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A Comparative Analysis of Macroeconomic Variables and Stock Market Performances in Africa (2000-2015)

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Abstract *The study aimed at evaluating the impact of macroeconomic variables on stock market performance in Africa from the period of 2000 to 2015. Four major African countries investigated were: Ghana, Kenya, South Africa and Nigeria. The specific objectives were to establish the extent to which GDP, inflation rate and real exchange rate affect the stock market performance represented by share price index. Time series data were employed and analyzed using multiple regression and t-test for hypotheses testing. With the use of SPSS software the result revealed negative impact of GDP, inflation and real exchange rate on SPI in Nigeria. Insignificant relationship of all the variables was also observed. The result for South Africa's stock market showed that GDP and inflation had a negative impact on stock market and real exchange rate has no impact on the stock market. The impact of GDP on Ghana's stock market was negative while the others had no impact. Real exchange rate had negative impact on Kenyan stock market, but GDP and inflation had no impact. The researchers therefore conclude that macroeconomic variables have to be checked by the government of the African countries to avoid this scenario of negative effects since they are major determinant of the success of the stock markets in every economy.*

Key words Stock market, macroeconomic variables, Inflation, real exchange rate, GDP

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1. Introduction

Stock markets play a vital role in every economy. Over the past few decades, the interaction of the stock price and other macroeconomic variables has been an interesting topic among financial analyst and researcher. It is often argued that stock market performance is determined by some fundamental macroeconomic variables such as the interest rate, Gross Domestic Product (GDP), exchange rate, inflation and money supply. Anecdotal evidence from the financial press reveals that investors generally believe that monetary policy and macroeconomic events have a large influence on the volatility of the stock market. This implies that macroeconomic variables could exert shocks on share returns and influence inventors' investment decision (Khumalo, 2013). This study however has been guided by the following research objectives which include; finding out the effect of GDP, exchange rate and inflation on stock market performance in Africa. The research is a comparative study of four major Sub-Saharan African countries namely; Nigeria, Ghana, South Africa and Kenya. The study made use of time series data from the Central Banks and National Bureau of Statistics of the above named countries. Stock exchange provides businesses, government and individual investors with an avenue to raise capital by selling shares to the investor (Black and Gilson, 1998). As an important pillar of the country's economy, the stock market is carefully observed by governmental bodies, companies and investors (Nazir *et al.*, 2010). Many emerging economies have had financial liberalization which has led to considerable growth of the stock markets. In addition, more financial markets have become linked together and the risks associated with them are now more interconnected (Bhoyu, 2011). However, both mature and emerging financial markets have had considerable volatility in the past few years. Sudden changes in economic situation can affect investor's perception and decision towards the stock market. This trend is associated with risks attendant to

macroeconomic variables in the stock market. The effects of macroeconomic variables on stock performance have been studied in different economies. Several studies conducted in the US (Fama 1990, Barro 1990, Al-Jafari *et al*., 2011) describe the correlation between US stock return and the aggregate real economic activity. These studies reveal the significance of domestic macroeconomic variables such as inflation, money supply, currency rate, resources, interest rate, and industrial production as sources of stock market changes. However, majority of the existing studies have entirely focused on the developed countries and other emerging markets. There is therefore need for an empirical review of the impact of the macroeconomic variables on stock market performances in Africa.

1.1. Research hypotheses

Ho1: the stock market performance in Africa is not significantly influenced by the GDP;
Ho2: the inflation rate does not have any significant impact on the stock market performance;
Ho3: Stock market in Africa is not significantly affected by the real exchange rate.

2. Literature review

2.1. Conceptual framework

In this study, the independent variables will be; GDP, inflation rate, and the exchange rate. The study sought to understand how these independent variables determine the stock market performance in Africa. Share price index will be the dependent variable.

Share Price Index

Share price indices are calculated from the prices of common shares of companies traded on national or foreign stock exchanges. They are usually determined by the stock exchange, using the closing daily values for the month data and normally expressed as simple arithmetic averages of the daily data. *A share price index* measures how the value of the stocks in the index is changing a share return index tells the investor what their "return" is, meaning how much money they would make as a result of investing in that basket of shares (OECD, 2016).

