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# THE RETURNS OF BOTSWANA'S EQUITY MARKET ARE PREDICTABLE: IS THIS A BLESSING OR A CURSE?

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**Abstract**

*Empirical research to date has declared the returns of Botswana's equity market (BSE) predictable. This paper investigates whether investors are taking advantage of this return predictability and examine the investments strategies employed by investors to capitalize on this advantage. We start our investigation by confirming that indeed the returns are predictable .Auto-correlation, KPSS, Engle-Granger, and BDS tests applied on the BSE index returns series confirm that the returns do not follow a stochastic process, suggesting that the market is inefficient. We investigate, through the use of semi-structured questionnaires, how this predictability is exploited by investors and check whether this presents a benefit or not at both micro and macroeconomic levels. The results show that, investors use active strategy of fundamental analysis to exploit the inefficiencies and they consider this inefficiency to be a blessing. Policymakers and regulators on other hand consider these inefficiencies to be a curse and an issue requiring urgent attention. We recommend that to improve the efficiency of the market policy makers should redirect their efforts of market development from BSE to economic restructuring that will stimulate market participation by many investors since mechanical improvements to the BSE operations alone has to date failed to improve market efficiency.*

*Keywords: BSE, Stochastic process, technical analysis, fundamental analysis, abnormal returns*

## INTRODUCTION

The results of empirical researches carried on the efficiency of Botswana equity market to date suggest that the equity returns do not follow a stochastic process, but rather deterministic which therefore declares the market vulnerable for exploitation by investors. Some of the recent published studies carried on the market include study by Mollah (2007), Chiwira & Monyambiri (2012), and Radikoko (2014) which all declare the Botswana's equity market returns to be predictable. It is on the backdrop of these empirical findings that we take a different and qualitative approach and further investigates if this return predictability is a blessing or a curse to difference market participants and policy makers. Particularly we use questionnaire technique to gather data that we use to investigate whether investors and potential investors take advantage of these inefficiencies and the strategies they use in their quest to make abnormal returns. We further investigate how these market inefficiencies impact the overall economy so as to ascertain if at macroeconomic levels these inefficiencies are beneficial or problematic. However, before we embark on this qualitative approach we start the investigation by confirming the results of empirical research on the market which has declared the market inefficient to date. We apply several statistical tests to the return series of Botswana stock exchange's main equity indices (The Domestic company index (DCI) and the Foreign companies index (FCI)) to test and confirm predictability of the returns. The DCI return series runs from 1989-2014 whilst the FCI return series covers 2005- 2014.We start with the most basic and common statistical test of Autocorrelation to detect any linear relationship present in the data series. We further test for stationary in the series by using the Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) unit root test. The choice of the KPSS unit root test is guided by the fact that previous research has shown that it is a more superior test than the other unit root tests (the Dickey-Fuller and Augmented Dickey-Fuller Tests (ADF), as well as the Phillips-Perron test (PP)). Worthinton and Higgs (2003); Shiller and Radikoko (2014) particularly show that the advantage of KPSS test is its ability to distinguish between a true non-stationary and a deceptive non-stationary process. However despite choosing KPSS test because of its power, economists continue to generally slam unit root tests because of their deceptive behavior which can render correlations in the data points to be spurious especially when there are structural breaks in the data series. For example (Perron 1989; Shrestha and Chowdhury 2005) show that in the presence of structural breaks in the time series, many perceived non-stationary series discovered in the past were in fact stationary particularly when the ADF and PP test were used. To address this problem of structural breaks and spurious correlations especially when the structural break date is unknown, several tests have been suggested by researchers which includes Perron and Vogelsang (1992), Perron (1997), Zivot and Andrew models (1992). As to which model has

more power than the rest, Shrestha and Chowdhury (2005) show that Perron (1997) is more powerful and comprehensive. In addition to these tests, other researchers suggest that if there is a problem of spurious correlation, cointergration test like Johansen procedure and Engel-Granger tests can be applied. Ruxanda and Botezatu (2008), and Shiller (2013) are some of the proponents of these latter procedures.

Recent turbulence in financial markets which lead to one of the worst recession in recent history might have cause most economic data series to experience structural breaks emanating from external shocks. Botswana like most economies around the world was in the mist of this financial turmoil and might have suffered from the external shocks resulting from this global financial unrest that started in 2008/2009 and hence leading to structural breaks in its economic data series. Apart from these external shocks, structural breaks, particularly in equity return series in Botswana might exist due to regime and policy changes that was directed at trying to improve the efficiency of Botswana's equity market. Radikoko (2014) show that, as a result of this policy change, several developments have occurred in Botswana's equity markets in the last five years with a quest to improve efficiency of the market. These changes include the introduction of the Central Securities Depository, Exchange traded funds and the automation of the trading platform of Botswana Stock Exchange.

