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EFFECTS OF MACROECONOMIC VARIABLES ON STOCK MARKET PERFORMANCE IN RWANDA. CASE STUDY OF RWANDA STOCK EXCHANGE

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Abstract:
Countries all over the world are generally concerned about the performance of the stock markets due to its greater contribution to financial stability of the country and by extension economic growth. Through trading in securities in the stock market, the country is able to mobilize savings and channel it to viable investment opportunities which ultimately lead to expansion of GDP. Several studies have been carried out in Rwanda regarding the stock market performance but none looked at the macroeconomic effects on stock market performance in Rwanda. The study analyzed the effects of exchange rate, GDP growth rate, inflation (CPI) and interest rate (KRR) on stock market performance measured by market capitalization. The study used monthly time series data for a period of 6 years. Engel Granger Cointegration tests were carried out to determine the long run relationship between the variables respectively. The study adopted VAR method in analyzing the effects of the above macroeconomic variables on stock market performance. This involved computing impulse response functions and Variance Decomposition Analysis. The findings indicated that GDP, inflation and exchange rate are negatively significant in affecting stock market performance while interest rate is negatively insignificant. The study recommended that public awareness campaign on the importance of RSE should be carried out, industrialization should be encouraged to avoid high importation, money supply

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should be regulated to reduce inflation, Key repo rate should be lowered to encourage more borrowing for investment. This study will be important to the government in encouraging more investments through growth of RSE hence employment creation. It's also important to the management of RSE more so to the policy analysis department in strategic decision making and offering advice to the relevant stakeholders towards achieving growth of securities market. Lastly, the study will also add on the existing literature and act as a basis of reference for future researchers.

Keywords: macroeconomic variables, stock market performance, market capitalization, RSE, VAR analysis

JEL: B22, E02, E44, F40

1. Introduction

1.1 Background of the study

In a market economy, the role of the stock market is very important. The good functioning of the stock market is vital in the contemporary economy, in order to achieve an efficient transfer of monetary resources from those who save money toward those who need capital and who succeed to offer it a superior utilization; the capital market can influence significantly the quality of investment decisions. The gathering of temporary capitals that are available in the economy, the reallocation of those that are insufficiently or inefficiently used at a certain moment and even the favoring of some sectorial reorganization, outline the capital market's place in the economy of many countries, Shaw (2003).

Good functioning of the capital market determines the quality of the ensemble. Thus, for instance, the efficient allocation of resources, which is achieved by the help of the capital market, relies on the information obtained regarding the market prices. The inadequate functioning of the stock market mechanism as a component part of the capital market and eventually the lack of relevance of the stock market prices can generate errors inside the system which can alter its finality. In this case, the efficient allocation of resources will fail leading to failure of the capital market.

A well-functioning stock market may assist the development process in an economy through two important channels: boosting savings and allowing for a more efficient allocation of resources. Savings are presumed to increase as the stock market provides households with assets that may satisfy their risk preferences and liquidity needs (Taylor, 2007). Also, based upon the idea of the price mechanism, a well-

functioning stock market values profitable company's shares more than those of unsuccessful companies. That is, relative share prices in a well-functioning stock market may fundamentally reflect the status of a company compared to the other companies listed in the stock market, that is, the expected dividend growth and discount rates. Therefore, the price mechanism ensures the efficiency of utilizing current and future economic resources available to the economy in the sense that the cost of capital to the profitable company will be lower compared to the cost that the unsuccessful companies would face (Lamin, 1997). Thus, understanding the dynamic behavior of the stock market is crucial for financial analysts, macroeconomists, and policymakers.

There are two main theories that are prevalent in predicting the relationship between stock performance and economic factors: Capital Asset Pricing Model (CAPM) and Arbitrage Pricing Theory (ATP). Besides the customary equilibrium based Capital Asset Pricing Model, a number of multi factor asset pricing models have been constructed e.g., arbitrage-based model under Arbitrage Pricing Theory. According to Opfer and Bessler (2004) these models have been developed on the basis that the stock's Performance is caused by a specific number of economic variables. The capital asset pricing model (CAPM) has been criticized in the recent years due to its incapability to explain the pricing of risky assets.

A multifactor model can be either from an arbitrage pricing theory (APT) or from a multi-beta CAPM perspective. Theses multi factor models have been developed with the assumption that stock Performance are based upon several economic factors which include market performance as well as other factors, and can be grouped into sector wide and macroeconomic forces.

Today, many countries in the world compare their economies based on the functioning and performance of the stock market. Stock market plays an important role on investment promotion and economic prosperity of the country, Bragg (2012).

In the United States of America, the stabilization of securities market began with the passing of the "Blue Sky Law" in 1911 in the Kansas State to protect investors through anti-fraud provisions, regulation of brokers, dealers and registration of securities. The technology innovation in United States made them the biggest economy in the world. Information Technology led to paradigm shift and revolutionized the structure and functioning of Capital Markets by reducing information asymmetry and assisting faster settlements of transactions. After that establishment of technology on trading, the investors increased from 5% up to 12%. Today the investors in New York Exchange is the biggest one in terms of market capitalization and value of turn over caused by the investment promotion of NSE William and Ford, (2009).

