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Evaluation of the weak form of efficient market hypothesis: Empirical evidence from Nigeria

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Abstract

Efficient Market Hypothesis is one of the important models in the present modern finance. Market Efficiency has become the basis for numerous financial models thus providing for investment strategies. If a stock market is not efficient, the pricing mechanism will not ensure efficient allocation of capital within the economy which will have negative effects in such economy. Some financial Researchers have discounted many reports of market inefficiency on the grounds of new statistical insight which has given rise to increase study of the efficient market hypothesis. In this study we are interested in testing the weak form of efficiency to stock market indexes of Nigeria between 1984 and 2012 using the monthly stock market indexes of the country within the period. Also to look at the effect of interest rate on the expected average annual monthly market share performance in Nigeria. The study adopted unit root test and t-test to investigate efficient market hypothesis based on monthly annual share index panel data. Johansson co integration test was used to establish relationship between the monthly share prices. VAR model and granger causality were used to test for impact of interest rate on market share index. The result revealed that there exist random walk model confirming no market efficiency based on the annual result. However, no random walk model was confirmed in the monthly stock returns hence, there was market efficiency in the monthly transaction in Nigeria stock exchange. Variance ratio was able to monitor the performance of the stock market. The study recommended; maintaining robust share market return policy could enhance the survival of the stock prices return. Adopting regulatory bodies that study the interest rate of the market capitalization so as to regulate the high interest rate that give rise to total performance in the stock market which will in turn generate substance for economy growth and sustainable development in the Nigeria emerging economy.

Keywords: Efficient Market; weak form hypothesis; stock indexes; random walk; Unit root; VAR

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1. Introduction

Stock index is a means of measuring stock market trends and performance. It is used as barometer for monitoring upswings in the stock market prices .Over the years Efficient Market theory and random walk Hypothesis have occupied major issues in the financial Literature. Random walk does not mean that markets participants cannot exploit insider information that is not part of the historical prices to gain excess returns. It is apparent that validity of the random walk hypothesis has important implications for financial theories and investment strategies thus very relevant to academia, investors and regulatory bodies. In academic the understanding of the behaviour of stock prices and the standard risk return models like the Capital Asset Pricing model rely on the hypothesis of normality or random walk behaviour of prices. In trading, the Investors' interest is in designing strategies that will take account of the prices characterized by random walks or persistence in short run, and mean reversion in the long run. The presence of inefficiency in any stock market of an economy should be a signal for the regulatory bodies to step in with all necessary techniques and reforms needed to effect corrections.

Several studies including Kendall (1953) have it that stock price movements do not follow discernible pattern or any notable serial. Prices fluctuate up and down at any given day irrespective of their past movements. The big question then is what exactly influenced the stock prices. If the answer to this is the past performance, investors could have quickly developed or formulated a model to calculate the probable next price movement following the pattern and thus making large sum of profits with minimum risk. Again any stock price that is about to rise would have done that instantaneously due to the fact that large number of investors would have scramble to buy them while those holding them may not want to sell. This lays credence on the fact that market prices rely on performance data already available about the stock hence any information that could affect a stock should already be reflected in the stock price. A definition of efficient market is the one in which the price of stock fully reflects all the information available about it as originally defined by Ross et al. (2002). But according to Cootner (1964) if any substantial group of buyers thought that prices were too low, they would want to buy and this situation will force the prices up. The reverse would be true for sellers. Except for appreciation due to earnings retention, the conditional expectation of tomorrow's price, given today's price, is today's price.

In such a world, the only price changes that would occur are those that result from new information to be non-random in appearance, the period to period price changes of a stock should be random movement, statistically independent of one another.

Efficient Market Hypothesis theory was designed by Professor Eugene Fama in 1960 and according to the theory, when investors are faced with new set of information some of them could over react while others could under react which means that investors' reaction are random behaviour and trace a normal distribution pattern. In this situation the net effect on market prices may not be completely explored to create room for abnormal profits.

Fama (1970) designed Efficient Market hypothesis with empirical base which he divided into three different headings based on information, the weak form, the semi-strong form and strong form. The weak-form hypothesis is based on the historical sequence of prices. The theory of the weak-form hypothesis has it 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. This hypothesis implies that trend analysis and the developing of trading rules by financial analyst in predicting future stock price movement that would allow them to earn abnormal rate of return is fruitless. Studies on the weak-form hypothesis concluded that changes in the price of stock price follow a random walk. This implied that changes in stock price are impossible to predict from available information and thus consistent with the notion of an efficient market. The semi-strong form hypothesis, states that all publicly available information regarding the company's past performance as well as the prospects of the company is already reflected in the stock price. Such information includes, in addition to past prices, fundamental data on the firm's product line, quality of management, balance sheet composition, patents held, earning forecasts, and accounting practices. Then finally, the strong-form version of the efficient market hypothesis, which states that stock prices reflect all information relevant to the firm, including information available only to company insiders and those who have access to the company's policies and plans. In the light of the three versions of the efficient market hypothesis, a large number of literature have emerge both in the developed and emerging stock markets of the word.

In an efficient market situation, the price will reflect the intrinsic values of the security in the market. According to Hamid et al. (2010) if the equity market is working efficiently, the prices will show the intrinsic value of such equity and in reply, the limited savings will be allocated to productive investment sector optimally in such a way that it will provide stream of benefits to the individual investors and to the economy of the nation.

This paper reviews the most related literatures in stock markets of both developed and developing economy. The study adopts descriptive statistics to evaluated the average monthly share price performance in effective market weak form and also determine the relationship between the average monthly share prices and interest rate annually in Nigeria. Specifically, the paper evaluates the weak form of efficient market hypothesis.

2. Literature review

Efficient market hypothesis states that changes in stock prices are impossible to predict from available public information and that the only thing that can move stock price is news that changes the market's perception of asset value of a firm. The theoretical framework hinges on the fact that prices in an efficient market are fully representing available information intended for the market. The hypothesis is based upon the assumption that stock prices absorb speedily the influx of latest information such that present prices totally replicate all the existing information about the stock in the market. According to Hamid et al, (2010) this theory does not seem possible to constantly perform extraordinarily in the market by applying any sort of information that is already known by the market. Efficient Market Hypothesis has generated a lot controversy in finance and Economics discussions. Critics of the efficiency market hypothesis argued that the efficient market hypothesis does much better in description of the world than might be thought (Markiw 2009). The critics stress the point that there is every reason to doubt that shareholders are always rational and the stock prices are informational efficient on every moment because stock prices are influenced by psychological perception (optimism/pessimism) of investors' economic outlook. In response, the proponent of the efficient market hypothesis on the other hand argued that even if the stock price is not exactly informational efficient but it is very close to it. The fact that a stock price rose or declined yesterday or in the past is not an indication that it would repeat similar performance in the future as well.

Aga and Kocaman (2008) examined the efficiency market hypothesis in Istanbul stock exchange market. The study used a computed index called return index-20 and also used a times series model to test the weak-form of the efficient market hypothesis for the period spanning 1986 to 2005. The result obtained from the times analysis revealed that there is evidence of a weak-form of efficient market hypothesis in Istanbul stock exchange market.

Cavusoglu (2007) examined the weak form of the efficient market hypothesis for the Athens Stock Exchange through approaches accounting for conditional heteroscedasticity. The study also examined the influence of changes in economic conditions on stock returns and on conditional volatility. The study covered the period 1999 to 2007, using the daily FTSE/ASE-20 stock price index. The findings from the study did not provide evidence on the weak form of the efficient market hypothesis. Bhattacharya and Murherjee, (2002) examined the nature of the causal relationship between stock prices and macroeconomic aggregates in India. The study adopted the techniques of unit–root tests, cointegration and the long–run granger non–causality test recently proposed by Toda and Yamamoto (1995). The study utilized Bombay Stock Exchange Index and the five macroeconomic variables, viz., money supply, index of industrial production, national income, interest rate and rate of inflation using monthly data for the period 1993 to 2001. The major findings of the study are: firstly, there is no causal linkage between stock prices and money supply; stock prices and national income and between stock prices and interest rate; secondly, index of industrial production lead the stock price, and thirdly, there exists a two – way causation between stock price and rate of inflation. The study concluded that Indian stock market is approaching towards informational efficiency at least with respect to three macroeconomic variables, viz. money supply, national income and interest rate.

Dima and Milos (2009) investigated the efficiency market efficiency on Bucharest Stock Exchange using daily observations (from 10.04.2000 to 08.04.2009). The findings of the study revealed that there is a limit to the informational efficiency of the market (in its weak form), given the prolonged financial instability experienced within the Romanian economy. Also, Dragotă et al. (2009) tested the weak-form of information efficiency of the Romanian capital market using a database that consists in daily and weekly returns for 18 companies listed on the first tier of the Bucharest Stock Exchange and in daily and weekly market returns estimated by using the indexes of the Romanian capital market. The study adopted a Multiple Variance Ratio and the findings of the study revealed that most of the stock prices are informational efficient.

Gilmore and McManus (2003) tested the efficient market hypothesis in its weak form for Czech Republic, Poland and Hungary for the period 1995 to 2000; the findings of the study rejected the random walk hypothesis. Chun (2000) found that the Hungarian capital market was weakly efficient. Vosvorda et al. (1998) tested the Efficient Market Hypothesis for the Prague Stock Exchange for the 1995 to 1997. The findings of the study reject the weak form market efficiency. Macskasi and Molnar (1996) using Ljung-Box Qstatistics tested for the efficiency market hypothesis on Budapest Stock Exchange (BSE) and found that Budapest Stock Exchange was not efficient because "it offered the possibility of excessively high returns". Gordon and Rittenberg (1995) tested the efficiency market hypothesis on the Warsaw Stock Exchange (WSE) efficiency and found that either the weak form efficiency does not apply to WSE or "prices do not adequately reflect information at a given point of time, thereby resulting in sufficient time lags of which investors can take advantage". Dickinson and Muragu (1994), through serial correlation analysis and runs test, have provided results for the Nairobi Stock Exchange that does not contradict the weak-form efficiency.

The efficient market hypothesis is based on the proposition that stock price fully reflect all available information in the market and investors cannot use available information or any trading rules to earn extraordinary returns or use available information to exploit the market. Although empirical evidence from developed and other developing stock markets support the efficient market hypothesis, however our empirical analysis revealed that the Nigerian stock market is not informational efficient. That is, stock price does not possess all available information in the market and as such financial analyst can earn above normal return from stocks by using previous stock prices to predict the pattern of future price changes and future stock return. Similar evidence on the weak-form informational inefficiency of the Nigerian stock market have also been reported by Olowe (1999) and Vitali and Mollah (2010). To enhance informational efficiency of the Nigerian stock exchange especially in this era where the lost of the global financial crisis have dominated the minds of investors, there is the need to ensure strong and adequate supervision by the regulatory authorities. This would prevent any stock price bubble and at the same time ensure that information about stock price is a true reflection of the value of shares. Also, there is the need for a greater development of the Nigeria stock market through appropriate policies which would enhance the informational efficiency of the market.

The theoretical explanation on the relationship between capital market and economic growth could be further expatiated using Efficient Market Hypothesis (EMH) developed by Fama in 1965. According to EMH, financial markets are efficient if prices on traded assets have already reflected all known information and therefore are unbiased because they represent the collective beliefs of all investors about future prospects. Previous test of the EMH have relied on long-range dependence of equity returns. It shows that past information has been found to be useful in improving predictive accuracy. This assertion tends to invalidate the EMH in most developing countries. Equity prices would tend to exhibit long memory or long range dependence, because of the narrowness of their market arising from immature regulatory and institutional arrangement. In a situation where the market is highly and unreasonably speculative, investors will be discouraged from parting with their funds for fear of incurring financial losses. Such situations will have detrimental effect on economic growth of any country, meaning that investors will refuse to invest in financial assets. The implication is that companies will find it cumbersome to raise additional capital needed for expansion. In every economy it is apparent that efficiency of the capital market is a necessary condition for enhancing economic growth (Nyong, 2003).