To eliminate any possibility of spurious correlations emanating from these perceived and unknown structural changes we apply the Engel-Granger procedure for testing cointergration. We adopt this approach instead of the Johansen's procedure based on the power of this test. Shiller (2013) shows that there is a consensus among many financial researchers that the power of Engel-Granger 2-step method is greater than that of the Johansen maximum likelihood approach for testing the existence of cointegration if one of the variables entering the model is not normally distributed. We therefore chose this approach because descriptive statistics, particularly the Jarque-Bera test and its associated p-values and the autocorrelation test that we will performed are likely to show that the distribution of all error term variables is not normal.

Lastly, we apply the Brock, Dechert, and Sheinkman (BDS) test to the return series to detect any deterministic process of a nonlinear nature that may be deceptive and make the return series to appear nonrandom and hence predictable whilst in actual fact the contrary is the case. Moreover, when the data has experienced some structural break, Panday, V., Kohers, T., & Kohers, G. (1998) and Shiller & Radikoko (2014) show that, BDS test results can erroneously reveal a chaos (stochastic) process followed by the data implying the return series is predictable (completely unpredictable). To account for this drawback and rule out any possibility of structural break influence in the data, we divide our return series in to 2 parts- pre recessionary and recessionary/ post recessionary periods and apply the BDS test in these return series.

The rest of this paper is structured as following: Next we present description of the data used, followed by empirical quantitative analysis and related methodology and results. We then perform qualitative analysis related findings. We end our investigation with concluding remarks and recommendations.

## METHODOLOGY

The data used for this study consists of both primary and secondary data. The former is collected through the use of semi-structured questionnaire distributed to money managers, stock brokers and different policy makers in Botswana. The latter data consists of two daily price indices obtained from Botswana stock Exchange database representing a series of daily stock prices. These daily price series are the DCI and the FCI. The DCI runs from January 1989-January 2014 and the FCI run from January 2005-January 2014. We use this secondary time series data to confirm that indeed the market is inefficient using quantitative analysis. The daily price series is converted into continuously compounded returns using logarithms. We ignore any additional returns (e.g dividends, bonuses and rights issues) in our calculations of equity returns because previous empirical research has shown that whether they are incorporated on not does not alter the end results. The compounded returns are calculated on trade-to-trade basis and adjusted for interval variability as follows: $\tilde{R}_t = 1/K_t\ [\ \ln(P_t) - \ln(P_{t-Kt})]$, where: $\tilde{R}_t$ is trade-to-trade returns adjusted for interval effects, $P_t$ is the stock's traded price in period *t,* $P_{t-Kt}$ is the price of stock $K_t$ periods in the past and $K_t$ is the length of time (in days) between the trade in period t and the previous successive trade. Mlambo & Biekpe (2007) and Radikoko (2014) assert that this latter procedure is useful especially when dealing with emerging markets where there is a problem of illiquidity in the market because it minimises zero returns in the series by removing zero returns between periods when there is no trading in the market.

## ANALYSIS

Statistical description of the data is shown in table 1 that follows. This includes presentation of means, Skewness, kurtosis and Jaquer-Bera statistics and their associated p-values.

Table 1. Descriptive statistics

| | Observations | Mean | Median | Max | Min | Std. Dev. | Skewness | Kurtosis | Jarque-Bera | Probability |
|---|---|---|---|---|---|---|---|---|---|---|
| **DCI** | 4215.00 | 0.00054 | 0.00009 | 0.09506 | -0.04775 | 0.00 | 3.83 | 76.25 | 952671.00 | 0.00 |
| **FCI** | 2253.00 | 0.00039 | 0.00000 | 0.20393 | -0.23730 | 0.01 | 0.07 | 97.11 | 831374.30 | 0.00 |

The results in table 1 above reveal that the distributional property of the data is non-normal for both the DCI and FCI return series. In statistics, for the series to be observed as following a normal curve, it should have a skewness value of zero and a kurtosis valuable of about 3 in a Gaussian distribution. However, the DCI (FCI) report skewness values of 3.83(0.07), kurtosis values of 76.25(97.11) and Jarquer-Berastatistics of 95, 2671(83, 1374.30), the results that dismisses normality in the distribution of the two series. Next we perform quantitative analysis on these data sets to check predictability of returns.

**Testing for Linear Dynamics**

We kick startour analysis of the data by applying the most basic and common statistical test of Autocorrelation to detect any linear relationship present in the series. In its basic form, the auto-correlation model can be represented as: $U_t = LnR_{mt} – LnR_{mt-1.}$ The auto-correlation is measured by $r_n$ = [Covariance ( $U_t$, $U_{t-1}$)]/ [ Variance($U_t$)], where $r_n$ is the n-th order of auto-correlation coefficient or auto-correlation coefficient having n-period lag, and $U_t$ is the change of the logarithm of price from period t to t-1. We use the large sample Box-Pierce statistic (Q-Statistic) which is approximately distributed as the chi-square distribution with *m* degrees of freedom.

Table 2 below reports the results of the autocorrelation test and the Box-Pierce Q-statistics. The null hypothesis for the autocorrelation test is that all correlation coefficients at different lags are zero. The Q-statistic test the joint hypothesis that, individual correlation coefficients are jointly zero. The results from the table below show that the null hypothesis of no correlation is rejected for both the DCI and FCI at 1% level of significant. Furthermore, the joint hypothesis of zero correlation is also rejected at all lags at 1% level of significance.