1.2 Statement of the problem

The performance of the stock market generally determines the economic performance of any country. An increasing Share index overtime indicates stability of the economy while a falling share index indicates an unstable economy. With the introduction of free and open economic policies and advanced technologies all over the world, investors are finding easy access to stock markets around the world. This increasing importance of the stock market has motivated the formulation of many theories to describe the working of the stock markets (Gupta, Chevalier and Sayekt, 2008). Several studies have been carried out on stock market performance both in developed and developing economies. These studies however have different views on the determinants of stock market performance.

Maku and Atanda (2010) revealed that the stock market performance in Nigeria is mainly affected by macro-economic forces in the long-run in Nigeria. Ting et al. (2012) established that Kuala Lumpur Composite Index is consistently influenced by interest rate, money supply and consumer price index in the short run and long-run in Malaysia. Mehwish (2013) established that there is a negative relationship between real interest rate and stock market performance in Pakistan. Jahur et al. (2014) established macro-economic variables such as Consumer Price Index, Interest Rate have significant impact on the stock market performance in Bangladesh. Wanjala (2014) found that there is a relationship between stock market performance and macroeconomic variables in Kenya. Gatuhi (2015) found mixed significant results on various sectors regarding the relationship between macroeconomic variables: exchange rate, inflation and money supply on stock market performance in Kenya.

From these results, there is lack of a consensus concerning the effect of macro-economic variables on stock market performance. This therefore raises the question of what are the macroeconomic determinants of stock market performance, the causal relationship and the magnitude of the effects of these macroeconomic variables on stock market performance.

1.3 Objectives of the Study

1.3.1 General Objective

To examine the effects of macroeconomic variables on stock market performance in Rwanda

1.3.2 Specific Objectives

1. To determine the effects of Gross Domestic Product on stock market performance in Rwanda.

2. To establish the effects of interest rates on stock market performance in Rwanda.
3. To analyze the effects of exchange rate on stock market performance in Rwanda.
4. To determine the effects of inflation on stock market performance in Rwanda.

1.4 Research Hypotheses

The following hypotheses will guide this research based on the specific objectives.

1. $Ho1$: Gross Domestic Product has significant effect on stock market performance in Rwanda.
2. $Ho2$: Interest rate has significant effect on stock market performance in Rwanda.
3. $Ho3$: Exchange rate has significant effect on stock market performance in Rwanda.
4. $Ho4$: Inflation has significant effect on stock market performance in Rwanda.

2. Literature Review

2.1 Theoretical Literature

A. Arbitrage Price Theory (APT)

The theory of asset pricing, in general, demonstrates how assets are priced given the associated risks. The Arbitrage Price Theory (APT) suggested by Ross (1976) has been an influential form of asset price theory. APT is a general form of Sharpe's (1964) capital asset price model (CAPM). While the CAPM suggests that asset prices or expected Performance is driven by a single common factor, the APT advocates that they are driven by multiple macroeconomic factors. Mathematically APT can be expressed as:

$$Rit = rif + \beta iXt + \varepsilon t \quad \text{.....2.2}$$

Where, Rit is the performance of the stock i at time t, rif is the risk free interest rate or the expected performance at time t. Xt is a vector of the predetermined economic factors or the systematic risks while βi measures the sensitivity of the stock to each economic factor included in Xt , εt is the error term, represents unsystematic risk or the premium for risk associated with assets that cannot be diversified.

From the equation 2.2, Ross (1976) argues that there is a positive relationship between expected returns of an asset, $E(Ri)$ and the measure of risk of an asset, βi that is the expected performance increases as investors accept more risk, assuming all assets in the market are priced competitively. APT however does not specify the type or the number of macroeconomic factors for researchers to include in their study. This theory

will form the main reference for this study since it has been adopted by several previous researchers.

2.2 Empirical Literature

Joseph (2012) studied the effect of foreign exchange and interest rate changes on UK firms in the chemical, electrical, engineering and pharmaceutical industries for the period of 1988 to 2000. The study employed two different measures of foreign exchange rate, along with a measure of interest rate changes. The results revealed that sector Performance were more negatively affected by interest rate changes than by foreign exchange rate changes. The negative effects of interest rate changes and foreign exchange rate changes appeared more evident for the electrical and engineering sectors whereas these effects were positive for the pharmaceutical sector. Additionally, the results at the portfolio-level were generally similar with those based on the firm-level analysis, except that the short term foreign exchange rate impact was very weak at the portfolio level.

Maku and Atanda (2010) conducted a critical analysis of the long-run macroeconomic determinants of stock market performance in Nigeria between 1984 and 2007. The Augmented Engle-Granger Co-integration test result revealed that the stock market performance in Nigeria is mainly affected by macroeconomic forces in the long-run. However, the empirical analysis showed that the Nigerian Stock Exchange all share index is more responsive to changes in exchange rate, inflation rate, money supply, and real output. The study recommended that investors should pay close attention to exchange rate, inflation, money supply, and economic growth rather than Treasury bill rate in the long-run in their investment decision.