In another exposition, Gabriel, (2002) as enunciated by Nyong, (2003) emphasis on the Romanian capital market and conclude that the market is inefficient and as a result has not it has not contributed effectively as such to the economic growth in Romania.

2.1. Theoretical framework

The random walk model requires that successive price changes be independent and identically distributed. According to Nzotta (2005) the theory argues that the prices of securities or current stock prices fully reflects what is known of the stock from historical share price data. Such that the current market prices of any security fully reflects the information content of its historical prices. This implies that with the knowledge of historical prices of securities and detailed analysis of such security prices relying on such knowledge, an investor would be better guided in his investment decisions. If a random walk hypothesis is confirmed, past prices constitute the best information for forecast. The model implies that the price sequence cannot be used to obtain information about future price sequences (Uhlir, 1979).

2.2. Testing for market efficiency

There is notion that testing for market efficiency is difficult as a result of lack of obvious methodological approach. This problem was described according to Fama (1970) ''that the definitional statement that in an Efficient Market prices fully reflects available information is so general that it has no empirically testable implications. To make the model testable the process of price formulation must be specified in more detail to define what is exactly meant by the term fully reflected''. Most of the available tests are hinged on the assumption that market efficiency is measurable by observing and analyzing expected returns and actual returns or their variances. These tests do not only test efficient markets theory but tests the underlying assumptions that the expected returns or the variance can be used to test for market efficiency simultaneously. Acceptance of this assumption makes it easy to test for market efficiency. In an efficient market no trading system based on the historical information that these markets are believed to fully reflect and can create returns higher than the equilibrium expected returns. Fama(1970) opined that, if a trading system is observed consistently creating returns in excess of the equilibrium expected returns in a given market, efficiency can be rejected for the information that the trading was based on.

2.3. The Random Walk Model

The theory stated that there is a serial correlationship between successful price changes of securities over time period such that successful price movements are independent over time and that the pattern of price changes of security does not provide any useful information for prediction of subsequent price movements.

The assumption of economists was that one could,

> "*analyze an economic time series by extracting from it a long-term movement, or trend, for separate study and then scrutinizing the residual portion for short-term oscillatory movements and random fluctuations*" (Kendall, 1953).

When Kendall examined 22 UK stock and commodity price series, overwhelmed with the results. And in his conclusion he concluded that,

> "*in series of prices which are observed at fairly close intervals the random changes from one term to the next are so large as to swamp any systematic effect which may be present. The data behave almost like wandering series*."

The near-zero serial correlation of price changes was an observation that appeared inconsistent with the views of economists. Nevertheless, these empirical observations came to be labeled the "random walk model" or even the "random walk theory".

Random movement in price poses a major challenge to market analysts while trying to predict the future path of security prices. Drawing from Kendall's (1934) work and earlier research by Working, Roberts (1959) that demonstrated that a time series generated from a sequence of random numbers was indistinguishable from a record of US stock prices – the raw material used by market technicians to predict future price levels. According to him,

> "*the main reason for this paper is to call to the attention of financial analysts empirical results that seem to have been ignored in the past, for whatever reason, and to point out some methodological implications of these results for the study of securities.*"

Fama (1965) was of the view that the statement is general and needs to be tested and demands for mathematical models and formulations for market equilibrium to be build up which will be used for testing the market efficiency. Fama (1970) reported the EMH theory as a fair game model, which indicates that the investors are confident regarding to the current market price which fully replicates all available information regarding to a security. Moreover the expected returns are based upon this price which is consistent with its risk. Fama divided the empirical tests of the hypothesis into three categories based on the given information sets (i.) weak-form (ii.) Semi-strong-form, and (iii.) Strong-form. The Random Walk Model (RWM) is the model which assumes that subsequent price changes are sovereign and homogeneously distributed random variables and changes in future prices cannot be forecasted through historical price changes and movements. The Random Walk Model is generally used to testify the weak-form Efficient Market Hypothesis.

Inefficiency indications will compel the regulatory authorities to take positive steps to avoid such scenario and restructure to accurate it. As the influential effort of Fama (1970) for thirty stocks of DJIA for the period 1957 to 1962 and found no evidence; Fama and French (1988) analyzed the industry portfolio using data for the period 1926 to 1985 and the results of autocorrelation indicates a curvilinear ''U'' pattern against increasing returns. Lo and MacKinlay (1988) used equal and value weighted index regarding to NYSE:AMEX for the period 1962 to 1985 to test the hypothesis and strongly rejected the Random Walk Movement for the entire period. Fama (1970), Granger (1975), Hawawini (1984), Fama (1991) comprehensively tested empirically the RWM and the weak form EMH of both developed and emerging economies. And in conclusion stated that there exists empirical evidence in support of the EMH theory. There are a number of articles that have investigated specific stock markets individually in an empirical manner moreover there are few studies that had also matched the efficiency of various stock markets. For instance Solink, (1973) examined stocks from 8 stock markets using France, Italy, UK, Germany, Belgium, Neither land, Switzerland, Sweden and USA. The RWM result showed that the deviations are slightly more apparent in European stock markets than the

USA market. It could be attributable to technical and institutional characteristics of European Capital markets. Ang and Pohlman (1978) also examined fifty four stocks belonging to 5 far Eastern equity stock markets Japan, Singapore, Australia, Hong Kong and Philippine. They found that these markets are slightly efficient in the weakest form. The reason could only be attributable to the effect of the greater existence of extreme returns and not concerned with price dependencies as explained by serial correlations. Errunza and Losq (1985) studied the behavior of equity prices of 9 emerging equity markets as well and the results revealed that the probability distributions are consistent with a normal distribution of some securities showing non-stationary variance. On the average one could say that less developed countries (LDC) markets are less efficient than developed countries markets. The reason behind the behavior of security prices seems to be generalizable for the severely traded segments of the less developed countries markets.

Urrutia (1995) investigated the Random Walk Model for 4 Latin American emerging stock markets using the monthly index data from Argentina, Brazil, Chile and Mexico for the period December 1975 to March 1991. Variance ratio test rejected the random walk hypothesis but long-run test result indicates that there exists weak form of efficiency in these markets. The reason behind this scenario is that the domestic investors are not competent enough to design trading strategies that may allow them to earn excess returns.

Huang (1995) examined the equity markets of 9 Asian countries. He used the variance ratio statistics to test the random walk hypothesis of the Asian stock markets and found that the RWM hypothesis for Korean and Malaysian equity markets is strongly rejected for all the study periods. Moreover the RWM hypothesis is also rejected for the equity markets of Hong Kong, Singapore, and Thailand. Dahel and Laabas (1999) investigated the efficiency of Bahrain, Kuwait, Saudi Arabia and Oman belonging to Gulf Cooperation Council equity markets. They investigated the observations from year 1994 to 1998. They concluded that the stock market of Kuwait is strongly in support of weak form of efficiency and other markets reject the weak form of the EMH. The reason seems to be the strong market characteristics of the Kuwait in comparison to the other three markets.

Fama (1991) empirically studied and detected a number of anomalies such as the January effect, effect of holiday, effect of weekend, the small size effect, and volatility tests. Large number of empirical tests has been applied in the literature to investigate the acceptability and validity of EMH and the RWM. Hasan et al. (2007) examined the weak-form market efficiency of Karachi Stock Exchange (KSE) in Pakinstan. The results reveal that prices behaviour is not supporting random walks and hence are not weak-form efficient. For such situation technical analysis may be helpful in predicting equity markets behaviours in the short run. The prior empirical findings are based upon the data of developed equity markets and hence it implies that the security prices are reacting immediately to all publicly available information.

The world markets initiated concentration on the study of this particular issue. There are number of studies on different individual markets as well as on regional markets e.g, Latin America Urrutia,(1995).And for Brazil and Mexico, Grieb and Reyes (1999), both studies are in support of random walk. Few studies about African market by Magnusson and Wydick (2000) that favours the random walk hypothesis for all the markets. Groenewold and Ariff. (1999) studied ten countries in the Asia-Pacific region to evaluate the effect of liberalization on market-efficiency. They found that numerous measures of market-efficiency are unchanged by deregulation.

On the other hand methods based on regression and autocorrelation point towards greater predictability for domestically as well as internationally stock markets after de-regulation. Abraham et al. (2002) studied Middle East markets. They observed that index in thinly traded equity markets may not embody the true fundamental index value. Moreover there is a systematic bias towards rejecting the EMH. The three emerging Gulf equity markets show infrequent trading significantly that has changed the results of market efficiency and random walk tests. Worthington and Higgs (2004) investigated 20 European countries for the period August 1995 to May 2003 by applying serial correlation test, runs test for random walk, Augmented Dickey Fuller test (ADF) to test the stationarity and Lo and MacKinlay (1988) variance ratio test. They concluded that all indices are not normally distributed and only 5 countries fulfill the sternest criteria for a random walk. According to their findings Germany, Ireland, Portugal, Sweden and the United Kingdom follow random walk purely and France, Finland, Netherlands, Norway and Spain are following the random walk hypothesis.

In a recent study conducted by Borges (2008) on the equity markets of France, Germany, UK, Greece, Portugal and Spain, for the period January 1993 to December 2007.They used a serial correlation test, an augmented Dickey-Fuller test, a runs test and the Lo and MacKinlay (1988) multiple variance ratio to test the random walk in equity markets. The results provide insignificant evidences that monthly prices and returns follow RWM in all six equity markets. Daily returns are abnormally distributed as indicated by the negative skeweness and leptokurtic. France, Germany, UK and Spain follow the random walk with daily data but that hypothesis rejects random walk hypothesis for Greece and Portugal. The reason is due to serial positive correlation. But after year 2003 these two countries also follows random walk behaviour. There are number of studies on the efficient market hypothesis to test the randomness of stock prices of individual companies but still there are enough gaps in the study regarding testing the random walk of equity market indices around the world in present era.

3. Methodology

This study aims at providing empirical evidence on the weak form efficient market hypothesis in Nigeria. The data was sourced from Central Bank of Nigeria statistical Bulletin. The study applied monthly time series data of all share indexes 1984 to 2011. Testing for weak form market efficiency one must solely rely on past trading data. The trading rule applied in this study is based on the past prices to test whether its application can earn returns in excess of the expected market return.

$$P_t = f(p_{t-1,})$$

$$P_t = b_o + b_1 p_{t-1}$$

$$P_t = b_o + b_1 p_{t-1} + u$$

$$R_t = p_t, p_{t-1}$$

$$R_t = f(p_t / p_{t-1})$$

$$R_t = \beta_0 + \beta_1 (p_t / p_{t-1})$$

$$R_t = \ln(p_t / p_{t-1})$$

where,

R_t = return in time t

P_t = market price at time t

P_{t-1} = market price at time t_{-1}

According to Palan (2004) if weak form efficiency holds, stock prices should compose of only three components, the last period's price, the expected return on the stock and the random error term which has expected return of zero.