Table 2: Autocorrelation Test

| | LAG | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DCI** | **Corr.** | 0.11 | 0.10 | 0.07 | 0.14 | 0.10 | 0.12 | 0.07 | 0.10 | 0.06 | 0.11 | 0.08 | 0.07 |
| | **Q-Stat** | 47.35 | 86.34 | 104.82 | 192.91 | 231.70 | 289.69 | 309.79 | 352.13 | 364.78 | 417.48 | 444.22 | 462.67 |
| | **Prob.** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **FCI** | **Corr.** | -0.21 | 0.05 | -0.01 | -0.04 | 0.17 | -0.08 | 0.04 | -0.10 | 0.05 | 0.12 | -0.08 | 0.03 |
| | **Q-Stat** | 102.53 | 108.74 | 108.79 | 112.86 | 174.21 | 188.75 | 192.35 | 216.71 | 221.32 | 253.09 | 266.02 | 267.38 |
| | **Prob.** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

To test for stationarity in the return series we use the KPSS unit root test. Previous research has shown that KPSS test is a more superior test than the other unit root tests (DF and ADF, as well PP test). Worthinton and Higgs (2003); Shiller and Radikoko (2014) particularly show that the advantage of KPSS test is its ability to distinguish between a true non-stationary and a

deceptive non-stationary process. KPSS actually test the usual hypothesis of a unit root against the alternative of no unit root in a reversed manner. Thus, the null hypothesis under the KPSS test is that the observed series is either trend or level stationary, and for this paper we test the null hypothesis ($H_0$) of level stationary against the alternative ($H_1$) of a unit root. KPSS model without a trend term can be represented as:$Y_t = x_t + z_t$; where $z_t$ is stationary and $x_t$is a random walk, $x_t = x_{t-1} + v_t$; $v_t$~IID $(0,\sigma_v^2)$. If the variance is zero, i.e.,$\sigma_v^2 = 0$, then $x_t = x_0$ for all periods (t) and $Y_t$ is stationary. This means therefore, $H_0$ and $H_1$ can be represented as:$H_0$:$\sigma_v^2 = 0$ and $H_1$:$\sigma_v^2 > 0$.Under stationary condition ($H_0$) then $Y_t$ model that we started with becomes $Y_t$ = constant + $\hat{z}_t$. The KPSS test is given as: KPSS =$\frac{1}{T^2}\sum_{t=1}^{T} S_t^2 / \hat{\sigma}_\infty^2$, where $S_t$=$\sum_{s=1}^{t} \hat{z}t$ is a partial sum, and $\hat{\sigma}_\infty^2$ is a heteroskedasticity and autocorrelation correction (HAC estimator) of the variance of $\hat{z}_t$.A detailed discussion of the above model can be found in Kwiatkowski, Phillips, Schmidt, and Shin(1992) together with critical values for models with or without a linear trend.

The results of the KPSS model are presented below in table 3 and they show that the null hypothesis of level stationary in index return series fails to be rejected at 5% level of significance for the DCI and at 1% level of significance for the FCI. This implies that the data follows a stationary process and hence support the results of autocorrelation which declares the market inefficient.

Table 3: KPSS Test

| Index | t-Test | Probability |
|---|---|---|
| **DCI** | 0.34726 | Stationary |
| **FCI** | 0.594264 | Stationary |
| | **Asymptotic critical values*** | |
| | 1% level | 0.739 |
| | 5% level | 0.463 |
| | 10% level | 0.347 |

*****LR asymptotic critical values for KPSS statistics are derived from Kwiatkowski *et al*. (1992).

However despite choosing KPSS test because of its power, economists continue to generally slam unit root tests because of their deceptive behavior which can render correlations in the data points to be spurious especially when there are structural breaks in the data series. To eliminate any possibility of spurious correlations emanating from these perceived and unknown structural changes we apply the Engel-Granger procedure for testing cointergration. Shiller (2013) shows that there is a consensus among many financial researchers that the power of Engel-Granger two-step method is greater than that of the Johansen maximum likelihood approach for testing the existence of cointegration if one of the variables entering the model is

not normally distributed. Therefore, we choose this approach because autocorrelation test that we have performed above (see table 2) and Jarque-Bera normality test (see table 1) show that the distribution of all error term variables is not normal.

**Cointegration Test**

If there is a hypothesised value of β (from $y_t - \beta x_{t)}$ cointegration involves testing whether $y_t$ and $x_t$ are cointegrated, which could be done by defining a new variable $s_t = y_t - \beta x_t$ and then applying either DF or ADF test to test the variable $\{s_t\}$. If a unit root in $\{s_t\}$ is rejected in favour of the no unit root alternative, then $y_t$ and $x_t$ are cointegrated (Wooldridge, 2008). Therefore the null hypothesis is that $y_t$ and $x_t$ are not cointegrated. However, testing for unit root is more difficult if cointegrating parameter β is not known, since rather than testing for a unit root in $\{s_t\}$, β needs to be estimated first. If $y_t$ and $x_t$ are cointegrated, it turns out that the Ordinary List Squares (OLS) estimator from the regression $y_t = \hat{\alpha} + \hat{\beta}x_t$ is consistent with β. The problem is that the null hypothesis states that the two series are not cointegrated which means that under $H_0$ a spurious regression is being run. Luckily, it is possible to tabulate critical values even when β is estimated, where DF or ADF is applied to test the residuals, i.e $\hat{\mu} = y_t - \hat{\alpha} - \hat{\beta}x_t$. The resulting test is called Engle-Granger Test (EG**)**. A detailed discussion of the EG test can be found in Engel and Granger (1987).

