Testing the Strong-Form Efficiency of the Namibian Stock Market

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Abstract

This paper analyses the strong form efficiency of the capital market in Namibia using the autoregressive conditional heteroscedasticity and general autoregressive conditional heteroscedasticity modelling techniques. These tests were applied on the monthly data for the period covering the year 1997 to 2012. The results from the study showed that there is no evidence of strong form efficiency in Namibia’s stock market. However, there is evidence of weak form efficiency. Therefore, investors in Namibia Stock Exchange cannot predict stock prices or returns in the short term or from historical prices or returns or from volume traded. With regard to the firms, it suggest that the securities of firms cannot outperform the market and the present market price is to a certain extent a true reflection of the present situation of their security.

Keywords: Efficient market hypothesis, Namibia, stock market, autoregressive conditional heteroscedasticity.
1. Introduction

Capital market is referred to as a “network of specialized financial institutions, series of mechanisms, processes and infrastructure that, in various ways, facilitate the bringing together of suppliers and users of medium to long term capital for investment” (Al-Faki, 2006). According to Owolabi and Ajayi (2013) “capital markets are the complex of institutions and mechanisms through which long –term funds with maturity of 5years and above are pooled and made available to business, governments, individual, and instruments already outstanding are transferred”. Kola (2002) describes capital markets as a market through which medium and long-term funds of more than one year in maturity are raised. From the above descriptions, it is clear that capital market caters for both medium and long term funds.

Donwa and Odia (2010) indicates that the capital market can be divided into two categories namely, the primary and the secondary market. The primary market facilitates the new issuance of securities where government and corporate bodies raise new funds. The secondary market caters for sale and purchase of existing securities. The advantage of capital market is that it offers access to a diversity of financial instrument that allow economic agents to pool price and exchange risk. In addition, it encourages savings in financial form through assets with attractive yields, liquidity and risk characteristics. Hence, a combination of the said characteristics of financial instruments is very vital for all institutions in need of long-term funds and for suppliers of long-term funds (Nwankwo, 1991). Moreover, the current market value of a company is also determined in capital market by market forces demand and supply of its shares (Potocki and Swist, 2012).

Accordingly, the stock market is the hub for traders, purchasers, sellers etc, aiming to generate returns in the capital market. In many instances, many investors try to outperform the market. This can only happen if market is operationally inefficient, implying that there is friction in the trading process (Ojo and Azeez, 2012). The efficient and effective operation of the capital markets is key and fundamental to the development of the modern economy. In particular, the stock markets are central in capital allocation and its transformation from savings to financing new investment opportunities and subsequently creating more wealth (Potocki and Swist, 2012). In terms of an operational efficiency, a stock market is expected to be externally and informational efficient; thus “security prices at any point in time are an unbiased reflection of all the available information” on the expected future cash flows and the risk involved in owning such a security. Therefore, such a market tends to provide accurate signals for resources allocation as market prices represent the intrinsic value of each security. However, it should be noted that at times market prices can deviate from the securities’ true value, but these deviations are completely random and uncorrelated (Ojo and Azeez, 2012).
Though many studies have been conducted on the efficiency of the foreign exchange markets and/or capital market in developed countries, little is known about these markets in the developing economies and much less so in Namibia. Therefore, the objective of this study is to investigate whether there exists strong-form efficiency in the Namibian stock market. The paper is organized as follows: the next section presents a literature review. Section 3 discusses the methodology. The empirical analysis and results are presented in section 4. Section 5 concludes the study.

2. Literature Review

2.1 Theoretical Literature

In the context of capital markets, the term efficiency refers to the incorporation of the expectations and information of all market participants such that it is reflected in the prices of financial assets (Gillette, 2005). According to Potocki and Swist (2012), market informational efficiency is fundamental in the field of finance, particularly when making reference to a market in which relevant information is reflected in the price of financial assets. Hence, economists use this concept in relation to operational efficiency of a market and consequently, the concept of efficiency market hypothesis (EMH). EMH maintains that competition between investors seeking abnormal gains forces prices to their “fair value” implying that prices incorporates information in the market. Hence, the level of efficiency is determined by the ability of the stock market to incorporate information into prices (Fama, 1970).

Efficient Market Hypothesis (EMH) asserts that in an efficient market, prices fully reflect all available information that is relevant to their valuation at all times (Fama, 1970). Fama further classified the informational item available to the market participants into three levels based on the speed at which information is incorporated into price. These are classifications are (1) weak-form EMH (2) semi-strong form EMH, and (3) strong-form EMH as discussed below.

According to Rehman and Qamar (2014), the weak form of EMH is only limited to historical information about the share price itself. In this regard, there should be no relationship between the current and previous prices resulting from new information. Alternatively, the movement in the share price in response to new information should not be traceable form the last movement or price. Hence, the future price cannot be forecasted on the basis of the new information Ojo and Azeez (2012). Therefore, the weak form EMH states that: (1) No surpluses on returns can be earned by devising investment strategies based on historical share prices or other financial data, (2) technical analysis will not be able to produce excess returns and (3) Testing for the weak form efficiency would only require the use statistical analysis in time series data of prices. This is because, in a weak form efficient
market, current share prices are the best, unbiased, estimate of the value of the security. News is generally assumed to occur randomly and therefore, it is also expected that share price changes also be random.

A semi strong form efficient market reflects all publicly available information and is calculated into a stock’s current share price. Furthermore, this form is concerned with both the speed and accuracy of the market’s response to information provided as it becomes available (Ayentimi, Mensah and Naa-Idar, 2013). In this regard, neither fundamental nor technical analysis can be used to achieve more than normal gains on the account that if the market is semi-strong form efficient, then stock price reacts so fast to all public information that no investor stand a chance to earn an above normal return by acting on this type of information. Therefore, according to Ojo and Azeez (2012), under the semi-strong form EMH; the following are assumed: (1) share prices adjust instantaneously and in an unbiased manner to publicly available new information, (2) fundamental analysis will not be able to produce excess return and (3) Testing for it would require that, the adjustments to previously known news must be of a greater magnitude and instantaneous.

In its strongest form, “prices are expected to reflect both public and private information, which seems to be more concerned with the disclosure efficiency of the information market than the pricing efficiency of the securities market” (Ayentimi et al, 2012). Therefore, the following points hold in the strong-form EMH: (1) Share prices reflect all information and no one can earn excess returns, (2) Testing for the strong form efficiency requires an existence of a market where investors cannot consistently earn excess returns over a long period of time and (3). Should there be fund managers who have consistently beaten the market, then strong-form market efficient is disqualified (Ojo and Azeez, 2012).

Hallwood and MacDonald (2000) assert that the EMH is one which emphasizes the fact that financial markets are informationally efficient. Thus, one cannot consistently achieve returns in excess of average market returns on a risk-adjusted basis; given the information available at the time the investment is made.

2.2 Empirical Literature

There are numerous studies that have empirically investigated the various forms of efficient market hypothesis. Below is a list of few selected empirical studies on the various forms of efficiency.

Weak-Form Efficiency Market Hypothesis

Mlambo and Biekpi (2007) studied the weak form of EMH for ten African stock markets using the serial correlation and run tests. Serious thin trading was observed on all markets, and particularly for Namibia and Botswana, the two markets with considerable dual-listed stock on
In all markets studied, except for Namibia, a significant number of stocks rejected the random walk hypothesis. According to Mlambo and Biekpi, the weak-form efficiency on the Namibia stock market is attributable to its correlation with the JSE which was also found to be weak form efficient for the period investigated.

In Botswana, Chiwira and Muyambiri (2012) evaluated the presence of weak form efficiency in the Botswana Stock Exchange (BSE) for the period 2004 - 2008. The study used a number of tests to examine the randomness of the BSE stock prices. This included the Augmented Dickey Fuller tests, autocorrelation test, Kolmogorov-Smirnov Test, Runs Test and the Phillips Perron unit root test. All the tests show that the BSE is inefficient at the weak-form suggesting the need to improve the efficiency. Furthermore, the random walk hypothesis is rejected implying that investment analysts outperform the market and they reap higher than expected profits through the use of historic data.

Sing and Sapna (2013) examined the weak form market efficiency in five stock exchanges of Asian countries. The data used consisted of daily, weekly and monthly closing values. The results of the run test show that the Bombay stock exchange (BSE) and Singapore stock exchange (STI) do not follow random behavior in case of daily prices. In case of monthly price, BSE has been found weak form efficient. Further, the results of autocorrelation and Ljung-Box test revealed that all stock exchanges under study follow random walk behavior in case of monthly and weekly prices except BSE.

Gilani, Nawaz, Shakoor and Asab (2014) study explored the weak form efficiency of Islamabad Stock Exchange (ISE) from January 2013 to December 2013. In testing for the weak form efficiency of Islamabad Stock exchange, different statistical techniques were used in analyzing the data of weekly ISE-10 share index. This includes the famous tests of statistics such as run test and ADF test to check the Weak form of ISE. The study also focused on the random walk behavior of stock market of Islamabad. Run test and auto correlation test show market inefficiency at specific periods but ADF test descriptive showed market efficiency in weak form.

Semi-Strong Form Efficiency Market Hypothesis

Moreover, Wickremasinghe (2004) examined the weak and semi-strong forms of the efficient market hypothesis (EMH), using the currency of Sri Lanka as a starting point for six international currencies. In order to examine the weak-form of EMH, he considered the traditional unit root test, while in order to contrast the semi-strong efficiency he utilized the methodology of Engle and Granger, in which the tests of Augmented Dickey Fuller (ADF) and of Phillips-Perron (PP) were applied over the residuals of the cointegration equation. Wickremasinghe carried out Johansen’s tests, Granger causality and Variance Decomposition.
In this work, monthly spot rates were used for the Japanese Yen, the Pound sterling, the US dollar, the French Franc, the Indian Rupee and the German Mark, relative to the Sri Lankan Rupee, for the period of January 1986 until November 2000. The principal results point to the fact that evidence exists for rejecting the semi-strong version of the EMH.

Torun and Kurt (2007) study investigated whether or not there is weak and semi-strong form efficiency of stock exchanges in European Monetary Union Countries with panel data variables stock market price index, consumer price index, purchasing power of euro, unemployment rate using panel unit root, causality and co-integration tests for the period of 2000-2007. The study employed panel unit root tests in testing for the weak form efficiency while panel co-integration and causality analysis were used to test for the semi-strong form efficiency. The result from unit root analysis show that stock markets of European Monetary Union countries is weak efficient. According to results of co-integration and causality analysis, some countries aren't semi-strong form efficient.

Cooray and Wickremasinghe (2007) study examined the efficiency in the stock markets of India, Sri Lanka, Pakistan and Bangladesh using monthly for the period January 1996 to January 2005. The Augmented Dickey Fuller (ADF), the Phillips-Perron (PP), the Dickey-Fuller Generalized Least Square (DF-GLS) and Elliot-Rothenberg-Stock (ERS) tests are used to examine weak form stock market efficiency and the results were confirmed by the classical unit root tests. However, it is not strongly supported for Bangladesh under the DF-GLS and ERS tests. Cointegration and Granger causality tests were used to examine semi-strong form efficiency. Semi-strong form efficiency is not supported as these tests indicate a high degree of interdependence among the South Asian stock markets. The above results have implications for domestic as well as foreign investors in South Asian stock markets.

Çiçek (2014) study examined the within-country market efficiency of the Turkish foreign exchange markets on the basis of the forward rate unbiasedness hypothesis, in case of the Turkish lira/US dollar and the Turkish lira/Euro for the period February 5, 2005 through July 26, 2013. The study employed the unit root test and Johansen cointegration method. Unit root tests on the spot and forward exchange rates confirm that they are non-stationary but first differencing of these variables makes them stationary. Hence, the unit root test results provide evidence for efficient market hypothesis in its weak form, indicating all exchange rates follow random walk. However, the Johansen cointegration test results indicate that the forward rates are cointegrated with its corresponding spot rate with a unitary cointegrating vector (1, -1). This implies that the forward rate unbiasedness hypothesis does not hold, suggesting the failure of market efficiency in its semi-strong form. The evidence presented for the forward rate unbiasedness hypothesis refers that the forward rates is an unbiased predictor of the
corresponding future spot rates; market agents can use the forward rates as indicators of the future spot rates. This can be interpreted as it usually has been that market expectations regarding exchange rate movements are rational and/or non-existence of time varying risk premium, i.e. no systematic forecast errors.

**Strong-Form Efficiency Market Hypothesis**

Jensen (1968) studied the performance of 115 mutual funds, using annual data between 1955 and 1964. The study revealed that on the average, the mutual funds were not able to predict security prices well enough to outperform a buy-and-hold strategy. Hence, there was little evidence that any individual fund was in the position to beat the market in order to gain abnormal profit. Thus, the findings strongly support the presence of the strong form of efficient market hypothesis.

In India, Gupta, Anand and Singh (2008) examined the strong-form efficient market hypothesis using stocks for the period 2003 to 2007. Data for 347 stocks was extracted from the Prowess database. Prices at the beginning and end of the financial year were collected. The t-test has been used to establish the significance. The study showed that mutual fund managers with access to sophisticated analytical tools, superior information and may be even some insider information were not able to outperform randomly selected portfolios of index stocks. Interestingly, investing in a random portfolio of stocks generated more return when compared to the returns generated by investing in the equity-oriented mutual fund schemes. This paper showed that the Indian market is strong form efficient to the extent that mutual fund managers could not outperform randomly constructed portfolios of index stocks for the period 2003-2007. This implies that an investor can build his/her own portfolio without any expert guidance and still earn returns comparable to professionally managed funds.

Ojo and Azeez (2012) investigated the existence of the strong-form efficient market hypothesis in the Nigerian capital market for the period 1986 to 2010. The empirical analysis was conducted employing the Autoregressive Conditional Heteroscedascity (ARCH) and Generalized Autoregressive Conditional Heteroscedascity (GARCH) models. The findings revealed weak-form efficiency in the Nigerian capital market.

Potocki and Swist (2012) study examined the strong form of market informational efficiency, based on the assumption that the institutions issuing recommendations have access to information inaccessible to the community of investors. The research sample consists of 3,270 recommendations produced between 1 January 2005 and 31 March 2010 by 63 financial entities with reference to companies making up the WIG 20 index. The results revealed evidence for the hypothesis that the strong form efficiency is characteristic of the WIG 20 index shares listed on the Warsaw Stock Exchange.
Oladapo and Ayowole (2013) study investigates empirically the efficiency of the Nigerian Stock Market and to test whether professionally managed funds beat the market index or not. The average monthly returns data of five banks over the period 2007 to 2011 were used. The “market model” for estimating residuals was used to test the efficiency of the Nigerian Stock Market. The abnormal return of the professionally managed portfolio is found to be insignificantly different from zero. The result indicates that the Nigerian Stock Market is efficient in the strong form.

Based on the afore-mentioned literature on the different forms of efficient market hypothesis, one can safely say the following: there are mixed findings for both forms of efficiency market hypothesis, ranging from those refuting, agreeing and no relationship at all. There are also different methodological approaches whether it is cross-country or individual country’s studies. There is variation in terms of data frequency used. There seem to be only one cross-country study by Mlambo and Biekpi (2007) that relates to Namibia. This study fills two gaps the time gap and that it is country-specific looking at strong form efficiency in Namibia’s capital market. It is against this background this study intends to fill the gap and add to empirical literature for Namibia.

3. Methodology

In order to analyse the presence of the strong-form efficiency, this paper adopts the procedure as used by Ojo and Azeez (2012).

3.1 Econometric or Analytical Framework

This study hypothesized that there is no presence of strong-form efficient in the Namibian stock market. The econometric techniques applied are the Autoregressive Heteroscedacity (ARCH) introduced by Engel (1982) and the Generalized Autoregressive Conditional Heteroscedacity (GARCH) introduced by Bollerslev (1986) in carrying out this exercise. The advantage of the GARCH (1, 1) model is that it allows for a time-variant conditional variance and non-linearity in generating mechanism. Furthermore, it captures both volatility clustering and unconditional return distribution with heavy tails.

The estimation procedures are to determine whether the Namibian Capital Market is strongly efficient or not, or in case of overshooting this can be seen as the presence of outrageous level of volatility. The presence of volatility is determined by summing up the root of the autoregressive model of α+β. This is referred to as the rule of the thumb, in this case if:

\[ \alpha + \beta < 0.5, \text{ strongly efficient} \]

\[ 0.5 \leq \alpha + \beta \leq 1, \text{ weak form efficient} \]

\[ \alpha + \beta > 1, \text{ no efficiency or inefficient market} \]
3.2 Model Specification

The model used in this study is similar to that of Ojo and Azeez (2012) but with slight modification. The methodological approach is comprised of a system of equation which is made up of endogenous and exogenous variables specified as follows:

**Model 1**

\[ MC = f(VT, ASI) \]  

\[ MC = \beta_0 + \beta_1 VT + \beta_2 ASI + \mu \] 

\[ \sigma^2 = \sigma + \alpha \Sigma^2 t + \beta \sigma^2 t - 1 \]  

**Model 2**

\[ ASI = f(MC, VT) \]  

\[ ASI = \beta_0 + \beta_1 MC + \beta_2 VT + \mu \] 

\[ \sigma^2 = \sigma + \alpha \Sigma^2 t + \beta \sigma^2 t - 1 \]

Where;
- MC=Market Capitalization
- VT=Value of transaction at the stock exchange
- ASI=All Share Index
- \( \sigma^2 \) =Conditional Variance
- \( \Sigma^2 t \) =ARCH (news about volatility from previous period)
- \( \sigma^2 t-1 \) =ARCH term (variance of last period forecast)
- \( \alpha \) = the Coefficient of ARCH
- \( \beta \) = the Coefficient of GARCH
- \( \beta_0, \beta_1, \beta_2, \alpha \) are parameters and
- \( \mu \) = Stochastic error term

3.3 Data, Data Sources and Data Measurements

The data used in this paper consists of monthly market capitalization on the Namibian stock exchange, all share index and the value of transaction at the Namibian stock exchange for the period 1997:01 to 2012:12. Secondary data were obtained from the Bank of Namibia’s various statutory publications and Namibia stock exchange.

4. Empirical Analysis and Results

4.1 First Model (Analysis of the ARCH and GARCH)

In model 1, the variable market capitalization (MC) is the regressand, while the regressors are the value of transaction (VT) and all share index (ASI) on the Namibian stock exchange. The estimated results reveal the following:

*The coefficient of ARCH (\( \alpha \)) is given as -0.148990
*The coefficient of GARCH (\( \beta \)) is given as 0.994002
*The summation of \( \alpha \) and \( \beta \), \( \alpha + \beta = 0.845012 \)
The summation of the two coefficients from the ARCH and GARCH models is greater than 0.5, but less than 1. In this regard, the conclusion supports the weak form efficiency and does not support the hypothesis of strong form efficiency in the Namibian capital market. However, the model has a good fit as supported by the $R^2$ of about 0.994, suggesting that about 99% of the total variation in the regressand is explained by the regressors with 1% accounted for by the error term. Furthermore, the F-statistic also support the hypothesis of the overall significance of the model as the p-value of 0.00 is less than 0.05 the level of significance, whereas the Durbin-Watson test for autocorrelation also shows no evidence of the presence of autocorrelation in the model.

4.2 Second Model (Analysis of the ARCH and GARCH)

In model 2, the variable all share index (ASI) entered the model as a regressand while, market capitalization (MC) and the value of transaction (VT) served as regressors in the model. The estimated results reveal the following:

- The coefficient of ARCH ($\alpha$) is given as 0.150000
- The coefficient of GARCH ($\beta$) is given as 0.60000
- The summation of $\alpha$ and $\beta$, $\alpha + \beta = 0.75000$

Similarly, the summation of the two coefficients from the ARCH and GARCH models is greater than 0.5, but less than 1. Therefore, the conclusion supports the weak form efficiency and does not support the hypothesis of strong form efficiency in the Namibian stock market. The model also shows a good fit as supported by the $R^2$ of about 0.799, suggesting that about 80% of the total variation in the regressand is explained by the regressors with 20% accounted for by the error term. Furthermore, the F-statistic also support the hypothesis of the overall significance of the model as the p-value of 0.00 is less than 0.05 the level of significance. However, the Durbin-Watson test for autocorrelation also shows evidence of the presence of positive autocorrelation in the model.

The findings from both models do not support the strong form efficiency in the Namibian stock market but rather suggest weak form efficiency. In particular, the results from the study imply that NSX is not efficient in the strong form. These findings are similar to those of Ojo and Azeez (2012) who conducted a similar study in Nigerian capital market. The economic implication arising from these findings are that there is evidence that investors in NSX cannot predict stock returns in the short term or from historical returns or from volume traded. Of course one cannot rule out the possibility of beating the market based on privately available information with them. With regard to the firms, it suggest that the securities of firms cannot outperform the market and the present market price is to a certain extend a true reflection of the present situation of their security.
5. Conclusion

This study examined the strong form efficiency in Namibia’s capital market. This was done with the purpose of establishing whether there are investment analysts who are reaping abnormal gains. Furthermore, to establish whether there is a need for government authorities to intervene. The study was based on monthly data covering the period 1997:01 to 2012:12, utilizing the technique of autoregressive conditional heteroscedasticity and general autoregressive conditional heteroscedasticity. In this regard, two models were estimated. The results reveal that there exists market efficiency in Namibia’s capital market but in the weak form efficiency and not in the strong form. This suggests that the current values do not have memory and thus, past values cannot be used to predict the current value. The weak form efficiency on the Namibia capital market is attributable to its correlation with the JSE which was also found to be weak form efficient for the period investigated. The study recommends that Namibia would need to develop its financial markets that would create investment opportunities in order to retain funds in the country (reduce capital outflows) and address the issue of thin-trading, for it to optimally realize full benefits that come along with an efficient capital market. It is further suggested that future studies should use other methodologies in testing the strong form of efficiency and compare the findings thereof with those in the current study.

References