3.1. Modeling Procedure

The following are the model procedure for empirical data analysis. The data for expected stock return in time is computed as:

$$R_t = \ln(p_t / p_{t-1})$$

where ln is log-form of,

$$LnR_t = \frac{1}{Log(p_t / p_{t-1})} \tag{1}$$

The growth rate of LnR_t is expressed as $RLnAR_t$ where A is the average monthly expected stock return per annual. Average Monthly expected Stock Prices Return ($LnAR_t$) is the total monthly expected stock returns divided by 12 annually. Therefore, the growth rate of expected average stock return is computed as:

$$RLnAR_t = \frac{LnAR_t - LnAR_{t-1}}{LnAR_{t-1}} * 100$$

Interest growth rate,

$$RLnINT = \frac{LnINT_t - LnINT_{t-1}}{LnINT_t} * 100 \tag{2}$$

Based on the transforms, the model for the study is specified as:

$$RLnARt = f(RLnINT) \tag{3}$$

$$RLnARt = \beta_1 + \beta_2 \sum_{i=1}^{n} RLnINT_{t-1} + \partial(-1) + \varepsilon_t$$

4. Analytical approach

The study employs descriptive statistics, unit root test using Augmented Dickey Fuller and Johansen co integration test with intention of error correction model relying on the model developed by Hamid, et al. (2010) in the testing for the weak form of Efficient Market Hypothesis in Asia- Pacific Markets which they used monthly closing values of stock market indices for the countries. In this study only the case of Nigeria stock market will be considered and the data is basically monthly share index per annual. Test of efficient weak form hypothesis test based on month and year of share market index. The test of hypothesis requires studentized t-test to investigate the presence of effective weak form of market share with respect to year. In addition, variance ratio test will use to detect the market share performance, granger causality test determine the influencing factor in the stock market and VAR was employed to measure effect of interest growth rate on the average expected annual monthly market share index.

5. Empirical analysis and result of market efficiency test

5.1. Unit root for expected stock return stationarity test for random walk

The result of the unit root test at 5% critical value using ADF Test is shown in Table 1.

Table 1 shows that there is no unit root among the time series properties of the expected stock monthly returns from January through to December when subjected to ADF-test at various order difference 2. This confirms stationarity in the share index value in January, February, April, June, July, August, September, October, November to December as the ADF values are greater than the critical value at 5% level but there is unit root among the time series properties in the month of March and May because the ADF results are less than 5% critical level irrespective of sign difference. In March and May, it is observed that expected stock returns are not stationary.

Table 1. Summary of Result of Unit Root Test using Augmented Dickey Fuller Test (ADF Test)

Expected Monthly Stock Price Returns Annually	ADF Test Value	Critical Value at 5%	Decision	Conclusion
LnR_t January I(2)	-3.1060	-3.0038*	No Unit Root	It is Stationary
LnR_t FebruaryI(2)	-4.5749	-3.0038*	No Unit Root	It is Stationary
LnR_t March I(2)	-2.8487	-3.0038	Unit Root	It is not stationary

Expected Monthly Stock Price Returns Annually	ADF Test Value	Critical Value at 5%	Decision	Conclusion
LnR_t)April I(2)	-3.1063	-3.0038*	No Unit Root	It is stationary
LnR_t May I(2)	-1.9714	-3.0038	Unit Root	It is not stationary
LnR_t June I(0)	-4.6244	-3.0038*	No Unit Root	It is stationary
LnR_t July I(2)	-4.1819	-32.9969	No Unit Root	It is stationary
LnR_t August I(2)	-3.4699	-3.0038*	No Unit Root	It is stationary
LnR_t September I(2)	-4.8190	-3.0038*	No Unit Root	It is stationary
LnR_t October I(2)	-3.6366	-3.0038*	No Unit Root	It is stationary
LnR_t November I(2)	-3.7055	-3.0038*	No Unit Root	It is stationary
LnR_t December I(2)	-5.1271	-3.0038*	No Unit Root	It is stationary

**significant at 5% level, ADF test > Critical value, the variable is stationary*
(Source: E-Views 4.0 Result Output)

Error correction model estimate is likely unreliable in this study because the stationary properties of the monthly share index are totally not stationary at order 2. This is because volatility data is usually expected to attained stationarity at order 2 to established weak or no weak form. The empirical result of the unit root test for the monthly annual market suggests that there are serial dependencies of returns in some of the monthly annual market returns (March and May) of the entire monthly annual share index calculated. ADF calculated values are statistically significant at 5% critical level in January through December except in the months of March and May that ADF calculated values are not statistically significant at second order difference I(2). This further suggests that the month of March and May follow random walk model while January through to December do not follow random walk. It is evident that some of the market share index is efficient in weak form.

Variance-Ratio method which is an age long but rarely used technique in detecting the performance of random walk model for efficient market share adopted in this study shows that unstable market share is experienced in Nigeria. The result of the ratio of maximum to minimum variation of the monthly market share reveals that the variance ratio (V.R) test, if the value of VR falls within 0 to 2.0 (i.e $0 \le V.R \le 2.0$), we accept that market share is performing otherwise it is not performing. From the Variance-Ratio result in appendix 4 shows that share market index from 1984 to 1986 experienced high performance compare to non performance in the year 1987, 1988 and 1989. Market share performance picked up in 1990 to 1994 with huge performance records in the stock exchange market. Low performance was experienced in 1995 but later went up in 1996 through to 2007. Short fall in market share set in 2008 with highest record of pick performance from 2009 to 2011.

To investigate random walk of the market share based on the annual panel data analysis, the Table 2 below tests the market efficiency based on the annual market share index reports from the Nigerian Stock Market (NSE).

Table 2. Test of effective weak form based on the annual share index (expected stock returns)

Year Share Index	t-cal	df	Pvalue	Pvalue <0.05
1984	221.304	11	.000	Sig.
1985	87.246	11	.000	Sig.
1986	33.093	11	.000	Sig.
1987	4.352	11	.001	Sig.
1988	3.806	11	.003	Sig.
1989	3.188	11	.009	Sig.
1990	23.263	11	.000	Sig.
1991	27.787	11	.000	Sig.
1992	27.575	11	.000	Sig.
1993	32.485	11	.000	Sig.
1994	42.910	11	.000	Sig.
1995	11.504	11	.000	Sig.
1996	31.645	11	.000	Sig.
1997	30.207	11	.000	Sig.
1998	70.384	11	.000	Sig.
1999	59.922	11	.000	Sig.
2000	29.833	11	.000	Sig.
2001	42.752	11	.000	Sig.
2002	63.292	11	.000	Sig.
2003	21.543	11	.000	Sig.
2004	40.207	11	.000	Sig.
2005	50.699	11	.000	Sig.
2006	22.292	11	.000	Sig.
2007	28.518	11	.000	Sig.
2008	15.048	11	.000	Sig.
2009	28.019	11	.000	Sig.
2010	65.318	11	.000	Sig.
2011	35.456	11	.000	Sig.

Source: SPSS 17.0 Result Output t-test, 2012

From the Table 2, the t-test result suggests that none of the market share index follows random walk model because the probability value associated with the t-calculated value is less than 0.05 critical hence statistically significant at 5%. This, of course, implies that none of these years follow random walk and none of these market shares is efficient in weak form from the annual expected stock returns. This result confirms the study of Hamid, Suleiman, Shah and Akash (2010).

Table 3. Johnson Co integration Result

Sample: 1984 2011
Included observations: 27
Test assumption: Linear deterministic trend in the data
Series: **LNRTJ LNRTF LNRTM LNRTA LNRTMA LNRTJU LNRTJUL LNRTAU LNRTS LNRTO LNRTN LNRTD**
Warning: Critical values were derived for a maximum of 10 endogenous series
Lags interval: No lags

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.999827	756.8199	233.13??	247.18??	None **
0.995546	522.9285	233.13??	247.18??	At most 1 **
0.985546	376.7498	233.13	247.18	At most 2 **
0.965031	262.3567	192.89	205.95	At most 3 **
0.813518	171.8175	156.00	168.36	At most 4 **
0.655299	126.4731	124.24	133.57	At most 5
0.612660	97.71603	94.15	103.18	At most 6
0.597312	72.10783	68.52	76.07	At most 7
0.503688	47.54883	47.21	54.46	At most 8
0.380363	28.63397	29.68	35.65	At most 9
0.306520	15.71117	15.41	20.04	At most 10
0.194154	5.828303	3.76	6.65	At most 11

**(**) denotes rejection of the hypothesis at 5% (1%) significance level*
?? denotes critical values derived assuming 10 endogenous series
L.R. test indicates 5 cointegrating equation(s) at 5% significance level
(Source: E-Views 4.0)

The efficient weak form result of unit root test in the Table 3 shows that all the stock return in the monthly share index are not entirely stationary at order 2 independently therefore market random walk model is not followed based on monthly stock market investigation. We may further wish to test for co integration to verify possible long run relationship among the monthly market share returns. From Table 3 above the likelihood function values are greater than critical value at 1% (**) and at 5% significance level. This reveals that there is cointegration with an implication that at least 5 co integrating equations among the variables. The null hypothesis which states that there is no co-integration among the variables is rejected in favour of the alternative hypotheses at 1 per cent critical level. This is because their values exceed the critical values at the 0.01 level which implies that a long-run relationship exists among the expected monthly annual stock returns in the Nigeria market.

The Johansen co integration shows that there is no presence of full rank given that subtraction of the number of co integrating equations and the variables under study do not equal to zero implying that the model is good and in functional form.

Table 4. Four Year Moving Average Growth Rate of Expected Stock Return and Interest Rate

Year	Expected Stock Returns Growth Rate (Rt)	Interest Growth Rate (INT)
1984-1987	193.3	-5.6
1988-1991	76.6	-1.9
1992-1995	71.3	2.8
1996-1999	-37.8	-2.8
2000-2003	137.6	1.8
2004-2007	495	5.8
2008-2011	-30.7	-20.6

Source: Author's Computation, 2012

From Table 4, the four year growth rate moving average of Expected Stock Returns (R_t) and Interest Rate (INT) revealed that between 1984 to 1987, the expected stock returns was about 193.3% but the INT decreased by -5.6%. In 1988 to 1991, there was drop in Rt and INT by positive value of 76.7% and negative drop of -1.9 % respectively recording dramatic change in interest rate. The Return rate was observed falling to 71.3% as the INT growth rate experienced unprecedented rise by 2.8% in the year 1992 to 1995. As at 1996 to 1999, the Returns expected growth rate dropped significantly to -37.8% with significant decrease in INT by -2.8%. In 2000 to 2003, share market returns experienced very high significant rise by 137.6% and INT increased to 1.8%. As at 2004 to 2007, expected stock return witnessed great increased significantly by 495% and INT increased by 5.8%. However, decreasing growth rates were both experienced in the expected stock returns and interest rates in 2008 to 2011 by -30.7% and -20.6% respectively.

Table 5. Unit Root of RLNART and RLNINT using ADF-Test

Variables	ADF Test Value	Critical Value at 5%	Decision	Conclusion
RLNART I(I)	-3.1060	-3.0038*	No Unit Root	It is Stationary
RLNINT I(0)	-4.5749	-3.0038*	No Unit Root	It is Stationary

**significant at 5% level, ADF test > Critical value, then the variable is stationary*
Source: E-Views 4.0 Result Output

Table 5 shows that there is no unit root among the time series properties of the average expected stock market annual monthly returns growth rate when subjected to ADF-test at various order difference 1. In addition, the interest growth rate is also statistically significant as the ADF calculated value is greater than the critical value at 5% critical value at level I(0). These reveal that the time series properties of RLNART and RLNINT are stationary. Therefore, we can estimate the model using unrestricted VAR to test the significant relationship and the magnitude of interest growth rate on the average expected stock market annual monthly returns growth rate.