Gross Domestic Product (GDP) is a macroeconomic measure of the value of economic output adjusted for price changes (i.e., inflation or deflation). This adjustment transforms the money-value measure, nominal GDP, into an index for quantity of total output (Barasa, 2014).

Inflation

A high inflation rate raises the cost of living and results to a shift of resources from investments to consumption. The demand for market instruments falls leading to reduction in the volume of stock traded. This will force the monetary policy authorities to respond to the increased rate of inflation with economic tightening policies, which in turn increases the nominal risk-free rate and hence raises the discount rate in the valuation model (Adam and Twenoboa, 2008).

Real Exchange Rate

The currency volatility has effects on the stock returns. When currency appreciates, in a situation where the country is export-oriented, it is expected that there will be a reduction in the competitiveness of her exports, and would therefore have a negative impact on the domestic stock market. This is because the export-oriented companies quoted on the stock exchange market would be less profitable and this may in turn become less attractive to investors (Muthike and Sakwa, 2012).

The conceptual framework presented below depicts that all the explanatory variables determine the performance of the dependent variable (SPI).

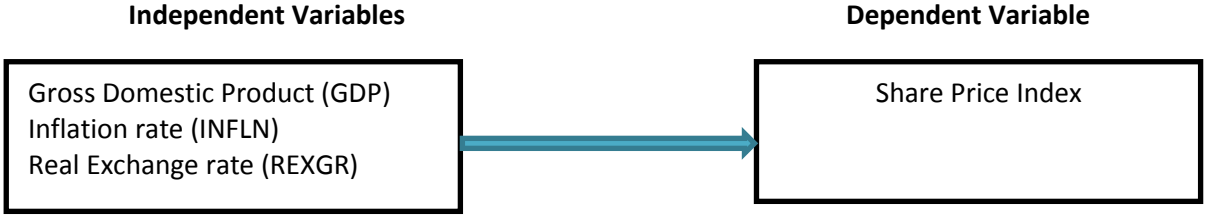

Figure 1. Conceptual Framework

2.2. Theoretical review

Arbitrage Pricing Theory

The theoretical underpinning of this study is the arbitrage pricing theory. Arbitrage Pricing Theory is a general theory of asset pricing that has become influential in the pricing of assets. This theory was developed primarily by the economist Stephen Ross in 1976 as an alternative to the capital market pricing model (CAPM). It is a multi-factor model in which every investor believes that the stochastic properties of returns of capital assets are consistent with factors structure. Ross (1976) argues that if equilibrium prices offer no arbitrage opportunities over static portfolio of assets, then the expected returns on the assets are approximately linearly related to the factor loadings or beta. In other words, the expected returns of a financial asset can be modeled as a linear function of various macroeconomic variables or theoretical market indices, where the sensitivity to change in each factor is represented by a factor specific beta coefficient. The model-derived rate of return is used to price the asset correctly and the asset price should equal the expected end of period price discounted at the rate r, implied by the model. If the price diverges, arbitrage should bring it back into line. APT can be written in equation below as:

$$E(r) = rf + \beta_{it} F_i + \beta_{12} F_2 + \beta_{13} F_3 + \ldots + \beta_{in} F_n + \varepsilon_t \quad (1)$$

Where: E(ri) is the risky asset's expected return; rf is the risk free rate; βin is the sensitivity of the asset to factor n, also called factor loading; Fn is the macroeconomic factors and εt in this equation is idiosyncratic risk.

2.3. Empirical review

Stock market performance and GDP

Kenya

Kirui, Wawira and Onono (2014) study on macroeconomic variables, volatility and stock market returns in Kenya using a time series data that spanned from 2000 to 2012 revealed that Gross Domestic Product (GDP) and stock returns have insignificant relationship.

