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Stock Market Performance, Interest Rate and Exchange Rate Interactions in Zimbabwe: A Cointegration Approach

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ABSTRACT

This research empirically examines the connection between stock market performance, exchange rates and interest rates using the VECM model and monthly time series data. During the pre hyperinflationary phase findings showed that the impact of interest rates on stock market performance were mixed. Stock market performance converged to long run equilibrium with bank rates (1.4%) within 8 months. Unidirectional causality moves from stock market to exchange rates, Treasury bill rates and deposit rates. Bank rates granger causes stock market performance. In hyperinflationary period exchange rate and deposit rates had a positive impact on stock market performance while Treasury bills had a negative effect. In long term the convergence to equilibrium with stock market performance was at rates of 1.3%, 1.5% and 1.8% for exchange rates, Treasury bills and deposit rates respectively. Causality between stock market and exchange rates was bidirectional while unidirectional causality moved from stock market performance to interest rates. Sound exchange rates and treasury bills policies in the long term help stabilize the stock market. Mismanagement of exchange rates and interest rates by monetary authorities will destabilize the stock market. Changes in exchange rates and bank rates are important to investors in the short term.

Keywords: *Exchange rate, interest rate, stock market, Vector error correction, inflation.*

1. INTRODUCTION AND BACKGROUND

The equity market is important in determining the speed with which policy changes are transmitted into the entire economy. It is sensitive to any policy changes especially by monetary authorities through their manipulation of the levels of different macroeconomic variables in the economy. The level of development of the stock market, value of the local currency and the level of interest rates explain the dynamics in the level of development of the economy. The theoretical understanding is that there is a relationship among these variables in both the short and long term. For example an increase in interest rates would signal investors to move their investments to the money market, ceteris paribus, and a decline in interest rates would be a sign for investors to put their funds in stocks offering a better reward. This is possible where the stock and money market are perfect substitutes in the long term. Depreciation in a country's currency increases the competitiveness of firms that are in the export business as such the price of their stocks will follow an upward trend and the expectation is that foreign investors are attracted to the local stock market. Devaluation increases exports for local firms. An appreciation reduces both export competitiveness and performance of stock prices. For example Ma and Kao (1990) provide evidence in their analysis that a currency appreciation has both positive and negative effect on stock prices for import dominated and export dominated countries respectively. This kind of analysis is important in an exporting country of which Zimbabwe is one such nation which is on the export drive to boast growth. Most of the firms are exporting and they also rely on imports for materials.

Stock market activity in Zimbabwe can be traced back to the early 1890s when the first stock broking firms were set up in Harare and Bulawayo around 1894. It was known as the Rhodesian stock market since then until 1980 when the country gained independence at which time the name was changed to Zimbabwe Stock Exchange (ZSE). Regulation of the ZSE is done under the Securities Act Chapter 24.25 and since February 2009 the currency of operation is the United States dollar. Trading activity is done using the auction system which requires physical meeting between parties to a sale but this leaves questions on the system's effectiveness and fairness unanswered. The stock market's performance in Zimbabwe can be explained by two indices, the main industrial index and the mining index. The industrial index is composed of many stocks in terms of volume and turnover and this is where most of the companies fall in. There are few companies in the mining sector though they are also big in terms of size and trading activity. The industrial index, since 2009, is currently among the best performers in Africa though the ratio of market capitalization to GDP is still low. According to Maboja (2014) foreign participation has grown from 17.7% in 2009 to more than 50% in 2014.

In 1980 the exchange rate against the United States dollar (USD) was Z$0.647. This means that fewer units of the Zimbabwe dollar (Z$) would be supplied to obtain a USD which remained true until the end of 1983. The exchange rate deteriorated there after such that by the end of 1998 Z$31.4 would be supplied to get one USD and this worsened over the years such that by the end of 2008 the rate was around Z$580 million/USD according to Reserve bank of Zimbabwe (RBZ) statistics for 2013. The exchange rate arrangement in Zimbabwe was volatile being coupled with several exchange rates shifts. The country's exchange rate policy between 1980 and 2014 can be summarized as follows: Currency peg against different currencies including South African Rand, Botswana Pula, USD, and British Pound (1982-1990); less restrictive exchange rate with arrangements like the

Export retention scheme (1991-1993); widening of the Export retention scheme with the introduction of foreign currency accounts for companies and retention rate was increased to at least 60% (first half of 1994); managed float (second half of 1994 to the end of first quarter for 1999); arrangement with banks to fix rate at Z$38/USD (second quarter of 1999 to August 2000); fixed rate (November 2000 to March 2003); Export support rate (April 2003 to December 2003); foreign exchange auction system (January to October 2005); tradable foreign currency balances system (November 2005 until end of the first half of 2006); thereafter a fixed peg until end of April 2008 and finally market based rate was introduced from May 2008 to date, RBZ statistics (2013) and Makochekanwa (2007). Since the beginning of 2009 the country has adopted the multicurrency system in which the USD, Botswana Pula and South African Rand are accepted as legal tender.