Table 6. VAR Model of Average Expected Stock Returns and Interest Growth Rates

Sample(adjusted): 1986 2011 Included observations: 26 after adjusting end points Standard errors & t-statistics in parentheses	
	RLNART
RLNART(-1)	-0.075022
	(0.21432)
	(-0.35005)
RLNART(-2)	-0.276518
	(0.25714)
	(-1.07536)
C	54.14850
	(113.357)
	(0.47768)
RLNINT	3.204015
	(5.14372)
	(0.62290)
R-squared	0.051161
Adj. R-squared	-0.078226
Sum sq. resids	7018624.
S.E. equation	564.8260
F-statistic	0.395410
Log likelihood	-199.4702
Akaike AIC	15.65155
Schwarz SC	15.84510
Mean dependent	32.72077
S.D. dependent	543.9509

Source: E-Views 4.0

5.2. Discussion of VAR result of model 3

The VAR model adopted is presented in Table 6. The vector autoregressive model is not statistically significant at the current year (-1) and previous year (-2) as the probability of the t-ratios (-0.3500) and (-1.0754) is less than 2.0 rule of thumb. Estimate of interest growth rate is 3.02040. This implies direct relationship between Interest growth rate and Average expected market share return growth rate. A unit change in interest growth rate will result in about 30.2% increase in Average expected market share return growth rate.

Investigating the overall significance of the model, the value of F-statistics is 0.3954 and the probability associated with it is (0.000) which is less than 0.05 at 5% level of significance. This means that there exists statistical significance between expected average market share annual monthly index and interest growth rate in Nigerian stock market. R-square is 0.05 implying that the coefficient of determination (R^2) is statistically significant at 5% which adjudge the model as in accurate adequate for forecast and prediction.

To test for the significance of the individual parameter, the probability value of t-ratio for the coefficient of the regression coefficient is less than the 2.0 rule of thumb irrespective of the sign difference; we accept Ho and conclude that interest growth rate is not statistically significant to the Endogenous variable (Rt). We generalize that there is relationship between expected monthly market shares and interest growth in no run term.

Table 6. Co Integration

Sample: 1984 2011 Series: RLNART Exogenous series: RLNINT Lags interval: 1 to 2				
Eigenvalue	**Likelihood Ratio**	**5 Percent Critical Value**	**1 Percent Critical Value**	**Hypothesized No. of CE(s)**
0.264939	7.695059	3.76	6.65	None **

**(**) denotes rejection of the hypothesis at 5%(1%) significance level*
L.R. test indicates 1 cointegrating equation(s) at 5% significance level

The efficient weak form result of unit root test in the Table 3 shows that all the stock return in the monthly share index are not entirely stationary at order 2 independently therefore market random walk model is not followed based on monthly stock market investigation. We further carried out test for co integration to verify possible long run relationship among the monthly market share returns. From Table 6 above, the likelihood function value is greater than critical values both at 1% and 5% levels of significant. (**). This reveals that there is co integration with an implication of at least 1 co integrating equation at 5% significance level among the variables which were rejected in favour of the alternative hypotheses at 1 per cent critical level. This is because their values exceed the critical values at the 0.01 level which implies that a long-run relationship exists between the expected monthly annual stock returns in the Nigeria market.

Table 7. Granger Test

Pairwise Granger Causality Tests Sample: 1984 2011 Lags: 2			
Null Hypothesis:	**Obs**	**F-Statistic**	**Probability**
RLNINT does not Granger Cause RLNART	26	0.16083	0.85248
RLNART does not Granger Cause RLNINT		5.54358	0.01166

The causality effect of interest growth rate on expected average annual monthly market returns point out that interest growth rate is not statistically significant in explaining the causal effect on performance of expected average annual monthly market returns. This is explained by the result of the probability value of F-statistic being greater than 5% critical value. From the granger causality Table 7, interest growth rate (RLNINT) does not Granger cause the expected average annual monthly market returns (RLNART). However, expected average annual monthly market returns does Granger cause interest growth rate (RLNINT). This result explains that interest growth rate does not influence expected average annual monthly market returns. Hence there is uni-directional relationship between interest growth rate and expected average annual monthly market returns in Nigeria which signifies short run relationship existing between expected average annual monthly market returns and interest rate in Nigeria.

6. Conclusion

This study has critically reviews related literature on stock market and average expected stock market annual monthly returns in Nigeria stock market. It furthers examine the market efficient weak form hypothesis of the annual monthly stock market returns. The relationship between interest and average expected stock market annual monthly returns growth rates have been studied to know how they affect each other in the contemporary emerging market share environment.

It is observed that there is no unit root among the time series properties of the expected stock monthly returns from January through to December when subjected to ADF-test at order difference 2. This confirms stationarity in the share index value in January, February, April, June, July, August, September, October, November to December as the ADF values are greater than the critical value at 5% level but there is unit root among the time series properties in the month of March and May because the ADF results are less than 5% critical level irrespective of sign difference. In March and May, it is observed that expected stock returns are not stationary. This informs us that Nigeria stock market follows random walk model which the market is efficient.

The t-test result suggests that none of the market share index follows random walk model because the probability value associated with the t-calculated value is less than 5% critical value hence implies that none of the market share follows random work and it is not efficient in weak form from the annual expected stock returns which is in agreement with the study of Hamid, Suleiman, Shah and Akash (2010) previous studies.

More so, long-run relationship exists among the expected monthly annual stock returns in the Nigeria market. The vector autoregressive model is not statistically significant at the current year and previous years of the expected monthly annual stock returns in the stock market. It is evident because changes in future prices cannot be forecasted through historical price changes and movements. The Random Walk Model is generally used to test the weak-form Efficient Market Hypothesis going by the result of the studentized t-test of annual market share result the annual expected market share is not efficient. Generally, interest rate is not an influencing factor of market share but market share impact on the interest by the empirical result of granger causality test. This study recommended that to maintain robust share market return policy that enhances the survival of the stock return should be put in place. And, there should be regulatory bodies that study the interest rate of the market capitalization so as to regulate the high interest rate that give rise to total performance in the stock market that is capable of generating substance for economy growth and development in Nigeria.

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Table 1. Nigerian Stock Exchange (NSE) All Monthly Share Index Per Annual 1984-2011

year/month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1984	106.90	106.10	107.20	106.80	104.50	104.30	105.00	107.00	104.00	102.00	103.40	105.50
1985	111.30	112.20	113.40	115.60	116.50	116.30	117.20	117.00	116.90	119.10	124.60	127.30
1986	134.60	139.70	140.80	146.20	144.20	147.40	150.90	151.00	155.00	194.90	163.30	163.80
1987	810.70	166.20	161.70	157.50	154.20	196.10	193.40	193.00	194.90	154.80	193.40	190.90
1988	1119.90	191.40	195.50	200.10	199.20	206.00	211.50	217.60	224.10	228.50	231.00	233.60
1989	1792.80	251.00	256.90	257.50	257.10	259.20	269.20	281.00	279.90	298.40	311.30	325.30
1990	343.00	349.30	356.00	362.00	382.30	417.40	445.40	463.60	468.20	480.30	502.60	513.80
1991	528.70	557.00	601.00	625.00	649.00	651.80	688.00	712.10	737.30	757.50	769.00	783.00
1992	794.00	810.70	839.10	844.00	860.50	870.80	879.70	969.30	1022.00	1076.50	1098.00	1107.60
1993	1113.40	1119.90	1130.50	1147.30	1186.90	1187.50	1180.80	1195.50	1217.30	1310.90	1414.50	1543.80
1994	1666.30	1715.30	1792.80	1845.60	1875.50	1919.10	1926.30	1914.10	1956.00	2023.40	2119.30	2205.00
1995	2285.30	2379.80	2551.10	2785.50	3100.80	3586.50	4314.30	4664.60	4858.10	5068.00	5095.20	5092.20
1996	5135.10	5180.40	5266.20	5412.40	5704.10	5798.70	5919.40	6141.00	6501.90	6634.80	6775.60	6992.10
1997	7268.30	7699.30	8561.40	8729.80	8592.30	8459.30	8148.80	7682.00	7130.80	6554.80	6395.80	6440.50
1998	6434.60	6426.20	6298.50	6113.90	6033.90	5892.10	5817.00	5795.70	5697.70	5671.00	5688.20	5672.70
1999	5494.80	5376.50	5456.20	5315.70	5315.70	5977.90	4964.20	4946.20	4890.80	5032.50	5133.20	5266.40
2000	5752.90	5955.70	5966.20	5892.80	6095.40	6466.70	6900.70	7394.10	7298.90	7415.30	7164.40	8111.00
2001	8794.20	9180.50	9159.80	9591.60	10153.80	10937.30	10576.40	10329.00	10274.20	11091.40	11169.60	10963.10
2002	10650.00	10581.90	11214.40	11399.10	11486.70	12440.70	12458.20	12327.90	11811.60	11451.50	11622.70	12137.70
2003	13298.80	13668.80	13531.10	13488.00	14086.30	14565.50	13962.00	15426.00	16500.50	18743.50	19319.30	20128.90
2004	22712.90	24797.40	22896.40	25793.00	27730.80	28887.40	27062.10	23774.30	22739.70	23354.80	23270.50	23844.50
2005	23078.30	21953.50	20682.40	21961.70	21482.10	21564.48	21911.00	22935.40	24635.90	25873.80	24355.90	24085.80
2006	23679.40	23843.00	23336.60	23301.20	24745.70	26316.10	27880.50	33096.40	32554.60	32643.70	32632.50	33189.30
2007	36784.50	40730.70	43456.10	47124.00	49930.20	51330.50	53021.70	50291.10	50229.00	50201.80	54189.90	57990.20
2008	54189.92	65652.38	63016.56	59440.90	58929.00	55949.00	53110.90	47789.20	46216.10	36325.90	33025.80	31450.80
2009	21813.76	23377.14	19851.89	21491.10	29700.20	26861.60	25286.60	23009.10	22065.00	21804.70	21010.30	20827.20
2010	22594.90	22985.00	25966.25	26453.20	26183.21	25384.14	25844.20	24268.20	23050.60	25042.20	24764.70	24770.52
2011	26830.70	26016.80	25020.10	25041.70	25866.60	23916.90	23827.00	21497.60	23373.00	20934.96	20000.76	20730.63