Nigeria

The study of Oseni and Nwosu (2011) on the stock market volatility and macroeconomic variables volatility in Nigeria with the application of time series data ranging from 1986 to 2010 showed a bi-causal relationship between stock market volatility and real GDP volatility.

Inflation and stock market performance

Ghana

Haruna, Yazidu and Paul (2013) examined macroeconomic variables and stock market returns in Ghana. The study employed monthly time series data ranging from January 1995 to December 2010. The research made use of Vector Error Correction Model (VECM) to determine the long run and short run relationship between stock performance and macroeconomic variables. The study revealed among others that significant long run and short term relationship exist between stock returns and inflation. The study of Kuwornu and Victor (2011) in Ghana from 1992 to 2008 equally revealed a significant relationship between stock market returns and consumer price index used as proxy for inflation rate.

Kenya

Cyrus and Kirwa (2015) carried out a research on macroeconomic variables and the Kenyan Equity Market. The time series data they used spanned from 1997 to 2010. The study showed that inflation has a negative effect on equity market. In the same vein, Elly and Oriwo (2013) investigated the relationship between macroeconomic variables and stock market performance in Kenya using time series data from 2008 to 2012. The result showed a weak positive relationship between inflation and All Share Index of the stock market.

South Africa

Khumalo (2013) examined inflation and stock prices interactions in South Africa from 1980 to 2010. The study employed auto-regressive distributed lag model (ARDL). The result indicated that inflation exerts a significant and negative impact on stock prices in South Africa. Khanyisa *et al.* (2016) study of the interaction between the stock market and macroeconomic variable in South Africa from 1994 to 2012 showed that inflation affects stock market.

Nigeria

Oseni and Nwosu (2011) study in Nigeria also revealed that inflation is the main determinant of stock price volatility in Nigeria and recommended that inflation should be well regulated by the government to avoid negative effect on the stock market.

Real Exchange Rate and Stock Market Performance

Ghana

Kuwornu and Victor (2011) studied the macroeconomic variables and stock market returns in Ghana. The research made use of time series data spanning from the period of January 1992 to December 2008. GSE All Share Index was the proxy for Ghana stock market returns. Full information maximum likelihood estimation procedure was employed to establish the relationship between macroeconomic variables and stock market returns. The empirical result showed a negative significant influence of exchange rate on the stock market returns. Adams and Tweneboah (2008) study in Ghana established a co-integration between macroeconomic variables identified (including exchange rate) and stock prices in Ghana showing a long run relationship.

Kenya

Kirui *et al.* (2014) did a study on macroeconomic variables, volatility and stock market returns in Kenya. They made use of quarterly time series data from 2000 to 2012 obtained from the Central Bank of Kenya and Kenyan National Bureau of Statistics. The empirical result of the regression model revealed that exchange rate showed a significant relationship with stock returns. On the contrast, exchange rate was found to have a negative impact on stock returns in Ouma and Muriu (2014) study in Kenya with time series data spanning from 2003 to 2013.

South Africa

Khanyisa et al (2016) study also revealed that exchange rate equally affects stock market in South Africa.

Nigeria

Osazee and Nosakhare (2014) studied macroeconomic variables and stock price volatility in Nigeria using annual time series from 1980 – 2011. They discovered a weak effect of exchange rate on stock price volatility in Nigeria.

Research Gap

Several studies on macroeconomic variables and their effect on stock market performance have been reviewed. It could be noticed that there was no study in South Africa and Ghana that took into consideration the effect of GDP (as a macroeconomic variable) on the stock market performance. Generally, there has not been any comparative study using time series data from 2000 – 2015 for the four major African countries under review in this research.

3. Methodology of research

3.1. Research design

Research design refers to the schematic guideline that shows a step-to-step guide on how a given study is undertaken (Kombo and Tromp, 2006). Research design is also defined as the blueprint through which a study is conducted while ensuring maximum control over the factors that may have influence on the validity of the findings (Burns and Grove, 2003). Research design also refers to a plan describing the how, when and where associated with data collection and analysis (Kaunyangi and Tabitha, 2015). This current study utilized times series data from Ghana, Kenya, South Africa and Nigeria to assess the impact of the independent variables on the dependent variable under study. The research design adopted in this study is a cross sectional survey which involves a survey of existing data (secondary data). The cross sectional survey has been adopted to help sort out the existence and magnitude of causal effects of two or more explanatory variables upon a dependent variable of interest within a period of study.