Meywish (2013) analyzed the macroeconomic determinants of stock market performance in Pakistan using quantitative time series data from 1988 to 2008 by regression analysis method. The set of macro-economic determinants were; foreign direct investment as percentage of GDP, real interest rate, domestic credit provided by banking sector and value traded as percentage of GDP, whereas stock market performance was measured by market capitalization as percentage of GDP. The findings were that foreign direct investment and value traded have positive impact on stock market performance. It also highlighted that there is a negative relationship between real interest rate and stock market performance, whereas the banking sector development has no significant impact on stock market performance.

Barbic & Condic-Jurkic (2011) empirically investigated the relationship between stock market returns and macroeconomic variables in selected CEE countries. They used Johansen cointegration method to test for the long run relationships between stock

market index and some macroeconomic variable and Granger Causality test to gain more information about market efficiency. The result established a long run relationship between stock market indices and macroeconomic variables while the Granger causality reveals that there is no causal linkage between any macroeconomic variable and stock market index.

Stella (2017) analyzed the impact of macroeconomic indicators on the Nigerian Stock market performance using VAR model and granger causality tests to analyze the long run and short run dynamics of stock price movement and the macroeconomic variables with time series data spanning from 1981 – 2014. The results of Impulse response and Variance Decomposition showed that the response of all Share Index to one standard deviation in inflation, interest rate and real GDP were all fluctuating whereas its response to one standard deviation of exchange rate and Industrial Production Index were relatively stable overtime. The study recommended that the monetary authorities and policy makers should pay attention to changes in monetary aggregates in view of their sensitivity to stock price movements in Nigeria.

Prakash Kumar (2015) empirically examined the determinants of the stock market performance in Nepal using monthly data for the period of mid-August 2000 to mid-July 2014. The impact of major changes in politics and Nepal Rastra Bank's policy on lending against share collateral also was assessed. OLS results revealed that the performance of stock market respond positively to inflation and broad money growth, and negatively to interest rate. Stock market was also found to respond significantly to changes in political environment and the policy of Nepal Rastra Bank. This suggests that, in Nepal, share investors seem to take equity as a hedge against inflation and consider stock as an alternative financial instrument. Further, availability of liquidity and the low interest rates stimulate the performance of the Nepalese stock market.

The study by Flannery and Protopapadakis (2002) re-evaluated the effect of some macroeconomic series on US stock. Among these series, six macro variables, namely: balance of trade, housing starts, employment, consumer price index, M1 and producer price index seem to affect stock returns. On the other hand, two popular measures of aggregate economic activity (real GNP and industrial production) do not appear to be related with stock returns.

Dimitrova (2005) examined OLS multivariate model to determine relationship between exchange rates and stock prices in US and UK. The research tests the hypothesis that the enhancement in the stock market may lead to currency depreciation, while weak currency may lead to decline of financial market. She found positive relations between stock prices and exchange rate when stock price is the determining variable, but negative relation when exchange rate is the lead variable. Furthermore, it

concludes that stock prices have positive influence on the local output and inflation adversely relates to stock prices.

While studies like Floros (2004), Ugur (2005), Pesaran et al (2001), Crosby (2001), Spyros (2001), among others have found a negative relationship between inflation and stock Performance; Patra and Posshakwale (2006) and Lee and Wong (2000) among others reported a positive relationship between these variables.

Mongeri (2011) examined the impact of foreign exchange rates and foreign exchange reserves on stock markets performance at NSE using monthly time series data of NSE share index, foreign exchange rates and reserves for the period 2003-2010. The study established that foreign exchange rates had negative significant impact on stock market performance. Also, the study established that foreign exchange reserves had positive significant impact on stock market performance. The study also revealed that there is no significant relationship between Foreign exchange rates and foreign exchange reserves.

Ramadan (2015) while analyzing the relationship between the stock market and macroeconomic factors in two emerging economies (Egypt and Tunisia) for the period from January 1998 to January 2014 found that there is a causal relationship in Egypt between market index and consumer price index (CPI), exchange rate, money supply, and interest rate. The same goes for Tunisia except for CPI, which had no causal relationship with the market index. Results also revealed that the four macroeconomic factors are co-integrated with the stock market in both countries.

Tangjitprom (2012) stated that although the studies examining the causal relation between stock market and macroeconomic variables conclude different results, most of these studies agreed that there are significant relationships between macroeconomic variables and stock markets. These different results are due to different market regulations, investors, country location and other factors. Although macroeconomic variables are common, it is hard to generalize the results because the same variables have different impact in different economies (El-Nader & Alraimony, (2012). Bhunia (2012) and Pramod Kumar and Puja (2012) added that different periods will also result in different outcomes.

3. Research Methodology

3.1 Research Design

The researcher adopted quantitative research design because it involves systematic empirical investigation of observable phenomena via statistical or numerical data.

The study also sought to determine the causal relationship among the variables under study hence the adoption of causal research design. According to Kothari (2004), a causal research is used to explore the effect of one variable on another and this is consistent with this study which sought to establish the effect of macroeconomic factors and stock market performance. Secondary data was sourced from BNR, NISR and RSE data reports for the study period.

3.2 Model Specification

The study adopted the Arbitrage Pricing Theory model of stock market returns. The model for stock market performance and macroeconomic factors is expressed below.
Stock prices=f (macroeconomic factors)

$$R = \lambda o + \lambda 1 gdp + \lambda 2 if + \lambda 3 er + \lambda 4 ir + \varepsilon t$$

Where:
R=Expected performance of an asset
gdp =Gross domestic product
if =Inflation
er =Exchange rate
ir =Interest rate
εt =error term
λs measures the reward of bearing risk associated with economic factor fluctuations.

3.3 Data Analysis and Statistical Tests

The objective of this study was to examine the effects of selected macroeconomic variables on the stock market performance in Rwanda. This was achieved using the VAR model approach by computing the impulse response functions and Variance Decomposition Analysis. Before this, the study sought to determine the relationship between these variables by carrying out the cointegration tests and granger causality tests after testing for unit root.

3.3.1 Unit root test

This is the first step in a time series data analysis. This involves testing for stationarity of time series data in order to avoid suffering from spurious results that is committing type I or type II errors which may be misleading in decision making process. A stationary time series data is one in which mean, variance and auto covariance are constant for each given lag. (Chris Brooks, 2008).The study will use Augmented Dickey

Fuller Test to test for unit root for all the variables. The null hypothesis will be presence of unit root while the alternative will be absence of unit root. If the ADF value is greater than the critical values then the null hypothesis is rejected and a conclusion of stationarity of the variable is made otherwise no stationarity. The ADF test takes the following form of the equation, taking interest rate (^{ir}) as example

$$\Delta ir_t = a_1 + \gamma ir_{t-1} + a_2 t + \sum_{i=1}^{k} \alpha_i ir_{t-1} + \varepsilon_t$$

Where: $a_1$is intercept, t is linear time trend, k is the number of lagged first differences, and ε_t is error term. If γ is different from zero then the null hypothesis will be rejected otherwise it will be accepted.

3.3.2 Cointegration Test

There are two models for testing cointegration, Engel and Granger (1987) model and Johansen and Joselius (1990) model. Engle and Granger's model represents two step error correction processes while Johansen's method allows testing cointegration in the system in one step and doesn't require to carry errors from the first to second steps which result in more efficient estimators of cointegrating vectors. Another important implication is that Johansen method allows avoiding necessary assumption of endogenity/exogenity of variables in the model. The researcher will therefore use Johansen Cointegration test method to test for existence of long-term relationship (co-movement) between variables in a non-stationary series. Before testing for cointegration, it is important to determine the order of integration of the individual time series. A variable X_t is integrated of order d (1d) if it becomes stationary for the first time after being differenced d times (Hjalmarsson and Österholm, 2007). Cointegration also asserts that 1(1) can be estimated using OLS method and produce non spurious results.

3.3.3 Causality Test

Granger (1969) proposed a time-series data based approach in order to determine causality. Granger causality shows whether the past values of say V can be able to predict current or future values of T. Granger causality test is used to test the causal direction. It is also used to test for exogeneity and enables the researcher to decide whether to estimate the model using simultaneous or single equation. Granger causality test has been chosen in this paper for its favorable response to both large and small samples as evidenced by Gall, 1989, Salemi, 1982, Geweke et al., 1983. In this study, it is

predicted that the macroeconomic variables affect stock market performance. On the same breath stock market, performance could also have effect on one of the macroeconomic variables hence a bi-directional causality. Just in case the study estimates the model and gets a statistically significant association between macroeconomic variables and stock market performance, the study need to conduct the causality test to know the direction of causation. To establish whether macroeconomic variables cause stock market performance or it is bi-directional causation, the researcher will carry out a pairwise granger causality test of macroeconomic variables and stock market performance.

3.3.4 Vector Autoregressive (VAR) Model

Vector autoregressive (VAR) models have a long tradition as tools for multiple time series analysis. Vector autoregressive models became popular for economic analysis when Sims (1980) advocated them as alternatives to simultaneous equations. One of the critics of the model is that it has no theory foundation. VAR is a theoretical model that uses observed time series properties of the data to forecast economic variables.

The general form of VAR is the following:

$$\propto_t = \sum_{i=1}^{k} A_i \propto_{t-1} + \varepsilon_t$$

Where, $\propto_t$: is column vector of observations at time "t" on all the variables in the model. Σ: summation of endogenous variables at time "t", $\propto_{t-1}$: Lag of endogenous variables and ε_t: are the impulses or shocks.

Under vector autoregressive (VAR) model all the variables will be treated symmetrically; each variable has an equation explaining its evolution based on its own lags and the lags of all the other variables in the models. This study will compute Impulse response and Variance Decomposition forms of VAR analysis to analyze the objectives.

4. Research Findings

4.1 Unit root test

In order to avoid the risk of getting spurious results, the researcher tested for stationarity of the data using the ADF test method with trend and intercept.

Table 1: Unit root test results

	Augmented Dickey Fuller Test	
	Probability at level	probability at 1st dif
EXR	0.9985	0.0002
GDP	0.4995	0.0000
INF	0.1363	0.0197
IR	0.5669	0.0000
MC	0.4805	0.0000

Source: Researcher, 2018

The researcher tested the following hypothesis for stationarity of data set.

Ho : Presence of unit root in the data set

$H1$: No unit root in the data set

The decision criterion is that the null hypothesis is rejected when the probability is less than 5% otherwise accepted. From the results in the table above, the probabilities for all variables at level are greater than 5% hence we accept null hypothesis of presence of unit root hence no stationarity at level. In the first difference, the probabilities for all variables are less than 5% hence we reject null hypothesis of presence of unit root meaning that there is no unit root in the data set hence stationary. Therefore, the data set becomes stationary at first difference.

4.2 Cointegration test

The researcher carried out Engel Granger test of cointegration and the results are shown below.

Table 2: Cointegration results

Date: 02/28/18 Time: 05:23
Series: EXR GDP INF IR MC
Sample: 2010M01 2016M12
Included observations: 83
Null hypothesis: Series are not cointegrated
Cointegrating equation deterministic: C
Automatic lags specification based on Schwarz criterion (maxlag=11)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
EXR	-0.898871	0.0054	-2.868960	0.0008
GDP	-2.489667	0.0325	-11.59115	0.0356
INF	-1.620215	0.0064	-6.075078	0.0204
IR	-2.404062	0.0455	-12.53899	0.0037
MC	-2.821249	0.0071	-14.73490	0.0041

*MacKinnon (1996) p-values.

Source: Researcher, 2018

From the table above, the null hypothesis is that series are not cointegrated. This hypothesis is rejected if the probability of the variables is less than 5% otherwise accepted.

The probability values for all the variables both at t-statistic and z-statistic are less than 5% hence the null hypothesis is rejected meaning the series are cointegrated, there is a long run relationship between the variables

4.3 Multiple Regression Analysis

Regression analysis describes the magnitude of change of dependent variable per unit change of independent variable.

Table 3: Multiple Regression Results

Dependent Variable: MC
Method: Least Squares
Date: 02/28/18 Time: 04:46
Sample: 2010M01 2016M12
Included observations: 83

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXR	-0.014595	0.003025	-4.824927	0.0000
GDP	-0.508791	0.139474	-3.647919	0.0005
INF	-0.556534	0.145240	-3.831821	0.0003
IR	-0.865821	0.580608	-1.491232	0.1399
C	44.50191	4.643092	9.584543	0.0000
R-squared	0.703254	Mean dependent var		22.91181
Adjusted R-squared	0.672651	S.D. dependent var		2.205596
S.E. of regression	1.746950	Akaike info criterion		4.011970
Sum squared resid	238.0431	Schwarz criterion		4.157684
Log likelihood	-161.4968	Hannan-Quinn criter.		4.070510
F-statistic	13.17720	Durbin-Watson stat		0.351617
Prob(F-statistic)	0.000000			

Source: Researcher, 2018

From the results in the table above, it is evident that Exchange rate, GDP and inflation have significant effects on Market capitalization since the probabilities of 0.0000, 0.0005 and 0.0003 respectively are less than 5% while interest rate have insignificant effect since the probability value of 13.99% is greater than 5%. The coefficients of EXR, GDP, INF and IR are -0.04595, -0.508791, -0.556534, -0.865821. The constant value is 44.50191.the multiple regression model adopted in this study can therefore be fitted as;

$$R = 44.50191 - 0.508791gdp - 0.556534\inf - 0.014595exr - 0.865821ir + \varepsilon$$

4.4 Impulse Response Functions

The researcher computed the impulse response functions graphs to determine the response of one variable due to its own shock or due to the shock of another variable. The results are presented in the next page.

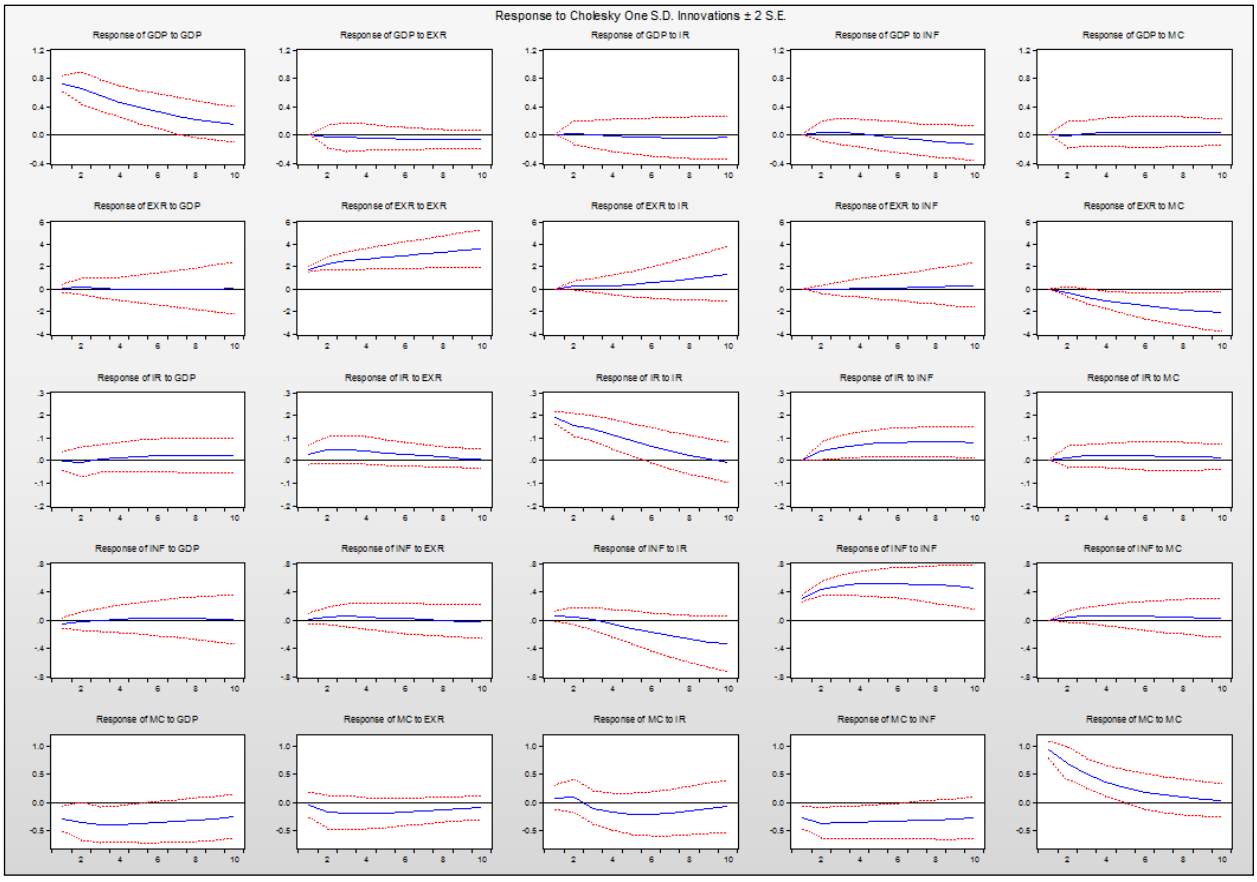

Figure 1: Impulse Response Functions

Source: Researcher, 2018

The figure above shows the impulse response functions. The last row shows the response of Market Capitalization which is a measure of stock market performance to its own shocks and those of other variables under study. The results show that MC responds negatively to the shocks of other variables and positively to its own shocks shown by the side in which blue line lies with reference to the origin black line.

4.5 Variance Decomposition Analysis

The variance decomposition indicates the amount of information each variable contributes to the other variables in the auto regression. It determines how much of the forecast error variance of each of the variables can be explained by exogenous shocks to the other variables. The results of VDA of Market capitalization are shown in the table in the next page.

