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# Relating stock market performance to macroeconomic variables in developing economies

**Abstract.** Given the uniqueness of the stock market in Sub-Saharan Africa (SSA) and the fact that empirical conclusions have always been drawn based on more advanced stock markets, it becomes necessary to investigate the nexus between stock market performance and selected macroeconomic variables in SSA countries. With a purpose of unveiling the relationship between stock market performance and selected macroeconomic variables, the uniqueness and relevance of the paper stems from the fact that it looks at developing stock markets in a developing macroeconomic environment, and it covers the period from 1997 to 2018. The Panel-Autoregressive Distributed Lag model supported by a good number of pre- and post-estimation techniques was used as the estimation technique and the datasets which are of secondary nature were drawn from the World Development Indicators. The study's findings revealed that stock market indicators responded relatively to macroeconomic indicators in the long run and were adjusted to the shocks and dynamics of the changing macroeconomic environment. The findings confirmed that the nexus between broad money supply and the dependent variables for the two models was a mixed one. The findings arising from this study shown by the short run adjustment of stock market performance to changes in macroeconomic variables is important for governments to interpret and make policies on contemporaneous effects and forecast of the dynamism of the stock market and macroeconomic linkage

**Keywords:** economic development, efficient market hypothesis, market capitalization, interest rate, inflation rate

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## INTRODUCTION

Investors' awareness of equity markets have increased significantly, particularly in sub-Saharan Africa (SSA) and other developing nations in the world [1; 2]. However, this significant economic development owing to stock market activities, has not matched expectations owing to impediments (these include among others, policy uncertainty, high inflation rate, unstable interest rate and exchange rate) arising from the macroeconomic environment, especially in developing economies. African stock markets, in their totality, represent an insignificant share (following IMF Survey, total market capitalization of African stock markets fall below 10%) of the world market capitalization [3]. However, African stock markets have been making strides in this respect, which is optimistic. Evidence shows that since 1995, there has always been at least one African stock exchange among the top ten stock markets in the world, which reflects certain development of markets in the region [1]. The degree to which this is made possible by an improved macroeconomic environment, remains an issue for investigation.

It is worth noting that the stock market is a topical area in economics and finance, as its performance has attracted significant attention and research interest over time. From the large stock markets such as Nasdaq, the London Stock Exchange and Euronext, to smaller ones in sub-Saharan African countries like Nigeria, Algeria, Kenya, South Africa

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and Ghana, the functions are relatively the same. They are channels that raise funds for corporations, governments, and similar bodies [4]. In addition, individuals are afforded liquidity transmission opportunities from existing securities. Following the second primary function of the stock market, the market's interaction with the macroeconomic environment has remained an area of investigative interest for researchers [2; 5].

Stock market players, participants and regulators alike consider certain variables such as money supply, interest, inflation, and exchange rates to value and measure the stock market performance and macroeconomic linkage. Stock markets in developed and developing economies are arguably affected by these macroeconomic indices. Findings from [5] study affirm that these variables, including industrial production, are reflected in stock prices.

The capital asset pricing model, efficient market hypothesis and arbitrage pricing theory are considered to be theoretical crossing points of stock market performance and macroeconomic indicators [5; 6]. These theories affect the activities of the stock market. [7-9] argue that investors are motivated to hold risky assets if the anticipated returns are high enough to cover the inherent risk. However, some risks are unavoidable, hence risks cannot be diversified, even in the most efficient portfolios. These are systemic risks which result largely from changes in economic activities [5].

There is a dearth of empirical studies in this area, while the few available studies lack solid statistical evidence to back the models that macroeconomic factors affect the stock market [9; 10]. These studies seem to concentrate on the entire market and examine the aggregate market of nations [11; 12].

The study used market capitalization (as the value of the company's paid-up capital). When this is aggregated for all quoted securities, it translates to market capitalization for the entire stock exchange [13]. Market capitalization is a critical component that measures the stock market's efficiency. It is a more robust measure of market performance than the share index.

The link between stock market performance and domestic macroeconomic variables has been overemphasized in literature, while some of the thoughts are purely theoretical, and others emanated from empirical studies. Some of the empirical studies relate to individual countries (e.g., Nigeria – [13]; Cyprus – [14]; Turkey – [15],the US – [16]; Greece – [17]; Iran – [18]; India – [19]; and the US and Japan comparative studies – [20]). Other studies focused on groups of countries that share commonalities (e.g., five Asian countries – [21]; three Baltic states – [22]; and 20 Emerging Market countries – [23]). Though not exhaustive, the foregoing list of extant empirical studies in this area is enough to suggest that there are empirical gaps, which this study should address, as well as variables and aspects of methodology that it must adopt as a matter of convention. For instance, though past studies have focused on countries in sub-Saharan Africa, there is a dearth of group studies within this area.

The study has consciously concentrated on reviewing the literature, which covers the post-1990s period. The reason for this is that some empirical studies, which were conducted before the 2000s, have been well documented. Hence, unless demanded otherwise, it would amount to an unnecessary repetition and doubt the integrity of previous researchers to repeat such reviews. For instance, [20] reviewed the works of [24; 25] concluding that these papers generally attest to the fact that relationships between changes in macroeconomic variables like industrial production, interest rates, inflation, the yield curve, and risk premium have significant relationships with stock market returns.

A review of recent works reveals additional macroeconomic variables that were found to have significantly influenced stock market performance. These include exchange rate, the national output (or GDP), money supply, consumer price index (CPI), unemployment, and government or state debt. For an oil producing country, oil price shocks or volatility are recognized as a relevant variable. Economies where international trade is a major contributor to the economy include export and import or trade balance as relevant local macroeconomic variables [26]. [27] include investor sentiment as one of the key macroeconomic variables that relate to investment. External influence on local stock market performance is captured by factors such as foreign institutional investments [28] or a global index such as the MSCI World Index [19]. In most of the studies that were reviewed, stock market performance was measured by the share index of named stock exchanges.

The foregoing list of macroeconomic variables and stock market performance indicators, therefore, formed the basis for selecting relevant variables for this study. Justification for this selection is owed to [23], who observed the contention on the number of factors that affect equity returns. According to the above mentioned authors, selection of these factors are subject to criticism on the basis of subjectivity and the arbitrary nature of the selection process. However, they recommend that researchers should investigate prior research before deciding on the importance of various factors.

As alluded earlier, this study sought to examine the interplay of stock market performance and macroeconomic variables in sub-Saharan African countries.

The aim of this study is the research of the interplay of stock market performance and macroeconomic variables in sub-Saharan African countries, using annualized panel data from 1997 to 2018. The selection of SSA countries aimed to expose the nexus between macroeconomic variables in developing countries and the performance of an equally less developed stock market. This study is a departure from prior studies that have predominantly focused on more advanced economies and their stock markets, thereby ignoring stock market forces in developing markets/economies.

## THEORETICAL FRAMEWORK

Macroeconomic variables. Money supply, or money stock as it is sometimes called, is a common money market variable, which is used in extant literature in this area. It refers to the entirety of money in a given country at a particular time [12]. The narrowest definition of money stock ($M_1$) incorporates currency, travelers' cheques, demand deposits and other chequable deposits. $M_1$ is the most liquid form of all other money stocks. This definition of money stock views money purely as a medium of exchange. $M_2$ incorporates financial assets under $M_1$, as well as savings and time deposits; therefore, $M_2$ money stock can easily be converted to $M_1$ with little or no loss of value. This kind of financial asset reflects a direct function of the level of a country's

financial market development. Countries that have highly developed financial markets can incorporate more financial assets into their broad definitions of money. For instance, in the United States (US), money stock is also defined more broadly as $M_3$ and L, with the latter containing the least financial assets liquid.

The interest rate is another money market variable, which is often used in related studies. It is the price that is paid to borrow debt capital [13].

D. Tsoukalas [14] identify default risk associated with loans, expected future rate of inflation, and savers' time preferences for current versus future consumption as major interest rate determinants that are the basic returns from production opportunities within the economy. Excessive government borrowing to finance deficit budgets is also believed to lead to high interest rates. By implication, changes in these variables are mainly responsible for observed fluctuations in interest rates within the economy. It is clear that there are different interest rates in a particular economy as opposed to a single representative rate, which is assumed to be a function of the interaction between funds supply (by savers) and forces of funds demand (by borrowers).

Interest rates can be real or nominal. The Fisher equation expresses the nexus between real and nominal interest rates, thus: $i = r + \pi^{e,}$ where "$i$" is the nominal rate of interest, "$r$" is the real rate of interest, and $\pi^e$ is the expected rate of inflation [12]. Sometimes interest rates are expressed as a yield curve [15; 16]. Yield curves show the nexus between interest rates in the short and long term. A typical yield curve slopes upward (from left to right), reflecting the effect of inflationary expectations of interest rates in the long term. When yield curves slope downwards, they show borrowers' preference for short-term funds or expected declines in future rates of inflation. [28] assert that the most important inputs into an investment decision are interest rates and forecasts of their future values.

The gross domestic product (GDP), measured at the current market price, reflects the value of final goods manufactured and services provided within a country at a particular time. It is believed to be the most commonly used measure of nominal aggregate output. A country's GDP can be expressed either in nominal or in real terms. The relationship between nominal output, price level, and real output is expressed mathematically as:

$$Y^* = P \times Y, \quad (1)$$

where $Y^*$, $P$, and $Y$ represent nominal output, price level, and real output, respectively. An upward trend in the real output (defined mathematically as $Y = Y^* / P$) indicates an expanding economy with enormous opportunity for increased sales and investment, while a downward trend shows otherwise (i.e. recession). An economy's output can also be measured by its industrial production [14] (see studies by [17]; [18], for example). In this case, emphasis is on the economy's manufacturing sector. The GDP is disaggregated to measure the growth and contributions of different sectors to the overall GDP. More often than not, the focus of analysts and researchers is on the GDP's growth rate.

Inflation is the persistent increase in general price level, which is often expressed in rates. [12] contend that the inflation rate reflects the rate of change, stated as a percentage change in the price level yearly. Possible proxies for inflation are the GDP Implicit Price Deflator (GDP Deflator), the Consumer Price Index (CPI), or the Producer Price Index (PPI). The GDP deflator reflects all goods and services that a country produces in a weighted average of prices. It is regarded as the most comprehensive measure of the price level. The rate of change in the prices of goods and services of a particular consumer or average household is measured by the CPI. The market basket of goods and services are usually determined on the basis of a survey, which is conducted in the year chosen as the base year. The CPI reports, therefore, show how much more or less expensive the base year representative market basket would be in different years. The CPI is often used to measure an economy's cost of living; a role that makes it the most common used proxy for inflation in studies on macroeconomic variables. Different CPIs can be calculated for urban and rural areas. The PPI measures price changes at a wholesale level.

Initial selection of macroeconomic (explanatory) variables seems to exempt the labour market and the cross-border market. While the study cannot rationalize their exemption at this initial stage, the study intends to introduce some of their common variables as the need arises. The next set of variables relevant to this study, therefore, relates to the security market performance.

*Stock market performance indicators*. Stock market performance can be measured by using different indices. Some of these indices include value/volume of shares traded, efficiency or turnover ratio, market concentration or capitalization, index of abnormal returns, index of information disclosure, and stock market (price) index. Stock market price index is a composite index which is used to measure the number of shares and changes of companies in the index. It is by far the most commonly used indicator of market performance, and it serves as a barometer to check economy fluctuations. The share price index can be price-weighted or market-value-weighted. It can be computed to capture the entire market stock. Recently, regional and international stock market indices have been computed; examples are the 50-country index and several regional indices computed by Morgan Stanley Capital International (MSCI) used in [29] to represent global "explanatory" factors). The study used market capitalization to measure stock market performance.

## MATERIALS AND METHODS

The peculiar feature of this study is the novelty of the estimation technique. Firstly, the stationarity properties of the used longitudinal data are estimated to ensure that the time series elements do not corrupt the stability of the estimates. The study used [30; 31] to ensure test robustness. The next step in the analytic framework was the linear association test (using the correlational matrices) among the variables under study, and the use of descriptive statistical properties. Thirdly, rather than the traditional Pooled Regression in panel estimations, this study used two estimators suggested by [32], which deal with bias in a heterogeneous panel, namely the Mean Group (MG) and Pooled Mean Group (PMG) Models.

To estimate the models and to appraise the significance of the selected macroeconomic variables on the

stock market performance of the selected SSA countries, longitudinal data sets were collected, spanning 1997 to 2018. Justification for the longitudinal series covering six SSA countries, namely Kenya, Mauritius, Namibia, Nigeria, South Africa, and Swaziland, was based on data availability. The World Development Indicators (WDI), a repository of the World Bank data source, was used, as it is considered to be reliable without posing integrity problems.

*Theoretical considerations. Equation of exchange/quantity theory of money.* One of the fundamental theories upon which this study was based is the Equation of Exchange/Quantity Theory of Money of the classical economists. The theory explains the link between money stock and its velocity. Mathematically, it is defined as:

$$MV = PY \tag{2}$$

(where $M$ = money stock, $V$ = velocity of money, $P$ = price level, and $Y$ = real output).

Defined in terms of growth rates, it can be stated as:

$$\frac{\Delta M}{M} + \frac{\Delta V}{V} = \frac{\Delta P}{P} + \frac{\Delta Y}{Y} \; or \; gm + gv = \pi + gy, \tag{3}$$

where the variables are as presented above with the inclusion on the growth terms.

Interpreted as money growth rate plus velocity of money growth rate equals the growth rate of the price level or inflation rate plus real output growth rate. With velocity of money (V) and real output (Y) usually assumed to be stable in the long run (the classical economists' view), the Equation of Exchange transforms to the Quantity Theory of Money, simply expressed as $M = P$ and interpreted as a change in money stock that equals a proportionate change in the price level ultimately. Some economists, however, do not subscribe to the constancy of money velocity; they believe, for instance, that inflationary expectations can increase velocity of money by increasing the rate of money-for-goods swap as a remedy for continuous reduction in the purchasing power of money. [33], therefore they claim that "the quantity theory consolidates all other determinants of aggregate demand into velocity so that changes in taxes, interest rates or tastes are all considered changes in velocity".

Another theory that tends to underpin this study is the Efficient Market Hypothesis (EMH). In its simplest form, the EMH holds that security price reflects information which is publicly available. The prices adjust quickly when new information becomes available. When this happens, the security market is assumed to have achieved informational efficiency [34]. Information on macroeconomic performance indicators are ready inputs in determining the market or systematic risks of securities. It is common for investors, especially foreign portfolio investors, to consider macroeconomic variables such as inflation rate, interest rates, GDP per capita growth rate, GDP growth rate and their likes in their investment decisions. In portfolio management, risks associated with changes in these variables are regarded as market risks, which cannot be reduced through portfolio diversification since they affect every security, irrespective of firm or industry-specific characteristics [34]. The publicly available information on these variables, therefore, helps to adjust security prices either by increasing or decreasing demand for securities quoted at the exchange.

## RESULTS

*Estimation approach.*

*Model, statistical properties and linear association of the series.* The relationship under study is presented as follows:

$$SPI = f(Macvar), \tag{4}$$

*SPI* is Stock Market Performance Indicators, while *Macvar* represents Macroeconomic Variables. For the purposes of this study, the selected macroeconomic variables are those that are monetary in nature and are perceived to be closely associated with the stock market. (5) and (6) decouple the relationship, thus:

$$MC = f(infl, intr, m2), \tag{5}$$

$$ST = (infl, intr, m2). \tag{6}$$

*MC* is the natural logarithm of the absolute value of Market Capitalization; *ST* is the natural logarithm of the Value of Stock Traded; *infl* and *intr* are the Inflation Rate and Interest Rate, respectively; and *m*2 is the natural logarithm of Broad Money Supply.

*Stationarity properties of the series.*

The models for the panel unit root tests follow the form specified below [35]:

$$\Delta Y_{it} = \alpha_i + \rho Y_{it-1} + \sum_{k=1}^{n} \emptyset_k \Delta Y_{it-k} + \delta_i t + \theta_t + u_{it} - LLC \; Model \tag{7}$$

This is with an $H_0$: $\rho = 0$ and $H_A$: $\rho<0$ [36]:

$$\Delta Y_{it} = \alpha_i + \rho_i Y_{it-1} + \sum_{k=1}^{n} \emptyset_k \Delta Y_{it-k} + \delta_i t + \theta_t + u_{it} - IPS \; Model. \tag{8}$$

This is with an $H_0$: $\rho_i = 0$ for all $i$ and $H_A$: $\rho<0$ for at least one.

Following [37]:

$$\rho = -2 \sum_{t=1}^{N} lnP_i - ADF \; Fisher \; Model, \tag{9}$$

where: $N$ = the cross-section units or identities; $P_i$ = the cross-section unit root value for the cross section $I$; and $-2lnP_i$ = Chi-square distribution for 2 degrees of freedom.

The fourth and last panel unit root test follows the PP Fisher model of the form created by [38] which is as follows:

$$y = \frac{1}{\sqrt{N}} i = \sum_{i}^{N} \omega^{-1} (\varphi_i) \cong N(0,1), \tag{10}$$

where $\omega^{-1}$ = the opposite of the normal cumulative distribution function.

The essence of the varied tests is to combine the tests with homogenous $D$ assumption and those with heterogeneous $D$, where $D$ is the coefficient of $Y_{i.}$

*Panel estimation methods.*

The MG follows the form specified by [39]:

$$\gamma_i(L)z_{it} = \alpha(L)y_{it} + d_iX_{it} + \varepsilon_{it}, \quad (11)$$

*i = 1, 2, 3 .....N,* which is for the cross-sectional unit, given that the mean group model's long run and short run coefficients, and the long run coefficient for each cross section is given as:

$$\varphi_i = \frac{a_i(1)}{b_i(1)}. \quad (12)$$

In sum, the mean group estimator for the entire panel is represented as follows:

$$\varphi = \frac{1}{N}\sum_{i=1}^{N}\varphi_t. \quad (13)$$

According to [39], the MG estimators are reliable and have asymptotic normal distribution for N and T, which are adequate.

Nevertheless, owing to its inconsistency in terms of the small T (T is for number of observation), it can become quite biased; hence, the Pooled Mean Group occupies an intermediary locus between MG and the Fixed Effect Model. It does this by allowing the short run coefficients to vary and the long run coefficients to pool across countries. According to [40], PMG combines the efficiency of pooled estimations while overtaking the inconsistencies that emanate from the pooling heterogeneous dynamic relationship.

Following the [39] prescription, the PMG for this study assumed the following form:

$$Z_{it} = \sum_{j=i}^{n}\gamma_{i\,j}Z_{i,t-j} + \sum_{j=0}^{m}\partial_{ij}\gamma_{i,t-j} + \mu_i + \varepsilon_{it}. \quad (14)$$

This model is reparametrized in a vector error correction framework following [39]:

$$\Delta Z_{it} = \sigma_i\left(Z_{i,t-1} - \beta_i y_{i,t-1}\right) + \sum_{j=1}^{n-1}\delta_{ij}\Delta Z_{i,t-j} + \sum_{j=0}^{m-1}\delta'_{ij}y_{i,t-j}\mu_i + \varepsilon_{it}. \quad (15)$$

In sum, the major inferences in the relationship under study are based on the estimates provided by the PMG model.

Panel A in Table 1 contains the basic descriptive statistics of the series under study. The mean and the median are measures of the aggregative tendencies of stock market performance and show the studied macroeconomic variables across the period and the studied SSA countries. The spread and dispersion of these indicators are also shown by their respective standard deviation, minimum, and maximum. For the kurtosis, the series are all found to be leptokurtic (>3). The Jarque Bera statistics [40] predisposes us to a test of skewness of 0 and kurtosis of 3, which is a combined test for normality of the series. It can be inferred from the Jarque Bera statistics [40] and the associated probability value (all<5%) that the series are characteristically distributed like economic and financial time series [34]. The linear association of the series is shown in the correlational matrix, as illustrated in Panel B of Table 1. It is evident that the variables share a combination of positive and negative correlation. Market Capitalization shares a strong positive correlation with the volume of stock traded and broad money supply, while it shares a negative linear association with real interest rate and inflation rate. This is the same as the volume of stock traded, which also correlates negatively with inflation rate and real interest rate but has a positive correlation with broad money supply. This shows that as interest rate and inflation rate rise, there is a tendency that stock activity drops, showing a dip in market capitalization and volume of stock traded. The results of the panel unit root test, following the form specified in equations 1, 2, 3 and 4, respectively, are presented in Panel C of Table 1 below in line with [35-38].

**Table 1.** Summary of basic preliminary tests

| PANEL A: BASIC DESCRIPTIVE STATISTICS | | | | | | | |
|---|---|---|---|---|---|---|---|
| Variable | Mean | Median | Std Dev | Skewness | Kurtosis | Jarque Bera | Prob |
| GDPR | 3.86 | 4.04 | 6.88 | 1.18 | 44.02 | 110058.05 | 0.000 |
| INFL | 44.68 | 7.65 | 670.05 | 32.79 | 1147.32 | 7531660.05 | 0.000 |
| M2 | 26.01 | 21.79 | 16.59 | 2.04 | 8.11 | 2601.04 | 0.000 |
| MC | 8.91 | 2.94 | 2.17 | 3.05 | 11.17 | 714.69 | 0.000 |
| RIR | 6.17 | 13.61 | 13.61 | 1.48 | 13.69 | 4318.12 | 0.000 |
| ST | 8.63 | 20.11 | 20.11 | 3.35 | 15.14 | 1391.26 | 0.000 |
| **PANEL B: CORRELATIONAL MATRIX** | | | | | | | |
| | ST | RIR | MC | M2 | | | |
| INFL | -0.11 | -0.40% | -0.05% | -0.264 | | | |
| M2 | 0.37% | 0.24% | 0.36% | ------- | | | |
| MC | 0.97% | -0.06% | ------ | ------- | | | |
| RIR | -0.026% | -------- | -------- | -------- | | | |
| ST | | | | | | | |

Table 1, Continued

| PANEL C: STATIONARITY PROPERTIES OF THE SERIES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Variables | LLC | | IPS | | ADF-FISHER | | PP-FISHER | |
| | Test Stat | Inference | Test Stat | Inference | Test Stat | Inference | Test Stat | Inference |
| | | | | | | | | |
| ST | -7.95 (pv<0.05) | I(1) | -8.48 (pv<0.05) | I(1) | -85.34 (pv<0.05) | I(1) | -229.44 (pv<0.05) | I(1) |
| RIR | -6.83 (pv<0.05) | I(0) | -6.54 (pv<0.05) | I(0) | -196.97 (pv<0.05) | I(0) | -323.18 (pv<0.05) | I(0) |
| MC | -3.02 (pv<0.05) | I(1) | -4.38 (pv<0.05) | I(1) | -63.85 (pv<0.05) | I(1) | -118.38 (pv<0.05) | I(1) |
| INFL | -12.04 (pv<0.05) | 1(0) | -9.83 (pv<0.05) | 1(0) | -244344 (pv<0.05) | 1(0) | -418.60 (pv<0.05) | 1(0) |
| M2 | -16.50 (pv<0.05) | I(1) | -21.64 (pv<0.05) | I(1) | -565.03 (pv<0.05) | I(1) | -935.84 (pv<0.05) | I(1) |

**Note:** LC = Levin, Lin and Chu Test, IPS = Im, Pesaran and Shin W-Stat, ADF FISHER = Augmented Dickey Fueler Fisher Chi-Square Test, PP FISHER = Philip Peron Fisher Chi-Square Test (MC is the natural logarithm of the absolute value of Market Capitalization; ST is the natural logarithm of the Value of Stock Traded; INFL and RIR are the Inflation Rate and Interest Rate, respectively; and M2 is the natural logarithm of Broad Money Supply and GDPGR is economic growth rate)

**Source:** the authors' fieldwork

The panel unit root test results show varied stationarity properties at the 5% level of significance. The results show that there is a mixed order of integration, justifying the use of the Pooled Mean Group (PMG) estimates.

*Short run elasticities.* There was no short run impact on stock market indicators, as shown in Panel A of Table 2, which shows that market investments are usually represented by financial assets of a long term nature; hence, the market indicators are not expected to exhibit ideal short run elasticities to changes in the explanatory variables.

*Long run elasticities.* Two models were specified in Panel B of Table 2. In the first model, real interest rate had a negative impact on stock market capitalisation and volume of stock traded over the long run. It showed that a percentage change in real interest rate caused a long run 7% and 4% decrease in market capitalization and volume of stock traded, respectively. Conversely, it was found that both market capitalization and volume of stock traded are positively significant functions of inflation rate. At the 0.05 level of significance, a 1% change in inflation rate caused a 5% and 8% increase in market capitalization and volume of stock traded, respectively. There was a mixed relationship between broad money supply and the dependent variables for the two models. While market capitalization performed a positively significant function of the broad money supply at 5% level of significance, the volume of stock traded proved to be a negatively significant function of broad money supply. As indicated, while a 1% change in broad money supply increased market capitalization by 9%, it reduced volume of stock traded by 7% (Table 2).

**Table 2.** Pooled mean group estimates showing short run, long run elasticities and error correction representation

| PANEL A: Short Run Estimates AND ERROR CORRECTION REPRESENTATION | | |
|---|---|---|
| Variables | *logMC=f(logM2,infr,rir)* | *logST=f(logM2,infr,rir)* |
| *RIR* | 0.002 (0.09) | 0.002 (0.06) |
| *logm2* | -0.03 (-0.05) | 0.21 (0.08) |
| *Infr* | 0.002 (0.03) | 0.001 (0.01) |
| $ECM_{t-1}$ | -0.43 (-3.22) | -0.66 (-4.15) |
| **PANEL B: Long Run Estimates** | | |
| *RIR* | -0.24 (3.89)** | -0.14 (3.17)** |
| *logm2* | 0.09 (2.09)** | -0.07 (2.25)** |
| *INFR* | 0.05 (3.11)** | 0.08 (2.39)** |

*Error correction representations.* The error correction estimates showed the convergence to long run equilibrium owing to changes originating from the short run. The two models indicated that the error terms were negatively significant, indicating the speed of adjusting from short run disequilibrium to long run equilibrium. The adjustment speed of market capitalization to macroeconomic variables was 43%, while the volume of stock traded was 66%. This implies the convergence to equilibrium level in the long run from a short deviation, which takes place as follows: a little above 2 years for market capitalization and a little above 1 year for the volume of stock traded. The relationships are plausible, as they fall between 0 and 1, rendering them reasonably and economically predictable.

## DISCUSSION

The study's findings partly align with the efficient market hypothesis that establishes a relationship between indicators of stock market performance and macroeconomic variables. In its simplest form, information on macroeconomic performance indicators, as used in this study, proved to be good predictors of stock market performance. It was found to be consistent with the efficient market hypothesis that macroeconomic indicators are ready inputs in determining the current and dynamic behavior of the stock market.

Implications of long run adjustments of the market in SSA countries to shocks emanating from the macroeconomic environment can be blamed for the lack of information efficiency. Put differently, the EMH may not explain the performance of the stock markets in SSA largely owing to information defect. Changes in money stock, all things being equal, lead to changes in aggregate demand, which, in turn, lead mainly to changes in real output (Y) in the short run and changes in the price level (P) in the long run. In the long run, the economy is assumed to have attained full resource employment level so that a further increase in money stock (M) raises the price level (P) rather than the real output (Y). Total demand is the summation of investment demand, consumption demand, government demand, and net export demand, while their respective determinants are wealth, interest rates, taxes and tariffs, and exchange rate [41]. By extension, changes in money stock can impact the stock market by affecting investment demand directly, along with other components of aggregate demand. This conclusion concurs with the Monetarist's perspective that the transmission mechanism between money and aggregate demand is direct; hence, additional cash balances are spent directly on real goods and services, both investment and otherwise (a similar view is expressed by [42].

Even the Keynesian's view supports the linkage between money stock and aggregate demand but disagrees with the direct-link position of the Monetarists. They opine that the linkage between money stock and aggregate demand occurs through the interest rate [43]. An increase in investment (say equity) demand, *ceteris paribus*, results in an increase in equity prices at the stock market [44].

Changes in interest rates affect stock prices in two major ways: first, through their effects on corporate profits, and second, through investors' decisions on asset holdings, namely whether to hold more or less stocks or bonds in their investment portfolio. A rise in interest rates increases corporate interest expenses and decreases corporate profits (a component of the national income). The decrease in corporate profits decreases funds available for consumption and investment demands. It also sends wrong "signals" to investors in the stock market. Moreover, higher interest rates could shift investments to bonds at the expense of stocks (and other assets). In response to rising interest rates, stock sales obviously depress stock prices. Inversely, lower interest rates could shift investments to stocks (and other assets) at the expense of bonds and increase demand for stock raises and stock prices. [44] argue that a rise in interest rates raises the discount rate in computing the present value of stock prices while decreasing the latter.

The impact of inflation on prices appears a bit controversial. A more general consensus is that, under competition, inflation increases production costs, lowers revenue, and decreases the future cash flow of firms, which, in turn, discourages equity demand and lowers stock prices. There is a counter argument that stock prices, through hedging, could react positively to inflation, since equities are claims of real assets [25].

This study was conducted with a focus on SSA countries, which represent a collection of developing economies and stock markets in Africa. