International Journal of Research in Finance and Marketing (IJRFM)
Available online at : http://euroasiapub.org/current.php?title=IJRFM
Vol. 7 Issue 3, March - 2017, pp. 107~120
ISSN(o): 2231-5985 | Impact Factor: 6.397 | Thomson Reuters Researcher ID: L-5236-2015

A TEST OF THE MICRO-EFFICIENCY OF THE ZIMBABWE STOCK EXCHANGE

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ABSTRACT

This research tested the validity of Samuelson's Dictum on the Zimbabwe Stock Exchange (ZSE) for the period 1 April 2009 to 31 May 2016. The research focuses on the weak form of the EMH in testing the validity of the dictum. The researcher uses parametric tests (autocorrelation tests), non parametric tests (runs tests) as well as visual analysis (graphical analysis) to draw conclusions on the weak form efficiency of the ZSE. The tests were conducted at the 95% confidence level. The analysis concluded that Samuelson's (1998) dictum is indeed true for the ZSE as it was found that of the 31 stocks analysed, 22 stocks had a random return series (thus implying micro efficiency) whilst the Zimbabwe Industrials Index series, which was used as a proxy for the market return, was found to be non random; thus implying macro inefficiency.

Keywords: Microefficiency, Samuelson's dictum, Efficiency

1. Introduction

The question of the efficiency of capital markets has been one of prolonged debate with various academics putting forward different definitions of the term 'efficient markets'. **Fama (1970)** put forward the most widely accepted definition of efficient markets when he put forward the Efficient Markets Hypothesis (EMH). He described efficient markets as those markets which quickly impound new information into the asset price to the end that the price of the asset fully reflects the value of the asset.

The question then grows to concern the type of information that is fully reflected in asset prices; thus leading to different forms of efficiency depending on the type of information that has been impounded in the asset price. **Fama (1970)** further categorised the 'forms' of market efficiency resulting in three forms of market efficiency being identified; that is, weak form, semi-strong form and strong form efficiency. In assessing the efficiency of capital markets, therefore, the attention shifts from whether or not a market is efficient but the various stakeholders are more interested in the extent to which the market is efficient with regards to the type of information that is being factored into the price. **(Doukas, Ball, Daniel, French, Ross and Shanken,2002)**

Easton and Kerin (2010) argue that in discussing the concept of efficient markets, one has to take cognisance of the fact that there are different levels of efficiency; that is, micro-efficiency and macro-efficiency. **Samuelson (1998)** was the first to make a distinction in the 'type' or level of efficiency being referred to; that is, whether it is micro efficiency or macro efficiency**. Easton and Kerin (2010)** define micro efficiency as "…the extent to which the prices of financial securities

reflect information relative to other securities in the same asset class…" whilst at the macro level of efficiency, the question to be answered is "…whether the market as a whole reflects all available information…"

As a result of the distinction discussed above one may find that a stock market can be efficient at the micro level but inefficient at the macro level. The reasoning behind the argument has been put forward by **Samuelson (1998)** in what has widely become known as 'Samuelson's Dictum'. Samuelson argues that the Efficient Markets Hypothesis (EMH) as we know it is more applicable to individual stocks than it is to the market as a whole.

The fundamental reasoning behind Samuelson's argument is that investors are in a far much better position to access and analyse data pertaining to a particular stock than they are able to do the same for the market as a whole. Market data is a function of various macroeconomic variables such as inflation, interest rates, and levels of Gross Domestic Product (GDP). Though these factors also have a bearing on individual stocks, they can easily be ignored since there is nothing the investors can do about the systematic risk they introduce anyway. Consequently, because of easier information flow between investors and companies, individual stocks tend to be more efficiently priced as compared to the market as whole.

Samuelson further (1998) argues that micro efficiency is increased by the increase in specialisation, not only of human resources, but also of financial instruments; particularly the use of such financial instruments as options, swaps, futures and other such derivatives. These instruments enable investors to take advantage of arbitrage opportunities. As Samuelson (1998) puts it "…we've come a long way, baby, in two hundred years toward micro efficiency of markets: Black-Scholes option pricing, indexing of portfolio diversification, and so forth…" Against macro efficiency, he argues that since the duration of a bubble in the stock market cannot be determined with any level of accuracy, an investor cannot expect to make any money by correcting macro inefficiencies in the price level of the stock market. Consequently, since these inefficiencies cannot be eliminated, the market remains macro inefficient but micro efficient.

2.0 REVIEW OF RELATED LITERATURE

Bernhard and Verhofen (2011) used the parametric approach as proposed by Barndt, Santa **Clara and Valkanov (2009)** to test for macro efficiency in the major financial markets of the world. Their data set covered all major asset classes; that is, bonds, equity and cash, in different countries, namely, the United Kingdom (UK), United States of America (USA), Europe (excluding UK), Japan, Germany and Emerging Markets. Their analysis concluded that the parametric portfolio policy outperforms an equally weighted benchmark in a robust manner. Furthermore, in testing the robustness of their results, they found that their active multi-asset portfolio outperforms the benchmark on an absolute as well as on a risk-adjusted basis.

In contrast **Goddard, McMillan and Wilson (2008)** examine the validity of the concept that security prices are equal to the present value of discounted future dividends, where the discount rate is equal to the required rate of return. Their empirical analysis was based on firm-level price and dividend price series data from 104 non-financial firms in the UK, spanning a period of 34 years. The objective was to establish the relationship between dividends and prices through the use of the present value model. Where the model is found to be true it can therefore be concluded that the market is micro efficient and their results were consistent with the model. Other studies

which tested the same model using aggregated stock prices and dividend index data found that the model did not hold thus conceding to macro inefficiency. These results were therefore in line with Samuelson's dictum.

Jung and Shiller's (2002, 2006) study supports the view held by Samuelson. This is one study which primarily focused on establishing the validity of the dictum. They conducted a study in which they concluded that the dictum may very well be true for the American stock markets. Their data comprised of all U.S. firms on the Center for Research on Security Prices (CRSP) tape that had survived since 1926. They studied the micro view of individual stocks in a wide variety of tests over different time periods, and they drew the conclusion that there existed a strong positive relationship between dividend yields and subsequent rates of dividend growth and these tests confirmed micro efficiency. **Jung and Shiller's (2006)** paper notes that there is no evidence for macro efficiency but there is indeed a good bit of evidence supporting claims of micro efficiency.

Kagwaini-Muthoka (2012) carried out a study on the Nairobi Stock Exchange (NSE) which supports the idea of micro efficiency. She used a sample of 20 companies from the 20-share index at the NSE for the period 2003-2011. The researcher was testing for the weak form of the EMH and also the extent to which the market leaned towards the semi-strong form. She analysed the abnormal returns of the companies basing on the RWM and found that the NSE had a majority of positive betas as a compared to negative betas. She concluded that this implied that the daily returns, when compared to the market returns, were moving in the same direction thus implying that the stocks were efficiently priced (micro efficiency) as investors could not earn abnormal returns.

Mlambo et. al. (2003) investigated the random walk behaviour of stock returns on four African stock markets: Egypt, Kenya, Morocco and Zimbabwe. They also used individual firm's share price data in trying to test for the markets' efficiency. On all four markets, the hypothesis that stock returns are normally distributed was rejected. Almost half of the stocks on each of the four markets showed significant positive serial correlation and there was therefore not enough evidence to accept the hypothesis of a random walk. **Mlambo et. al.(2003)** adjusted the returns for thin-trading effect, but the results continued to show significant departure from the EMH.

Mobarek (2000) tested the weak-form efficiency of the Dhaka Stock Exchange. The results of both non-parametric (Kolmogorov –Smirnov normality test and run test) test and parametric test (Auto-correlation test, Auto-regression, ARIMA model) provide evidence that the share return series do not follow random walk model and the significant autocorrelation co-efficient at different lags reject the null hypothesis of weak-form efficiency. The researcher used the share return series of 30 randomly selected individual firms, it follows that the research concluded that the market was micro inefficient.

Raihan and Ullah (2004) carried out a study on the Chittagong Stock Market of Bangladesh. They used individual stock data to assess the degree to which the market is weak-form efficient. The results of the individual share returns showed that they were not following a random walk, thus the market is micro inefficient. Their study also concluded that the market was weak- form macro inefficient from their empirical analysis.