3.2. Sampling procedure and sample size

The most important reason for undertaking sampling is to select a number of study units from a defined study population. Sampling, therefore, aims at selecting a subset of the wider target population in order to use it in the study as a true representative (Oso and Onen, 2009). The current study utilized non-

probabilistic sampling technique in selecting three member countries of the East African Community which have been members before the year 2000. As posited by Mugenda and Mugenda (2008), non-probabilistic sampling provides a researcher with an opportunity to determine the minimum inclusion criteria for the individuals to be used in the study. In this study, through convenient sampling, Ghana, Kenya, South Africa and Nigeria were selected for the study due to the fact that they have been the major African countries with functional stock exchange market with accessible time series data.

3.3. Data collection

The study made us of secondary source of data obtained from the Central Banks and National bureau of statistics of Ghana, Kenya, South Africa and Nigeria. Also, from World Bank and Organization for Economic Co-operation and Development (OECD). The focus of the research is to determine the impact of selected macroeconomic variables on stock market performance in the selected countries representing Africa for the period of 2000-2015. Time series data employed were analyzed using SPSS software to find out how the variables collectively and individually affect share price index. A Durbin Watson test was used to test for autocorrelation, while F-test and T-test were adopted to test the impact of the explanatory variable collectively and individually on the SPI.

3.4. Model specification

The model of this study has been specified as follows:

$$SPI = f (GDP, INFL, REXGR) \quad (2)$$

Where:-
SPI = Share Price Index;
GDP = Gross Domestic Product;
INFL = Inflation Rate;
REXGR = Real Effective Exchange Rate Index.
To linearize the function (1) above, the statistical regression model is:

$$SPI = \beta_0 + \beta_1 GDP_t + \beta_2 INFL_t + \beta_3 REXGR_t + \varepsilon_t \quad (3)$$

Where:
β_0 = the intercept for equation;
β_1 = the parameter estimate of GDP;
β_2 = the parameter estimate of INFL;
β_3 = the parameter estimate of REXGR;
ε_t = the random variable or error term.

4. Result Presentation and Discussion

4.1. Summary of result

	Ghana	Kenya	South Africa	Nigeria
R	0.175	0.469	0.676	0.500
R^2	0.031	0.220	0.457	0.250
Adjusted R	-0.212	0.025	0.322	0.062
Std Error	54.647	11.332	15.029	32.602
Durbin Watson	1.704	0.753	2.159	2.020
F-Value	0.127	1.130	3.371	1.331
DF	15-3=12ie 3.49	15-3=12ie 3.49	15-3=12ie 3.49	15-3=12ie 3.49
P-Value	0.943	0.376	0.055	0.310

Source: SPSS output for research data, 2016.

R^2 is 0.031 (Ghana), 0.220 (Kenya), 0.457 (South Africa) and 0.250 (Nigeria). This shows that the explanatory variables explain the variation in the dependent variable to the tune of 3.1 %(Ghana), 22% (Kenya), 45.7 %(South Africa) and 25 %(Nigeria). The result shows a very weak relationship between the macroeconomic variables and the share price index (SPI) being proxy for stock market performance in all

the countries under study. The F-ratios are not statistically significant. That means the model does not have a good fit. Durbin Watson computed shows absence of autocorrelation in Ghana, South Africa and Nigeria, while the result in Kenya indicates presence of autocorrelation.

4.2. Individual test of hypotheses

Ghana

Variables	Result	Remarks
GDP		
T-test	-0.058 < 3.49	Negative Impact
P-value	0.955 > 0.05	Not Significant
INFLN		
T-test	0.389 < 3.49	No Impact
P-value	0.704 > 0.05	Not Significant
REXGR		
T-test	0.439 < 3.49	No Impact
P-value	0.669 > 0.05	Not Significant

Source: SPSS output for research data, 2016.