Source: Nigerian Stock Exchange (NSE) All Monthly Share Index Per Annual, 2012

Table 2a. Data Presentation of Expected Monthly Stock Returns Per Annual 1984-2011

year/Month	JAN	Rt	lnRt	FEB	Rt	lnRt	MAR	Rt	lnRt	APR	Rt	lnRt	MAY	Rt	lnRt
1984	106.9	1.04	57.09	106.1	1.06	41.19	107.2	1.06	40.95	106.8	1.08	29.08	104.5	1.11	21.18
1985	111.3	1.21	12.11	112.2	1.25	10.50	113.4	1.24	10.64	115.6	1.26	9.80	116.5	1.24	10.79
1986	134.6	6.02	1.28	139.7	1.19	13.26	140.8	1.15	16.64	146.2	1.08	30.93	144.2	1.07	34.34
1987	810.7	1.38	7.13	166.2	1.15	16.31	161.7	1.21	12.13	157.5	1.27	9.62	154.2	1.29	8.99
1988	1119.9	1.60	4.89	191.4	1.31	8.49	195.5	1.31	8.43	200.1	1.29	9.13	199.2	1.29	9.02
1989	1792.8	0.19	-1.39	251	1.39	6.97	256.9	1.39	7.06	257.5	1.41	6.76	257.1	1.49	5.80
1990	343	1.54	5.32	349.3	1.59	4.93	356	1.69	4.40	362	1.73	4.22	382.3	1.70	4.35
1991	528.7	1.50	5.66	557	1.46	6.13	601	1.40	6.90	625	1.35	7.67	649	1.33	8.16
1992	794	1.40	6.81	810.7	1.38	7.13	839.1	1.35	7.72	844	1.36	7.50	860.5	1.38	7.16
1993	1113.4	1.50	5.71	1119.9	1.53	5.40	1130.5	1.59	4.99	1147.3	1.61	4.84	1186.9	1.58	5.03
1994	1666.3	1.37	7.29	1715.3	1.39	7.03	1792.8	1.42	6.53	1845.6	1.51	5.59	1875.5	1.65	4.58
1995	2285.3	2.25	2.84	2379.8	2.18	2.96	2551.1	2.06	3.18	2785.5	1.94	3.47	3100.8	1.84	3.78
1996	5135.1	1.42	6.63	5180.4	1.49	5.81	5266.2	1.63	4.74	5412.4	1.61	4.82	5704.1	1.51	5.62
1997	7268.3	0.89	-18.90	7699.3	0.83	-12.74	8561.4	0.74	-7.50	8729.8	0.70	-6.46	8592.3	0.70	-6.51
1998	6434.6	0.85	-14.58	6426.2	0.84	-12.91	6298.5	0.87	-16.04	6113.9	0.87	-16.46	6033.9	0.88	-18.17
1999	5494.8	1.05	50.16	5376.5	1.11	22.51	5456.2	1.09	25.77	5315.7	1.11	22.34	5315.7	1.15	16.82
2000	5752.9	1.53	5.43	5955.7	1.54	5.32	5966.2	1.54	5.37	5892.8	1.63	4.73	6095.4	1.67	4.51
2001	8794.2	1.21	12.03	9180.5	1.15	16.21	9159.8	1.22	11.38	9591.6	1.19	13.34	10153.8	1.13	18.67
2002	10650	1.25	10.37	10581.9	1.29	9.00	11214.4	1.21	12.26	11399.1	1.18	13.68	11486.7	1.23	11.29
2003	13298.8	1.71	4.30	13668.8	1.81	3.87	13531.1	1.69	4.38	13488	1.91	3.55	14086.3	1.97	3.40
2004	22712.9	1.02	144.27	24797.4	0.89	-18.90	22896.4	0.90	-22.64	25793	0.85	-14.32	27730.8	0.77	-9.02
2005	23078.3	1.03	89.55	21953.5	1.09	27.89	20682.4	1.13	19.07	21961.7	1.06	38.89	21482.1	1.15	16.28
2006	23679.4	1.55	5.23	23843	1.71	4.30	23336.6	1.86	3.70	23301.2	2.02	3.27	24745.7	2.02	3.28
2007	36784.5	1.47	5.94	40730.7	1.61	4.82	43456.1	1.45	6.20	47124	1.26	9.92	49930.2	1.18	13.90
2008	54189.92	0.40	-2.53	65652.38	0.36	-2.23	63016.56	0.32	-1.99	59440.9	0.36	-2.26	58929	0.50	-3.36
2009	21813.76	1.04	65.45	23377.14	0.98	-136.11	19851.89	1.31	8.58	21491.1	1.23	11.08	29700.2	0.88	-18.27
2010	22594.9	1.19	13.40	22985	1.13	18.58	25966.25	0.96	-62.03	26453.2	0.95	-41.99	26183.2	0.99	-189.27
2011	26830.7	0.00	0.00	26016.8	0.00	0.00	25020.1	0.00	0.00	25041.7	0.00	0.00	25866.6	0.00	0.00

Source: Author's Computational Results of Expected Monthly Stock Return, 2012

Table 2b. Continue Expected Monthly Stock Returns Per Annual 1984-2011

year/Month	JUN	Rt	lnRt	JUL	Rt	lnRt	AUG	Rt	lnRt	SEP	Rt	lnRt	OCT	Rt	lnRt
1984	104.3	1.12	21.14	105	1.12	20.95	107	1.09	25.77	104	1.12	19.69	102	1.17	14.86
1985	116.3	1.27	9.72	117.2	1.29	9.11	117	1.29	9.03	116.9	1.33	8.16	119.1	1.64	4.68
1986	147.4	1.33	8.07	150.9	1.28	9.28	151	1.28	9.38	155	1.26	10.05	194.9	0.79	-10.00
1987	196.1	1.05	46.75	193.4	1.09	25.74	193	1.13	19.19	194.9	1.15	16.49	154.8	1.48	5.91
1988	206	1.26	10.02	211.5	1.27	9.55	217.6	1.29	9.01	224.1	1.25	10.36	228.5	1.31	8.63
1989	259.2	1.61	4.83	269.2	1.65	4.57	281	1.65	4.60	279.9	1.67	4.48	298.4	1.61	4.84
1990	417.4	1.56	5.17	445.4	1.54	5.30	463.6	1.54	5.36	468.2	1.57	5.07	480.3	1.58	5.05
1991	651.8	1.34	7.95	688	1.28	9.37	712.1	1.36	7.47	737.3	1.39	7.05	757.5	1.42	6.55
1992	870.8	1.36	7.42	879.7	1.34	7.82	969.3	1.23	10.98	1022	1.19	13.17	1076.5	1.22	11.69
1993	1187.5	1.62	4.80	1180.8	1.63	4.70	1195.5	1.60	4.89	1217.3	1.61	4.86	1310.9	1.54	5.30
1994	1919.1	1.87	3.68	1926.3	2.24	2.86	1914.1	2.44	2.58	1956	2.48	2.53	2023.4	2.50	2.51
1995	3586.5	1.62	4.79	4314.3	1.37	7.28	4664.6	1.32	8.37	4858.1	1.34	7.90	5068	1.31	8.55
1996	5798.7	1.46	6.10	5919.4	1.38	7.20	6141	1.25	10.28	6501.9	1.10	24.94	6634.8	0.99	-189.81
1997	8459.3	0.70	-6.37	8148.8	0.71	-6.83	7682	0.75	-8.17	7130.8	0.80	-10.26	6554.8	0.87	-15.90
1998	5892.1	1.01	159.27	5817	0.85	-14.52	5795.7	0.85	-14.53	5697.7	0.86	-15.08	5671	0.89	-19.28
1999	5977.9	1.08	29.30	4964.2	1.39	6.99	4946.2	1.49	5.73	4890.8	1.49	5.75	5032.5	1.47	5.94
2000	6466.7	1.69	4.38	6900.7	1.53	5.39	7394.1	1.40	6.89	7298.9	1.41	6.73	7415.3	1.50	5.72
2001	10937.3	1.14	17.88	10576.4	1.18	14.06	10329	1.19	13.02	10274.2	1.15	16.51	11091.4	1.03	72.07
2002	12440.7	1.17	14.60	12458.2	1.12	20.21	12327.9	1.25	10.27	11811.6	1.40	6.89	11451.5	1.64	4.67
2003	14565.5	1.98	3.36	13962	1.94	3.48	15426	1.54	5.32	16500.5	1.38	7.18	18743.5	1.25	10.47
2004	28887.4	0.75	-7.88	27062.1	0.81	-10.91	23774.3	0.96	-64.10	22739.7	1.08	28.75	23354.8	1.11	22.48
2005	21564.48	1.22	11.56	21911	1.27	9.56	22935.4	1.44	6.28	24635.9	1.32	8.26	25873.8	1.26	9.91
2006	26316.1	1.95	3.45	27880.5	1.90	3.58	33096.4	1.52	5.50	32554.6	1.54	5.31	32643.7	1.54	5.35
2007	51330.5	1.09	26.73	53021.7	1.00	1369.84	50291.1	0.95	-45.12	50229	0.92	-27.65	50201.8	0.72	-7.12
2008	55949	0.48	-3.14	53110.9	0.48	-3.10	47789.2	0.48	-3.15	46216.1	0.48	-3.11	36325.9	0.60	-4.51
2009	26861.6	0.94	-40.70	25286.6	1.02	105.57	23009.1	1.05	43.22	22065	1.04	52.69	21804.7	1.15	16.63
2010	25384.14	0.94	-38.67	25844.2	0.92	-28.33	24268.2	0.89	-18.99	23050.6	1.01	165.78	25042.2	0.84	-12.85
2011	23916.9	0.00	0.00	23827	0.00	0.00	21497.6	0.00	0.00	23373	0.00	0.00	20935	0.00	0.00

Source: Author's Computational Results of Expected Monthly Stock Return, 2012

Table 2c. Continue Expected Monthly Stock Returns Per Annual 1984-2011

year/Month	NOV	Rt	lnRt	DEC	Rt	lnRt
1984	103.4	1.21	12.35	105.5	1.21	12.26
1985	124.6	1.31	8.51	127.3	1.29	9.13
1986	163.3	1.18	13.61	163.8	1.17	15.04
1987	193.4	1.19	12.96	190.9	1.22	11.41
1988	231	1.35	7.72	233.6	1.39	6.95
1989	311.3	1.61	4.81	325.3	1.58	5.04
1990	502.6	1.53	5.41	513.8	1.52	5.47
1991	769	1.43	6.47	783	1.41	6.64
1992	1098	1.29	9.09	1107.6	1.39	6.93
1993	1414.5	1.50	5.70	1543.8	1.43	6.46
1994	2119.3	2.40	2.62	2205	2.31	2.75
1995	5095.2	1.33	8.08	5092.2	1.37	7.26
1996	6775.6	0.94	-39.92	6992.1	0.92	-28.02
1997	6395.8	0.89	-19.64	6440.5	0.88	-18.14
1998	5688.2	0.90	-22.43	5672.7	0.93	-30.98
1999	5133.2	1.40	6.91	5266.4	1.54	5.33
2000	7164.4	1.56	5.19	8111	1.35	7.64
2001	11169.6	1.04	57.91	10963.1	1.11	22.62
2002	11622.7	1.66	4.53	12137.7	1.66	4.55
2003	19319.3	1.20	12.37	20128.9	1.18	13.59
2004	23270.5	1.05	50.51	23844.5	1.01	228.68
2005	24355.9	1.34	7.87	24085.8	1.38	7.18
2006	32632.5	1.66	4.54	33189.3	1.75	4.13
2007	54189.9	0.61	-4.65	57990.2	0.54	-3.76
2008	33025.8	0.64	-5.09	31450.8	0.66	-5.59
2009	21010.3	1.18	14.01	20827.2	1.19	13.28
2010	24764.7	0.81	-10.78	24770.52	0.84	-12.93
2011	20000.76	0.00	0.00	20730.63	0.00	0.00