Policies targeting money market instruments were also changing from time to time. For example the level of the key interest rates as depicted by Treasury bills (TB) rate, bank lending (BL) rate, and the three months deposit rate (DR) were 3.6%, 4.5% and 3.2% respectively at independence and these rates had reached 35.3%, 39% and 40.3% by end of 1998 they respectively. Both the TB rate and the three months DR slowed down at the beginning of 2001 until the end of 2002 the period during which the BL remained at 57.2% levels. The TB rate and BL continued to rise until the end of 2008 but the 3 months DR reached the 500% mark by end of 2006 after which the RBZ reduced and pegged it at 250% until the end of 2008 (RBZ statistics, 2013).

The efficient market hypothesis measures the ability with which the stock market is able to incorporate known and unknown information into stock prices. The stock market is said to be inefficient where it fails to incorporate all available information and investors are able to come up with trading rules that assist them in making above average market returns. In this case the stock market would fail to channel resources to their next best use. But when the stock market is efficient it means that the stock prices are able to incorporate all available information whether public or not and no investor will be able to gain by forming trading rules. The levels of efficiency would range from weak, semi strong to strong form efficiency. If the market is in strong form efficient then even those with inside information are not able to beat the market while other forms of efficiency take care of publicly available information. The flow oriented model, according to Joseph (2002), confirms the existence of a causal link between exchange rate and stock market prices. For example depreciation in the exchange rates means exports performs well which reflects in increased earnings for exporting firms as such their stock prices move in the upward direction. The arbitrage pricing theory explains the connection between stock market performance and macroeconomic variables like exchange rates, interest rates and money supply. Any change in interest rates can affect exchange rates and stock prices at the same time. For example a fall in interest rates increases stock prices as present value of firms' cash flows increases and causes an appreciation in the exchange rate as hot money flows into the economy but this is not the case under fixed exchange rate regime.

The development in these variables did not leave the stock market stagnant but it was also influenced according to our understanding from theory. Therefore this paper is significant in explaining how stock market, exchange rates and interest rates interacted during the review period. The paper analyses the different exchange rate and interest rates arrangement and their impact on the performance of the stock market. This is important for investors, policy makers in Zimbabwe and also to make a profound contribution on the current debate in literature. Results affect both fiscal and monetary policy making. The developments on fiscal policy may affect the ultimate impact of monetary policy. For example depreciation in the exchange rate which is meant to encourage export may be dampened by an increase in interest rates. Knowledge on the exchange rates interactions with stock prices is important for listed firms that are involved in international trade either as importers and exporters. Monetary authorities should be fully aware of the resultant effect of their actions on the stock market. The aim of this paper is to empirically examine the connection between stock market performance and exchange rates and interest rates. This is done by examining their short run and long run interactions and the direction of causality. This research is being motivated by the existence of different exchange rate arrangements in Zimbabwe between January 1980 and December 2008 which can bring a different understanding on the relationship in view of the common stance found in literature. A study in this direction is not available for Zimbabwe though this is an important area of debate at the moment. The nature of their relationship is not yet clear both from literature and in the Zimbabwean context.
The remaining sections of this paper are organized as follows: section 2 gives the empirical review, section 3 explains data and methodology issues, Section 4 discusses the empirical results and the last section concludes the paper and presents a gateway for further research.

2. REVIEW OF LITERATURE

2.1 Empirical Review

This section examines the relationship among stock market performance, interest rates and exchange rates. The aim is to show the perceived relationships and the findings in literature which attest to the fact that the relationship is not yet clear.

Dimitrova (2005) examined link between the stock market and exchange rates using a multivariate, open-economy, short-run model that allowed for simultaneous equilibrium in the goods, money, foreign exchange and stock markets in the United States and the United Kingdom over the period January 1990 to August 2004. Their results showed that a depreciation of the

currency negatively affects the stock market and an appreciation would boost the stock market. Findings made in this paper were dismissed by Beirne et al (2009) who later found that exchange rates' effect are mixed. Karoui (2006) tested the interaction between equity volatilities and foreign exchange rates for emerging countries and whether the variation in foreign exchange rate would cause a variation in the stock markets. Their results agreed with Muktadir Al-Mukit (2012) who showed that a positive transmission mechanism existed between volatilities in equity and foreign exchange rates markets and the relationship was significant. According to Beirne et al (2009) there was a significant positive effect of stock market returns on mean returns in each sector and that interest rates and exchange rates had a significant effect on stock market returns (negative and mixed, respectively). Findings by Agrawal, Srivastav and Srivastava (2010) on the relationship between Nifty returns and Indian Rupee/ USD exchange rates contradict Md-Yusuf and Abd Rahman (2012). Their results showed that Nifty returns and exchange rates were non-normally distributed; exchange rates and Nifty returns were stationary at the level form. Negative correlation between the two variables was found to exist. Granger causality results, in contradiction to Muktadir Al-Mukit (2012), showed that there was unidirectional relationship moving from exchange rates to stock market returns (an increase in stock market returns caused a decline in exchange rates – the converse was not found) and variables were cointegrated as such a one percent increase in exchange rate and in interest rate contributes 1.04% increase and 1.71 % decrease in market index respectively. According to Muktadir Al-Mukit (2012), there is unidirectional causality from market index to exchange rate and from interest rate to market index. Results by Md-Yusuf and Abd Rahman (2012) contradicted Muktadir Al-Mukit (2012) as they confirmed the existence of a bi-directional causality between equity market and exchange rate in the industrial and finance sectors only. Unidirectional effect ran from interest rates to exchange rates (interest rates would be used to correct exchange rates). Zia (2011) found no evidence of both short and long run relationship existing between stock market index and exchange rates and there was no causal relationship. These results are different from those in the following year by Muktadir Al-Mukit (2012) which showed a unidirectional relationship and Dimitrova (2005) who found a mixed relationship.