Kenya

Variables	Result	Remarks
GDP		
T-test	1.524 < 3.49	No Impact
P-value	0.153 > 0.05	Not Significant
INFLN		
T-test	1.370 < 3.49	No Impact
P-value	0.196 > 0.05	Not Significant
REXGR		
T-test	-0.299 < 3.49	Negative Impact
P-value	0.770 > 0.05	Not Significant

Source: SPSS output for research data, 2016.

South Africa

Variables	Result	Remarks
GDP		
T-test	-0.949 < 3.49	Negative Impact
P-value	0.361 > 0.05	Not Significant
INFLN		
T-test	-1.988 < 3.49	Negative Impact
P-value	0.70 > 0.05	Not Significant
REXGR		
T-test	0.734 < 3.49	No Impact
P-value	0.477 > 0.05	Not Significant

Source: SPSS output for research data, 2016.

Nigeria

Variables	Result	Remarks
GDP		
T-test	-0.170 < 3.49	Negative Impact
P-value	0.868 > 0.05	Not Significant
INFLN		
T-test	-1.524 < 3.49	Negative Impact
P-value	0.153 > 0.05	Not Significant
REXGR		
T-test	-1.486 < 3.49	Negative Impact
P-value	0.163 > 0.05	Not Significant

Source: SPSS output for research data, 2016.

GDP and SPI

Countries	Impact of GDP on SPI	Significance Level @ 5%	Accept/Reject Null Hypotheses
Ghana	Negative Impact	Not Significant	Accept
Kenya	No Impact	" "	"
South Africa	Negative Impact	" "	"
Nigeria	Negative Impact	" "	"

INFLN and SPI

Countries	Impact of INFLN on SPI	Significance Level @ 5%	Accept/Reject Null Hypotheses
Ghana	No Impact	Not Significant	Accept
Kenya	No Impact	" "	"
South Africa	Negative Impact	" "	"
Nigeria	Negative Impact	" "	"

REXGR and SPI

Countries	Impact of REXGR on SPI	Significance Level @ 5%	Accept/Reject Null Hypotheses
Ghana	No Impact	Not Significant	Accept
Kenya	Negative Impact	" "	"
South Africa	No Impact	" "	"
Nigeria	Negative Impact	" "	"

All the macroeconomic variables used in this study revealed negative impact on the share price index (proxy for stock market performance) in Nigeria. Ghana's result revealed negative impact in GDP and no impact in inflation (INFLN) and real exchange rate (REXGR). The result for Kenya showed no impact in GDP and inflation, but a negative impact in real exchange rate (REXGR). South Africa's result, is almost like that of Nigeria, but showed no impact in REXGR. The results of this study have agreed with so many other studies being reviewed. However, the result obtained from the effect of inflation on stock market performance in South Africa agrees with Khumalo (2013) study in South African where he established that inflation rate has a negative effect on stock returns. Similarly, the result obtained in REXGR in Kenya is also in line with the findings of Ouma and Muriu (2014) study in Kenya which proved that exchange rate negatively affects stock returns

5. Conclusions and recommendations

From the foregoing macroeconomic variables have shown a serious negative impact on African stock markets. Studies have shown that exchange rate and inflation have recorded more serious negative effect on stock returns in the past and present times. This trend may continue if the policy makers of the African countries do not hurry and get them under control. This study is an eye opener to both the government and the investors to strive to see that out stock markets are stable. This can only be achieved by proper regulation of the macroeconomic variables which are major determinants of stock market performance. We therefore recommend that policies be put in place to stabilize volatile economic environment. Obviously low inflation rate helps businesses to strive and spurs investors to invest more. In the same manner, stable and normal exchange rate and GDP growth encourages both foreign and local investors. Future researchers are advised to investigate the effect of other macroeconomic variables on stock markets of other African countries not covered in this study.

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