Source: Author's Computational Results of Expected Monthly Stock Return, 2012

Table 3. Data presentation of Expected and Average Expected Monthly Stock Returns Per Annual 1984-2011

year/Month	LnRtJan	LnRtFeb	LnRtm	LnRtAPr	LnRtMay	LnRtJun	LnRtJul	LnRtAug	LnRtSep	LnRtOct	RtNov	RtDec	LNART
1984	57.09	41.19	40.95	29.08	21.18	21.14	20.95	25.77	19.69	14.86	12.35	12.26	316.51
1985	12.11	10.50	10.64	9.80	10.79	9.72	9.11	9.03	8.16	4.68	8.51	9.13	112.19
1986	1.28	13.26	16.64	30.93	34.34	8.07	9.28	9.38	10.05	-10.00	13.61	15.04	151.88
1987	7.13	16.31	12.13	9.62	8.99	46.75	25.74	19.19	16.49	5.91	12.96	11.41	192.63
1988	4.89	8.49	8.43	9.13	9.02	10.02	9.55	9.01	10.36	8.63	7.72	6.95	102.20
1989	-1.39	6.97	7.06	6.76	5.80	4.83	4.57	4.60	4.48	4.84	4.81	5.04	58.36
1990	5.32	4.93	4.40	4.22	4.35	5.17	5.30	5.36	5.07	5.05	5.41	5.47	60.05
1991	5.66	6.13	6.90	7.67	8.16	7.95	9.37	7.47	7.05	6.55	6.47	6.64	86.02
1992	6.81	7.13	7.72	7.50	7.16	7.42	7.82	10.98	13.17	11.69	9.09	6.93	103.43
1993	5.71	5.40	4.99	4.84	5.03	4.80	4.70	4.89	4.86	5.30	5.70	6.46	62.69
1994	7.29	7.03	6.53	5.59	4.58	3.68	2.86	2.58	2.53	2.51	2.62	2.75	50.56
1995	2.84	2.96	3.18	3.47	3.78	4.79	7.28	8.37	7.90	8.55	8.08	7.26	68.46
1996	6.63	5.81	4.74	4.82	5.62	6.10	7.20	10.28	24.94	-189.81	-39.92	-28.02	-181.61
1997	-18.90	-12.74	-7.50	-6.46	-6.51	-6.37	-6.83	-8.17	-10.26	-15.90	-19.64	-18.14	-137.43
1998	-14.58	-12.91	-16.04	-16.46	-18.17	159.27	-14.52	-14.53	-15.08	-19.28	-22.43	-30.98	-35.71
1999	50.16	22.51	25.77	22.34	16.82	29.30	6.99	5.73	5.75	5.94	6.91	5.33	203.54
2000	5.43	5.32	5.37	4.73	4.51	4.38	5.39	6.89	6.73	5.72	5.19	7.64	67.30
2001	12.03	16.21	11.38	13.34	18.67	17.88	14.06	13.02	16.51	72.07	57.91	22.62	285.68
2002	10.37	9.00	12.26	13.68	11.29	14.60	20.21	10.27	6.89	4.67	4.53	4.55	122.32
2003	4.30	3.87	4.38	3.55	3.40	3.36	3.48	5.32	7.18	10.47	12.37	13.59	75.28
2004	144.27	-18.90	-22.64	-14.32	-9.02	-7.88	-10.91	-64.10	28.75	22.48	50.51	228.68	326.94
2005	89.55	27.89	19.07	38.89	16.28	11.56	9.56	6.28	8.26	9.91	7.87	7.18	252.30
2006	5.23	4.30	3.70	3.27	3.28	3.45	3.58	5.50	5.31	5.35	4.54	4.13	51.64
2007	5.94	4.82	6.20	9.92	13.90	26.73	1369.84	-45.12	-27.65	-7.12	-4.65	-3.76	1349.03
2008	-2.53	-2.23	-1.99	-2.26	-3.36	-3.14	-3.10	-3.15	-3.11	-4.51	-5.09	-5.59	-40.07
2009	65.45	-136.11	8.58	11.08	-18.27	-40.70	105.57	43.22	52.69	16.63	14.01	13.28	135.42
2010	13.40	18.58	-62.03	-41.99	-189.27	-38.67	-28.33	-18.99	165.78	-12.85	-10.78	-12.93	-218.10
2011	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Author's Computational Results of Expected Monthly Stock Return, 2012

Table 4. Transformation and Growth Rate of Average Expected Stock Return and Interest Rates Per Annual / Four Year Moving Average Growth Rates

Year	LnARt	RLnARt	INT	LnINT	4YRLnARt	RLnINT	4YRLnINT
1984	316.51	-64.55	8.5	1.18		-8.5	
1985	112.19	35.37	8.5	1.08		0.0	
1986	151.88	26.83	8.5	1.08		0.0	
1987	192.63	-46.95	11.8	1.08	193.3	-13.9	-5.6
1988	102.2	-42.9	11.8	0.93		0.0	
1989	58.36	2.9	17.5	0.93		-14.0	
1990	60.05	43.24	17.5	0.8		0.0	
1991	86.02	20.24	15	0.8	76.7	6.2	-1.9
1992	103.43	-39.39	21	0.85		-10.6	
1993	62.69	-19.35	26	0.76		-6.6	
1994	50.56	35.4	12.5	0.71		28.2	
1995	68.46	-365.28	12.5	0.91	71.3	0.0	2.8
1996	-181.61	-24.33	12.3	0.91		1.1	
1997	-137.43	-74.02	12	0.92		1.1	
1998	-35.71	-670.03	13	0.93		-3.2	
1999	203.54	-66.94	17	0.9	-37.8	-10.0	-2.8
2000	67.3	324.49	12	0.81		14.8	
2001	285.68	-57.18	13	0.93		-3.2	
2002	122.32	-38.46	18.9	0.9		-13.3	
2003	75.28	334.31	15	0.78	137.6	9.0	1.8
2004	326.94	-22.83	14.2	0.85		2.4	
2005	252.3	-79.53	13	0.87		3.4	
2006	51.64	2512.48	12.3	0.9		2.2	
2007	1349.03	-102.97	8.8	0.92	495.0	15.2	5.8
2008	-40.07	-437.94	3.5	1.06		73.6	
2009	135.42	-261.05	5.1	1.84		-23.4	
2010	-218.1	-100	11.1	1.41		-32.6	
2011	0	0	11.4	0.95	-30.7	-100.0	-20.6

NB: LnART = Log of Average Expected Monthly Stock Returns
RLnART = Growth Rate Log of Average Expected Monthly Stock Returns
LnINT = Log of Interest Rate
RLnINT = Growth rate Log of Interest Rate
4YRRLnART = Four Year Growth Rate Log of Average Expected Monthly Stock Returns
4YR RLnINT = Four Year Growth rate Log of Interest Rate
(Source: Author's Computational Results of Expected Monthly Stock Return, 2012)

Appendix 2. ADF Unit Root Test for Stationarity

Rt January

Order 2

ADF Test Statistic	-3.106341	1% Critical Value*	-3.7667
		5% Critical Value	-3.0038
		10% Critical Value	-2.6417

**MacKinnon critical values for rejection of hypothesis of a unit root.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RTA,3)
Method: Least Squares
Date: 10/31/12 Time: 17:29
Sample(adjusted): 1990 2011
Included observations: 22 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RTA(-1),2)	-3.931254	1.265558	-3.106341	0.0064
D(RTA(-1),3)	1.450097	1.062998	1.364158	0.1903
D(RTA(-2),3)	0.315170	0.674423	0.467318	0.6462
D(RTA(-3),3)	-0.173703	0.265822	-0.653455	0.5222
C	-0.680851	3.999296	-0.170243	0.8668

R-squared	0.946433	Mean dependent var	4.406740
Adjusted R-squared	0.933829	S.D. dependent var	72.65014
S.E. of regression	18.68826	Akaike info criterion	8.890384
Sum squared resid	5937.267	Schwarz criterion	9.138348
Log likelihood	-92.79423	F-statistic	75.09043
Durbin-Watson stat	1.803440	Prob(F-statistic)	0.000000

Rt February

At Order 2

ADF Test Statistic	-4.574909	1% Critical Value*	-3.7667
		5% Critical Value	-3.0038
		10% Critical Value	-2.6417

**MacKinnon critical values for rejection of hypothesis of a unit root.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RTF,3)
Method: Least Squares
Date: 10/31/12 Time: 17:48
Sample(adjusted): 1990 2011
Included observations: 22 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RTF(-1),2)	-6.490291	1.418671	-4.574909	0.0003
D(RTF(-1),3)	4.097107	1.273517	3.217158	0.0051
D(RTF(-2),3)	2.392709	0.928412	2.577207	0.0196
D(RTF(-3),3)	1.246842	0.443892	2.808885	0.0121
C	0.165290	8.603469	0.019212	0.9849
R-squared	0.942623	Mean dependent var		-8.162301
Adjusted R-squared	0.929122	S.D. dependent var		147.3585
S.E. of regression	39.23103	Akaike info criterion		10.37353
Sum squared resid	26164.25	Schwarz criterion		10.62149
Log likelihood	-109.1088	F-statistic		69.82132
Durbin-Watson stat	2.479251	Prob(F-statistic)		0.000000

Rt March

At Order 2

ADF Test Statistic	-2.848683	1% Critical Value*	-3.7667
		5% Critical Value	-3.0038
		10% Critical Value	-2.6417

**MacKinnon critical values for rejection of hypothesis of a unit root.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RTM,3)
Method: Least Squares
Date: 10/31/12 Time: 17:33
Sample(adjusted): 1990 2011
Included observations: 22 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RTM(-1),2)	-3.645550	1.279732	-2.848683	0.0111
D(RTM(-1),3)	1.120463	1.098359	1.020125	0.3220
D(RTM(-2),3)	0.027924	0.712942	0.039167	0.9692
D(RTM(-3),3)	-0.339331	0.291751	-1.163084	0.2609
C	-1.750359	4.461585	-0.392318	0.6997

R-squared	0.933654	Mean dependent var	5.923470
Adjusted R-squared	0.918044	S.D. dependent var	72.56975
S.E. of regression	20.77529	Akaike info criterion	9.102122
Sum squared resid	7337.412	Schwarz criterion	9.350086
Log likelihood	-95.12334	F-statistic	59.80847
Durbin-Watson stat	1.578043	Prob(F-statistic)	0.000000

Rt April

At Order 2

ADF Test Statistic	-3.106341	1% Critical Value*	-3.7667
		5% Critical Value	-3.0038
		10% Critical Value	-2.6417

**MacKinnon critical values for rejection of hypothesis of a unit root.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RTA,3)
Method: Least Squares
Date: 10/31/12 Time: 17:34
Sample(adjusted): 1990 2011
Included observations: 22 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RTA(-1),2)	-3.931254	1.265558	-3.106341	0.0064
D(RTA(-1),3)	1.450097	1.062998	1.364158	0.1903
D(RTA(-2),3)	0.315170	0.674423	0.467318	0.6462
D(RTA(-3),3)	-0.173703	0.265822	-0.653455	0.5222
C	-0.680851	3.999296	-0.170243	0.8668
R-squared	0.946433	Mean dependent var	4.406740	
Adjusted R-squared	0.933829	S.D. dependent var	72.65014	
S.E. of regression	18.68826	Akaike info criterion	8.890384	
Sum squared resid	5937.267	Schwarz criterion	9.138348	
Log likelihood	-92.79423	F-statistic	75.09043	
Durbin-Watson stat	1.803440	Prob(F-statistic)	0.000000	

Rt May

At order 2

ADF Test Statistic	-1.971432	1% Critical Value*	-3.7667
		5% Critical Value	-3.0038
		10% Critical Value	-2.6417

**MacKinnon critical values for rejection of hypothesis of a unit root.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RTMA,3)
Method: Least Squares
Date: 10/31/12 Time: 17:35
Sample(adjusted): 1990 2011
Included observations: 22 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RTMA(-1),2)	-3.986765	2.022269	-1.971432	0.0652
D(RTMA(-1),3)	1.022358	1.985005	0.515040	0.6132
D(RTMA(-2),3)	-0.023236	1.482179	-0.015677	0.9877
D(RTMA(-3),3)	-0.395016	0.672009	-0.587814	0.5644
C	-7.092445	10.24220	-0.692473	0.4980
R-squared	0.883583	Mean dependent var		16.52350
Adjusted R-squared	0.856190	S.D. dependent var		123.5390
S.E. of regression	46.84876	Akaike info criterion		10.72844
Sum squared resid	37311.71	Schwarz criterion		10.97641
Log likelihood	-113.0129	F-statistic		32.25659
Durbin-Watson stat	1.845699	Prob(F-statistic)		0.000000