Table 4: Variance Decomposition Analysis Results of Market capitalization

Period	S.E.	GDP	INF	IR	EXR	MC
1	0.722354	8.744589	6.326019	1.347631	0.252164	83.32960
2	0.975779	11.49583	10.60627	1.864572	1.905673	74.12765
3	1.121526	15.22376	13.73824	1.576617	2.724867	66.73652
4	1.215406	17.87840	16.53745	1.996488	3.235056	60.35260
5	1.278127	19.91422	18.89828	2.638217	3.546328	55.00295
6	1.321450	21.50307	20.87059	3.178881	3.724807	50.72266
7	1.352494	22.75666	22.52504	3.501925	3.819478	47.39690
8	1.375761	23.74857	23.91853	3.617827	3.862809	44.85226
9	1.394147	24.52602	25.09181	3.590420	3.875642	42.91610
10	1.409525	25.12116	26.07310	3.495223	3.870999	41.43952
11	1.423105	25.55846	26.88325	3.398452	3.856872	40.30297
12	1.435666	25.85926	27.53976	3.348316	3.838103	39.41456
13	1.447697	26.04397	28.05927	3.373222	3.817613	38.70593
14	1.459498	26.13276	28.45865	3.483770	3.797177	38.12764
15	1.471240	26.14535	28.75517	3.676599	3.777916	37.64497
16	1.483005	26.10038	28.96605	3.938838	3.760598	37.23414
17	1.494814	26.01471	29.10785	4.252332	3.745822	36.87929
18	1.506650	25.90290	29.19582	4.597157	3.734118	36.57001
19	1.518470	25.77690	29.24343	4.954217	3.725996	36.29945
20	1.530215	25.64601	29.26211	5.306916	3.721973	36.06299
21	1.541820	25.51702	29.26116	5.642026	3.722566	35.85723
22	1.553222	25.39450	29.24787	5.949937	3.728291	35.67940
23	1.564364	25.28117	29.22768	6.224486	3.739647	35.52702
24	1.575197	25.17827	29.20447	6.462523	3.757108	35.39763
25	1.585682	25.08593	29.18084	6.663350	3.781108	35.28877
26	1.595796	25.00351	29.15833	6.828148	3.812034	35.19798
27	1.605527	24.92985	29.13776	6.959417	3.850222	35.12275
28	1.614874	24.86353	29.11936	7.060500	3.895952	35.06065
29	1.623850	24.80301	29.10300	7.135187	3.949450	35.00935
30	1.632477	24.74674	29.08831	7.187402	4.010886	34.96666
31	1.640786	24.69330	29.07478	7.220977	4.080382	34.93056
32	1.648814	24.64139	29.06186	7.239495	4.158016	34.89924
33	1.656604	24.58989	29.04899	7.246189	4.243825	34.87111
34	1.664204	24.53785	29.03567	7.243897	4.337819	34.84477
35	1.671662	24.48449	29.02142	7.235043	4.439978	34.81906
36	1.679029	24.42922	29.00585	7.221651	4.550270	34.79301
37	1.686355	24.37154	28.98862	7.205369	4.668647	34.76581
38	1.693692	24.31111	28.96947	7.187513	4.795057	34.73685
39	1.701086	24.24767	28.94816	7.169106	4.929449	34.70561
40	1.708584	24.18103	28.92454	7.150925	5.071774	34.67174
41	1.716231	24.11106	28.89845	7.133543	5.221992	34.63495
42	1.724068	24.03770	28.86980	7.117365	5.380070	34.59507
43	1.732133	23.96089	28.83849	7.102669	5.545991	34.55196
44	1.740463	23.88059	28.80447	7.089633	5.719749	34.50555
45	1.749092	23.79681	28.76768	7.078356	5.901352	34.45580
46	1.758050	23.70951	28.72806	7.068889	6.090822	34.40271
47	1.767366	23.61870	28.68558	7.061240	6.288195	34.34629
48	1.777067	23.52435	28.64018	7.055396	6.493519	34.28656

49	1.787177	23.42646	28.59182	7.051327	6.706854	34.22354
50	1.797719	23.32499	28.54047	7.048998	6.928271	34.15727
51	1.808714	23.21993	28.48607	7.048371	7.157849	34.08778
52	1.820182	23.11123	28.42858	7.049410	7.395674	34.01510
53	1.832142	22.99887	28.36795	7.052082	7.641839	33.93925
54	1.844612	22.88280	28.30415	7.056363	7.896439	33.86025
55	1.857609	22.76297	28.23712	7.062230	8.159572	33.77811
56	1.871149	22.63933	28.16682	7.069672	8.431337	33.69284
57	1.885248	22.51185	28.09320	7.078679	8.711830	33.60444
58	1.899921	22.38047	28.01622	7.089250	9.001147	33.51291
59	1.915185	22.24515	27.93585	7.101386	9.299375	33.41824
60	1.931053	22.10584	27.85205	7.115093	9.606599	33.32042
61	1.947540	21.96249	27.76478	7.130379	9.922894	33.21945
62	1.964662	21.81508	27.67402	7.147254	10.24833	33.11532
63	1.982433	21.66356	27.57975	7.165731	10.58295	33.00800
64	2.000868	21.50792	27.48194	7.185822	10.92682	32.89750
65	2.019981	21.34812	27.38059	7.207536	11.27996	32.78380
66	2.039787	21.18415	27.27568	7.230885	11.64238	32.66690
67	2.060302	21.01600	27.16722	7.255878	12.01410	32.54680
68	2.081540	20.84368	27.05521	7.282520	12.39510	32.42349
69	2.103517	20.66718	26.93966	7.310816	12.78536	32.29698
70	2.126248	20.48653	26.82059	7.340765	13.18482	32.16729
71	2.149748	20.30175	26.69804	7.372366	13.59342	32.03443
72	2.174033	20.11286	26.57202	7.405613	14.01108	31.89842
73	2.199119	19.91992	26.44258	7.440495	14.43770	31.75930
74	2.225022	19.72297	26.30977	7.477000	14.87316	31.61710
75	2.251758	19.52208	26.17364	7.515110	15.31731	31.47186
76	2.279344	19.31732	26.03425	7.554805	15.76999	31.32363
77	2.307796	19.10876	25.89167	7.596059	16.23103	31.17248
78	2.337131	18.89650	25.74598	7.638843	16.70021	31.01847
79	2.367365	18.68064	25.59726	7.683126	17.17732	30.86166
80	2.398517	18.46128	25.44560	7.728872	17.66210	30.70215
81	2.430604	18.23855	25.29109	7.776040	18.15431	30.54002
82	2.463642	18.01257	25.13384	7.824589	18.65364	30.37536
83	2.497651	17.78348	24.97397	7.874473	19.15980	30.20827

Cholesky Ordering:
GDP INF IR EXR MC

Source: Researcher, 2018

From the table above, most of the error variations in Market capitalization were explained by its own shocks, GDP and inflation shocks both in the short run and long run since they commanded greater percentages. Exchange rate explained most of the variations in Market capitalization in the long run. Interest rate explained the least variations in Market capitalization both in the long and short run.