Affleck-Graves and Money (1975) tested the RWM on South Africa's Johannesburg Stock Exchange (JSE). They used the data of 50 shares quoted on the JSE and found that there was

considerable support for the model. In all the tests for the 50 shares there was insignificant evidence of autocorrelation. 70-80% of the stocks' price behaviour conformed with the RWM whilst the empirical auto correlation in the remaining 20-30% was very small; this confirming micro efficiency of the market.

3.0 Research Methodology

The study uses one non-parametric test (run test) and one parametric test (auto correlation coefficient test). Basically the analyses are univariate time series analysis.

The analysis was based on the random walk model. The dependence of the returns can be expressed in terms of their co-variances such that in an efficient market, for an arbitrarily chosen $f(\cdot)$ and $g(\cdot)$,

$$cov\,[f(r_t)\,, g(r_{t+k})] = 0 \text{ for all t and k}$$

The empirical analysis of this research uses weekly individual-firm returns for the counters listed on the bourse as the weekly market return for the period from 1 April 2009 to 31 May 2016. Data from the 19th of February, when the exchange first traded under the multi-currency system was omitted as trading during that time was sporadic; resulting in missing data.

In order to avoid the bias induced by thin trading, the researcher adopted the method used by **Shanken (1987)**; that is, only those counters which were trading actively during the period under review were used. **Taylor (1986)** also argues that this increases the power of the random walk test. The researcher also used returns for longer periods (weekly instead of daily returns) and this increased the chances that selected counters would have traded during that period.

4.0 Data Analysis and Interpretation

4.1 Skewness and Kurtosis

Skewness and kurtosis can be used to determine the extent to which the data is peaked or flatter than the normal distribution. A normal distribution has a skewness value of zero and kurtosis of 3. The skewness and kurtosis of each of the variables being analysed are presented below:

Table 1
Skewness and Kurtosis

Variable	N	Skewness	Kurtosis	Excess kurtosis
ABCH	166	0.39	2.15	-0.85
AFRICANSUN	166	0.01	1.63	-1.37
AICO	166	1.3	7.74	4.74
ARIS	166	-0.54	6.09	3.09
ART	166	-0.02	1.14	-1.86
BARC	166	1.98	10.24	7.24
CAIRNS	166	-1.27	9.58	6.58
CBZ	166	2.51	16.03	13.03
CELSYS	166	-0.50	17.63	14.63
DAIR	166	0.19	1.95	-1.05

DAWN	166	0.94	4.03	1.03
DELT	166	2.14	11.84	8.84
ECONET	166	3.68	20.27	17.27
FBCH	166	0.90	8.85	5.85
HUNY	166	1.46	11.31	8.31
INNS	166	0.80	3.07	0.07
MASH	166	0.70	4.60	1.6
MEDTECH	166	-0.21	2.23	-0.77
MEIKLES	166	1.19	6.64	3.64
OK	166	-0.98	8.76	5.76
OLDMU	166	0.75	4.31	1.31
PEARL	166	-0.29	3.76	0.76
PPC	166	0.74	3.79	0.79
SEED	166	1.54	7.78	4.78
STAR	166	0.42	1.59	-1.41
T.S.L	166	1.27	6.57	3.57
TA	166	-0.18	1.47	-1.53
ZIMRE	166	0.34	2.32	-0.68
ZPI	166	0.23	5.82	2.82
HWANGE	166	1.26	5.29	2.29
RIO	166	0.30	2.44	-0.56
ZIMI	166	2.09	10.93	7.93
ZIMM	166	0.88	3.23	0.23

Source: Computed by the researcher on the basis of data collected from field work

The above statistics indicate that none of the series follows a normal distribution. Of the 31 counters analysed, 22 counters had positive excess kurtosis whilst the remaining 9 counters had negative excess kurtosis. Negative kurtosis implies that the price changes in these securities were medium to large and they were frequent whereas positive kurtosis emanates from very frequent small changes. **Fama (2012),** when asked if investors should expect normal returns, states that stock returns tend to have more outliers as compared to normal distributions. Consequently, he says investors should expect extreme returns, both negative and positive.