Rt June

At Order 2

ADF Test Statistic	-4.624385	1% Critical Value*	-3.7667
		5% Critical Value	-3.0038
		10% Critical Value	-2.6417

**MacKinnon critical values for rejection of hypothesis of a unit root.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RTJU,3)
Method: Least Squares
Date: 10/31/12 Time: 17:47
Sample(adjusted): 1990 2011
Included observations: 22 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RTJU(-1),2)	-4.696175	1.015524	-4.624385	0.0002
D(RTJU(-1),3)	2.411093	0.841682	2.864612	0.0107
D(RTJU(-2),3)	1.186300	0.544987	2.176751	0.0439
D(RTJU(-3),3)	0.347335	0.233503	1.487498	0.1552
C	-0.515255	11.50230	-0.044796	0.9648

R-squared	0.890876	Mean dependent var	0.232176
Adjusted R-squared	0.865200	S.D. dependent var	146.3190
S.E. of regression	53.72127	Akaike info criterion	11.00221
Sum squared resid	49061.57	Schwarz criterion	11.25018
Log likelihood	-116.0243	F-statistic	34.69646
Durbin-Watson stat	2.125193	Prob(F-statistic)	0.000000

Rt July

At order 2

ADF Test Statistic	-4.181968	1% Critical Value*	-3.7497
		5% Critical Value	-2.9969
		10% Critical Value	-2.6381

**MacKinnon critical values for rejection of hypothesis of a unit root.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RTJUL,2)
Method: Least Squares
Date: 10/31/12 Time: 17:38
Sample(adjusted): 1989 2011
Included observations: 23 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RTJUL(-1))	-5.428940	1.298178	-4.181968	0.0006
D(RTJUL(-1),2)	3.364350	1.137788	2.956923	0.0084
D(RTJUL(-2),2)	2.330169	0.857893	2.716151	0.0142
D(RTJUL(-3),2)	1.200053	0.478667	2.507073	0.0220
C	71.19168	70.59859	1.008401	0.3266

R-squared	0.852203	Mean dependent var	1.935908
Adjusted R-squared	0.819359	S.D. dependent var	728.3517
S.E. of regression	309.5635	Akaike info criterion	14.49786
Sum squared resid	1724932.	Schwarz criterion	14.74471
Log likelihood	-161.7254	F-statistic	25.94707
Durbin-Watson stat	1.993692	Prob(F-statistic)	0.000000

Rt August

At Order 2

ADF Test Statistic	-3.469968	1% Critical Value*	-3.7667
		5% Critical Value	-3.0038
		10% Critical Value	-2.6417

**MacKinnon critical values for rejection of hypothesis of a unit root.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RTAU,3)
Method: Least Squares
Date: 10/31/12 Time: 17:39
Sample(adjusted): 1990 2011
Included observations: 22 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RTAU(-1),2)	-4.300929	1.239472	-3.469968	0.0029
D(RTAU(-1),3)	1.979960	1.036578	1.910092	0.0731
D(RTAU(-2),3)	0.584812	0.675908	0.865223	0.3990
D(RTAU(-3),3)	-0.034758	0.286703	-0.121232	0.9049
C	1.483795	5.538908	0.267886	0.7920

R-squared	0.934149	Mean dependent var	3.428433
Adjusted R-squared	0.918655	S.D. dependent var	90.51972
S.E. of regression	25.81723	Akaike info criterion	9.536678
Sum squared resid	11331.00	Schwarz criterion	9.784642
Log likelihood	-99.90345	F-statistic	60.28961
Durbin-Watson stat	1.963857	Prob(F-statistic)	0.000000

Rt September

At Order 2

ADF Test Statistic	-4.819003	1% Critical Value*	-3.7667
		5% Critical Value	-3.0038
		10% Critical Value	-2.6417

**MacKinnon critical values for rejection of hypothesis of a unit root.*

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(RTS,3)

Method: Least Squares

Date: 10/31/12 Time: 17:50

Sample(adjusted): 1990 2011

Included observations: 22 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RTS(-1),2)	-6.527903	1.354617	-4.819003	0.0002
D(RTS(-1),3)	4.414108	1.257441	3.510390	0.0027
D(RTS(-2),3)	3.027379	1.006491	3.007854	0.0079
D(RTS(-3),3)	0.895403	0.588179	1.522330	0.1463
C	3.202060	9.831492	0.325694	0.7486
R-squared	0.764722	Mean dependent var		-12.68717
Adjusted R-squared	0.709363	S.D. dependent var		83.02473
S.E. of regression	44.75927	Akaike info criterion		10.63719
Sum squared resid	34057.67	Schwarz criterion		10.88515
Log likelihood	-112.0091	F-statistic		13.81376
Durbin-Watson stat	2.221648	Prob(F-statistic)		0.000034

RT October

At Order 2

ADF Test Statistic	-3.636573	1% Critical Value*	-3.7667
		5% Critical Value	-3.0038
		10% Critical Value	-2.6417

**MacKinnon critical values for rejection of hypothesis of a unit root.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RTO,3)
Method: Least Squares
Date: 10/31/12 Time: 17:42
Sample(adjusted): 1990 2011
Included observations: 22 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RTO(-1),2)	-3.973823	1.092738	-3.636573	0.0020
D(RTO(-1),3)	1.680393	0.908585	1.849463	0.0819
D(RTO(-2),3)	0.650195	0.585526	1.110447	0.2823
D(RTO(-3),3)	0.086120	0.242234	0.355523	0.7266
C	-0.457454	14.26553	-0.032067	0.9748
R-squared	0.909207	Mean dependent var		2.220146
Adjusted R-squared	0.887844	S.D. dependent var		199.7589
S.E. of regression	66.89852	Akaike info criterion		11.44095
Sum squared resid	76082.00	Schwarz criterion		11.68891
Log likelihood	-120.8504	F-statistic		42.56000
Durbin-Watson stat	2.034548	Prob(F-statistic)		0.000000

Rt November

At Order 2

ADF Test Statistic	-3.705512	1% Critical Value*	-3.7667
		5% Critical Value	-3.0038
		10% Critical Value	-2.6417

**MacKinnon critical values for rejection of hypothesis of a unit root.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RTN,3)
Method: Least Squares
Date: 10/31/12 Time: 17:43
Sample(adjusted): 1990 2011
Included observations: 22 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RTN(-1),2)	-3.943045	1.064103	-3.705512	0.0018
D(RTN(-1),3)	1.675928	0.897479	1.867373	0.0792
D(RTN(-2),3)	0.677580	0.584471	1.159305	0.2624
D(RTN(-3),3)	0.174092	0.245150	0.710145	0.4872
C	0.223714	6.028706	0.037108	0.9708
R-squared	0.899856	Mean dependent var		1.510399
Adjusted R-squared	0.876292	S.D. dependent var		80.37167
S.E. of regression	28.26840	Akaike info criterion		9.718083
Sum squared resid	13584.74	Schwarz criterion		9.966047
Log likelihood	-101.8989	F-statistic		38.18876
Durbin-Watson stat	2.055613	Prob(F-statistic)		0.000000

Rt December

At Order 2

ADF Test Statistic	-5.127121	1% Critical Value*	-3.7667
		5% Critical Value	-3.0038
		10% Critical Value	-2.6417

**MacKinnon critical values for rejection of hypothesis of a unit root.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RTD,3)
Method: Least Squares
Date: 10/31/12 Time: 19:51
Sample(adjusted): 1990 2011
Included observations: 22 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RTD(-1),2)	-4.863670	0.948616	-5.127121	0.0001
D(RTD(-1),3)	2.544944	0.792180	3.212584	0.0051
D(RTD(-2),3)	1.308117	0.513948	2.545235	0.0209
D(RTD(-3),3)	0.442777	0.218432	2.027065	0.0586
C	0.235622	15.38982	0.015310	0.9880
R-squared	0.908677	Mean dependent var		1.663995
Adjusted R-squared	0.887189	S.D. dependent var		214.9056
S.E. of regression	72.18109	Akaike info criterion		11.59295
Sum squared resid	88571.87	Schwarz criterion		11.84091
Log likelihood	-122.5224	F-statistic		42.28803
Durbin-Watson stat	2.168450	Prob(F-statistic)		0.000000

Appendix 3. Student t-test Result

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
1984	221.304	11	.000	105.22500	104.1785	106.2715
1985	87.246	11	.000	117.28333	114.3246	120.2421
1986	33.093	11	.000	152.65000	142.4974	162.8026
1987	4.352	11	.001	230.56667	113.9505	347.1829
1988	3.806	11	.003	288.20000	121.5308	454.8692
1989	3.188	11	.009	403.30000	124.8650	681.7350
1990	23.263	11	.000	423.65833	383.5739	463.7428
1991	27.787	11	.000	671.61667	618.4187	724.8147
1992	27.575	11	.000	931.01667	856.7037	1005.3296
1993	32.485	11	.000	1229.02500	1145.7549	1312.2951
1994	42.910	11	.000	1913.22500	1815.0892	2011.3608
1995	11.504	11	.000	3815.11667	3085.1645	4545.0689
1996	31.645	11	.000	5955.14167	5540.9520	6369.3314
1997	30.207	11	.000	7638.59167	7082.0175	8195.1658
1998	70.384	11	.000	5961.79167	5775.3593	6148.2240
1999	59.922	11	.000	5264.17500	5070.8185	5457.5315
2000	29.833	11	.000	6701.17500	6206.7897	7195.5603
2001	42.752	11	.000	10185.07500	9660.7242	10709.4258
2002	63.292	11	.000	11631.86667	11227.3696	12036.3638
2003	21.543	11	.000	15559.89167	13970.2196	17149.5637
2004	40.207	11	.000	24738.65000	23384.4174	26092.8826
2005	50.699	11	.000	22876.69000	21883.5580	23869.8220
2006	22.292	11	.000	28101.58333	25327.0322	30876.1345
2007	28.518	11	.000	48773.30833	45009.1014	52537.5152
2008	15.048	11	.000	50424.70500	43049.5197	57799.8903
2009	28.019	11	.000	23091.54917	21277.6586	24905.4398
2010	65.318	11	.000	24775.59333	23940.7390	25610.4477
2011	35.456	11	.000	23588.06250	22123.7880	25052.3370