Therefore their findings are not conclusive.

The causal link between the exchange rates and stock prices does not exist according to Nath and Samanta (2003) using Indian data. Damankeshideh and Shanasaei (2013) also questioned the impact of exchange rate uncertainty on stock market index. Findings revealed that the impact of all explanatory variables except GDP on the Stock Index was negative. Their findings are not consistent with Muktadir Al-Mukit (2012) but they are in agreement with Dimitrova (2005). Mlambo et al (2013)'s findings contradicted Karoui (2006), their study found a weak relationship between currency volatility and stock market performance. Prime overdraft rate and total mining production were found to have a negative relationship on currency volatility. US interest rates had a positive impact on market capitalization. But their results were consistent with Beirne et al (2009) who also found that interest rates had a negative impact on the stock market. Jamil and Ullah (2013) argued that the relationship between the stock market returns and exchange rates is short run in nature which is not consistent with earlier results by Maku, and Atanda (2010) while it confirms earlier findings by Karoui (2006) that exchange rates have a significant impact on stock returns using the Vector Error Correction Model.

Studies by Zia and Rahman (2011) and Muhammad and Rasheed (2011) confirmed the absence of both short run and long run relationship between stock prices and exchange rate. Jamil and Ullah (2013) support the findings of no long term relationship between exchange rates and stock prices. Menike (2006), Sekmen (2011) and Khan and Yousuf (2013) contradicted the preceding studies by providing evidence of a negative long run relationship while Muktadir Al-Mukit (2012) a positive long term relationship. Khan and Yousuf (2013) found a positive long term relationship exists between interest rates and stock market but their study contradicts findings by Amara et al (2013) which showed a negative long term relationship. Adel (2004) confirms the existence of a long run relationship between stock prices and variables like exchange rates and interest rates.

2.2 Chapter Summary

The following key observations were made on the interactions between variables in this paper. The relationship between exchange rates and stock markets performance and between interest rates and stock markets was not conclusive. There is no definite direction suggested on the relationship in both the long and short run, the causal link is also not clear. Some researchers suggested no causal link, bidirectional relationship or unidirectional link. Variables were found to converge to long run equilibrium and in some cases there was no long run relationship. The impact of the dependent variables used in this research on the performance of the stock market was also mixed. In some cases no impact was found while some studies reported a significant impact. Some findings reported a positive impact and in some cases the impact was negative. Several researchers attest to these assertions which include: Bahmani-Oskoee and Sohrabian (1992); Mok (1993); Karoui (2006); Jamil and Ullah (2013); Beirne et al (2009); Mlambo et al (2013); Nath and Samanta (2003); Muktadir Al-Mukit (2012); Zia (2011). Literature fails to therefore provide a general consensus on the relationship and the direction in which the variables are related. Literature shows that models or tests used by researchers include: Autocorrelation, stationarity, multicollinearity, heteroskedasticity and granger causality, four-variate GARCH-mean model, Engle-Granger Co-integration test, multivariate vector auto regression (VAR), EGARCH model and the VECM. But what literature is agreeing is that a relationship exists

among these variable and so this warrants further examination for a developing nation like Zimbabwe. The next section describes the methodology that had been employed to test the relationship among the variables used in this study.

3. METHODOLOGY

3.1 Data

The data used in this research consists of monthly observations on exchange rates, interest rates and the main industrial index for the Zimbabwe stock exchange. The exchange rate is the official rate of one Zimbabwe dollar to United states dollars as published by the Reserve bank of Zimbabwe, interest rates are composed of Treasury bills (TBrate), Bank rate (Brate), Deposit rates (Drate). Data used in this research were collected from the Reserve Bank of Zimbabwe statistics and reports. All variables have been changed to their natural logarithms to address the problem of multicollinearity. Our study covers a 29 year period from January 1980 to December 2008. Dummy variables are employed covering the different exchange systems that were witnessed during the review period. The dummies allowed the researcher to give an in-depth examination of the impact of the exchange rate on the stock market performance.

3.2 Model Specification

In testing the relationship among the variables the study employs the techniques from the Vector error correction model, modified Dickey fuller test and Johansen co-integration. The stock market performance is expressed as a function of exchange rate (EX), Treasury bill rate (TBrate), Bank rate (Brate), Deposit rate (Drate) and exchange rate dummies (D_{exrate}).

$$SMP_1 = f(Ex, TBrate, Drate, Brate, D_{exrate}) \quad (1)$$

The specific model is expressed hereunder:

$$LnSMP_t = \beta_0 + \beta_1 LnEx_t + \beta_2 LnTBrate_t + \beta_3 LnDrate_t + \beta_4 LnBrate_t + \beta_5 D1_t + \beta_6 D2_t + \beta_7 D3_t + \beta_8 D4_t + \varepsilon_t \quad (2)$$

Where:

β_0 is a constant, and β_1…….β_8 are measures of the level of sensitivity of each independent variable to the dependent variable and ε_t is the error correction term.