To augment the findings observed from the graphs, the researcher used the Kolmogorov-Smirnov goodness-of-fit test to measure the degree to which the distributions of the data series conform to the normal distribution. The results from the test are presented in Table 2 below:

Table 2
Kolmogorov – Smirnov Test Results

Variable	Mean	Std. Dev	N	K-S	p-value
ABCH	0.007073	0.1190	166	0.198	<0.010
AFRICANSUN	-0.013070	0.1395	166	0.107	<0.010
AICO	0.001098	0.1171	166	0.129	<0.010
ARIS	0.002238	0.2009	166	0.140	<0.010
ART	-0.01017	0.1701	166	0.174	<0.010
BARC	-0.001531	0.1232	166	0.152	<0.010
CAIRNS	-0.005909	0.1627	166	0.243	<0.010
CBZ	0.007588	0.1178	166	0.163	<0.010
CELSYS	-0.008767	0.3928	166	0.208	<0.010
DAIR	0.006094	0.1061	166	0.117	<0.010
DAWN	-0.004176	0.1158	166	0.148	<0.010
DELT	0.007372	0.0645	166	0.162	<0.010
ECONET	0.009989	0.0605	166	0.218	<0.010
FBCH	0.007027	0.1592	166	0.168	<0.010
HUNY	0.008351	0.1861	166	0.248	<0.010
INNS	0.004846	0.0663	166	0.137	<0.010
MASH	0.004470	0.1246	166	0.105	<0.010
MEDTECH	-0.005520	0.2619	166	0.287	<0.010
MEIKLES	-0.003578	0.0976	166	0.184	<0.010
OK	0.006324	0.0934	166	0.172	<0.010
OLDMU	0.005307	0.0532	166	0.114	<0.010
PEARL	-0.000635	0.1080	166	0.201	<0.010
PPC	0.002925	0.0654	166	0.143	<0.010
SEED	0.008716	0.0793	166	0.164	<0.010
STAR	-0.01460	0.1416	166	0.158	<0.010
T.S.L	0.006414	0.1247	166	0.149	<0.010
TA	-0.004946	0.1269	166	0.129	<0.010
ZIMRE	0.00000	0.1329	166	0.181	<0.010
ZPI	0.005211	0.1406	166	0.130	<0.010
HWANGE	0.004472	0.0428	166	0.144	<0.010
RIO	0.001283	0.0873	166	0.127	<0.010
ZIMI	0.004422	0.1193	166	0.158	<0.010
ZIMM	-0.003197	0.1127	166	0.159	<0.010

Source: computed by the researcher on the basis of data collected from field work

The findings obtained in this study are consistent with those obtained by **Mobarek and Keasey (2000)**, who also used the K-S test on the Dhaka Stock Market. **Mlambo et. al. (2003)** also obtained the same results for the ZSE, as well as for Egypt and Morocco. These results are not unique to developing countries. Fama (1965) also concluded that the market returns on the U.S.A stock market were not normally distributed.

Where there is significant deviation from normality, one can opt to use non parametric tests, such as the runs test, since they do not assume any specific distribution. However, **Kendall (1948)** argues that despite the fact that the returns do not follow a normal distribution, to enable statistical analysis to be carried out; near normality can still be assumed. This can only be done where the number of observations is large. Moore (1962) also concurs with this view. **Mlambo et. al. (2003)** argue that parametric tests can still be carried out on non-normal returns, the justification being that parametric tests can detect higher order serial correlation which may not

be detected by the runs test. Consequently, serial correlation tests were conducted in this study in testing for both micro efficiency and macro efficiency.

4.2 Testing micro efficiency

i. Autocorrelation tests

In testing for micro efficiency, the auto correlation functions for each of the 31 counters as well as the two market indices were calculated. The significance of the autocorrelation coefficients was tested using the LB Q-statistic. Of the 31 counters whose weekly returns were tested for autocorrelation, 71% (22 counters) showed little autocorrelation for all the time lags up to lag 42. The remaining 29 %(9 counters) indicate that there is significant autocorrelation in their return data.