5. Summary, Conclusion and Recommendations

5.1 Summary of Findings

The study analyzed the effects of inflation, interest rate, GDP and exchange rate on stock market performance in Rwanda. The study utilized secondary data. Multiple linear regression model and VAR analysis approaches were used to analyze the data. The summary of findings for the research is presented below.

5.1.1 Effect of GDP on Stock market performance

From the Engel Granger test of cointegration results, the probability for t-statistic and z-statistic are 0.0325 and 0.0356 respectively. The multiple regression results indicate that the beta coefficient for GDP is -0.508791 with a probability of 0.0005. The impulse response results for GDP and market capitalization indicate a negative response shown by the blue line below the origin line. Most of the VDA results indicate that GDP account for 0ver 20% of market capitalization variations both in the long run and short run.

5.1.2 Effect of inflation on stock market performance.

The probability for the t-statistic and z-statistic in the cointegration results of inflation are 0.0064 and 0.0204 respectively. The beta coefficient for inflation in the regression results is 0.556534 with a probability of 0.0003.the impulse response results indicate a negative response of market capitalization to inflation shocks. The VDA results indicate a high percentage of stock market variations accounted for by Inflation in the economy.

5.1.3 Effect of exchange rate on stock market performance

The probability for exchange rate in the Engel granger cointegration results are 0.0054 and 0.0008 for t-statistic and z-statistic respectively. The beta coefficient for exchange rate in the regression results is -0.014595 with a probability of 0.0000. This is an indicator that exchange rate is highly significant influencer of stock market performance. The impulse response function indicates a negative response of market capitalization to shocks in exchange rate. The VDA results indicate that exchange rate accounted for a relatively smaller percentage of market capitalization variations in the short run and relatively high percentage in the long run within the study period.

5.1.4 Effect of Interest rate on stock market performance

Interest rate has a probability of 0.0457 and 0.0037 for t-statistic and z-statistic respectively in the cointegration results. This is an indication of existence of long run

relationship between interest rate and stock market performance. The regression results indicate that the beta coefficient for interest rate is -0.865821 with a probability of 0.1399 which is insignificant. The impulse response results show a negative response of Market capitalization to interest rate shocks. VDA results indicate that Interest rates accounted for least percentage of the stock market performance variations both in the short run and long run with less than 10% all through.

5.2 Conclusion

Based on the findings above the researcher made the following conclusions:

There is a long run relationship between macroeconomic variables under study and stock market performance. In addition, all the macroeconomic variables considered in this study that is GDP, inflation, interest rate and exchange rate had a negative effect on stock market performance. This is according to regression and impulse response results. This implies that an increase in the value of these variables leads to a fall in the value of market capitalization and hence stock market performance.

Secondly, the researcher concluded that GDP, inflation and exchange rate have significant influence on Stock market performance. This is explained by the probability values of less than 5% in the regression results for these variables. Interest rate however has an insignificant effect on stock market performance since the probability value is greater than 5% in the regression results.

The four independent variables under study that is inflation, interest rate, GDP and exchange rate explain 70.3 % of the stock market performance while the remaining 30% is explained by other factors which are not captured by the model. This is an indication that macroeconomic factors are very influential in determining the performance of security markets.

Lastly, GDP and Inflation account for greater percentage of the shocks in market capitalization while Interest rates and exchange rate account for relatively lower percentage. Otherwise, market capitalization accounts for the greatest percentage in its own shocks in the short run and long run.

5.3 Recommendations

The government should carry out public awareness campaign on the importance of security market in encouraging investment and savings. The public would be able to invest in securities and hence stimulate performance of the securities. Additionally the government should create a conducive environment which encourages investments to thrive well hence thereafter increasing the number of listed companies in the stock market exchange.

Inflation should be kept low and stable overtime so as to avoid its pressure on share prices which may end up fluctuating hence affecting the returns of the shareholders. This can be done through regulating money supply by the BNR so as to eliminate excess demand of goods and services which shoots up the prices hence bringing disparity in consumption and welfare of public.

Exchange rate should be kept stable and predictable overtime. This can be done through discouraging excessive importation of goods and services and setting up new industries and supporting the existing ones to perform well. This will encourage consumption of locally made products, expansion of companies and industries and ultimately increased number of listed companies in the Rwanda stock exchange.

Lastly, the key repo rate should be lowered by BNR to encourage commercial banks to have more credit to lend to the customers at a cheaper rate hence encouraging investments. With the loans, investors are able to invest in the securities market in order to get returns and hence the number of shares of companies at RSE will increase overtime. This ultimately results to better performance of security markets.

5.4 Area for Further Research

The study analyzed the macroeconomic variables and stock market performance in Rwanda. More research can be done on other factors such as microeconomic factors, social and cultural factors amongst others and performance of stock markets in Rwanda. Moreover, the study did not exhaust all the macroeconomic factors. More research can be done on the effects of other macro factors such as trade balance, fiscal policies on stock market performance.

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