Source: SPSS 17.0 Result Output t-test, 2012

Appendix 4 Performance Analysis of market share index

Descriptive Statistics

Year	N	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance	Variance Ratio
1984	12	102.00	107.20	1262.70	105.23	1.65	2.71	1.05
1985	12	111.30	127.30	1407.40	117.28	4.66	21.69	1.14
1986	12	134.60	194.90	1831.80	152.65	15.98	255.33	1.45
1987	12	154.20	810.70	2766.80	230.57	183.54	33687.19	5.26
1988	12	191.40	1119.90	3458.40	288.20	262.32	68811.00	5.85
1989	12	251.00	1792.80	4839.60	403.30	438.23	192041.37	7.14
1990	12	343.00	513.80	5083.90	423.66	63.09	3980.14	1.50
1991	12	528.70	783.00	8059.40	671.62	83.73	7010.32	1.48
1992	12	794.00	1107.60	11172.20	931.02	116.96	13679.67	1.39
1993	12	1113.40	1543.80	14748.30	1229.03	131.06	17176.11	1.39
1994	12	1666.30	2205.00	22958.70	1913.23	154.45	23856.25	1.32
1995	12	2285.30	5095.20	45781.40	3815.12	1148.86	1319884.31	2.23
1996	12	5135.10	6992.10	71461.70	5955.14	651.89	424957.58	1.36
1997	12	6395.80	8729.80	91663.10	7638.59	875.98	767349.31	1.36
1998	12	5671.00	6434.60	71541.50	5961.79	293.42	86097.32	1.13
1999	12	4890.80	5977.90	63170.10	5264.18	304.32	92611.47	1.22
2000	12	5752.90	8111.00	80414.10	6701.18	778.11	605449.78	1.41
2001	12	8794.20	11169.60	122220.90	10185.08	825.27	681068.77	1.27
2002	12	10581.90	12458.20	139582.40	11631.87	636.63	405301.13	1.18
2003	12	13298.80	20128.90	186718.70	15559.89	2501.96	6259823.64	1.51
2004	12	22712.90	28887.40	296863.80	24738.65	2131.41	4542903.93	1.27
2005	12	20682.40	25873.80	274520.28	22876.69	1563.08	2443210.86	1.25
2006	12	23301.20	33189.30	337219.00	28101.58	4366.83	19069200.62	1.42
2007	12	36784.50	57990.20	585279.70	48773.31	5924.44	35098939.21	1.58
2008	12	31450.80	65652.38	605096.46	50424.71	11607.71	134738867.09	2.09
2009	12	19851.89	29700.20	277098.59	23091.55	2854.86	8150217.34	1.50
2010	12	22594.90	26453.20	297307.12	24775.59	1313.97	1726507.52	1.17
2011	12	20000.76	26830.70	283056.75	23588.06	2304.60	5311192.14	1.34

Source: SPSS 17.0 Result Output Descriptive Statistics, 2012

Appendix 5. Co integration Result

Sample: 1984 2011
Included observations: 27
Test assumption: Linear deterministic trend in the data
Series: LNRTJ LNRTF LNRTM LNRTA LNRTMA LNRTJU LNRTJUL LNRTAU LNRTS LNRTO LNRTN LNRTD
Lags interval: No lags

	Likelihood	5 Percent	1 Percent	Hypothesized
Eigenvalue	Ratio	Critical Value	Critical Value	No. of CE(s)
0.999827	756.8199	233.13??	247.18??	None **
0.995546	522.9285	233.13??	247.18??	At most 1 **
0.985546	376.7498	233.13	247.18	At most 2 **
0.965031	262.3567	192.89	205.95	At most 3 **
0.813518	171.8175	156.00	168.36	At most 4 **
0.655299	126.4731	124.24	133.57	At most 5
0.612660	97.71603	94.15	103.18	At most 6
0.597312	72.10783	68.52	76.07	At most 7
0.503688	47.54883	47.21	54.46	At most 8
0.380363	28.63397	29.68	35.65	At most 9
0.306520	15.71117	15.41	20.04	At most 10
0.194154	5.828303	3.76	6.65	At most 11

*(**) denotes rejection of the hypothesis at 5%(1%) significance level?? denotes critical values derived assuming 10 endogenous series L.R. test indicates 9 cointegrating equation(s) at 5% significance level

Unnormalized Cointegrating Coefficients:						
LNRTJ	LNRTF	LNRTM	LNRTA	LNRTMA	LNRTJU	LNRTJUL
0.000114	-0.004901	0.006394	-0.002782	0.000309	0.000151	3.97E-05
-0.005700	-0.002509	0.024922	-0.014378	-0.002478	0.001121	-0.000116
0.001529	0.007317	0.010290	-0.000699	-0.028886	5.43E-05	0.000930
0.002907	0.007166	-0.042048	0.012825	-0.016403	0.003387	0.001198
-0.007630	0.002893	0.006792	0.023913	-0.043948	-0.003165	3.55E-05
0.022903	0.008516	-0.063293	-0.076867	0.119050	-0.001716	0.000820
-0.018196	-0.004424	0.020094	0.063665	-0.058416	0.003245	0.000214
0.000337	0.001310	-0.011265	-0.002542	0.008112	-0.003352	0.000247
-0.004245	-0.002306	0.005258	0.025549	-0.021738	0.001323	-0.000651
-0.005684	-0.002281	0.002134	-0.001204	0.005807	2.42E-06	0.000124
0.005922	-0.002501	0.010480	-0.051137	0.058940	0.002218	-0.000501
0.004426	-0.004347	0.021089	-0.007571	-0.016901	-0.002590	-0.000382
Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)						
LNRTJ	LNRTF	LNRTM	LNRTA	LNRTMA	LNRTJU	LNRTJUL
1.000000	-43.09490	56.22131	-24.45786	2.716470	1.325969	0.349329
	(31.4551)	(42.1645)	(15.4542)	(2.10905)	(1.02689)	(0.24501)
Log likelihood	-1329.077					

Normalized Cointegrating Coefficients: 2 Cointegrating Equation(s)						
LNRTJ	LNRTF	LNRTM	LNRTA	LNRTMA	LNRTJU	LNRTJUL
1.000000	0.000000	-3.759826	2.249704	0.457798	-0.181348	0.023616
		(0.20403)	(0.43048)	(0.32743)	(0.01893)	(0.00449)
0.000000	1.000000	-1.391838	0.619738	-0.052412	-0.034977	-0.007558
		(0.04666)	(0.09844)	(0.07488)	(0.00433)	(0.00103)
Log likelihood	-1255.988					
Normalized Cointegrating Coefficients: 3 Cointegrating Equation(s)						
LNRTJ	LNRTF	LNRTM	LNRTA	LNRTMA	LNRTJU	LNRTJUL
1.000000	0.000000	0.000000	1.006172	-3.729222	-0.097121	0.159762
			(0.63794)	(0.84445)	(0.03112)	(0.01672)
0.000000	1.000000	0.000000	0.159399	-1.602391	-0.003797	0.042841
			(0.21574)	(0.28558)	(0.01052)	(0.00565)
0.000000	0.000000	1.000000	-0.330742	-1.113621	0.022402	0.036211
			(0.15224)	(0.20152)	(0.00743)	(0.00399)
Log likelihood	-1198.791					
Normalized Cointegrating Coefficients: 4 Cointegrating Equation(s)						
LNRTJ	LNRTF	LNRTM	LNRTA	LNRTMA	LNRTJU	LNRTJUL
1.000000	0.000000	0.000000	0.000000	-11.72152	0.809192	0.540606
				(15.7350)	(1.51446)	(0.67443)
0.000000	1.000000	0.000000	0.000000	-2.868541	0.139783	0.103175
				(3.39193)	(0.32647)	(0.14538)
0.000000	0.000000	1.000000	0.000000	1.513549	-0.275515	-0.088977
				(3.76253)	(0.36214)	(0.16127)
0.000000	0.000000	0.000000	1.000000	7.943265	-0.900753	-0.378507
				(12.8157)	(1.23349)	(0.54931)
Log likelihood	-1153.522					
Normalized Cointegrating Coefficients: 5 Cointegrating Equation(s)						
LNRTJ	LNRTF	LNRTM	LNRTA	LNRTMA	LNRTJU	LNRTJUL
1.000000	0.000000	0.000000	0.000000	0.000000	-0.128223	0.053548
					(0.11680)	(0.01257)
0.000000	1.000000	0.000000	0.000000	0.000000	-0.089626	-0.016020
					(0.03929)	(0.00423)
0.000000	0.000000	1.000000	0.000000	0.000000	-0.154470	-0.026086
					(0.03643)	(0.00392)
0.000000	0.000000	0.000000	1.000000	0.000000	-0.265499	-0.048445
					(0.07151)	(0.00770)
0.000000	0.000000	0.000000	0.000000	1.000000	-0.079974	-0.041552
					(0.02402)	(0.00259)
Log likelihood	-1130.849					

Normalized Cointegrating Coefficients: 6 Cointegrating Equation(s)						
LNRTJ	LNRTF	LNRTM	LNRTA	LNRTMA	LNRTJU	LNRTJUL
1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.058342
						(0.01382)
0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	-0.012669
						(0.00592)
0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	-0.020310
						(0.00585)
0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-0.038519
						(0.00690)
0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	-0.038562
						(0.00416)
0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.037388
						(0.04174)
Log likelihood	-1116.471					

Appendix 6. Unit Root Test

RLNART

At Order

ADF Test Statistic	-3.675205	1% Critical Value*	-3.7497
		5% Critical Value	-2.9969
		10% Critical Value	-2.6381

**MacKinnon critical values for rejection of hypothesis of a unit root.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RLNART,2)
Method: Least Squares
Date: 11/01/12 Time: 03:20
Sample(adjusted): 1989 2011
Included observations: 23 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RLNART(-1))	-3.078710	0.837698	-3.675205	0.0017
D(RLNART(-1),2)	1.297419	0.691465	1.876334	0.0769
D(RLNART(-2),2)	0.565885	0.464750	1.217612	0.2391
D(RLNART(-3),2)	0.197512	0.232994	0.847710	0.4077
C	-17.00368	147.0060	-0.115667	0.9092

R-squared	0.796609	Mean dependent var	4.171739
Adjusted R-squared	0.751411	S.D. dependent var	1411.184
S.E. of regression	703.5972	Akaike info criterion	16.13995
Sum squared resid	8910881.	Schwarz criterion	16.38680
Log likelihood	-180.6094	F-statistic	17.62492
Durbin-Watson stat	2.078189	Prob(F-statistic)	0.000005

RLNINT

At Level

ADF Test Statistic	-3.265525	1% Critical Value*	-3.7343
		5% Critical Value	-2.9907
		10% Critical Value	-2.6348

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RLNINT)
Method: Least Squares
Date: 11/01/12 Time: 03:21
Sample(adjusted): 1988 2011
Included observations: 24 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RLNINT(-1)	-2.482574	0.760237	-3.265525	0.0041
D(RLNINT(-1))	1.537582	0.679418	2.263087	0.0355
D(RLNINT(-2))	1.316317	0.567947	2.317674	0.0318
D(RLNINT(-3))	0.422458	0.542488	0.778742	0.4457
C	1.070132	5.339497	0.200418	0.8433

R-squared	0.456093	Mean dependent var	-3.587500
Adjusted R-squared	0.341586	S.D. dependent var	30.84712
S.E. of regression	25.03018	Akaike info criterion	9.461093
Sum squared resid	11903.69	Schwarz criterion	9.706521
Log likelihood	-108.5331	F-statistic	3.983113
Durbin-Watson stat	1.960716	Prob(F-statistic)	0.016385

Appendix 7

VAR Model

Date: 11/01/12 Time: 02:41
Sample(adjusted): 1986 2011
Included observations: 26 after adjusting endpoints
Standard errors & t-statistics in parentheses

	RLNART
RLNART(-1)	-0.075022
	(0.21432)
	(-0.35005)
RLNART(-2)	-0.276518
	(0.25714)
	(-1.07536)
C	54.14850
	(113.357)
	(0.47768)
RLNINT	3.204015
	(5.14372)
	(0.62290)
R-squared	0.051161
Adj. R-squared	-0.078226
Sum sq. resids	7018624.
S.E. equation	564.8260
F-statistic	0.395410
Log likelihood	-199.4702
Akaike AIC	15.65155
Schwarz SC	15.84510
Mean dependent	32.72077
S.D. dependent	543.9509

Appendix 8

Granger Causality Tests

Date: 11/01/12 Time: 02:47

Sample: 1984 2011

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
RLNINT does not Granger Cause RLNART	26	0.16083	0.85248
RLNART does not Granger Cause RLNINT		5.54358	0.01166

Co integration

Sample: 1984 2011

Series: RLNART

Exogenous series: RLNINT

Lags interval: 1 to 2

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.264939	7.695059	3.76	6.65	None **

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 1 cointegrating equation(s) at 5% significance level