Table 3
P-Values for Autocorrelation Tests

Variable	p-value	Test Result (at α=0.05)
ABCH	0.14	Zero autocorrelation
AFRISUN	0.33	Zero autocorrelation
AICO	0.75	Zero autocorrelation
ARIS	0.52	Zero autocorrelation
ART	0.02	Significant autocorrelation
BARC	0.17	Zero autocorrelation
CAIRNS	0.51	Zero autocorrelation
CBZ	0.86	Zero autocorrelation
CELSYS	0.00	Significant autocorrelation
DAIR	0.73	Zero autocorrelation
DAWN	0.45	Zero autocorrelation
DELTA	0.75	Zero autocorrelation
ECONET	0.01	Significant autocorrelation
FBCH	0.00	Significant autocorrelation
HUNY	0.39	Zero autocorrelation
INNS	0.21	Zero autocorrelation
MASH	0.01	Significant autocorrelation
MEDTECH	0.10	Zero autocorrelation
MEIKLES	0.95	Zero autocorrelation
OKZIM	0.00	Significant autocorrelation
OLDMU	0.83	Zero autocorrelation
PEARL	0.00	Significant autocorrelation
PPC	0.72	Zero autocorrelation
SEEDCO	0.05	Significant autocorrelation
STAR	0.84	Zero autocorrelation
T.S.L	0.89	Zero autocorrelation
TA	0.61	Zero autocorrelation
ZIMRE	0.39	Zero autocorrelation
ZPI	0.00	Significant autocorrelation
HWANGE	0.99	Zero autocorrelation
RIO	1.00	Zero autocorrelation

Source: Computed by the researcher on the basis of data collected from field work

An analysis of the stocks that show significant autocorrelation indicates that these stocks have little in common. That is, there is no discernible relationship in the stocks which have returns which are significantly autocorrelated which can be exploited by analysts to earn abnormal

returns. This result is in line with **Mabhunu's (2004)** study on the JSE in which he found that of the 48 stocks he analysed, only 14 (21%) had significantly correlated returns.

These findings indicate that there is very little evidence for serial correlation in the stocks listed on the ZSE. For those stocks that have correlated returns, one may find that the gains from trying to exploit these efficiencies will be limited because of the costs involved. It can therefore be concluded that, based on the autocorrelation tests, the ZSE is micro efficient in the weak form.

ii. Runs Test

To validate the results from the Autocorrelation tests, the researcher used the runs test. Runs tests do not need the data to follow any particular distribution thus they can provide unbiased results. The results from the runs test are presented below:

Table 4
Runs Test Results

	K	Observed runs	Expected runs	Runs above K	Runs below K	P- value
ABCH	0.0071	63	73.87	54	112	0.05
AFRICANSUN	-0.0131	84	81.29	98	68	0.66
AICO AFRI	0.0011	91	80.52	66	100	0.88
ARIS	0.00224	89	79.65	64	102	0.12
ART	-0.0102	95	75.85	109	57	0.00
BARC	-0.0015	92	83.23	91	75	0.17
CAIRNS	-0.0059	63	64.72	123	43	0.73
CBZ	0.0076	76	79.18	63	103	0.60
CELSYS	-0.0088	92	70.87	116	50	0.00
DAIR	0.0061	77	80.92	67	99	0.53
DAWN	-0.0042	100	81.96	96	70	0.00
DELT	0.0074	73	79.65	64	102	0.27
ECONET	0.0099	61	74.55	55	111	0.02
FBCH	0.007	80	79.18	63	103	0.89
HUNY	0.0084	72	65.67	44	122	0.21
INNS	0.0048	69	81.64	69	97	0.04
MASH	0.0045	84	80.92	67	99	0.62
MEDTECH	-0.0055	58	60.67	127	39	0.56
MEIKLES	-0.0036	67	82.27	95	71	0.02
OK ZIM	0.0063	75	81.29	68	98	0.31
OLDMU	0.0053	86	83.02	74	92	0.64
PEARL PROP	-0.0006	87	70.88	116	50	0.00
PPC	0.0029	70	80.92	67	99	0.08
SEED	0.0087	69	79.65	64	102	0.08
STAR AFRI	-0.0146	91	82.8	93	73	0.20
T.S.L	0.0064	82	78.17	61	105	0.52
TA	-0.0049	77	86.27	95	71	0.40
ZIMRE	0.0000	84	75.85	57	109	0.16
ZPI	0.0052	92	79.65	64	102	0.04
HWANGE	0.0044	68	77.06	59	107	0.12
RIO	-0.0032	75	83.81	87	79	0.17

Source: computed by the researcher on the basis of secondary data

Results from the runs test almost mirror those obtained using autocorrelation tests. In this case, however, 74% of the analysed counters show zero autocorrelation whilst the returns from the remaining 26% indicate that there is significant autocorrelation. The runs test leads to a conclusion of weak form micro efficiency as the majority of the stocks tested follow a random walk. Table 4.3 illustrates these findings.