The values for dummy variables are capturing the periods in which notable changes were made to the exchange rate arrangement which would present a possible impact in the way the stock market performed. The dummies, $D1_t$ $D2_t$ $D3_t$ and $D4_t$ respectively, capture the effects of different exchange rate arrangements on stock market performance for the periods in which there was a currency peg (January 1982 – December 1990), export related rates (January 1991 – June 1994 and April 2003 – June 2006), Flexible arrangement (July 1994 – March 1999 and May 2008 – December 2008) and fixed exchange rate (April 1999 – March 2003 and July 2006 – April 2008). The dummies take binary values having values of 1 when a certain arrangement was in place otherwise it would take a value of 0.

3.3 Data Analysis Techniques

In order to examine the interactions among the variables in both the short and the long term our estimations proceeded as follows: first the presence of multicollinearity was tested using pair wise correlation and any higher order correlation was corrected using modified Dickey-Fuller test. The stationarity of our series was tested using the modified Dickey-Fuller test because it was found to produce superior results than the ADF test.

It includes a lagged variable for the dependent variable in the analysis. In conducting the stationarity tests we set the following hypothesis with its alternative: H_0: $\mu=0$ (there is unit root) against the one sided alternative H_1: $\mu<0$ (series is stationary). The null hypothesis that Y_t is non-stationary time series is rejected if the value(s) of μ are less than the MacKinnon critical values. See the work by Girma (2012), Kumar (2011) and Hosseini, Ahmad and Lai (2011).

$$\Delta Y_t = \alpha + \beta T + \mu Y_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta Y_{t-1} + e_t \quad (3)$$

Where:

Y_t is the time variable in period t, T is the time trend, Δ is the difference parameter, e_t is the error term disturbance with mean zero and variance of sigma squared. The values of i start from 1 to k which is the number of lags. If the number of lags increases then there is a need to estimate additional parameters which results in loss of degrees of freedom. Our variables showed a clear upward trend therefore the researcher used a model with both a constant and time trend.

The VECM was used check the order of lag selection. The number of lags was based on the Akaike's Information Criteria (AIC), see Girma (2012) and Adel (2004); Schwarz Bayesian information criterion (SBIC) method, Hannan-Quinn Information Criterion (HQIC) method and Sequential likelihood ratio (LR). The researcher then proceeded to test whether variables

converged to a long run equilibrium using the Johansen Cointegrating rank, Hosseini, Ahmad and Lai (2011) using the following model:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + A_p y_{t-p} + Bx_t + \mu_t \quad (4)$$

Where: y_t is a k – vector of I(1) variables, x_t is a n-vector of deterministic trends and μ_t is a vector of innovations. The model used the trace test statistics and the maximum eigenvalue test statistics to determine the number of co-integrating vectors at both 1% and 5% levels of significance. The researcher used the results from VECM to explain both the direction of causality and long run relationship among variables. In capturing the short and long run relationship among the cointegrated variables we used a VECM relationship as follows:

$$\Delta X_t = \gamma_1 (Y_{t-1} - \mu - \beta X_{t-1}) + e_{1t} \quad (5)$$

$$\Delta Y_t = \gamma_2 (Y_{t-1} - \mu - \beta X_{t-1}) + e_{2t} \quad (6)$$

Where μ represent the error correction terms making it possible to reach long run equilibrium and hence detect granger causality. The factors γ_1 and γ_2 capture the long run causality relationship among the variables. The variables will be taken to be independent where γ_s are not statistically significant. If γ_1, and not γ_2, is statistically significant then the decision rule is that there is unidirectional causality running from Y to X. Bidirectional causality exists where both γ_s are statistically significant.

4. EMPIRICAL RESULTS

4.1 Descriptive Statistics

This section gives a summary of statistics and results from pair-wise correlation in tables (1A) and (2A) respectively in the appendix. We explain the key observations in the data for the period from 1980 to 2008.

According to table 1 the monthly average for the variables was between 0.19 to 3.96 being the values for the period in which there was a flexible arrangement in the exchange rate system and value of the official exchange rate. The highest maximum value was observed for the bank rate being for the rates applicable in the second half of 2008 and the lowest minimum value was for the industrial index being for the month of June 1984.

The average exchange rate was 3.96 per each United States dollar. The most volatile variables were the stock market performance and exchange rate as they exhibit a higher value for standard deviation. This confirms the frequent changes done to the exchange rate arrangement to stimulate growth in the economy, promote exports and industrial production. The ZSE was the most volatile due the inflationary pressure in the economy and the desire by investors to cushion themselves against inflation risk. The distributions for stock market performance, exchange rates, and bank rate were normal and others were non-normally distributed with kurtosis less than 3. All our variables are skewed to the right.

Table 2 shows that stock market performance had a strong positive relationship with the exchange rate. Weak association is reflected between the interest rates themselves and relationship between the stock market performance and the different exchange rate arrangements was mixed and weak with values less than 0.8. These findings can be compared to Muktadir Al-Mukit (2012), Karoui (2006), Agrawal et al (2010) who found a negative correlation, and Mlambo et al (2013).