The results of the EG cointegration test, which are not presented here to preserve space, but which are available upon request, show that the series is cointergrated at all lags examined. The null hypothesis of no cointergration in return series is thus rejected at 1% level for both the DCI and FCI series. These findings suggests that the structural breaks that might have affected the data due to external shocks resulting from the global financial unrest that started in 2008/2009 and regime and policy changes that was directed at trying to improve the efficiency of Botswana's equity market in the last five years did not course any spurious correlation. We can therefore be confident in our KPSS unit root test which rules out against the alternative hypothesis of a unit root in favour of the null of level stationary suggesting that indeed there is serial dependence in the data. This means that all our linear tests are consistent in showing that the returns of Botswana's equity markets are predictable.

**Testing for Non-Linear Dynamics**

Up to this point we have performed our tests based on linear relationship that may exist in the return series. To dispel any possible deceptive behavior in the return series that may render it to appear random when linear dynamics tests are used, we also apply the BDS test. BDS test is a non-linear dynamics test which came about as a result of advancements in chaos theory. The

first BDS test was developed by Brock, Dechert, and Sheinkman (BDS) in 1987,but for our analysis we use the improved Brock, Dechert, and Sheinkman and Lebron (1996) test. BDS test is used to test whether there is serial dependence in the residuals after detrending the series by fitting an autoregressive (AR) model of order (n). The null hypothesis is that the residuals are independently and identically distributed (IID), tested against an unspecified alternative. One of the problems experienced in emerging markets is thinness in trading and like Miller, Muthuswamy and Whaley (1994) have shown, this characteristic has an effect of making returns in a series to appear correlated. To remove this illusive correlation we fit first order AR model, AR (1), to remove linear dependence in the data. Since we have already cleaned our data initially to minimise artificial correlation by calculating logarithm compounded returns on trade-to-trade basis and adjusting for interval variability we believe AR (1) is enough to remove any remaining linear structures present in the data.

One of the problems with BDS test however is that test results can erroneously reveal a chaos or stochastic process followed by the data implying the return series is predictable or unpredictable especially when there is presence of structural break in the data. To address this drawback and rule out any possibility of structural break influence we divide our return series in to two parts, (the pre and recessionary/post recessionary periods) and apply the BDS test in these data series. Pre recessionary period covers from January 1989 to December 2007 for the DCI and January 2005 to December 2007 for the FCI and we refer it as the extended sample. The recessionary and post recessionary period (common sample) covers period of January 2008 -January 2014 for both the DCI and FCI.

Table 4(a) and 4(b) below presents the results of the BDS test for the extended sample period (4215 observations) and common sample (1508 observations) using standard deviation (σ) to specify ϵ (distance measure) between data points in the series. According to the BDS test, a lower epsilon (ϵ) value represent a more stringent criteria since points in the m-dimensional space must be clustered together to qualify as being “close”, hence, $\epsilon = 0.5\sigma$ reflects the most stringent test, while $\epsilon = 1.00\sigma$ is a most relaxed test (Pandey *et al*., 1998). We use 6 (m = 2,…, 6) correlation dimensions, which roughly represent the number of non-linear factors that describe the data, for both the DCI and FCI indices.

Table 4(a): BDS Test for the Extended Sample

| **m** | **2** | **3** | **4** | **5** | **6** | **2** | **3** | **4** | **5** | **6** |
|---|---|---|---|---|---|---|---|---|---|---|
| **ϵ/σ** | **0.5** | **0.5** | **0.5** | **0.5** | **0.5** | **1** | **1** | **1** | **1** | **1** |
| **DCI** | 10.5331 | 12.1962 | 14.1105 | 16.0388 | 18.1566 | 8.3531 | 9.2636 | 10.1393 | 11.0131 | 11.9785 |
| **FCI** | 22.9926 | 25.3559 | 26.0753 | 26.9419 | 27.6177 | 17.9351 | 19.1781 | 19.5317 | 19.8047 | 19.8605 |

Table 4(b): BDS Test for the Common Sample

| m | 2 | 3 | 4 | 5 | 6 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|---|---|
| **ϵ/σ** | **0.5** | **0.5** | **0.5** | **0.5** | **0.5** | **1** | **1** | **1** | **1** | **1** |
| **DCI** | 6.8019 | 7.0617 | 7.5104 | 8.1114 | 8.4443 | 5.1119 | 5.3272 | 5.2825 | 5.6861 | 6.0345 |
| **FCI** | 1.9560 | 3.4260 | 3.3455 | 3.0065 | 2.7712 | 0.5330 | 2.4826 | 2.6564 | 2.4957 | 2.4402 |