The results obtained in this study are in line with those obtained by **Okpara (2010).** He also used the runs test to test for weak form efficiency on the Nigerian Stock Exchange (NSE). He used a sample of 121 listed companies and found that their successive price changes were independent thus implying weak form micro efficiency. A comparison between the results obtained from the runs test and the autocorrelation test is tabulated below. The counters in which the two tests returned different results are highlighted.

Of the 31 stocks analysed, results from the two tests differed in only 7 counters. 3 counters, namely Dawn, Innscor and Meikles, which had shown zero autocorrelation in returns when tested using the autocorrelation test indicated that significant autocorrelation existed when tested using the runs test. The remaining 4 counters, namely FBCH, Mashonaland Holdings, OK Zimbabwe and Seed-Co had been found to have significantly correlated returns through the autocorrelation test but returns were apparently uncorrelated when tested using the runs test.

Though there are variations in the results obtained from the two tests, the differences are not so profound as to significantly impact the conclusion. As both tests indicate, the individual-firm return series can be said to follow a random walk thus leading to the conclusion that the ZSE is weak-form micro efficient.

4.3 Testing for macro efficiency

The hypotheses to be tested are stated as follows:

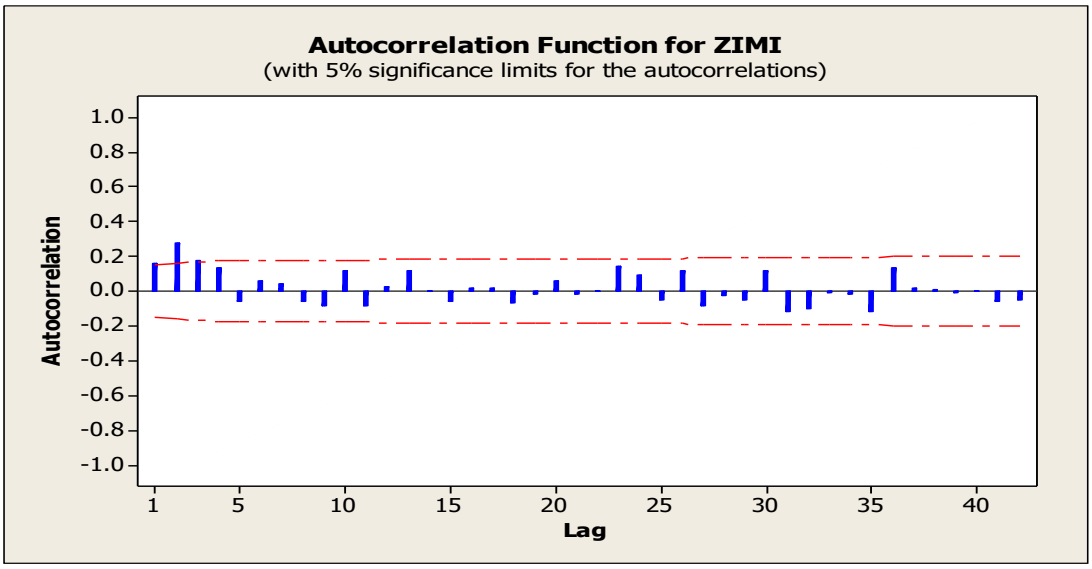
$H_{0:}$ The Zimbabwe Stock Exchange is macro efficient for the period April 2009 to May 2016

H_1: The Zimbabwe Stock Exchange is macro inefficient for the period April 2009 to May 2016