4.2 Regression Analysis

4.2.1 Results from Unit Root Tests

In testing for unit root we used modified Dickey Fuller and our results in table 3A in the appendix showed that stock market performance, Treasury bill rates and exchange rates are stationary at all levels of significance while deposit rates and the fixed exchange rates arrangement were stationary at 10% level of significance. The number of lags for all variables was 1 with the exception of bank rate which had a lag of 3 and being stationary at both 5% and 10% levels of significance. Findings on stationarity of variables can still be compared with work by Maku and Atanda (2010), Nath and Samanta (2003), Muktadir – Al – Mukit (2012).

4.2.2 Results from Johansen Cointegration Tests

4.2.2.1 VECM Model – Entire Sample

This section presents results using the sample covering the full period under review (1980.1 – 2008.12). The researcher selected the number of lags. According to table 4A in appendix one our model uses 4 lags which was decided based on Schwarz Bayesian Information Criterion (SBIC) method, Hannan-Quinn Information Criterion (HQIC) method, and Sequential likelihood ratio (LR) test all chose the lag order of 4 as indicated by the asterisk (*). Results in table 5A show that our variables were moving towards a long term equilibrium and that there were two Cointegrating vectors which shows an identification problem as such one equation was chosen which is closer to what is found in economic theory, see Hossini et al (2011) and Nath and Samanta (2003).

The adjustment parameters (table 7A) and the beta coefficients (table 6A) all have the right signs. The level of significance was tested at 5% and 10% and results show that adjustment parameters for stock market performance and all interest rates were significant while the adjustment parameter for exchange was insignificant. This means that exchange rates and stock market performance did not move to long run equilibrium as was the case between interest rates and stock market performance. These results are consistent with findings by Zia and Rahman (2011), Jamil and Ullah (2013) and Muhammad and Rasheed (2011). Findings suggest that Treasury bill rates would be pulled down to equilibrium

towards the level of stock market performance each time they start from a level above equilibrium. They would adjust at a rate of 1.3% per month. The level of deposit rates was found to be above equilibrium but this would taken back towards the level of stock market performance at a rate of 1.4% per month which was consistent with results by Adel (2004).

Using the VECM model results further (tables 6A and 7A) show that the level of stock market performance was positively impacted by the levels of exchange rates (especially during the period between July 1994 – March 1999 and May 2008 – December 2008) and deposit rates while a negative impact came from Treasury bills. The changes in the exchange rate regimes in other periods did not have any significant impact on the performance of the stock market. Bank rates had a weak positive effect on stock market performance. Results by Khan and Yousuf (2013) support the existence of a positive impact from interest rates. The negative impact from interest rates may be due to the fact that when monetary authorities increase Treasury bills investors would be tempted not to put additional investments in the stock market and those with existing investments in the stock market would start to make withdrawals and put their funds into risk free assets. The deposit rates failed to reduce stock market activity as most of the people in the Zimbabwean economy would not put their money in banks in form of deposits. The behavior of exchange rates was such that any appreciation of the exchange rates would make imports cheaper and exports expensive.

Appreciation of the local currency means importing companies' production costs would fall as such their earnings would increase while those for exporting companies would fall. In the Zimbabwean economy the rate of exchange depreciated and the expectation was that stock prices would fall especially for importing companies. But the reality on the stock market showed that performance soured which could indicate that Zimbabwean companies were net exporters during the period under review. But other factors are also important in explaining the movements in stock prices. The implications are that for the Zimbabwean economy the behavior of exchange rates was consistent with theory as stock prices in. This kind of behavior from variables was further interrogated by splitting the data into two periods to check if our parameters changed during the period of low inflation and the period of hyperinflation. This is in line with the developments in the Zimbabwean economy after 1999.

Our results using VECM also explain the short run dynamics between stock market performance, exchange rates and interest rates. Stock market granger causes the level of exchange rates and interest rates. This shows that stock market was important in predicting the levels of the two macroeconomic variables in the short term. Causality moves from stock market performance to Treasury bill rates and not the other way round but the relationship between stock market performance and two variables (exchange rates and deposit rates) was bidirectional. Bidirectional causality was also present between exchange rates and deposit rate while unidirectional causality moved from exchange rates to Treasury bills and from bank rates to exchange rates. The levels of stock market performance, bank rates and deposit rates granger causes themselves and this is evidence that they can be used to predict their own future levels in the short term. The level of bank rates was found to granger cause the level of flexible exchange rates. The short and long run relationship among the variables is important for example any positive shift in the stock market performance will result in a fall in Treasury bills rates over the long term. Short run movements in exchange rates will have a positive impact on stock prices both in the short and long term.

We also proceeded in testing for the presence of structural breaks and our results in table 1 after conducting stability test showed that there was a structural break from February 1999 up to December 2008. This is the same time that the country experienced hyperinflation. Further analysis of the above results was done to check if there was a significant change in variables. Our results now relate to two sub samples one during which inflationary pressures were low and one in which there were severe inflationary pressures in the economy. Results from Chow test are presented below:

Table 1: Results on stability tests

RSS_R	RSS_{NR}	K	n	F	F(2, 340)
893.41	829.50	2	348	13.25	3

Stability tests were conducted using monthly time series data from 1980 to 2008. F-tests were done where RSS_R is residual sum of squares for all observations, RSS_{NR} is the residual sum of squares for two subsamples combined, k is the number of restrictions, hypothesis was tested at 5% and n is number of pairs.