With 250 Observations

| | Significance Level: 5% | | Significance Level: 1% | |
|---|---|---|---|---|
| **m** | **ϵ/σ=0.50** | **ϵ/σ=1.00** | **ϵ/σ=0.5** | **ϵ/σ=1.00** |
| 2 | 2.35 | 1.86 | 3.71 | 2.79 |
| 3 | 2.59 | 1.91 | 4.04 | 2.92 |
| 4 | 3.02 | 1.98 | 4.85 | 2.96 |
| 5 | 3.88 | 2.10 | 6.44 | 3.06 |

Critical values derived from Brock *et al* (1987)

The results for both DCI and FCI in table 4(a) for the extended sample and DCI for the common sample in table4(b) uniformly reject the null hypothesis of IID at 1% level of significance even when we use the most relaxed criteria where ϵ= 1.00σ. However, close look at table 4(b) for the common sample reveals that the null hypothesis can only be rejected at 5% level of significance when m=3 and m=4 and at all other correlation dimensions we fail to reject the null of IID unless when we use the less stringent test at 5% level where ϵ= 1.00σ, save to where m=2 where we still fail to reject the null. However, generally the results of BDS test suggest that the returns series for both DCI and FCI do not follow a random walk process. These results are consistent with all the other tests we have performed so far and seal our confidence that indeed the returns of Botswana's equity market are predictable.

Having confirmed that the equity returns in Botswana are predictable and hence the market is inefficient, our next step is to investigate whether investors are taking advantage of these market inefficiencies identified and also find out the investments strategies they employ to capitalize on this advantage. Furthermore, we investigate whether these market inefficiencies are a benefit or not at both micro and macroeconomic levels and we do this through qualitative analysis that follows next.

## EFFECTS OF RETURN PREDICTABILITY TO INVESTORS AND MACRO ECONOMY

To address the qualitative aspect of the research we use Maximum Variation Sampling technique to gather our data. Unlike previous research on market inefficiency, e.g. Jaffe & Westerfield (1985), Lakonishok and Smidt (1988) and Condoyani, O'Hanlon and Ward (1987) who particularly investigate market anomalies, we aimed not to just ascertain the existence of such anomalies but to examine how investors exploit them. We collected the data through issuing of questionnaires and conducting interviews with brokers and different money managers

to solicit primary qualitative data pertaining to how investors have been taking advantage of the inefficiencies in the market in the past and their planned future investment strategies they will use in case the market remains inefficient. Moreover, we want to ascertain what strategies they will use if the efficiency of the market improves overtime, a situation that might nullify the strategies they used under inefficient market conditions. Lastly, we gather information that will give us an indication as to the effect market inefficiencies have to the economy at both micro and macroeconomic levels. We use a likert scale of 5 to reflect the frequency of responses such that mean score of 4 and 5 will represent that the respondent agreed with the stamen posed to them and 1 and two meaning they do not agree. An average mean score of 3 will mean the respondent is somewhat in between.

**Micro Economic Investigation at investor level**

We use brokers and asset management companies to represent the views of the investment community. The first question we posed to them is whether they think the market is efficient, and they said that the market is semi-strong form efficient, this represented a mean score of 3.75. When these respondents were further asked why they perceive the market to be semi-strong efficient the responses varied from lack of response to conditions of the market by investors, to the small size of the market. This explanation given forth by the brokers is contradictory to efficiency and is a response that is more suited for explaining why the market would be inefficient, we could not get a clear answer to support semi-strong efficiency in the market. A factor intriguing when dealing with brokers operating in an semi-strong efficient market as they say, is why then do they continue to invest because efficiency reduces the expectations of making a return on an investment. In response to this question, the brokers say that they take advantage of market timing and one broker was actually quoted as saying;

*"timing is essential when it comes to the buy and/or sell decision in the Botswana market and thus making returns should not be ruled out."*

The brokers initially said that the market is semi-strong efficient but then it can be inferred from this statement that they use a time strategy to exploit a lag in price adjustment caused by the small size of the domestic market, this leads us to conclude that there is a discrepancy in the understanding of the concept of informational efficiency by some investors and some brokers because such time strategy to exploit a lag in price adjustment should be associated to trading in a market that is weak form inefficient. The 3.75 mean response of the market being semi strong efficient market can from these explanations be included in the 1.25 of the respondents who said the market is inefficient because they all from their explanations agree with the response given by the minority that said the market was inefficient.

We also approached a number of asset management firms in Botswana to solicit the same kind of information on their view of the efficiency of equity market. Only one asset management firm (mean 1.667)is in consensus with brokers in postulating that the domestic market is semi-strong efficient. In support of why they continue to actively trade in this efficient market, the respondent held that there are still opportunities to make profit. The respondents actually said:

*"the market is only semi-strong form efficient and this is not the highest form of efficiency, there are still opportunities to make above normal returns if opportunity gaps, probably rising from private information that has not gone public yet, are fully exploited.*"

The rest of the asset management firms with a mean of 3.33 said that markets are weak-form inefficient and pointed out that share prices of securities usually fail to reflect public information immediately, thus there is a lag in price adjustments and they can predict future prices from past performance. When asked which investment strategies they use to exploit these inefficiencies, most of the respondents said they use the active strategy when investing, by employing stock picking techniques, actively selecting stocks, researching on individual counters, accessing the fundamentals of a company in order to outperform the benchmark index which is the Domestic Companies Index. There was an exception of one respondent who said they use a passive strategy, by using fundamentals to identify stocks and then maintains a buy and hold strategy because most of their clients are institutional investors.

With overall mean of 5, respondents maintain that these current investment strategies have worked well for them in the past and if market conditions were to improve most would not change their approach to investment. However, one respondent said they would change from an active to a more passive strategy if efficiency improved because transaction costs in a more efficient market tend to erode returns. Contrary to their assertion that the market is weak-form inefficient implying that past prices are predictable and can thus follow or map out a trend most of the respondents point out that they have not noticed any long term observable trends in the performance of Botswana's equity market. This implies that probably the anomalies in the market are short lived and the markets quickly correct itself to equilibrium level when there is deviation from efficiency. In fact one of the respondents pointed out that there are short term observable trends in stock prices. When asked which of the known market anomalies exists in Botswana's equity all of the respondents point out that there are three anomalies present in the Botswana equity market and these are the Calendar effect, the Size effect and the Neglected firm and trading activity effect.

The respondents who said markets are efficient (mean score of 1.67) acknowledged the existence of these anomalies too but they were quick to point out that due to the lack of liquidity and the small size of the market the anomalies are difficult to exploit as one said,

"*this is probably because most of the investors in the Botswana market are institutional investors and they buy and hold over long periods of time and so they are not taking and advantage of the noted anomalies"* .

The rest of other respondents (mean 3.33) said they do take advantage of these anomalies, particularly the Calendar effect because in the Botswana during the month of December retail industries sell some of their shares to fund the holiday increase in supply due to high demand from consumers. The respondents pointed out that they normally by stock in the retail sector in December and the lack of liquidity during the rest of the year in the market makes December the best time to buy stock as share prices are low and presumably rise again in January when the holiday season ends. In exploiting these anomalies these respondents said they employed both technical and fundamental analysis. The say the fundamental analytical technique provides the best results in the analysis of a particular company and the technical perspective ensures a comparative look into the companies' performance."

In sum, it can be gathered that, both brokers and asset managers take market inefficiencies as being a blessing to the investors because this enables possible positive alpha generation.

**Macro-Economic Investigation**

To address the last objective of the study which is to access the impact market inefficiencies have on the economy in a macroeconomic perspective, we approach different policy makers, economists and the regulatory body in the country to ascertain how these the economy of the country is affected by found market in efficiencies. However, our efforts to get information were futile at some instances as some policymakers declined to answer the questions on the basis that, they do not deal directly with the capital markets. The privatization agency in the country refused to answer giving the following reason,

*"Although our privatization endeavors will at one point be responsible for the ultimate listing of new companies in the exchange, we only relate with the company up to an IPO stage and are not concerned with the company's performance let along that of the market itself after listing in a secondary stock market."*

One of the policy makers in the country that we were successful at soliciting information from, the ministry of finance and development planning directed us to one of its parastatals, the Botswana Stock Exchange citing that, the response from the BSE can be used because it fits with the Ministry's position.

With a mean score of 5, the macroeconomic players approached said that the market is inefficient. The stock exchange representative said that the Botswana equity market is inefficient and this inefficiency is good for market participants mostly because the information that influences their view is not already reflected in stock prices as such presenting a return to them. We also approached one of the leading macroeconomic consultancy organizations in the country which pointed out that, the government urges people to invest not as a hint of efficiency or inefficiency but mainly because the market provides a savings avenue for Batswana. They point out that the government's concern is in building a savings culture, savings which can be used in developing high return projects by public companies and in the process contribute to economic growth, ensuring efficiency of savings thereby helps create value in the economy, and also ensures citizen economic empowerment through investments in listed companies. The response from the capital markets regulatory body in the country, although in agreement with these previous responses that government is indeed trying to encourage a new avenue of saving for Batswana brought in another perspective. The point they bring is that the government is also trying to bring in more retail investors into the Botswana Stock Exchange because currently the bulk of the investment instruments are held by institutional investors who employ a buy and hold strategy which cultivates illiquidity to the market. They suggest that, to improve liquidity the government should encourage individual investors to be active in the market as they will contribute to liquidity that will in turn bring about efficiency. With a mean score of 5, the respondents agreed that efficiency of the BSE has improved over time and note that this is noticeable through the improved level of disclosure by companies. In addition, overtime, there has been improvement in skills required for analyzing information and the increase in institutional investors who use fundamental and technical approaches in analyzing information. This therefore means that inefficiencies get eliminated and it becomes less easy to earn extraordinary returns, but this depends on the accuracy in predicting intrinsic values by analyst and the speed with which stocks reflect these true values. So we can conclude that, the respondent attributes the increase in efficiency to improved investment analytical skills, increase in market participants these include the increase in participation of foreign institutions in the domestic market that at times surpass the local institutions and these contribute to turnover hence signaling trust in the BSE as a stock exchange. However, there is one respondent (0.83 mean) whose view is that, these improvements in efficiency are so slow and spread over a long period that they are insignificant to the general outlook of the stock market. But generally all other respondents are of the view that although the market remains inefficient, the efficiency has improved over time.

As to why the market remain inefficiencies despite the efforts by BSE and government measures to improve efficiency all of the responses attributes this to limited listed financial instruments and as such the amount of money available to be invested in the stock market cannot be absorbed entirely. On this note one respondent actually said,

*"Basically we have a situation whereby there is more money in the economy chasing few available investments."*

This response brings us to infer an element of irrationality in investors in the sense that Batswana investors will be willing pay any amount to acquire a stock of their choice regardless of the fundamentals, this decision is based on the high demand and low supply of stock, this hampers prices from ever converging to their true intrinsic values making it impossible for the prices to reflect all available information about a stock or company with greater speed that would be expected of an efficient market. To add on to this perspective another respondent sited an example of the condition at which the Botswana's equity market was in 2006 and said,

"*I this period the market made returns of 75% and this was perceived as a major improvement in efficiency but this was false because these returns were not backed by fundamentals of the listed companies but unjustified demand of the stocks which drove the stock prices high at the time there were too few instruments in the market so prices inflated because of supply and demand forces."*

Inefficiencies still exists despite any measures because price fluctuations in the market have to be backed by fundamentals of the companies trading on the exchange not forces of supply and demand as is the case now. Other reasons as to why the market remains inefficient includes the fact that the improvements measures to inefficiency currently are aimed at the wrong sector of the market (The BSE)and almost all the respondents with a mean score of 5 agreed to this. Below is a quote from one of the respondent on this latter issue.

*"Improvements should not be aimed at the BSE's technical operations but rather to education and empowerment of Batswana to motivate interest and proper analysis research in the stock market. The economy has a leading effect on the stock markets, so for improvements in efficiency to occur they must start in the economy and then translate to the BSE, the current economic structure has to change first because these are the true improvements that will drive market efficiency, mechanical improvements in the stock market alone cannot improve informational efficiency because the BSE only follows the economy, so if economic activity has a lagged response to information the stock market will just as well follow suit."*

As to whether the inefficiency is a blessing or a curse, with a mean score of 5, the respondents argue that from a macroeconomic view, inefficiencies are a curse as they have contribute to negative and stagnant performance unnecessarily, for example one respondent was quoted saying,

*"If you take foreign companies listed on the BSE and compare their market value in the BSE against the performance of the same companies listing in other exchanges to assess their price reaction to information you would find that the prices on the BSE are less reactive to release of information concerning these companies. There are instances when local market indices remain at depressed levels when the fundamental do not warrant this and that is undesirable because it makes the market comparatively disadvantaged."*

Inefficiency of the stock market is a curse as it makes investors doubt the prices of stock in the local exchange and therefore makes them unwilling to take up new investment opportunities offered by the market and it also makes companies less willing to enter the market as well, thus making the market more illiquid and less efficient. Furthermore inefficiency creates an artificial market that responds to information that is no longer relevant to the listed companies' stock price in other competing markets like the Johannesburg Stock Exchange. As one respondent argued, there is a delay in information assimilation into the local stock market, for example during the 2008 financial crisis, the rest of the world stock markets were declining but the Botswana market was on a rise because it had not assimilated the impacts of the crisis. Such delay in response to information is clearly a bad thing because it puts investors and the economy in general at risk of prolonged periods of recession and slow economic growth.

With an overall mean of 5, respondents believe that apart from informational efficiency which we have discussed so far, allocation and transactional cost efficiency are equally important because they all affect capital allocation of resources from investors to companies that need the capital. They point out that, the BSE is currently the most expensive exchange to trade in as compared with other markets like South Africa and Mauritius and thus this pulls away listings from the Botswana market**.** To address inefficiencies the BSE needs more investment instruments but to do so the market has to be cost efficient and resources have to be allocated efficiently, but improving efficiency will come at a cost to the economy. The respondents believe that these improvements will contribute to capital markets efficiency and efficient allocation of capital to entities with positive Net Present values in the economy and so this will in the long run bring more benefit than the cost associated with improving efficiency by restructuring the economy. Thus the economy will achieving pareto efficiency in the long term but with pareto inefficiency in the short term because investors will tend to make less and less returns as efficiency improves.

All the respondents (mean score of 5) agree that more investment instruments are needed to improve efficiency as already discussed. About half of the respondents (mean score of 2.5) also believe that stimulation of economic activity is most vital. They argue that, there is no use in automating systems but not changing measures and methods that push the change in the structure of local stock exchange and the economy because this mechanical hardware will just be white elephants. Improved efficiency will strengthen the economy and the stock market by encouraging company growth through funding by equity and this growth will thus lead to creation of employment which will trickle down to the ordinary unemployed person as a benefit of improved efficiency. Overall, from macroeconomic perspective inefficiency is a curse and an error that needs immediate rectification.

## CONCLUSIONS AND RECCOMENDATIONS

Empirical research on the efficiency of Botswana equity market has to date declared the market inefficient. In this paper we investigate whether investors are taking advantage of these market inefficiencies identified in Botswana's equity markets and the investments strategies they employ to capitalize on this advantage. Furthermore, we investigate whether these market inefficiencies are a benefit or not at both micro and macroeconomic levels. We start our investigation by confirming that indeed the market is inefficient, and to do this, we perform auto-correlation, KPSS, Engle-Granger, and nonlinear dynamics BDS tests to the Botswana Stock Exchange (BSE) returns series data (The DCI and FCI) to check for predictability of the series.

The descriptive statistics performed on the data reveal that the data is not normally distributed but rather the distribution is skewed and leptokurtic which violate the prior condition of random walk model. The results of the autocorrelation test show that the null hypothesis of no correlation is rejected for both the DCI and FCI at 1% level of significant. Furthermore, the joint hypothesis of zero correlation is also rejected at all lags at 1% level of significance suggesting that the returns are predictable. We use KPSS test to test for unit root and the results of this test show that the null hypothesis of level stationary in index return series fails to be rejected at 5% level of significance for the DCI and at 1% level of significance for the FCI. This implies that the data follows a stationary process and hence support the results of autocorrelation which declares the market inefficient. To eliminate any possibility of spurious correlations emanating from any perceived and unknown structural changes in the data that may cause it to appear correlated we apply the Engel-Granger procedure for testing cointergration. The null hypothesis of no cointergration in return series is rejected at 1% level for both the DCI and FCI series suggesting that the return series is indeed cointergrated and thus the correlation is not spurious. To dispel any possible deceptive behavior in the return series that may render it to appear

random when linear dynamics tests are used, we also apply the BDS test. BDS test is a non-linear dynamics test which came about as a result of advancements in chaos theory. The BDS results for both DCI and FCI for the extended and common sample in uniformly reject the null hypothesis of IID suggesting that the returns series for both DCI and FCI do not follow a random walk process.Generally the results of all the tests performed confirm that the returns are predictable, suggesting that the market is inefficient in the weak-form. To further ascertain how this inefficiency is exploited, we gather information from the investment community (represented by different money managers and market makers) and from different policy makers (representing the macroeconomic sector). We use structured questionnaires for this purpose and find that investors in the Botswana equity market are aware of inefficiencies and most of them use active strategy of fundamental analysis to exploit them and generate positive alpha, and hence they consider these inefficiencies a blessing to them. Further analysis also reveals that policy evaluators and regulators consider these inefficiencies to be a curse and an issue that requires urgent economic restructuring to improve the market efficiency.

Further research might focus on the limitations in the economic structure of Botswana and how it currently limits more individual investors from entering the market. The results of this paper show that institutional investors hold the largest bulk of investments securities in the market and because they employ a buy and hold strategy this limits the liquidity of the market and thus fuels inefficiency despite government efforts to improve it. Moreover an area to look further into would be to compare returns of the stocks in the BSE with anomalies known to exist and which are currently being exploited by investors in order to see if these anomalies truly do exist. For example some respondents noted that there is Monday effect anomaly which they usually exploit, so research can be done on the returns of several stocks or the market index to check if indeed positive returns can be seen consistently on this day of the week. Doing this comparison may even discover more anomalies that investors have not yet observed in the market. Lastly, we recommended that policy makers redirect the focus of their market development efforts from the Botswana Stock Exchange to the economic restructuring that will incentivize market participation among Batswana because mechanical improvements to the BSE operations alone will not, and to date has failed to improve efficiency of the market because as it stand the Botswana stock market follows the lead of the economy. Therefore, further research efforts should be directed at finding out what is currently wrong with the economic structure and how efficiency can be improved within that structure and then be translated onto the stock market.

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**APPENDIX 1: List of participants approached in Botswana for the research data**

| Name of Institution | Representing |
|---|---|
| Afena Capital | Investment community |
| African Alliance Asset Managers | Investment community |
| Bank of Botswana | Policy Makers |
| Bfim Capital | Investment community |
| Botswana Stock Exchange | Investment community |
| Coronation Botswana | Investment community |
| Econsult Botswana | Policy Makers |
| Fleming asset management | Investment community |
| Imara Securities | Investment community |
| Investec | Investment community |
| Motswedi Securities | Investment community |
| Ministry of Finance and Development Planning | Policy Makers |
| Non Banking Financial Institutions Regulatory Authority | Policy Makers |
| Stanlib Asset managers | Investment community |
| Stock Brokers Botswana | Investment community |
| The Botswana Institute for Development Policy Analysis (BIDPA) | Policy Makers |
| The Public Enterprises Evaluation and Privatisation Agency (PEEPA) | Policy Makers |