i. Autocorrelation Tests

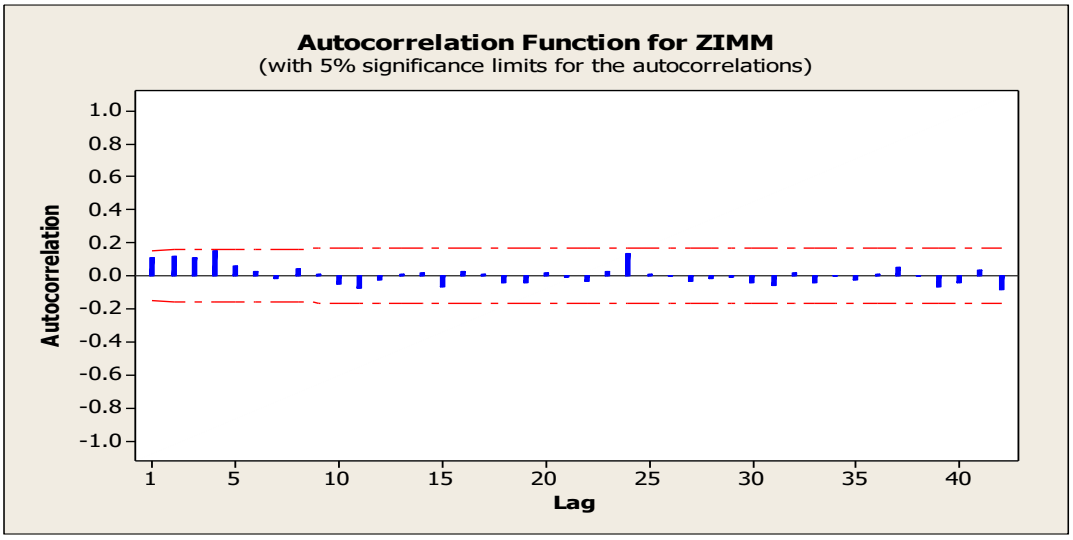
The correlograms of the two indices are as below:

Figure 1
ZIMI correlogram



Source: computed by the researcher on the basis of secondary data

Figure 2
ZIMM correlogram



Source: computed by the researcher on the basis of secondary data

The autocorrelation coefficient in lag 2 of the ZIMI is significantly different from zero, ρ_2=0.2794. This led to the researcher rejecting the null hypothesis of efficiency. A series can only be said to be random if the autocorrelation coefficients at all lags are equal to zero. **(Gujarati, 2004:813).**

The same method of analysis as that used for testing for micro efficiency was used. The autocorrelation coefficients up to lag 42 were tested for significance using the LBQ statistic. The p-values were calculated and compared against a critical value α = 0.05. The test results are presented in the table below.

Table 4.
P-values and associated conclusions

Variable	p-value	Test result
ZIMI	0.02	Significant autocorrelation
ZIMM	0.99	Zero autocorrelation

Source: computed by the researcher on the basis of secondary data

The null hypothesis was rejected for the ZIMI whilst the researcher failed to reject it for the ZIMM. That is, based on the ZIMI, the market was concluded to be inefficient whist the ZIMM showed that the market was efficient. However, the ZIMM is a share index which tracks only four counters on the exchange thus it cannot be used as a fair proxy for the whole market. From this analysis therefore, the researcher concluded that the ZSE is weak-form macro inefficient for the period under consideration.

It must be noted, however, that while autocorrelation coefficients which are significantly different from zero imply that there is dependence between subsequent returns, zero correlation does not necessarily mean independence; it just indicates that there are no linear relationships in the data analysed. The absence of linear relationships does not invalidate the work of technical analysts as there are other patterns which can be exploited to earn abnormal returns. That is, one can find that other geometric patterns are present such as double bottoms and support and resistance levels.

ii. Runs Test

The null hypothesis which was tested by the runs test was that the data had a random sequence, thus implying macro efficiency. The significance of the runs was tested at the 95% level of significance thus $\alpha = 0.05$; with $p < 0.05$ implying that the series is non random. The results from the tested are presented in the table below.

Table 5
Runs Test Results

Variable	K	Observed Runs	Expected Runs	Runs above K	Runs below K	p-value
ZIMI	0.0045	72	81.64	69	97	0.12
ZIMM	0.0013	66	81.29	68	98	0.01

Source: computed by the researcher on the basis of secondary data

The results show that, at the 95% level of significance, the ZIMI return series has a random sequence thus implying efficiency whilst the ZIMM has a non random return series. The results are at variance with those obtained using the autocorrelation tests. Consequently, the researcher failed to draw any conclusions about the weak form efficiency of the ZSE based on these tests. The researcher went on to use graphical analysis to ascertain whether there may be underlying trends which can be exploited to earn abnormal returns.

4.4 CONCLUSIONS

In testing for micro efficiency, the tests concluded that the market was micro efficient in the weak form. The autocorrelation coefficients were not significantly different from zero thus leading to the conclusion that the market is micro efficient. For macro efficiency, the researcher could not draw strong conclusions about the autocorrelations of the index returns as the tests returned mixed results. However, from the graphs that were plotted for the index return series it was inferred that there exist discernible trends in the series, consequently leading the researcher to conclude that the market is macro inefficient.