Following the results in table 1, we analyzed the behavior of our variables for two sub samples: January 1980 (1980.1) to January 1999 (1999.1) and February 1999 (1999.2) to December 2008 (2008.12). We proceed by investigating the Cointegration relationship during these two periods to verify the relationship between stock market performance with exchange rates and interest rates. Our findings are presented in the appendix and explained in the sections below.

4.2.2.2 Short Run Relationship - Causality

Findings using the first sub sample show that there was unidirectional causality moving from bank rate to stock market performance, the stock market granger causes interest rates (treasury bills and deposit rates) and exchange rates. The level of bank rates and treasury bill rates granger causes exchange rates and deposit rates respectively. All the four variables had predictive power, in the short run, to their own levels during the period of low inflation. During the period of hyperinflation results

were different from those found using the period of low inflation. For instance bidirectional causality was present between stock market performance and exchange rates (Mazila and Hamish, 2012), between bank rate and deposit rates, while unidirectional causality was present between stock market and interest rates like treasury bills and bank rates moving from the former to the later, causality moved from treasury bills to deposit rates, from exchange rates to treasury bill rates and from bank rates to exchange rates. The variables which granger causes themselves were stock market performance, bank rates and treasury bill rates. Results show that during the period of hyperinflation exchange rates and stock market performance were important in predicting the levels of stock market performance and interest rates respectively. Stock market performance was able to incorporate changes in interest rates but it failed to take into account the changes in exchange rates and stock market performance was important in explaining its own level in the two sub samples.

4.2.2.3 Long Run Dynamic Relationship

Results in the appendix (tables 8A, 9A, 10A, 11A) showed that exchange rates, Treasury bill rates and deposit rates had a negative relationship while bank rate had a positive relationship with stock market performance during the period of low inflation. The relationship was however significant for bank rates and Treasury bill rates while other variables were not significant. Stock market performance converged to long run equilibrium with bank rates which adjusted at a rate of 1.4% per month. Other variables had wrong signs and their relationship with stock market was analyzed in the short term using the causality approach. During the period of hyperinflation the signs for the coefficients of our variables changed. Exchange rates and deposit rates turned out be significant and their impact on stock market performance changed from being negative during the period of low inflation to being positive during the period of hyperinflation. Treasury bills and Bank rates maintained their positive signs but later turned out to be insignificant while the former remained significant. During the same period convergence to long run equilibrium for exchange rates, Treasury bill rates and deposit rates occurred at 1.3%, 1.5% and 1.8% within a period of 8 months respectively.

The negative relationship with stock market performance exhibited by Treasury bill rates is consistent with theory because when the rate rises investors withdraw their money from stock markets and put it in the money market which is risk free. This means capital and money market were substitutes in the long term. This finding is consistent with results by Menike (2006), and Okpara (2010), Kuwornu and Owusu (2011) but they contradict Sohail and Hussain (2012) who found a mixed effect and Kuwornu (2012) who found a negative effect. Increasing deposits rate had the same effect on stock market performance like treasury bills during the period of low inflation but their relationship was insignificant and deposits rates lacked predictive power on stock market performance in the short run. This shows that the monetary authorities made efforts during the two sub samples to attract funds from investors in order to raise funds for financing government recurrent expenditure as the country was sinking due to the economic crisis.

Bank rates had significant impact on stock market performance both in the long and short run during the period of low inflation. This may be explained by fact that as the monetary authorities increased the bank rate financial institutions would be deterred from being inefficient as such they improved on their performance levels which would translate to gains in their share price. On the other hand financial institutions had excess money balances which they would still use to finance stock market activities as such raising the bank rate was not effective for most of the listed financial institutions. During the hyperinflationary period changing the rate at commercial banks borrow from the reserve bank was not effective. The raising of bank rates is rendered effective where firms are dependent on financial institutions for funding otherwise the rate becomes ineffective where firms make withdrawals from sources outside the banking system.

During the period of hyperinflation exchange rates were significant in both the short and long term and the positive sign means that favorable change in exchange rates would increase stock market performance. Thus an increase in the rate of exchange would result in high stock prices on the market. Findings are consistent with Kuwornu (2012), Maysami et al (2004) but they are contradict Khan and Yousuf (2013), Damankeshideh and Shanasaei (2013) and Sangmi and Hassan (2013). In the Zimbabwean economy the value of the local currency worsened during the same period and the expectation was that exports would become cheaper and stock performance would increase as firms' revenues increase. On the other hand a devaluation of the currency increases import prices and lowers both profits and stock prices. The net effect of devaluation is dependent on which of the factors is stronger. Findings showed that Zimbabwean firms were net exporters during the period of hyperinflation which is consistent with Haque and Sarwar (2012).

Again an increase in deposit rates would attract more funds into the money market and stocks are expected to fall but this was not the case in the Zimbabwean scenario as stock continued to rise. This is evidence enough that stock market performance was driven by other factors during the same period. The different signs for the different forms of interest rates used in this research confirm the findings in literature which failed to explain the relationship between interest rates and stock market performance. Literature shows that the relationship is negative in the short term and positive in the long term, Muktadir (2012) and Abdulrahim (2011). The positive relationship between interest rates and stock market performance can be explained by the fact that any increases in interest rates accrued to financial institutions

and they became the beneficiaries as such their stocks rose and pushed the index upwards.

5. CONCLUSIONS AND POLICY IMPLICATIONS

This research aimed to empirically examine the short and long run relationship between stock market performance and exchange rates and interest rates using the Zimbabwean monthly time series data from 1980-2008. Our results show that both short and long run relationships exist among the variables. Stock market performance and bank rate have a long run relationship during the period up to January 1999 and stock market had a long run relationship with exchange rates, Treasury bill rate and deposit rates during the hyperinflationary period. During periods of low inflation exchange rates and deposit rates were important in explaining stock market performance in the long term. In the short term stock market performance was useful in predicting the levels of exchange rates and interest rates and the movement was one way. Bank rates were able to help in predicting the levels of stock market performance and exchange rates. During the hyperinflationary period, in the short term, stock market performance can help predict the levels of exchange and vice versa. The same applied to bank rates and deposit rates which were useful in explaining the levels of one another. The predictive power of stock market performance over interest rates was unidirectional moving from the former to the later while the relationship between exchange and interest rates was bidirectional without considering a specific type of interest rate.

Findings showed that a robust stock market can be encouraged by lowering the Treasury bill rates by monetary authorities. The use of Treasury bill rates in promoting stock performance is not sensitive to the level of inflation. There is consistence during both periods before and after the structural break in February 1999. Efforts used by monetary authorities during the pre-hyperinflationary period to change deposit rates were fruitless because the beta coefficient was insignificant. High Treasury bill rates were useful in slowing down the economy while low rates would stimulate stock market activity. Exchange rates are sensitive to the inflationary pressures as such a devaluation is beneficial (promotes stock market performance) during the periods of hyperinflation where firms are net exporters but it reduces stock market performance where firms are net importers.

Therefore for Zimbabwe the focus should be placed on, during hyperinflationary periods, exchange rate and treasury bills in the long term if the aim is to stimulate stock market performance while interest rates are key variable during periods of low inflation. In the short term the bank rate is useful in predicting stock market performance while the exchange rate is important during hyperinflationary episodes. During period of high inflation investors can use information obtained on exchange rates to predict behavior of stock prices and vice versa. This is in contradiction to portfolio balance models and traditional models which supports unidirectional causality from stock prices to exchange rates and from exchange rates to stock markets respectively; stock prices can be used predict the level of Treasury bills and deposit rates. The level of bank rates is useful in predicting the level of exchange rates in the short term. During periods of low inflation stock market performance was useful in explaining the level of exchange rates, Treasury bills and deposit rate while the bank rates was useful in explaining the stock prices and exchange rates. Thus monetary policy instruments are useful is stimulating stock prices in Zimbabwe. Policies aimed at stabilizing the stock market are of benefit to Zimbabwean economy as it influences interest rates and exchange rates. Good policies on interest rates and exchange rates are useful in stabilizing the performance of the stock market. Any mismanagement of exchange rates and interest rates by monetary authorities destabilizes the stock market.

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APPENDIX

Table 1A: Results on summary statistics

Stats	LnSMP	Ln Ex	LnTB	LnBR	Ln DR	D1	D2	D3	D4
mean	3.86	3.96	3.11	3.52	3.31	0.31	0.23	0.19	0.20
max	62.1	45.34	6.26	9.16	6.33	1	1	1	1
min	-2.30	-0.46	1.19	1.50	1.15	0	0	0	0
range	64.4	45.80	5.08	7.65	5.18	1	1	1	1
sd	9.34	6.27	1.09	1.63	1.22	0.46	0.42	0.39	0.40
skewness	3.45	3.39	0.56	1.41	0.61	0.82	1.26	1.61	1.49
kurtosis	17.0	17.51	2.90	4.95	2.70	1.67	2.60	3.58	3.22
N	348	348	348	348	348	348	348	348	348

Source: Output from Stata 12, summary statistics using variables in logarithmic form: Stock market performance (SMP), Exchange rates (Ex), Treasury bill rate (TB), Bank rate (BR), Deposit rate (DR), and dummy variables as explained in section 3.2 capturing effect of different exchange rate arrangements.

Table 2A: Results on correlation Matrix

	SMP	ExRate	TBrate	Brate	DRate	D1	D2 D3 D4
SMP	1.00						
ExRate	0.99	1.00					
TBrate	0.03	0.03	1.00				
Brate	0.42	0.36	0.17	1.00			
DRate	0.12	0.10	0.80	0.43	1.00		
D1	-0.04	-0.04	-0.32	-0.15	-0.36	1.00	
D2	-0.03	-0.03	0.40	-0.07	0.24	-0.37	1.00
D3	0.13	0.11	-0.06	0.28	-0.03	-0.32	-0.26 1.00
D4	-0.03	-0.03	0.09	0.02	0.29	-0.34	-0.28 -0.24 1.00

Source: Output from Stata 12, correlation matrix for stock market performance, exchange rates, treasury bill rates, bank rates, deposit rates and dummy variables as already defined in table 1A.

Table 3A: Results on Modified Dickey Fuller (DF-GLS)

Variables	Optimal lags	Test statistics	
SMP	1	-23.032*	
ExRate	1	-24.37*	
TBrate	1	-4.27*	
Brate	3	-3.18***	
Deposit rate	1	-2.80**	
D4	1	-2.71**	
Critical values		Level	Value
		1%	-3.48
		5%	-2.89
		10%	-2.61

Source: Author's computation
Stationarity tests for stock market performance, exchange rate, bank rate, deposit rate and dummy variable for the period with fixed exchange rate (April 1999 – March 2003 and July 2006 – April 2008).
* = Reject null hypothesis at all levels of significance; ** = Reject null hypothesis at 10% level of significance
*** = Reject null hypothesis at both 5% and 10% levels of significance

Table 4A: Selection-order criteria

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-22230.9				2.0e+46	129.296	129.332	129.385
1	-17086.4	10289	64	0.000	2.9e+33	99.7583	100.078	100.562
2	-16678.2	816.39	64	0.000	3.9e+32	97.7571	98.3619	99.2755
3	-15520.9	2314.6	64	0.000	6.9e+29	91.4008	92.2902	93.6338
4	-15298.6	444.62*	64	0.000	2.7e+29*	90.4804*	91.6544*	93.4279*

Selection of number of lags using Akaike's Information Criteria (AIC), Schwarz Bayesian information criterion (SBIC) method, Hannan-Quinn Information Criterion (HQIC) method and Sequential likelihood ratio (LR).

Table 5A: Johansen Tests for Cointegration

maximum rank	parms	LL	eigenvalue	trace statistic	5%	critical value	1%	critical value
0	56	299.42197		136.9560		54.64		61.21
1	63	337.58543	0.19899	60.6291		34.55		40.49
2	68	357.33994	0.10850	21.1200*1		18.17		23.46
3	71	364.82659	0.04259	6.1467		3.74		6.40
4	72	367.89996	0.01771					

The number of Cointegrating equations determined using Johansen tests and trace statistic was used at both 1% and 5% level.

Results for VEC Model

Table 6A: Model using Entire sample (1980.1-2008.12)

Equation	Variable	Coefficient (β)	Standard error	z-statistic	p-value
Entire Sample (1980.1-2008.12)	SMP	1			
	Ex	2.33	0.207	11.23	0.000*
	TB	-7.38	0.743	-9.94	0.000*
	BR	0.60	0.861	0.70	0.484
	DR	3.97	0.913	4.35	0.000*
	D3	1.68	0.491	3.42	0.001*
	Constant	4.41			

*Significant at 5%.

Results for VECM model of entire sample for stock market performance, exchange rate, treasury bill rate, bank rates, deposit rate, deposit rates, dummy variable for Flexible exchange rate arrangement for periods July 1994 – March 1999 and May 2008 – December 2008.

Table 7A: Adjustment Parameters - 1980.1-2008.12

Variable	Ex	TB	BR	DR	D3
Alpha	-0.0078	0.013	0.0072	0.014	-0.0038
p-value	0.626	0.000*	0.051**	0.016*	0.144

*Significant at 5% **Significant at 10%

Results for adjustment parameters for the entire sample for stock market performance, exchange rate, treasury bill rate, bank rates, deposit rate, deposit rates, dummy variable for Flexible exchange rate arrangement for periods July 1994 – March 1999 and May 2008 – December 2008.

Table 8A: Model using First sub sample (1980.1-1999.1)

Equation	Variable	Coefficient (β)	Standard error	z-statistic	p-value
First Sub Sample (1980.1-1999.1)	SMP	1			
	Ex	-0.016	0.547	-0.03	0.977
	TB	-7.114	2.99	-2.38	0.017*
	BR	11.74	2.28	5.15	0.000*
	DR	-2.38	1.89	-1.26	0.208
	Constant	-6.92			

Results for VECM model for the period 1980 to 1999 (first sub sample) for stock market performance, exchange rate, treasury bill rate, bank rates, deposit rate, deposit rates. Significance levels were tested at 5% levels.

Table 9A: Adjustment parameters- 1980.1-1999.1

Variable	Ex	TB	BR	DR
Alpha	-0.0067	-0.0007	-0.014	0.0067
p-value	0.030*	0.859	0.000*	0.261

*Significant at 5%

Results for adjustment parameters using VECM model in stata for the first sub sample (1980-1999) for stock market performance, exchange rate, treasury bill rate, bank rates, deposit rate, and deposit rates.

Table 10A: Model using Second sub sample (1999.2-2008.12)

Equation	Variable	Coefficient (β)	Standard error	z-statistic	p-value
Second Sub Sample (1999.2-2008.12)	SMP	1			
	Ex	2.17	0.371	5.84	0.000*
	TB	-7.00	1.12	-6.24	0.000*
	BR	1.91	1.82	1.05	0.294
	DR	3.00	1.59	1.88	0.060**
	Constant	0.957			

Results for VECM model for the period 1999 to 2008 (second sub sample) for stock market performance, exchange rate, treasury bill rate, bank rate, deposit rate, deposit rates. Significance levels were tested at 5% levels (*) and 10% (**).

Table 11A: Adjustment Parameters - 1999.2-2008.12

Variable	Ex	TB	BR	DR
Alpha	-0.013	0.015	0.007	-0.018
p-value	0.709	0.002*	0.330	0.107

*Significant at 5% **Significant at 10%

Results for adjustment parameters using VECM model in stata for the second sub sample (1999-2008) for stock market performance, exchange rate, treasury bill rate, bank rates, deposit rate, and deposit rates.