefficient was positive for lag one (0.3557) and was also statistically insignificant at 1% level, this means that there is the absence of the existence of predictability of returns in short period, which is general evidence for market efficiency, thus, it shows that at lag one, the returns cannot be predicted and weak form of efficiency did hold for the 2004 to 2005 china bear market cycle.

Fourthly, the autoregressive (AR) model which is a representation of a type of random process was also presented in Table 4.10. To test for weak form efficiency under the 2004 to 2005 bear market trend in china stock market. The result indicates that the one period lag of monthly stock returns in china under this period had a positive coefficient (0.2985) which was insignificantly different from zero at 1%. This implies that the returns on china stock market for the bear market period of 2004 to 2005 were not related and independent. This therefore means that the weak form of efficient hold for China stock market under the 2004 to 2005 bear market cycle.

Lastly, the Heteroskedasticity test (ARCH) test was also conducted to test for weak form efficiency under condition of return volatility for china under the 2004 to 2005 bear market cycle. From the results in table 4.10, the coefficient of lag one and two were both negative (-0.0453) and (-0.1978) and both was statistically insignificant even at 10%. The means that the time-varying volatility of the china stock market returns was not persistent under the 2004 to 2005 bear market cycle. That is, under condition of volatility the china stock market was weakly efficient during the 2004 to 2005 bear market cycle.

In addition to the above, we also conducted another bear market cycle in China for the period of 2010 to 2012. The results obtained are presented and discussed as follows;

Table 4.11: China 2010-2012 (Bear)

	Coefficient	Sig value	Lag	Joint Test	N
Unit root test	-0.902	(-5.104) [0]	1	0.44	35
Variance Ratio	0.6546 0.3084	(-1.9973) [0.0458] (-2.1920)[0.0284]	2 4	-	35
Serial correlation	0.1141 -0.1491	(0.6487)[0.521] [-0.846)[0.4034]	1 2	0.0302	36
Autoregressive	0.0979	(0.554) [0.583]	1	0.009	36
Heteroskedasticity test (ARCH)	-0.1720 -0.0410	-0.958 [0.345] -0.229[0.8205]	1 2	0.02	36

The Table 4.11 represents a bear market cycle in China for the period of 2010 to 2012. In testing our hypotheses three (H3) under this period we conducted several test and the results are discussed as follows;

Firstly, the results of unit root test which is based on the Augmented Dickey-Fuller (ADF) test as found in Table 4.11 shows absence of unit root in the monthly return series of china stock market for the long Bear market cycle that happened between the periods of 2010 to 2012. The ADF coefficient value was -0.902which is statistically significant at 1%. This therefore clearly shows that the china stock monthly return series under the 2010 to 2012 bear market cycle did not follow a random walk process. This means that the ADF unit root test provide sufficient evidence for us to conclude that china monthly stock return series under the 2010 to 2012 long bear market cycle was not efficient in weak form.

Secondly, in table 4.11, we also presents the variance ratios based on monthly return series of china monthly stocks returns under the 2010 to 2012 bear market cycle. It is important to note here that the estimates given for each interval of 2 and 4 returns lags as shows on the results, indicate tendency towards persistency (VR < 1) and statistical significant at 5%, which means that china stock prices did not follow a random walk under the 2010 to 2012 bear market cycle. This imply that china stock market was not in weak form efficient state under the 2010 to 2012 bear market regime.

Thirdly, the result of serial correlation test for china stock market under the 2010 to 2012 bear market cycle was also presented in table 4.111. Based on the result in table 4.11, the autocorrelation coefficient was positive for lag one (0.1141) and was also statistically insignificant at 1% level, this means that there is the absence of predictability of returns in short period, which is general evidence for market efficiency, thus, it shows that at lag one, the returns cannot be predicted and weak form of efficiency did hold for 2010 to 2012 china bear market cycle.

Fourthly, the autoregressive (AR) model which is a representation of a type of random process was also presented in Table 4.11. To test for weak form efficiency under the 2010 to 2012 bear market trend in china stock market. The result indicates that the one period lag of monthly stock returns in china under this period had a positive coefficient (0.0979) which was insignificantly different from zero at 1%. This implies that the returns on china stock market for the bear market for period of 2010 to 2012 were not related and independent. This therefore means that the weak form efficient did hold for china stock market under the 2010 to 2012 bear market.

Lastly, the Heteroskedasticity test (ARCH) test was also conducted to test for weak form efficiency under condition of return volatility for china under the 2010 to 2012 bear market cycle. From the results in Table 4.11, the coefficient of lag one and two were negative (-0.1720) and (-0.0410) and both was statistically insignificant even at 10%. The means that the time-varying volatility of the china stock market returns was not persistent under the 2010 to 2012 bear market cycle. That is, under condition of volatility the china stock market was weak form efficient during the 2010 to 2012 bear market cycle.

Following the analysis for all China bear cycle we therefore conclude that our hypothesis three ***(H3) which states that China stock market are not weak form efficient under bear market cycle should be accepted*** since some statistical test found market inefficiency. It should be noted that most statistical test found weak form efficiency under China bear market cycle when compared to the bull or full market cycle. This clearly means that investors are less likely to correctly predict market trends under bear market cycle than in Bull market cycle. A major explanation for this might be the existence of panic selling during bear market trends.

4.5 Discussion of Findings

The study investigated the possibilities of weak form market efficiency in bull and bear market cycles in Nigeria and China. From our analysis we observed that in Nigeria case, the results showed that the weak form efficiency was less pronounced on many statistical tests during the bull period of study (ie the bull and bear cycles) and during the bull market cycle, however, during the bear market cycle, we discovered that the market became more likely weak form efficient. This means investors are more likely to predict stock returns better in the bull market cycle than in the bear market cycle. This is consistent with the previous studies in Nigeria that have mixed results. Samuel and Yacourt (1981) which was one of the earliest studies on weak form of market efficiency in the NSE using serial correlation reported that the stock price changes were not serially correlated but followed a random walk. However, Osamwonyi and Anikanmade (2002) tested weak form of market efficiency in the NSE by conducting a runs test analysis. Their results showed that stock prices in the NSE were non-random and therefore the NSE was not efficient in the weak form. Emenike (2008) conducted his research on weak form efficiency and his results showed that the NSE is not efficient in the weak form.

In the case of China, our results showed that weak form efficiency was less pronounced on many statistical test under the bull period of study and during the bull market cycle, while the market became highly weak form efficient during the bear market cycle as found in Nigeria. This is consistent with previous studies in China that found mixed results. Wu (1996) examined efficiency in both Chinese stock market of Shanghai and Shenzhen and found the markets to be weak form efficient. Seddighi and Nian (2004) Liu et al. (1997) examined daily closing prices on the Shanghai and Shenzhen stock exchanges using the ADF unit root and cointegration tests for the period of May 21, 1992 to December 18,1995. The ADF unit root test was used to test randomness in each stock exchange share price index and cointegration and causality tests were used to examine relationship between the two share indexes. Their results suggested that the random walk for both the Shanghai and Shenzhen should be accepted, indicating that each market is individually efficient. Mookerjee and Yu (1999) test the efficiency of Chinese Stock Market of Shenzhen and Shanghai using serial correlation and the runs tests, they observed that there are significant inefficiencies present on both exchange. Darrat and Zhong (2000) however used the variance ratio test of Lo and Mackinlay (1988) and a model-comparison method to examine whether or not stock prices in both Chinese markets follow a random walk. Their results from variance ratio and model – comparison tests indicated that share indices on both markets do not follow a random walk. Their results also showed that prices of A-share indices exhibit positive autocorrelation, implying the potential for predictability.

Highly contradictory result have been found in case of emerging markets depending on the size of the market, influence of insider trader, market integration, liberalization, trading volume process, and infrequent trading (Shamshirm & Mustafa, 2014).

Various factors are identified for stock market inefficiency in various studies in emerging markets. Weak institutions (Johnson & Mitton, 2003; Fisman, 2001; Bertrand et al, 2002) broker and insider influences (Khwaja & Mian, 2005; Siddiqi, 2007; Phan & Zhou, 2014) size of stock market (Lagoarde – Segot & Lucey, 2008), volume of turnover (Smith & Ryoo, 2003), market manipulation capacity (Magnusson & Wydick, 2002).

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Findings

In this study we investigated the possibilities of the existence of weak form market efficiency in Nigeria and China stock markets but unlike previous studies we investigated the existence of weak form efficiency under bull and bear market cycles. The data for this study comprise of the monthly all share prices index returns (R), which was computed using percentage changes in monthly All Share Prices Index for Nigeria and China. The All Share Price Index data for Nigeria was obtained from the Nigeria Stock Exchange (NSE) webpage and it covered a period of 192 sampled months (i.e from January 1999 to December 2014) while data for China all share price index was obtained from Fred economics webpage and it also covered 192 months (i.e from January 1999 to December 2014).

This study like other similar research on weak form efficiency in Nigeria and China adopted the popular and widely use statistical test and analysis. This include the unit root test (ADF and PP test), random walk test, serial autocorrelation test, autoregressive test, variance ratios and the non-linear ARCH test. The following are the summary of findings:

1. It was observed that, the unit root test, variance ratio test; serial correlation test; autoregressive test and heteroskedasticity test show that Nigeria and China stock markets are not weak form efficient during the full period of the bull and bear market cycles.

2. From the results, we also find out that the unit root test, variance ratio test; serial correlation test; autoregressive test and heteroskedasticity test show that Nigeria and China stock markets are not weak form efficient during the bull market cycle.

3. The serial correlation test; autoregressive model and heteroskedasticity test show that Nigeria and china stock markets are weak form efficient during the bear market cycle.

4. As observed from the above, the study confirms that there is difference in weak form efficiency using different statistical tests.

5.2 Conclusion

We observed from theoretical and empirical literature that not much research has been conducted in the area of test for the weak form efficiency under different market cycle in Nigeria. This therefore forms the major problem this study seeks to address. The discussion of bull and bear market cycles attracts much attention in the literature, e.g Pagan and Sossounov (2003), Yan, et al (2007), Rutledge, Zhang and Karim (2008), Zhou, et al (2009), De Bondt, Peltonen and Santabarbara (2011) and because the cycles of bull and bear markets not only reflects distortion in market efficiency but if not considered in testing market efficiency can lead to conflicting results, since investors behaviour are different under this two state of market cycle.

The study confirms that the Nigeria and China stock markets are not weak form efficient. This is consistent with the studies of Osamwonyi and Anikanmade (2002), Wu (1996). However, it is the opinion of this study that the reason for conflicting results from previous studies is because of the fact that they did not take into consideration the market cycles in testing the weak form efficiency.

5.3 Recommendations

Based on the findings of this study, we suggest the following measures:

- **Arbitrage Trading Opportunities:** Because in our study, we found that market inefficiency is present in Nigeria and China under bull and bear market cycle. We therefore recommend that investors in both markets can buy and sell shares by using the buy low and sell high rule to profit in the market.

- **Information Asymmetry**: The existence of market inefficiency in Nigeria and China Market also clearly shows that there is lack of information in these markets. We therefore recommend that more information disclosure should be encouraged in both markets. Darrat and Zhong (2000) suggest market inefficiency often arise from thin trading and asymmetric information. They also claim that market imperfection such as ineffective legal structures and lack of transparency that prevents the smooth transfer of information, which typically characterized emerging markets, are also another explanation for inefficiency in Nigeria and Chinese stock markets.
- **Technical Analysis research:** The existence of market inefficiency in both markets under different market conditions also confirm that the use of charts or technical analysis to find trends that can lead to profitable trading should be adopted since the markets are not random. .
- **Bull and Bear Market Timing:** In this study we also found that bull markets are characterized by positive returns while bear market are characterized by negative average monthly returns. We therefore recommend that investors in Nigeria and China should pull out their funds from the stock market when average monthly returns starts to become negative and inject more funds into the market when monthly average stock

market returns starts to become positive. This study therefore recommend that investors can invest in upward market trend during bull cycle but should invest in diversified index funds as the market tend to be more efficient for Nigeria and China.

- **Inefficient market trading opportunities**: We also recommend that stock traders and short term investors should exploit more trading strategy that are based on seasonality, Size and Low P/E as there are inefficiencies in Nigeria and China Stock Market.
- **China and Nigeria Portfolio Diversification:** The low correlation between Nigeria and China stock exchange as found in this study suggest that international equity portfolio investors can reduce their international portfolio risk by investing in Nigeria and China. This is recommended because crisis in China stock Exchange will be minimally transmitted to Nigeria Capital Market.

5.4 Contribution to Knowledge

The study has contributed to knowledge by:

i. Creating the foundation for empirical literature on weak form efficiency for bull and bear market cycle in Nigeria and China. It has also added to knowledge in the area of weak form efficiency by adding to existing literature in emerging markets such as that of Nigeria. It has therefore filled a gap in literature as most studies on testing the weak form market efficiency have ignored the distortions in market as a result of the bull and bear market cycles.

ii. It has also contributed to knowledge in the sense that not many studies have compared the Nigeria stock market and China stock market. This study has therefore expanded the scope of study in testing for weak form market efficiency in emerging and developing markets.

iii. Most of the studies on testing the weak form use a maximum of two statistical tests. However, in this study five statistical tests were employed in data analysis five statistical tests were employed in data analysis. This has made the study more robust.

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LIST OF TABLES

CHINA 1999-2000 BULL ANALYSIS

UNIT ROOT TEST

Null Hypothesis: CHBULL_1999_2000 has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.984506	0.0059
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(CHBULL_1999_2000)

Method: Least Squares

Date: 04/19/15 Time: 07:47

Sample (adjusted): 2 24

Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CHBULL_1999_2000(-1)	-0.855308	0.214658	-3.984506	0.0007

Dependent Variable: CHBULL_1999_2000

Method: Least Squares

Date: 04/19/15 Time: 08:00

Sample (adjusted): 2 24

Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.024171	0.016145	1.497098	0.1492
CHBULL_1999_2000(-1)	0.144692	0.214658	0.674059	0.5076

R-squared	0.021178	Mean dependent var	0.028113
Adjusted R-squared	-0.025433	S.D. dependent var	0.071272
S.E. of regression	0.072172	Akaike info criterion	-2.336578
Sum squared resid	0.109386	Schwarz criterion	-2.23784
Log likelihood	28.87065	Hannan-Quinn criter.	-2.311746
F-statistic	0.454355	Durbin-Watson stat	1.983237
Prob(F-statistic)	0.507626		

AUTOREGRESSIVE MODEL: NIGERIA FULL ANALYSIS

Dependent Variable: NSERETN

Method: Least Squares

Date: 04/19/15 Time: 08:22

Sample (adjusted): 2 192

Included observations: 191 after adjustments

C	0.024171	0.016145	1.497098	0.1492

R-squared	0.430528	Mean dependent var	0.00087
Adjusted R-squared	0.403411	S.D. dependent var	0.09344
S.E. of regression	0.072172	Akaike info criterion	-2.336578
Sum squared resid	0.109386	Schwarz criterion	-2.23784
Log likelihood	28.87065	Hannan-Quinn criter.	-2.311746
F-statistic	15.87629	Durbin-Watson stat	1.983237
Prob(F-statistic)	0.000674		

VARIANCE RATIO

Null Hypothesis: CHBULL_1999_2000 is a martingale

Date: 04/19/15 Time: 07:48

Sample: 1 24

Included observations: 23 (after adjustments)

Heteroskedasticity robust standard error estimates

User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 8)*	1.281886	23	0.5902

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.650511	0.331685	-1.053679	0.292
4	0.527597	0.51846	-0.911165	0.3622
8	0.138541	0.672025	-1.281886	0.1999
16	0.310244	0.81041	-0.851119	0.3947

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.010779	0.005213	2.067715	0.04
NSERETN(-1)	0.117958	0.072208	1.633577	0.104

R-squared	0.013923	Mean dependent var	0.012208
Adjusted R-squared	0.008706	S.D. dependent var	0.071332
S.E. of regression	0.07102	Akaike info criterion	-2.441285
Sum squared resid	0.953295	Schwarz criterion	-2.40723
Log likelihood	235.1427	Hannan-Quinn criter.	-2.427491
F-statistic	2.668575	Durbin-Watson stat	2.021953
Prob(F-statistic)	0.104012		

AUTOREGRESSIVE MODEL FOR CHINA FULL ANALYSIS

Dependent Variable: CHRETUN

Method: Least Squares

Date: 04/19/15 Time: 08:24

Sample (adjusted): 2 192

Included observations: 191 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.00464	0.004656	0.996547	0.3203
CHRETUN(-1)	0.370199	0.067551	5.480255	0

*Probability approximation using studentized maximum modulus with parameter value 4 and infinite degrees of freedom

Test Details (Mean = 0.000869565217391)

Period	Variance	Var. Ratio	Obs.
1	0.00873	--	23
2	0.00568	0.65051	22
4	0.00461	0.5276	20
8	0.00121	0.13854	16
16	0.00271	0.31024	8

CHINA 1999-2000 BULL ANALYSIS

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.276363	Prob. F(2,21)	0.7613
Obs*R-squared	0.615486	Prob. Chi-Square(2)	0.7351

Test Equation:

Dependent Variable: RESID

Method: Least Squares

R-squared	0.137117	Mean dependent var	0.007314
Adjusted R-squared	0.132552	S.D. dependent var	0.068707
S.E. of regression	0.063992	Akaike info criterion	-2.649706
Sum squared resid	0.773947	Schwarz criterion	-2.61565
Log likelihood	255.0469	Hannan-Quinn criter.	-2.635912
F-statistic	30.03319	Durbin-Watson stat	2.032547
Prob(F-statistic)	0		

AUTOREGRESSIVE MODEL NIGERIA 2008-2009 BEAR

Dependent Variable: NSEBEAR_2008_2009

Method: Least Squares

Date: 04/19/15 Time: 08:26

Sample (adjusted): 2 24

Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.034367	0.029593	-1.161338	0.2585
NSEBEAR_2008_2009(-1)	-0.058122	0.217739	-0.266936	0.7921

R-squared	0.003382	Mean dependent var	-0.032343
Adjusted R-squared	-0.044076	S.D. dependent var	0.134259
S.E. of regression	0.137186	Akaike info criterion	-1.052021

Date: 04/19/15 Time: 07:50

Sample: 1 24

Included observations: 24

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.00018	0.014815	-0.012158	0.9904
RESID(-1)	0.155635	0.218398	0.712621	0.4839
RESID(-2)	-0.069904	0.219664	-0.318232	0.7535

R-squared	0.025645	Mean dependent var	-6.07E-18
Adjusted R-squared	-0.06715	S.D. dependent var	0.070248
S.E. of regression	0.072569	Akaike info criterion	-2.292102
Sum squared resid	0.11059	Schwarz criterion	-2.144845
Log likelihood	30.50522	Hannan-Quinn criter.	-2.253034
F-statistic	0.276363	Durbin-Watson stat	1.988007
Prob(F-statistic)	0.761254		

CHINA 1999-2000 BULL ANALYSIS

Heteroskedasticity Test: ARCH

F-statistic	0.175162	Prob. F(2,19)	0.8407
Obs*R-squared	0.398296	Prob. Chi-Square(2)	0.8194

Sum squared resid	0.395218	Schwarz criterion	-0.953282
Log likelihood	14.09824	Hannan-Quinn criter.	-1.027188
F-statistic	0.071255	Durbin-Watson stat	1.808719
Prob(F-statistic)	0.792122		

AUTOREGRESSIVE MODEL NIGERIA 2012-2013 BULL

Dependent Variable: NSEBULL_2012_2013

Method: Least Squares

Date: 04/19/15 Time: 08:28

Sample (adjusted): 2 24

Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.036162	0.012207	2.962334	0.0074
NSEBULL_2012_2013(-1)	-0.169021	0.216055	-0.782308	0.4428

R-squared	0.028318	Mean dependent var	0.031278
Adjusted R-squared	-0.017953	S.D. dependent var	0.049865
S.E. of regression	0.05031	Akaike info criterion	-3.058268
Sum squared resid	0.053154	Schwarz criterion	-2.959529
Log likelihood	37.17008	Hannan-Quinn criter.	-3.033435
F-statistic	0.612006	Durbin-Watson stat	1.978922
Prob(F-statistic)	0.442766		

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 04/19/15 Time: 07:51

Sample (adjusted): 3 24

Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.005805	0.003436	1.689545	0.1075
RESID^2(-1)	-0.069261	0.228437	-0.303194	0.765
RESID^2(-2)	-0.120489	0.228516	-0.527265	0.6041

R-squared	0.018104	Mean dependent var	0.004842
Adjusted R-squared	-0.085253	S.D. dependent var	0.013463
S.E. of regression	0.014025	Akaike info criterion	-5.569876
Sum squared resid	0.003737	Schwarz criterion	-5.421098
Log likelihood	64.26864	Hannan-Quinn criter.	-5.534828
F-statistic	0.175162	Durbin-Watson stat	2.016039
Prob(F-statistic)	0.840661		

CHINA BEAR ANALYSIS OF 2001-2002

Null Hypothesis: CHBEAR_2001_2002 has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=5)

AUTOREGRESSIVE MODEL 2000-2007 BULL MARKET

Dependent Variable: NSEBULL_2000_2007

Method: Least Squares

Date: 04/19/15 Time: 08:30

Sample (adjusted): 2 96

Included observations: 95 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.019496	0.006034	3.231132	0.0017
NSEBULL_2000_2007(-1)	0.248983	0.09996	2.490834	0.0145

R-squared	0.06254	Mean dependent var	0.026038
Adjusted R-squared	0.05246	S.D. dependent var	0.054395
S.E. of regression	0.052949	Akaike info criterion	-3.018149
Sum squared resid	0.260734	Schwarz criterion	-2.964384
Log likelihood	145.3621	Hannan-Quinn criter.	-2.996424
F-statistic	6.204255	Durbin-Watson stat	1.967079
Prob(F-statistic)	0.014518		

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.813605	0.0087
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(CHBEAR_2001_2002)

Method: Least Squares

Date: 04/19/15   Time: 07:52

Sample (adjusted): 2 24

Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CHBEAR_2001_2002(-1)	-0.821581	0.215434	-3.813605	0.001
C	-0.013365	0.011031	-1.211596	0.2391

R-squared	0.409176	Mean dependent var	-0.002191
Adjusted R-squared	0.381042	S.D. dependent var	0.064826
S.E. of regression	0.051001	Akaike info criterion	-3.030987
Sum squared resid	0.054624	Schwarz criterion	-2.932249
Log likelihood	36.85636	Hannan-Quinn criter.	-3.006155

F-statistic	14.54359	Durbin-Watson stat	1.865957
Prob(F-statistic)	0.001014		

CHINA BEAR ANALYSIS OF 2001-2002

VARIANCE RATIO

Null Hypothesis: CHBEAR_2001_2002 is a martingale

Date: 04/19/15 Time: 07:55

Sample: 1 24

Included observations: 23 (after adjustments)

Heteroskedasticity robust standard error estimates

User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 4)*	1.491576	23	0.4423

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.735203	0.244708	-1.082095	0.2792
4	0.378984	0.416349	-1.491576	0.1358
8	0.263337	0.612825	-1.202078	0.2293
16	0.148645	0.860505	-0.989367	0.3225

*Probability approximation using studentized maximum modulus with
parameter value 4 and infinite degrees of freedom

Test Details (Mean = -0.00219130434783)

Period	Variance	Var. Ratio	Obs.
1	0.0042	--	23
2	0.00309	0.7352	22
4	0.00159	0.37898	20
8	0.00111	0.26334	16
16	0.00062	0.14864	8

CHINA BEAR ANALYSIS OF 2001-2002

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.626111	Prob. F(2,21)	0.5444
Obs*R-squared	1.350576	Prob. Chi-Square(2)	0.509

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 04/19/15 Time: 07:56

Sample: 1 24

Included observations: 24

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000179	0.010339	0.017308	0.9864
RESID(-1)	0.204025	0.216436	0.942656	0.3566

RESID(-2)	-0.16354	0.218868	-0.747206	0.4632

R-squared	0.056274	Mean dependent var	4.77E-18
Adjusted R-squared	-0.033605	S.D. dependent var	0.049739
S.E. of regression	0.050568	Akaike info criterion	-3.01453
Sum squared resid	0.053699	Schwarz criterion	-2.867274
Log likelihood	39.17437	Hannan-Quinn criter.	-2.975463
F-statistic	0.626111	Durbin-Watson stat	1.956474
Prob(F-statistic)	0.544355		

CHINA BEAR ANALYSIS OF 2001-2002

Heteroskedasticity Test: ARCH

F-statistic	1.389144	Prob. F(2,19)	0.2735
Obs*R-squared	2.806572	Prob. Chi-Square(2)	0.2458

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 04/19/15 Time: 07:57

Sample (adjusted): 3 24

Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	0.003737	0.001178	3.172301	0.005
RESID^2(-1)	-0.381367	0.22909	-1.664706	0.1124
RESID^2(-2)	-0.112281	0.228039	-0.492378	0.6281

R-squared	0.127571	Mean dependent var	0.002493
Adjusted R-squared	0.035737	S.D. dependent var	0.003383
S.E. of regression	0.003322	Akaike info criterion	-8.450544
Sum squared resid	0.00021	Schwarz criterion	-8.301765
Log likelihood	95.95598	Hannan-Quinn criter.	-8.415496
F-statistic	1.389144	Durbin-Watson stat	2.054253
Prob(F-statistic)	0.273485		

AUTOREGRESSIVE

Dependent Variable: CHBEAR_2001_2002

Method: Least Squares

Date: 04/19/15 Time: 07:59

Sample (adjusted): 2 24

Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.013365	0.011031	-1.211596	0.2391
CHBEAR_2001_2002(-1)	0.178419	0.215434	0.828184	0.4169

R-squared	0.031628	Mean dependent var	-0.015791
Adjusted R-squared	-0.014485	S.D. dependent var	0.050636
S.E. of regression	0.051001	Akaike info criterion	-3.030987

Sum squared resid	0.054624	Schwarz criterion	-2.932249
Log likelihood	36.85636	Hannan-Quinn criter.	-3.006155
F-statistic	0.685889	Durbin-Watson stat	1.865957
Prob(F-statistic)	0.416879		

CHINA 2004-2005 BEAR ANALYSIS

Null Hypothesis: CHBEAR_2004_2005 has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.697676	0.0113
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(CHBEAR_2004_2005)

Method: Least Squares

Date: 04/19/15 Time: 08:02

Sample (adjusted): 2 24

Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CHBEAR_2004_2005(-1)	-0.701476	0.189707	-3.697676	0.0013
C	-0.010592	0.008946	-1.184007	0.2496

R-squared	0.394338	Mean dependent var	-0.002543
Adjusted R-squared	0.365497	S.D. dependent var	0.052243
S.E. of regression	0.041614	Akaike info criterion	-3.437805
Sum squared resid	0.036367	Schwarz criterion	-3.339067
Log likelihood	41.53476	Hannan-Quinn criter.	-3.412973
F-statistic	13.67281	Durbin-Watson stat	2.004768
Prob(F-statistic)	0.001335		

VARIANCE RATIO

Null Hypothesis: CHBEAR_2004_2005 is a martingale

Date: 04/19/15 Time: 08:03

Sample: 1 24

Included observations: 23 (after adjustments)

Heteroskedasticity robust standard error estimates

User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 8)*	1.125825	23	0.7005

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability

2	0.813012	0.224865	-0.831556	0.4057
4	0.545358	0.421489	-1.078655	0.2807
8	0.300682	0.621161	-1.125825	0.2602
16	0.722184	0.829712	-0.334834	0.7378

*Probability approximation using studentized maximum modulus with parameter value 4 and infinite degrees of freedom

Test Details (Mean = -0.00254347826087)

Period	Variance	Var. Ratio	Obs.
1	0.00273	--	23
2	0.00222	0.81301	22
4	0.00149	0.54536	20
8	0.00082	0.30068	16
16	0.00197	0.72218	8

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.367558	Prob. F(2,21)	0.2765
Obs*R-squared	2.765639	Prob. Chi-Square(2)	0.2509

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 04/19/15   Time: 08:04

Sample: 1 24

Included observations: 24

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000386	0.009296	0.041507	0.9673
RESID(-1)	0.355785	0.21865	1.627193	0.1186
RESID(-2)	-0.174114	0.219472	-0.79333	0.4365

R-squared	0.115235	Mean dependent var	0
Adjusted R-squared	0.030972	S.D. dependent var	0.046241
S.E. of regression	0.04552	Akaike info criterion	-3.224878
Sum squared resid	0.043513	Schwarz criterion	-3.077621
Log likelihood	41.69853	Hannan-Quinn criter.	-3.18581
F-statistic	1.367558	Durbin-Watson stat	1.870025
Prob(F-statistic)	0.276499		

Heteroskedasticity Test: ARCH

F-statistic	0.51834	Prob. F(2,19)	0.6037
Obs*R-squared	1.138261	Prob. Chi-Square(2)	0.566

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 04/19/15   Time: 08:05

Sample (adjusted): 3 24

Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002167	0.000854	2.538325	0.02
RESID^2(-1)	-0.045384	0.218772	-0.207451	0.8379
RESID^2(-2)	-0.197833	0.200034	-0.988997	0.3351

R-squared	0.051739	Mean dependent var	0.001655
Adjusted R-squared	-0.048078	S.D. dependent var	0.002877
S.E. of regression	0.002945	Akaike info criterion	-8.691297
Sum squared resid	0.000165	Schwarz criterion	-8.542518
Log likelihood	98.60427	Hannan-Quinn criter.	-8.656249
F-statistic	0.51834	Durbin-Watson stat	1.954336
Prob(F-statistic)	0.603691		

AUTOREGRESSIVE MODEL

Dependent Variable: CHBEAR_2004_2005

Method: Least Squares

Date: 04/19/15   Time: 08:05

Sample (adjusted): 2 24

Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.010592	0.008946	-1.184007	0.2496
CHBEAR_2004_2005(-1)	0.298524	0.189707	1.573602	0.1305

R-squared	0.105478	Mean dependent var	-0.014017
Adjusted R-squared	0.062882	S.D. dependent var	0.042988
S.E. of regression	0.041614	Akaike info criterion	-3.437805
Sum squared resid	0.036367	Schwarz criterion	-3.339067
Log likelihood	41.53476	Hannan-Quinn criter.	-3.412973
F-statistic	2.476224	Durbin-Watson stat	2.004768
Prob(F-statistic)	0.130526		

2006-2007 CHINA BULL ANALYSIS

Null Hypothesis: CHBULL_2006_2007 has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.472808	0.0185
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(CHBULL_2006_2007)

Method: Least Squares

Date: 04/19/15 Time: 08:07

Sample (adjusted): 2 24

Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CHBULL_2006_2007(-1)	-0.766694	0.220771	-3.472808	0.0023
C	0.049926	0.023307	2.142072	0.0441

R-squared	0.364799	Mean dependent var	-0.005396
Adjusted R-squared	0.334551	S.D. dependent var	0.100025
S.E. of regression	0.081596	Akaike info criterion	-2.091138
Sum squared resid	0.139815	Schwarz criterion	-1.992399
Log likelihood	26.04808	Hannan-Quinn criter.	-2.066305
F-statistic	12.0604	Durbin-Watson stat	1.79373
Prob(F-statistic)	0.002273		

VARIANCE RATIO

Null Hypothesis: CHBULL_2006_2007 is a martingale

Date: 04/19/15 Time: 08:08

Sample: 1 24

Included observations: 23 (after adjustments)

Heteroskedasticity robust standard error estimates

User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 4)*	2.121352	23	0.1288

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.866558	0.140452	-0.950088	0.3421
4	0.293532	0.333027	-2.121352	0.0339
8	0.252937	0.569271	-1.312316	0.1894
16	0.280973	0.827303	-0.869122	0.3848

*Probability approximation using studentized maximum modulus with parameter value 4 and infinite degrees of freedom

Test Details (Mean = -0.00539565217391)

Period	Variance	Var. Ratio	Obs.
1	0.01001	--	23
2	0.00867	0.86656	22
4	0.00294	0.29353	20

8	0.00253	0.25294	16
16	0.00281	0.28097	8

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.618442	Prob. F(2,21)	0.0965
Obs*R-squared	4.790402	Prob. Chi-Square(2)	0.0912

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 04/19/15 Time: 08:09
Sample: 1 24
Included observations: 24
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.003622	0.015517	0.233436	0.8177
RESID(-1)	0.281221	0.204476	1.375329	0.1835
RESID(-2)	-0.450384	0.227359	-1.980936	0.0608

R-squared	0.1996	Mean dependent var	0
Adjusted R-squared	0.123372	S.D. dependent var	0.080138
S.E. of regression	0.075032	Akaike info criterion	-2.22534

Sum squared resid	0.118225	Schwarz criterion	-2.078083
Log likelihood	29.70408	Hannan-Quinn criter.	-2.186273
F-statistic	2.618442	Durbin-Watson stat	2.039671
Prob(F-statistic)	0.096544		

Heteroskedasticity Test: ARCH

F-statistic	1.541049	Prob. F(2,19)	0.2398
Obs*R-squared	3.07064	Prob. Chi-Square(2)	0.2154

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 04/19/15 Time: 08:10

Sample (adjusted): 3 24

Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.009494	0.00248	3.828546	0.0011
RESID^2(-1)	-0.101703	0.212598	-0.478383	0.6378
RESID^2(-2)	-0.425625	0.245688	-1.732378	0.0994

R-squared	0.139575	Mean dependent var	0.006671
Adjusted R-squared	0.049003	S.D. dependent var	0.007496

S.E. of regression	0.00731	Akaike info criterion	-6.872976
Sum squared resid	0.001015	Schwarz criterion	-6.724197
Log likelihood	78.60273	Hannan-Quinn criter.	-6.837928
F-statistic	1.541049	Durbin-Watson stat	1.822902
Prob(F-statistic)	0.23976		

AUTOREGRESSIVE MODEL

Dependent Variable: CHBULL_2006_2007

Method: Least Squares

Date: 04/19/15 Time: 08:11

Sample (adjusted): 2 24

Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.049926	0.023307	2.142072	0.0441
CHBULL_2006_2007(-1)	0.233306	0.220771	1.056782	0.3026

R-squared	0.050495	Mean dependent var	0.066761
Adjusted R-squared	0.005281	S.D. dependent var	0.081812
S.E. of regression	0.081596	Akaike info criterion	-2.091138
Sum squared resid	0.139815	Schwarz criterion	-1.992399
Log likelihood	26.04808	Hannan-Quinn criter.	-2.066305
F-statistic	1.116789	Durbin-Watson stat	1.79373
Prob(F-statistic)	0.302617		

2010-2012 CHINA BEAR MARKET CYCLE

Null Hypothesis: CHBEAR_2010_2012 has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.103887	0.0002
Test critical values:	1% level	-3.6329	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(CHBEAR_2010_2012)

Method: Least Squares

Date: 04/19/15 Time: 08:15

Sample (adjusted): 2 36

Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CHBEAR_2010_2012(-1)	-0.902018	0.176732	-5.103887	0
C	-0.009209	0.007887	-1.167579	0.2513

R-squared	0.441148	Mean dependent var	0.001597
Adjusted R-squared	0.424213	S.D. dependent var	0.059237
S.E. of regression	0.044949	Akaike info criterion	-3.311122
Sum squared resid	0.066674	Schwarz criterion	-3.222245
Log likelihood	59.94464	Hannan-Quinn criter.	-3.280442
F-statistic	26.04966	Durbin-Watson stat	1.909781
Prob(F-statistic)	0.000014		

VARIANCE RATIO

Null Hypothesis: CHBEAR_2010_2012 is a martingale

Date: 04/19/15 Time: 08:17

Sample: 1 36

Included observations: 35 (after adjustments)

Heteroskedasticity robust standard error estimates

User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 4)*	2.192074	35	0.1088

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.65462	0.172915	-1.997396	0.0458
4	0.308494	0.315457	-2.192074	0.0284
8	0.191447	0.487791	-1.657581	0.0974
16	0.150413	0.693635	-1.224834	0.2206

*Probability approximation using studentized maximum modulus with

parameter value 4 and infinite degrees of freedom

Test Details (Mean = 0.00159714285714)

Period	Variance	Var. Ratio	Obs.
1	0.00351	--	35
2	0.0023	0.65462	34
4	0.00108	0.30849	32
8	0.00067	0.19145	28
16	0.00053	0.15041	20

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.514879	Prob. F(2,33)	0.6023
Obs*R-squared	1.089379	Prob. Chi-Square(2)	0.58

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 04/19/15 Time: 08:18

Sample: 1 36

Included observations: 36

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.44E-05	0.007419	0.001942	0.9985
RESID(-1)	0.114138	0.175934	0.648756	0.521
RESID(-2)	-0.149164	0.176206	-0.846532	0.4034

R-squared	0.030261	Mean dependent var	-1.16E-18
Adjusted R-squared	-0.028512	S.D. dependent var	0.043858
S.E. of regression	0.044479	Akaike info criterion	-3.307945
Sum squared resid	0.065287	Schwarz criterion	-3.175985
Log likelihood	62.54301	Hannan-Quinn criter.	-3.261887
F-statistic	0.514879	Durbin-Watson stat	1.951434
Prob(F-statistic)	0.602294		

Heteroskedasticity Test: ARCH

F-statistic	0.462229	Prob. F(2,31)	0.6341
Obs*R-squared	0.984562	Prob. Chi-Square(2)	0.6112

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 04/19/15 Time: 08:18

Sample (adjusted): 3 36

Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002327	0.000715	3.252248	0.0028
RESID^2(-1)	-0.172046	0.179484	-0.958558	0.3452
RESID^2(-2)	-0.041013	0.179232	-0.228829	0.8205

R-squared	0.028958	Mean dependent var	0.001921
Adjusted R-squared	-0.03369	S.D. dependent var	0.00282
S.E. of regression	0.002867	Akaike info criterion	-8.787111
Sum squared resid	0.000255	Schwarz criterion	-8.652432
Log likelihood	152.3809	Hannan-Quinn criter.	-8.741182
F-statistic	0.462229	Durbin-Watson stat	1.991501
Prob(F-statistic)	0.634149		

AUTOREGRESSIVE MODEL

Dependent Variable: CHBEAR_2010_2012

Method: Least Squares

Date: 04/19/15 Time: 08:19

Sample (adjusted): 2 36

Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.009209	0.007887	-1.167579	0.2513
CHBEAR_2010_2012(-1)	0.097982	0.176732	0.554411	0.583

R-squared	0.009228	Mean dependent var	-0.010383
Adjusted R-squared	-0.020795	S.D. dependent var	0.044489
S.E. of regression	0.044949	Akaike info criterion	-3.311122
Sum squared resid	0.066674	Schwarz criterion	-3.222245
Log likelihood	59.94464	Hannan-Quinn criter.	-3.280442
F-statistic	0.307372	Durbin-Watson stat	1.909781
Prob(F-statistic)	0.583036		

FULL RESULTS

	NSERETN	CHRETUN
Mean	0.012071	0.007199
Median	0.00535	0.0028
Maximum	0.382	0.3258
Minimum	-0.3064	-0.1551
Std. Dev.	0.07117	0.068545
Skewness	0.271598	1.112729
Kurtosis	8.325079	6.386704
Jarque-Bera	229.2122	131.3794
Probability	0	0
Sum	2.3176	1.3823
Sum Sq. Dev.	0.967443	0.89741
Observations	192	192

Correlation Matrix

	NSERETN	CHRETUN
NSERETN	0.0050388	0.00087234
CHRETUN	0.0008723	0.00467401

NSEBULL_2000_2007

FULL ANALYSIS

NIGERIA UNIT ROOT

Null Hypothesis: NSERETN has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.21524	0
Test critical values:	1% level	-3.464643	
	5% level	-2.876515	
	10% level	-2.574831	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(NSERETN)

Method: Least Squares

Date: 04/19/15 Time: 07:01

Sample (adjusted): 2 192

Included observations: 191 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NSERETN(-1)	-0.882042	0.072208	-12.21524	0

Mean	0.026729
Median	0.02585
Maximum	0.2035
Minimum	-0.1215
Std. Dev.	0.05453
Skewness	0.25645
Kurtosis	3.295592
Jarque-Bera	1.401766
Probability	0.496147
Sum	2.566
Sum Sq. Dev.	0.282486
Observations	96

NSEBEAR_2008_2009	
Mean	-0.033725
Median	-0.04915
Maximum	0.382
Minimum	-0.3064
Std. Dev.	0.131482
Skewness	1.18561
Kurtosis	6.166707
Jarque-Bera	15.65072

C	0.010779	0.005213	2.067715	0.04
R-squared	0.441179	Mean dependent var		9.11E-05
Adjusted R-squared	0.438222	S.D. dependent var		0.094755
S.E. of regression	0.07102	Akaike info criterion		-2.44129
Sum squared resid	0.953295	Schwarz criterion		-2.40723
Log likelihood	235.1427	Hannan-Quinn criter.		-2.42749
F-statistic	149.2121	Durbin-Watson stat		2.021953
Prob(F-statistic)	0			

NIGERIA VARIANCE RATIO

Null Hypothesis: NSERETN is a martingale

Date: 04/19/15 Time: 07:02

Sample: 1 192

Included observations: 191 (after adjustments)

Heteroskedasticity robust standard error estimates

User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 2)*	3.374766	191	0.003

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.511252	0.144824	-3.374766	0.0007
4	0.311791	0.249205	-2.761619	0.0058
8	0.13475	0.364818	-2.371734	0.0177

Probability	0.000399
Sum	-0.8094
Sum Sq. Dev.	0.397613
Observations	24

NSEBULL_2012_2013	
Mean	0.030267
Median	0.02735
Maximum	0.1455
Minimum	-0.0439
Std. Dev.	0.04902
Skewness	0.680127
Kurtosis	3.134087
Jarque-Bera	1.868268
Probability	0.392926
Sum	0.7264
Sum Sq. Dev.	0.055268
Observations	24

CHBULL_1999_2000

16	0.087451	0.475235	-1.920205	0.0548

*Probability approximation using studentized maximum modulus with parameter value 4 and infinite degrees of freedom

Test Details (Mean = 9.10994764398e-05)

Period	Variance	Var. Ratio	Obs.
1	0.00898	--	191
2	0.00459	0.51125	190
4	0.0028	0.31179	188
8	0.00121	0.13475	184
16	0.00079	0.08745	176

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.123437	Prob. F(2,189)	0.1225
Obs*R-squared	4.219472	Prob. Chi-Square(2)	0.1213

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 04/19/15 Time: 07:05
Sample: 1 192
Included observations: 192

Mean	0.026333
Median	0.01705
Maximum	0.2798
Minimum	-0.0607
Std. Dev.	0.070248
Skewness	1.862924
Kurtosis	8.109151
Jarque-Bera	39.98537
Probability	0
Sum	0.632
Sum Sq. Dev.	0.113501
Observations	24

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.27E-05	0.005106	-0.010311	0.9918
RESID(-1)	0.107321	0.072441	1.481491	0.1401
RESID(-2)	0.090829	0.072764	1.248272	0.2135

R-squared	0.021976	Mean dependent var	-9.41E-18
Adjusted R-squared	0.011627	S.D. dependent var	0.07117
S.E. of regression	0.070755	Akaike info criterion	-2.44369
Sum squared resid	0.946182	Schwarz criterion	-2.39279
Log likelihood	237.5941	Hannan-Quinn criter.	-2.42307
F-statistic	2.123437	Durbin-Watson stat	2.017401
Prob(F-statistic)	0.122465		

CHBEAR_2001_2002	
Mean	-0.014846
Median	-0.02105
Maximum	0.0851
Minimum	-0.1119
Std. Dev.	0.049739
Skewness	0.07346
Kurtosis	2.81487
Jarque-Bera	0.055859

Heteroskedasticity Test: ARCH

F-statistic	2.75117	Prob. F(2,187)	0.0664
Obs*R-squared	5.430815	Prob. Chi-Square(2)	0.0662

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 04/19/15   Time: 07:06

Probability	0.972457
Sum	-0.3563
Sum Sq. Dev.	0.056901
Observations	24

	CHBEAR_2004_2005
Mean	-0.010088
Median	-0.01895
Maximum	0.1052
Minimum	-0.0774
Std. Dev.	0.046241
Skewness	0.821799
Kurtosis	3.194299
Jarque-Bera	2.739165
Probability	0.254213
Sum	-0.2421
Sum Sq. Dev.	0.04918
Observations	24

	CHBULL_2006_2007

Sample (adjusted): 3 192

Included observations: 190 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004073	0.001109	3.671169	0.0003
RESID^2(-1)	0.036156	0.072155	0.501084	0.6169
RESID^2(-2)	0.163563	0.072148	2.267067	0.0245

R-squared	0.028583	Mean dependent var	0.005082
Adjusted R-squared	0.018194	S.D. dependent var	0.013739
S.E. of regression	0.013613	Akaike info criterion	-5.73993
Sum squared resid	0.034653	Schwarz criterion	-5.68866
Log likelihood	548.293	Hannan-Quinn criter.	-5.71916
F-statistic	2.75117	Durbin-Watson stat	2.044442
Prob(F-statistic)	0.066439		

CHINA ANALYSIS

UNIT ROOT TEST

Null Hypothesis: CHRETUN has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=14)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-9.323295	0

Mean	0.067671
Median	0.0535
Maximum	0.2139
Minimum	-0.0866
Std. Dev.	0.080138
Skewness	0.1856
Kurtosis	2.375593
Jarque-Bera	0.527673
Probability	0.768099
Sum	1.6241
Sum Sq. Dev.	0.147708
Observations	24

CHBEAR_2010_2012	
Mean	-0.010533
Median	-0.01605
Maximum	0.0896
Minimum	-0.1263
Std. Dev.	0.043858
Skewness	-0.183362
Kurtosis	3.111755
Jarque-Bera	0.220464

Test critical values:	1% level	-3.464643
	5% level	-2.876515
	10% level	-2.574831

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(CHRETUN)

Method: Least Squares

Date: 04/19/15 Time: 07:09

Sample (adjusted): 2 192

Included observations: 191 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CHRETUN(-1)	-0.629801	0.067551	-9.323295	0
C	0.00464	0.004656	0.996547	0.3203

R-squared	0.315028	Mean dependent var	9.11E-05
Adjusted R-squared	0.311404	S.D. dependent var	0.077116
S.E. of regression	0.063992	Akaike info criterion	-2.64971
Sum squared resid	0.773947	Schwarz criterion	-2.61565
Log likelihood	255.0469	Hannan-Quinn criter.	-2.63591
F-statistic	86.92384	Durbin-Watson stat	2.032547
Prob(F-statistic)	0		

Probability	0.895626
Sum	-0.3792
Sum Sq. Dev.	0.067324
Observations	36

VARIANCE RATIO

Null Hypothesis: CHRETUN is a martingale

Date: 04/19/15 Time: 07:11

Sample: 1 192

Included observations: 191 (after adjustments)

Heteroskedasticity robust standard error estimates

User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 4)*	3.532507	191	0.0016

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.66058	0.113243	-2.997273	0.0027
4	0.34158	0.186389	-3.532507	0.0004
8	0.185642	0.256863	-3.170398	0.0015
16	0.110192	0.346573	-2.567449	0.0102

*Probability approximation using studentized maximum modulus with parameter value 4 and infinite degrees of freedom

Test Details (Mean = 9.10994764398e-05)

Period	Variance	Var. Ratio	Obs.
1	0.00595	--	191
2	0.00393	0.66058	190

4	0.00203	0.34158	188
8	0.0011	0.18564	184
16	0.00066	0.11019	176

SERIAL CORRELATION TEST

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	15.22078	Prob. F(2,189)	0
Obs*R-squared	26.63479	Prob. Chi-Square(2)	0

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 04/19/15 Time: 07:12

Sample: 1 192

Included observations: 192

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.01E-05	0.004615	-0.002195	0.9983
RESID(-1)	0.353874	0.072669	4.869672	0
RESID(-2)	0.044102	0.07267	0.606884	0.5447
R-squared	0.138723	Mean dependent var		4.71E-18

Adjusted R-squared	0.129609	S.D. dependent var	0.068545
S.E. of regression	0.063949	Akaike info criterion	-2.64595
Sum squared resid	0.772918	Schwarz criterion	-2.59505
Log likelihood	257.0112	Hannan-Quinn criter.	-2.62534
F-statistic	15.22078	Durbin-Watson stat	2.00396
Prob(F-statistic)	0.000001		

Heteroskedasticity Test: ARCH

F-statistic	0.371431	Prob. F(2,187)	0.6903
Obs*R-squared	0.751794	Prob. Chi-Square(2)	0.6867

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 04/19/15   Time: 07:13

Sample (adjusted): 3 192

Included observations: 190 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004627	0.000927	4.991925	0
RESID^2(-1)	0.053163	0.073107	0.727195	0.468
RESID^2(-2)	-0.036478	0.073113	-0.498918	0.6184

R-squared	0.003957	Mean dependent var	0.004706
Adjusted R-squared	-0.006696	S.D. dependent var	0.010929
S.E. of regression	0.010965	Akaike info criterion	-6.17251
Sum squared resid	0.022484	Schwarz criterion	-6.12124
Log likelihood	589.3885	Hannan-Quinn criter.	-6.15174
F-statistic	0.371431	Durbin-Watson stat	1.994019
Prob(F-statistic)	0.690254		

NSEBULL_2000_2007

Null Hypothesis: NSEBULL_2000_2007 has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.5132	0
Test critical values:	1% level	-3.500669	
	5% level	-2.8922	
	10% level	-2.583192	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(NSEBULL_2000_2007)

Method: Least Squares

Date: 04/19/15 Time: 07:20

Sample (adjusted): 2 96

Included observations: 95 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NSEBULL_2000_2007(-1)	-0.751017	0.09996	-7.5132	0
C	0.019496	0.006034	3.231132	0.0017

R-squared	0.377711	Mean dependent var	-0.00024
Adjusted R-squared	0.371019	S.D. dependent var	0.066763
S.E. of regression	0.052949	Akaike info criterion	-3.01815
Sum squared resid	0.260734	Schwarz criterion	-2.96438
Log likelihood	145.3621	Hannan-Quinn criter.	-2.99642
F-statistic	56.44818	Durbin-Watson stat	1.967079
Prob(F-statistic)	0		

VARIANCE RATIO

Null Hypothesis: NSEBULL_2000_2007 is a martingale

Date: 04/19/15 Time: 07:22

Sample: 1 96

Included observations: 95 (after adjustments)

Heteroskedasticity robust standard error estimates

User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 4)*	2.917448	95	0.014

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.669002	0.13576	-2.438115	0.0148
4	0.348755	0.223224	-2.917448	0.0035
8	0.164031	0.325456	-2.568606	0.0102
16	0.096477	0.461308	-1.95861	0.0502

*Probability approximation using studentized maximum modulus with
parameter value 4 and infinite degrees of freedom

Test Details (Mean = -0.000234736842105)

Period	Variance	Var. Ratio	Obs.
1	0.00446	--	95
2	0.00298	0.669	94
4	0.00155	0.34875	92
8	0.00073	0.16403	88
16	0.00043	0.09648	80

SERIAL CORRELATION TEST

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.179727	Prob. F(2,93)	0.0462
Obs*R-squared	6.144434	Prob. Chi-Square(2)	0.0463

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 04/19/15 Time: 07:24

Sample: 1 96

Included observations: 96

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.74E-05	0.005443	0.012375	0.9902
RESID(-1)	0.26129	0.103745	2.518574	0.0135
RESID(-2)	-0.050669	0.104276	-0.485912	0.6282

R-squared	0.064005	Mean dependent var	-8.96E-18
Adjusted R-squared	0.043876	S.D. dependent var	0.05453
S.E. of regression	0.05332	Akaike info criterion	-2.99424
Sum squared resid	0.264406	Schwarz criterion	-2.91411
Log likelihood	146.7236	Hannan-Quinn criter.	-2.96185
F-statistic	3.179727	Durbin-Watson stat	1.992229
Prob(F-statistic)	0.046156		

Heteroskedasticity Test: ARCH

F-statistic	1.145902	Prob. F(2,91)	0.3225
Obs*R-squared	2.309202	Prob. Chi-Square(2)	0.3152

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 04/19/15 Time: 07:25

Sample (adjusted): 3 96

Included observations: 94 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002913	0.000619	4.703703	0
RESID^2(-1)	0.125064	0.103979	1.202779	0.2322
RESID^2(-2)	-0.108804	0.103929	-1.046908	0.2979

R-squared	0.024566	Mean dependent var	0.002959
Adjusted R-squared	0.003128	S.D. dependent var	0.004518
S.E. of regression	0.004511	Akaike info criterion	-7.93339
Sum squared resid	0.001851	Schwarz criterion	-7.85223
Log likelihood	375.8695	Hannan-Quinn criter.	-7.90061
F-statistic	1.145902	Durbin-Watson stat	2.005642
Prob(F-statistic)	0.322481		

NSEBEAR 2008-2009 BEAR ANALYSIS

UNIT ROOT TEST

Null Hypothesis: NSEBEAR_2008_2009 has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.859594	0.0008
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(NSEBEAR_2008_2009)

Method: Least Squares

Date: 04/19/15 Time: 07:30

Sample (adjusted): 2 24

Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NSEBEAR_2008_2009(-1)	-1.058122	0.217739	-4.859594	0.0001
C	-0.034367	0.029593	-1.161338	0.2585

R-squared	0.529313	Mean dependent var	0.00247
Adjusted R-squared	0.5069	S.D. dependent var	0.195363
S.E. of regression	0.137186	Akaike info criterion	-1.05202
Sum squared resid	0.395218	Schwarz criterion	-0.95328
Log likelihood	14.09824	Hannan-Quinn criter.	-1.02719
F-statistic	23.61566	Durbin-Watson stat	1.808719
Prob(F-statistic)	0.000084		

VARIANCE RATIO

Null Hypothesis: NSEBEAR_2008_2009 is a martingale

Date: 04/19/15 Time: 07:32

Sample: 1 24

Included observations: 23 (after adjustments)

Heteroskedasticity robust standard error estimates

User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 2)*	1.968742	23	0.182

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.473404	0.267478	-1.968742	0.049
4	0.404683	0.463557	-1.284237	0.1991
8	0.193964	0.685649	-1.17558	0.2398
16	0.204317	0.879437	-0.904764	0.3656

*Probability approximation using studentized maximum modulus with parameter value 4 and infinite degrees of freedom

Test Details (Mean = 0.00246956521739)

Period	Variance	Var. Ratio	Obs.
1	0.03817	--	23
2	0.01807	0.4734	22
4	0.01545	0.40468	20
8	0.0074	0.19396	16
16	0.0078	0.20432	8

SERIAL CORRELATION TEST

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.036539	Prob. F(2,21)	0.9642
Obs*R-squared	0.083229	Prob. Chi-Square(2)	0.9592

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 04/19/15 Time: 07:33

Sample: 1 24

Included observations: 24

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.15E-05	0.028041	-0.001837	0.9986
RESID(-1)	-0.057672	0.218387	-0.264081	0.7943
RESID(-2)	0.009249	0.218388	0.04235	0.9666

R-squared	0.003468	Mean dependent var	1.39E-17
Adjusted R-squared	-0.09144	S.D. dependent var	0.131482
S.E. of regression	0.137362	Akaike info criterion	-1.01593
Sum squared resid	0.396234	Schwarz criterion	-0.86867
Log likelihood	15.19112	Hannan-Quinn criter.	-0.97686
F-statistic	0.036539	Durbin-Watson stat	1.998276
Prob(F-statistic)	0.964181		

Heteroskedasticity Test: ARCH

F-statistic	0.066899	Prob. F(2,19)	0.9355
Obs*R-squared	0.153841	Prob. Chi-Square(2)	0.926

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 04/19/15 Time: 07:34

Sample (adjusted): 3 24

Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.017464	0.010532	1.658101	0.1137
RESID^2(-1)	-0.057811	0.223742	-0.258381	0.7989
RESID^2(-2)	-0.06258	0.22386	-0.27955	0.7828

R-squared	0.006993	Mean dependent var	0.015294
Adjusted R-squared	-0.097534	S.D. dependent var	0.03895
S.E. of regression	0.040805	Akaike info criterion	-3.43389
Sum squared resid	0.031636	Schwarz criterion	-3.28511
Log likelihood	40.77281	Hannan-Quinn criter.	-3.39884
F-statistic	0.066899	Durbin-Watson stat	1.948877
Prob(F-statistic)	0.935509		

2012-2013 BULL MARKET CYCLE

UNIT ROOT TEST

Null Hypothesis: NSEBULL_2012_2013 has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=5)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.410768	0.0002

Test critical values:	1% level	-3.752946
	5% level	-2.998064
	10% level	-2.638752

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(NSEBULL_2012_2013)

Method: Least Squares

Date: 04/19/15 Time: 07:37

Sample (adjusted): 2 24

Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NSEBULL_2012_2013(-1)	-1.169021	0.216055	-5.410768	0
C	0.036162	0.012207	2.962334	0.0074

R-squared	0.582309	Mean dependent var	0.002387
Adjusted R-squared	0.562419	S.D. dependent var	0.076055
S.E. of regression	0.05031	Akaike info criterion	-3.05827
Sum squared resid	0.053154	Schwarz criterion	-2.95953
Log likelihood	37.17008	Hannan-Quinn criter.	-3.03344
F-statistic	29.27642	Durbin-Watson stat	1.978922
Prob(F-statistic)	0.000023		

VARIANCE RATIO

Null Hypothesis: NSEBULL_2012_2013 is a martingale

Date: 04/19/15 Time: 07:38

Sample: 1 24

Included observations: 23 (after adjustments)

Heteroskedasticity robust standard error estimates

User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 2)*	1.891744	23	0.2143

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.471936	0.279141	-1.891744	0.0585
4	0.178049	0.473331	-1.736524	0.0825
8	0.163999	0.675628	-1.237369	0.216
16	0.180172	0.885767	-0.925557	0.3547

*Probability approximation using studentized maximum modulus with
parameter value 4 and infinite degrees of freedom

Test Details (Mean = 0.00238695652174)

Period	Variance	Var. Ratio	Obs.
1	0.00578	--	23
2	0.00273	0.47194	22

4	0.00103	0.17805	20
8	0.00095	0.164	16
16	0.00104	0.18017	8

SERIAL CORRELATION TEST

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.382338	Prob. F(2,21)	0.6869
Obs*R-squared	0.843212	Prob. Chi-Square(2)	0.656

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 04/19/15 Time: 07:39

Sample: 1 24

Included observations: 24

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	-0.00037	0.010297	-0.035967	0.9716
RESID(-1)	-0.184346	0.219713	-0.839031	0.4109
RESID(-2)	-0.085231	0.219774	-0.387814	0.7021

R-squared	0.035134	Mean dependent var	-5.20E-18
Adjusted R-squared	-0.056758	S.D. dependent var	0.04902
S.E. of regression	0.050392	Akaike info criterion	-3.02151
Sum squared resid	0.053326	Schwarz criterion	-2.87425
Log likelihood	39.25808	Hannan-Quinn criter.	-2.98244
F-statistic	0.382338	Durbin-Watson stat	2.015322
Prob(F-statistic)	0.686917		

Heteroskedasticity Test: ARCH

F-statistic	0.476049	Prob. F(2,19)	0.6284
Obs*R-squared	1.049823	Prob. Chi-Square(2)	0.5916

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 04/19/15 Time: 07:40

Sample (adjusted): 3 24

Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	0.002985	0.001121	2.663136	0.0154
RESID^2(-1)	-0.070734	0.223665	-0.316249	0.7553
RESID^2(-2)	-0.212421	0.224626	-0.945662	0.3562

R-squared	0.047719	Mean dependent var	0.002288
Adjusted R-squared	-0.052521	S.D. dependent var	0.003547
S.E. of regression	0.003639	Akaike info criterion	-8.26836
Sum squared resid	0.000252	Schwarz criterion	-8.11958
Log likelihood	93.95197	Hannan-Quinn criter.	-8.23331
F-statistic	0.476049	Durbin-Watson stat	1.943281
Prob(F-statistic)	0.628446		

APPENDIX I

	NSP	CHAINA	NSERETN	CHRETUN	AVERAGE RTN	AVERAGE RTN	NIG CYCLE	CHIN CYCLE
1999M01	5,494.8	0.40538	-1.41%	-1.46%			BEAR	BULL
1999M02	5,376.5	0.38653	-2.15%	-4.65%			BEAR	BULL
1999M03	5,456.2	0.40625	1.48%	5.10%			BEAR	BULL
1999M04	5,315.7	0.41014	-2.58%	0.96%			BEAR	BULL
1999M05	5,315.7	0.40490	0.00%	-1.28%			BEAR	BULL
1999M06	5,977.9	0.51818	12.46%	27.98%			BEAR	BULL
1999M07	4,964.4	0.55426	-16.95%	6.96%			BEAR	BULL
1999M08	4,946.2	0.57147	-0.37%	3.11%			BEAR	BULL
1999M09	4,890.8	0.57150	-1.12%	0.01%			BEAR	BULL
1999M10	5,032.5	0.53730	2.90%	-5.98%			BEAR	BULL
1999M11	5,133.2	0.51574	2.00%	-4.01%			BEAR	BULL
1999M12	5,266.4	0.49631	2.59%	-3.77%	-0.26%	1.91%	BEAR	BULL
2000M01	5,752.9	0.51668	9.24%	4.10%			BULL	BULL
2000M02	5,955.7	0.56796	3.53%	9.93%			BULL	BULL
2000M03	5,966.2	0.60882	0.18%	7.19%			BULL	BULL
2000M04	5,892.8	0.64234	-1.23%	5.51%			BULL	BULL
2000M05	6,095.4	0.64003	3.44%	-0.36%			BULL	BULL
2000M06	6,466.7	0.68010	6.09%	6.26%			BULL	BULL
2000M07	6,900.7	0.69677	6.71%	2.45%			BULL	BULL
2000M08	7,394.1	0.73015	7.15%	4.79%			BULL	BULL
2000M09	7,298.9	0.68585	-1.29%	-6.07%			BULL	BULL
2000M10	7,415.3	0.68340	1.59%	-0.36%			BULL	BULL
2000M11	7,164.4	0.72611	-3.38%	6.25%			BULL	BULL
2000M12	8,111.0	0.73003	13.21%	0.54%	3.77%	3.35%	BULL	BULL
2001M01	8,794.2	0.73508	8.42%	0.69%			BULL	BEAR
2001M02	9,180.5	0.69489	4.39%	-5.47%			BULL	BEAR
2001M03	9,159.8	0.71977	-0.23%	3.58%			BULL	BEAR
2001M04	9,591.6	0.75448	4.71%	4.82%			BULL	BEAR
2001M05	10,153.8	0.76723	5.86%	1.69%			BULL	BEAR
2001M06	10,937.3	0.78238	7.72%	1.97%			BULL	BEAR
2001M07	10,576.4	0.75569	-3.30%	-3.41%			BULL	BEAR
2001M08	10,329.0	0.67462	-2.34%	-10.73%			BULL	BEAR
2001M09	10,274.2	0.64258	-0.53%	-4.75%			BULL	BEAR
2001M10	11,091.4	0.59648	7.95%	-7.17%			BULL	BEAR
2001M11	11,169.6	0.59192	0.71%	-0.77%			BULL	BEAR
2001M12	10,963.1	0.59558	-1.85%	0.62%	2.63%	-1.58%	BULL	BEAR
2002M01	10,650.0	0.52893	-2.86%	-11.19%			BULL	BEAR

2002M02	10,581.9	0.53386	-0.64%	0.93%			BULL	BEAR
2002M03	11,214.4	0.57558	5.98%	7.82%			BULL	BEAR
2002M04	11,399.1	0.57821	1.65%	0.46%			BULL	BEAR
2002M05	11,486.7	0.56431	0.77%	-2.40%			BULL	BEAR
2002M06	12,440.7	0.55226	8.31%	-2.14%			BULL	BEAR
2002M07	12,458.2	0.59923	0.14%	8.51%			BULL	BEAR
2002M08	12,327.9	0.58683	-1.05%	-2.07%			BULL	BEAR
2002M09	11,811.6	0.57170	-4.19%	-2.58%			BULL	BEAR
2002M10	11,451.5	0.54386	-3.05%	-4.87%			BULL	BEAR
2002M11	11,622.7	0.51764	1.50%	-4.82%			BULL	BEAR
2002M12	12,137.7	0.49515	4.43%	-4.35%	0.92%	-1.39%	BULL	BEAR
2003M01	13,298.8	0.50581	9.57%	2.15%			BULL	BULL
2003M02	13,668.8	0.53047	2.78%	4.87%			BULL	BULL
2003M03	13,531.1	0.52401	-1.01%	-1.22%			BULL	BULL
2003M04	13,488.0	0.54768	-0.32%	4.52%			BULL	BULL
2003M05	14,086.3	0.54398	4.44%	-0.68%			BULL	BULL
2003M06	14,565.5	0.54413	3.40%	0.03%			BULL	BULL
2003M07	13,962.0	0.53105	-4.14%	-2.40%			BULL	BULL
2003M08	15,426.0	0.51431	10.49%	-3.15%			BULL	BULL
2003M09	16,500.5	0.49692	6.97%	-3.38%			BULL	BULL
2003M10	18,743.5	0.48508	13.59%	-2.38%			BULL	BULL
2003M11	19,319.3	0.48087	3.07%	-0.87%			BULL	BULL
2003M12	20,128.9	0.51996	4.19%	8.13%	4.42%	0.47%	BULL	BULL
2004M01	22,712.9	0.56171	12.84%	8.03%			BULL	BEAR
2004M02	24,797.4	0.59410	9.18%	5.77%			BULL	BEAR
2004M03	22,896.4	0.60373	-7.67%	1.62%			BULL	BEAR
2004M04	25,793.0	0.59707	12.65%	-1.10%			BULL	BEAR
2004M05	27,730.8	0.55340	7.51%	-7.31%			BULL	BEAR
2004M06	28,887.4	0.51802	4.17%	-6.39%			BULL	BEAR
2004M07	27,062.1	0.50256	-6.32%	-2.98%			BULL	BEAR
2004M08	23,774.3	0.48065	-12.15%	-4.36%			BULL	BEAR
2004M09	22,739.7	0.48376	-4.35%	0.65%			BULL	BEAR
2004M10	23,354.8	0.48024	2.70%	-0.73%			BULL	BEAR
2004M11	23,270.5	0.47482	-0.36%	-1.13%			BULL	BEAR
2004M12	23,844.5	0.46058	2.47%	-3.00%	1.72%	-0.91%	BULL	BEAR
2005M01	23,078.3	0.43747	-3.21%	-5.02%			BULL	BEAR
2005M02	21,953.5	0.45024	-4.87%	2.92%			BULL	BEAR
2005M03	20,682.4	0.44203	-5.79%	-1.82%			BULL	BEAR
2005M04	21,961.7	0.42391	6.19%	-4.10%			BULL	BEAR
2005M05	21,482.1	0.39109	-2.18%	-7.74%			BULL	BEAR
2005M06	21,564.8	0.38338	0.38%	-1.97%			BULL	BEAR

2005M07	21,911.0	0.36829	1.61%	-3.94%			BULL	BEAR
2005M08	22,935.4	0.40702	4.68%	10.52%			BULL	BEAR
2005M09	24,635.9	0.41810	7.41%	2.72%			BULL	BEAR
2005M10	25,873.8	0.40125	5.02%	-4.03%			BULL	BEAR
2005M11	24,355.9	0.38923	-5.87%	-3.00%			BULL	BEAR
2005M12	24,085.8	0.39772	-1.11%	2.18%	0.19%	-1.11%	BULL	BEAR
2006M01	23,679.4	0.43297	-1.69%	8.86%			BULL	BULL
2006M02	23,843.0	0.45253	0.69%	4.52%			BULL	BULL
2006M03	23,336.6	0.45293	-2.12%	0.09%			BULL	BULL
2006M04	23,301.2	0.48577	-0.15%	7.25%			BULL	BULL
2006M05	24,745.7	0.55466	6.20%	14.18%			BULL	BULL
2006M06	26,316.1	0.56904	6.35%	2.59%			BULL	BULL
2006M07	27,880.5	0.59623	5.94%	4.78%			BULL	BULL
2006M08	33,554.6	0.56793	20.35%	-4.75%			BULL	BULL
2006M09	32,643.7	0.60154	-2.71%	5.92%			BULL	BULL
2006M10	32,643.7	0.63010	0.00%	4.75%			BULL	BULL
2006M11	32,632.5	0.69123	-0.03%	9.70%			BULL	BULL
2006M12	33,189.3	0.81516	1.71%	17.93%	2.88%	6.32%	BULL	BULL
2007M01	36,784.5	0.98956	10.83%	21.39%			BULL	BULL
2007M02	40,730.7	1.00984	10.73%	2.05%			BULL	BULL
2007M03	43,456.1	1.05679	6.69%	4.65%			BULL	BULL
2007M04	47,124.0	1.24996	8.44%	18.28%			BULL	BULL
2007M05	49,930.2	1.42442	5.95%	13.96%			BULL	BULL
2007M06	51,330.5	1.41800	2.80%	-0.45%			BULL	BULL
2007M07	53,021.7	1.41921	3.29%	0.09%			BULL	BULL
2007M08	50,291.1	1.71347	-5.15%	20.73%			BULL	BULL
2007M09	50,229.0	1.89418	-0.12%	10.55%			BULL	BULL
2007M10	50,201.8	2.03727	-0.05%	7.55%			BULL	BULL
2007M11	54,189.9	1.86078	7.94%	-8.66%			BULL	BULL
2007M12	57,990.2	1.79474	7.01%	-3.55%	4.86%	7.22%	BULL	BULL
2008M01	54,189.92	1.78647	-6.55%	-0.46%			BEAR	BEAR
2008M02	65,652.38	1.58587	21.15%	-11.23%			BEAR	BEAR
2008M03	63,016.56	1.38362	-4.01%	-12.75%			BEAR	BEAR
2008M04	59,440.91	1.20134	-5.67%	-13.17%			BEAR	BEAR
2008M05	58,929.02	1.25967	-0.86%	4.86%			BEAR	BEAR
2008M06	55,949.00	1.06427	-5.06%	-15.51%			BEAR	BEAR
2008M07	53,110.91	0.99024	-5.07%	-6.96%			BEAR	BEAR
2008M08	47,789.20	0.88221	-10.02%	-10.91%			BEAR	BEAR
2008M09	46,216.13	0.76757	-3.29%	-13.00%			BEAR	BEAR
2008M10	36,325.86	0.69997	-21.40%	-8.81%			BEAR	BEAR
2008M11	33,025.75	0.66295	-9.08%	-5.29%			BEAR	BEAR

2008M12	31,450.78	0.68942	-4.77%	3.99%	-4.55%	-7.44%	BEAR	BEAR
2009M01	21,813.76	0.68506	-30.64%	-0.63%			BEAR	BULL
2009M02	23,377.14	0.77927	7.17%	13.75%			BEAR	BULL
2009M03	19,851.89	0.78742	-15.08%	1.05%			BEAR	BULL
2009M04	21,491.11	0.86930	8.26%	10.40%			BEAR	BULL
2009M05	29,700.24	0.92307	38.20%	6.19%			BEAR	BULL
2009M06	26,861.55	1.00021	-9.56%	8.36%			BEAR	BULL
2009M07	25,286.61	1.13433	-5.86%	13.41%			BEAR	BULL
2009M08	23,009.10	1.08683	-9.01%	-4.19%			BEAR	BULL
2009M09	22,065.00	1.02093	-4.10%	-6.06%			BEAR	BULL
2009M10	#######	1.04115	-1.18%	1.98%			BEAR	BULL
2009M11	21,010.29	1.13308	-3.64%	8.83%			BEAR	BULL
2009M12	20,827.17	1.13796	-0.87%	0.43%	-2.19%	4.46%	BEAR	BULL
2010M01	22,594.90	1.11993	8.49%	-1.58%			BULL	BEAR
2010M02	22,985.00	1.05832	1.73%	-5.50%			BULL	BEAR
2010M03	25,966.25	1.08024	12.97%	2.07%			BULL	BEAR
2010M04	26,453.20	1.08070	1.88%	0.04%			BULL	BEAR
2010M05	26,183.21	0.94418	-1.02%	-12.63%			BULL	BEAR
2010M06	25,384.14	0.89947	-3.05%	-4.74%			BULL	BEAR
2010M07	25,844.20	0.88113	1.81%	-2.04%			BULL	BEAR
2010M08	24,268.20	0.93160	-6.10%	5.73%			BULL	BEAR
2010M09	23,050.60	0.93221	-5.02%	0.07%			BULL	BEAR
2010M10	#######	1.01570	8.64%	8.96%			BULL	BEAR
2010M11	24,764.70	1.05085	-1.11%	3.46%			BULL	BEAR
2010M12	24,770.52	1.00569	0.02%	-4.30%	1.60%	-0.87%	BULL	BEAR
2011M01	26830.67	0.97837	8.32%	-2.72%			BEAR	BEAR
2011M02	26016.84	1.00847	-3.03%	3.08%			BEAR	BEAR
2011M03	24621.21	1.03962	-5.36%	3.09%			BEAR	BEAR
2011M04	25041.68	1.05776	1.71%	1.75%			BEAR	BEAR
2011M05	25866.62	1.00040	3.29%	-5.42%			BEAR	BEAR
2011M06	24980.2	0.95752	-3.43%	-4.29%			BEAR	BEAR
2011M07	23826.99	0.98013	-4.62%	2.36%			BEAR	BEAR
2011M08	21497.61	0.91615	-9.78%	-6.53%			BEAR	BEAR
2011M09	20373	0.86999	-5.23%	-5.04%			BEAR	BEAR
2011M10	20934.96	0.84500	2.76%	-2.87%			BEAR	BEAR
2011M11	20003.36	0.86811	-4.45%	2.73%			BEAR	BEAR
2011M12	20730.63	0.79471	3.64%	-8.46%	-1.35%	-1.86%	BEAR	BEAR
2012M01	20875.83	0.79908	0.70%	0.55%			BULL	BEAR
2012M02	20123.51	0.83610	-3.60%	4.63%			BULL	BEAR
2012M03	20652.47	0.84243	2.63%	0.76%			BULL	BEAR

2012M04	22045.66	0.82873	6.75%	-1.63%			BULL	BEAR
2012M05	22066.4	0.84419	0.09%	1.87%			BULL	BEAR
2012M06	21599.57	0.80624	-2.12%	-4.50%			BULL	BEAR
2012M07	23061.38	0.76642	6.77%	-4.94%			BULL	BEAR
2012M08	23750.82	0.74716	2.99%	-2.51%			BULL	BEAR
2012M09	26011.63	0.73156	9.52%	-2.09%			BULL	BEAR
2012M10	26430.92	0.74107	1.61%	1.30%			BULL	BEAR
2012M11	26494.44	0.72187	0.24%	-2.59%			BULL	BEAR
2012M12	28078.8	0.75082	5.98%	4.01%	2.63%	-0.43%	BULL	BEAR
2013M01	31853.18	0.81475	13.44%	8.51%			BULL	BULL
2013M02	33075.14	0.84578	3.84%	3.81%			BULL	BULL
2013M03	33536.25	0.81152	1.39%	-4.05%			BULL	BULL
2013M04	32993.97	0.78096	-1.62%	-3.77%			BULL	BULL
2013M05	37794.75	0.79891	14.55%	2.30%			BULL	BULL
2013M06	36464.39	0.75374	-3.52%	-5.65%			BULL	BULL
2013M07	37914.33	0.71159	3.98%	-5.59%			BULL	BULL
2013M08	36248.53	0.73285	-4.39%	2.99%			BULL	BULL
2013M09	36585.08	0.77249	0.93%	5.41%			BULL	BULL
2013M10	37622.74	1.02413	2.84%	32.58%			BULL	BULL
2013M11	38920.85	1.02706	3.45%	0.29%			BULL	BULL
2013M12	41329.19	1.02998	6.19%	0.29%	3.42%	3.09%	BULL	BULL
2014M01	40571.62	1.03291	-1.83%	0.28%			BEAR	BULL
2014M02	39558.89	1.03584	-2.50%	0.28%			BEAR	BULL
2014M03	38748.01	1.03877	-2.05%	0.28%			BEAR	BULL
2014M04	38485.56	1.04170	-0.68%	0.28%			BEAR	BULL
2014M05	41474.4	1.04463	7.77%	0.28%			BEAR	BULL
2014M06	42482.48	1.04756	2.43%	0.28%			BEAR	BULL
2014M07	42097.49	1.05049	-0.91%	0.28%			BEAR	BULL
2014M08	41532.31	1.05341	-1.34%	0.28%			BEAR	BULL
2014M09	41210.1	1.05634	-0.78%	0.28%			BEAR	BULL
2014M10	37550.24	1.05927	-8.88%	0.28%			BEAR	BULL
2014M11	34543.05	1.06220	-8.01%	0.28%			BEAR	BULL
2014M12	34657.15	1.06513	0.33%	0.28%	-1.37%	0.28%	BEAR	BULL

APPENDIX II

No OBSV	NSERETN	CHRETUN	NSEBULL 2000_2007	NSEBEAR 2008_2009	NSEBULL 2012_2013	CHBULL 1999_2000	CHBEAR 2001_2002	CHBEAR 2004_2005	CHBULL 2006_2007	CHBEAR 2010_2012
1	-1.41%	-1.46%	9.24%	-6.55%	0.70%	-1.46%	0.69%	8.03%	8.86%	-1.58%
2	-2.15%	-4.65%	3.53%	21.15%	-3.60%	-4.65%	-5.47%	5.77%	4.52%	-5.50%
3	1.48%	5.10%	0.18%	-4.01%	2.63%	5.10%	3.58%	1.62%	0.09%	2.07%
4	-2.58%	0.96%	-1.23%	-5.67%	6.75%	0.96%	4.82%	-1.10%	7.25%	0.04%
5	0.00%	-1.28%	3.44%	-0.86%	0.09%	-1.28%	1.69%	-7.31%	14.18%	-12.63%
6	12.46%	27.98%	6.09%	-5.06%	-2.12%	27.98%	1.97%	-6.39%	2.59%	-4.74%
7	-16.95%	6.96%	6.71%	-5.07%	6.77%	6.96%	-3.41%	-2.98%	4.78%	-2.04%
8	-0.37%	3.11%	7.15%	-10.02%	2.99%	3.11%	-10.73%	-4.36%	-4.75%	5.73%
9	-1.12%	0.01%	-1.29%	-3.29%	9.52%	0.01%	-4.75%	0.65%	5.92%	0.07%
10	2.90%	-5.98%	1.59%	-21.40%	1.61%	-5.98%	-7.17%	-0.73%	4.75%	8.96%
11	2.00%	-4.01%	-3.38%	-9.08%	0.24%	-4.01%	-0.77%	-1.13%	9.70%	3.46%
12	2.59%	-3.77%	13.21%	-4.77%	5.98%	-3.77%	0.62%	-3.00%	17.93%	-4.30%
13	9.24%	4.10%	8.42%	-30.64%	13.44%	4.10%	-11.19%	-5.02%	21.39%	-2.72%
14	3.53%	9.93%	4.39%	7.17%	3.84%	9.93%	0.93%	2.92%	2.05%	3.08%
15	0.18%	7.19%	-0.23%	-15.08%	1.39%	7.19%	7.82%	-1.82%	4.65%	3.09%
16	-1.23%	5.51%	4.71%	8.26%	-1.62%	5.51%	0.46%	-4.10%	18.28%	1.75%
17	3.44%	-0.36%	5.86%	38.20%	14.55%	-0.36%	-2.40%	-7.74%	13.96%	-5.42%
18	6.09%	6.26%	7.72%	-9.56%	-3.52%	6.26%	-2.14%	-1.97%	-0.45%	-4.29%
19	6.71%	2.45%	-3.30%	-5.86%	3.98%	2.45%	8.51%	-3.94%	0.09%	2.36%
20	7.15%	4.79%	-2.34%	-9.01%	-4.39%	4.79%	-2.07%	10.52%	20.73%	-6.53%
21	-1.29%	-6.07%	-0.53%	-4.10%	0.93%	-6.07%	-2.58%	2.72%	10.55%	-5.04%
22	1.59%	-0.36%	7.95%	-1.18%	2.84%	-0.36%	-4.87%	-4.03%	7.55%	-2.87%
23	-3.38%	6.25%	0.71%	-3.64%	3.45%	6.25%	-4.82%	-3.00%	-8.66%	2.73%
24	13.21%	0.54%	-1.85%	-0.87%	6.19%	0.54%	-4.35%	2.18%	-3.55%	-8.46%
25	8.42%	0.69%	-2.86%							0.55%
26	4.39%	-5.47%	-0.64%							4.63%
27	-0.23%	3.58%	5.98%							0.76%
28	4.71%	4.82%	1.65%							-1.63%
29	5.86%	1.69%	0.77%							1.87%
30	7.72%	1.97%	8.31%							-4.50%

31	-3.30%	-3.41%	0.14%	-4.94%
32	-2.34%	-10.73%	-1.05%	-2.51%
33	-0.53%	-4.75%	-4.19%	-2.09%
34	7.95%	-7.17%	-3.05%	1.30%
35	0.71%	-0.77%	1.50%	-2.59%
36	-1.85%	0.62%	4.43%	4.01%
37	-2.86%	-11.19%	9.57%	
38	-0.64%	0.93%	2.78%	
39	5.98%	7.82%	-1.01%	
40	1.65%	0.46%	-0.32%	
41	0.77%	-2.40%	4.44%	
42	8.31%	-2.14%	3.40%	
43	0.14%	8.51%	-4.14%	
44	-1.05%	-2.07%	10.49%	
45	-4.19%	-2.58%	6.97%	
46	-3.05%	-4.87%	13.59%	
47	1.50%	-4.82%	3.07%	
48	4.43%	-4.35%	4.19%	
49	9.57%	2.15%	12.84%	
50	2.78%	4.87%	9.18%	
51	-1.01%	-1.22%	-7.67%	
52	-0.32%	4.52%	12.65%	
53	4.44%	-0.68%	7.51%	
54	3.40%	0.03%	4.17%	
55	-4.14%	-2.40%	-6.32%	
56	10.49%	-3.15%	-12.15%	
57	6.97%	-3.38%	-4.35%	
58	13.59%	-2.38%	2.70%	
59	3.07%	-0.87%	-0.36%	
60	4.19%	8.13%	2.47%	
61	12.84%	8.03%	-3.21%	
62	9.18%	5.77%	-4.87%	
63	-7.67%	1.62%	-5.79%	
64	12.65%	-1.10%	6.19%	
65	7.51%	-7.31%	-2.18%	

66	4.17%	-6.39%	0.38%
67	-6.32%	-2.98%	1.61%
68	-12.15%	-4.36%	4.68%
69	-4.35%	0.65%	7.41%
70	2.70%	-0.73%	5.02%
71	-0.36%	-1.13%	-5.87%
72	2.47%	-3.00%	-1.11%
73	-3.21%	-5.02%	-1.69%
74	-4.87%	2.92%	0.69%
75	-5.79%	-1.82%	-2.12%
76	6.19%	-4.10%	-0.15%
77	-2.18%	-7.74%	6.20%
78	0.38%	-1.97%	6.35%
79	1.61%	-3.94%	5.94%
80	4.68%	10.52%	20.35%
81	7.41%	2.72%	-2.71%
82	5.02%	-4.03%	0.00%
83	-5.87%	-3.00%	-0.03%
84	-1.11%	2.18%	1.71%
85	-1.69%	8.86%	10.83%
86	0.69%	4.52%	10.73%
87	-2.12%	0.09%	6.69%
88	-0.15%	7.25%	8.44%
89	6.20%	14.18%	5.95%
90	6.35%	2.59%	2.80%
91	5.94%	4.78%	3.29%
92	20.35%	-4.75%	-5.15%
93	-2.71%	5.92%	-0.12%
94	0.00%	4.75%	-0.05%
95	-0.03%	9.70%	7.94%
96	1.71%	17.93%	7.01%
97	10.83%	21.39%	
98	10.73%	2.05%	
99	6.69%	4.65%	
100	8.44%	18.28%	

101	5.95%	13.96%
102	2.80%	-0.45%
103	3.29%	0.09%
104	-5.15%	20.73%
105	-0.12%	10.55%
106	-0.05%	7.55%
107	7.94%	-8.66%
108	7.01%	-3.55%
109	-6.55%	-0.46%
110	21.15%	-11.23%
111	-4.01%	-12.75%
112	-5.67%	-13.17%
113	-0.86%	4.86%
114	-5.06%	-15.51%
115	-5.07%	-6.96%
116	-10.02%	-10.91%
117	-3.29%	-13.00%
118	-21.40%	-8.81%
119	-9.08%	-5.29%
120	-4.77%	3.99%
121	-30.64%	-0.63%
122	7.17%	13.75%
123	-15.08%	1.05%
124	8.26%	10.40%
125	38.20%	6.19%
126	-9.56%	8.36%
127	-5.86%	13.41%
128	-9.01%	-4.19%
129	-4.10%	-6.06%
130	-1.18%	1.98%
131	-3.64%	8.83%
132	-0.87%	0.43%
133	8.49%	-1.58%
134	1.73%	-5.50%
135	12.97%	2.07%

136	1.88%	0.04%
137	-1.02%	-12.63%
138	-3.05%	-4.74%
139	1.81%	-2.04%
140	-6.10%	5.73%
141	-5.02%	0.07%
142	8.64%	8.96%
143	-1.11%	3.46%
144	0.02%	-4.30%
145	8.32%	-2.72%
146	-3.03%	3.08%
147	-5.36%	3.09%
148	1.71%	1.75%
149	3.29%	-5.42%
150	-3.43%	-4.29%
151	-4.62%	2.36%
152	-9.78%	-6.53%
153	-5.23%	-5.04%
154	2.76%	-2.87%
155	-4.45%	2.73%
156	3.64%	-8.46%
157	0.70%	0.55%
158	-3.60%	4.63%
159	2.63%	0.76%
160	6.75%	-1.63%
161	0.09%	1.87%
162	-2.12%	-4.50%
163	6.77%	-4.94%
164	2.99%	-2.51%
165	9.52%	-2.09%
166	1.61%	1.30%
167	0.24%	-2.59%
168	5.98%	4.01%
169	13.44%	8.51%
170	3.84%	3.81%

171	1.39%	-4.05%
172	-1.62%	-3.77%
173	14.55%	2.30%
174	-3.52%	-5.65%
175	3.98%	-5.59%
176	-4.39%	2.99%
177	0.93%	5.41%
178	2.84%	32.58%
179	3.45%	0.29%
180	6.19%	0.29%
181	-1.83%	0.28%
182	-2.50%	0.28%
183	-2.05%	0.28%
184	-0.68%	0.28%
185	7.77%	0.28%
186	2.43%	0.28%
187	-0.91%	0.28%
188	-1.34%	0.28%
189	-0.78%	0.28%
190	-8.88%	0.28%
191	-8.01%	0.28%
192	0.33%	0.28%