To enable the use of auto correlation tests the researcher first set out to determine if the return series of the individual firms and the two market indices followed a normal distribution. The analysis conducted using the K-S test found the data to be significantly non-normal thus the normality assumption was rejected at the 95% confidence level. The data was subsequently analysed to ascertain the nature of the deviation from the normal distribution of the data. Using kurtosis, the researcher found that the 22 of the analysed counters had returns which were platykurtic relative to the normal whist the remaining 9 counters were leptokurtic in nature. Capital Market Risk Advisors (Pvt) Ltd., state that returns that are platykurtic came about as a result of frequent medium to large changes in stock prices whilst peaked returns emanate from very frequent small changes. These results are consistent with the Zimbabwean market. Of the stocks that have platykurtic returns, the researcher found that the majority of the blue chips were in this category. As argued earlier, these are the counters that experience frequent trade as compared to the other counters on the market. Consequently, their stock prices change frequently hence the platykurtic returns. On the other hand, the researcher found that the counters with leptokurtic returns did not trade as frequently. There was therefore a bit of compensatory behaviour on the part of the traders as they tended to have high jumps when they did trade on these counters. The researcher concluded that on the ZSE stock prices exhibited this kind of behaviour as a result of the low levels of liquidity which inhibited trading activity during the period under review.

Samuelson's (1998) dictum asserts that the financial markets tend to be micro efficient (efficient pricing of individual-firm stocks) but macro inefficient (mispricing of the aggregate market. The tests conducted in this research found the ZSE to be micro efficient but macro inefficient and this is in line with the dictum. At least 71% of the listed counters are efficiently priced whilst the ZIMI was found not to follow a random walk.

The research was conducted using 31 counters which were selected in such a manner as to be representative of the aggregate market. In an effort to reduce bias which can be induced as a result of thin trading, the researcher selected counters which were actively trading during the period. As a result of this selection criterion, one finds that most of the counters the study focused on are those counters which are viewed as blue chip counters in the market. These include such counters as African Sun, Dairiboard, Econet, Delta, Old Mutual, PPC, TA Holdings, among others. These counters are the focus of many analysts in the Zimbabwean market; consequently information pertaining to any of their activities quickly filters through the market. This heightened interest in particular counters ultimately leads to an efficient pricing of the stocks as information is arbitraged quickly; thus the market becomes micro efficient.

In addition to the above, the exchange has 15 registered trading brokers, spread over just 74 listed counters. On average therefore, about 5 stocks will be analysed by a single broker. Simply put, the ZSE is a very small market which can be analysed on a stock-by-stock basis and this increases micro efficiency.

The transaction costs that investors incur when trading on the ZSE are amongst the highest in sub-Saharan Africa and this is detrimental to trading on the market. It therefore becomes expensive for investors to try and take advantage of any arbitrage opportunities that may exist and any gains to be made by identifying the remaining 29% mispriced stocks are easily eroded by the costs. An investor will therefore be content to put their money in an index fund or to create a portfolio that closely tracks the market index.

As already noted, the analysis conducted found the market to be macro inefficient. The return series of both indices display trends which even an amateur technical analyst can easily discern. The head and shoulders pattern that was observed through graphical analysis is most vivid during the month of March, extending to some extent into April. This may be as result of the fact this is the period in which most listed companies release their financial results for the previous trading year. Financial results of companies create a hive of activity in the market, particularly from speculators. Consequently, the market tends to be bullish around this time but as the season draws to a close the market turns bearish as investors as profit-taking sets in.

The non-random behaviour of the market indices can also be attributed to the counters comprising the index. One finds that in the composition of the index, some counters have greater influence over the behaviour of index than others. For example, the changes in the highly capitalised counters such as Econet or Old Mutual tend to exert greater pressure on the index as compared to such small caps as Celsys. On the other side of the coin, the sporadic trading of these small caps creates a lot of 'noise' in the market. Though this noise may lead to random changes in the index, the randomness so induced is easily overshadowed by the fact that these counters' trading days are few and far between thus the index series invariably remains non-random.

The results from the above analysis therefore lead to the conclusion that Samuelson's (1998) dictum was indeed valid for the ZSE during the period under review.

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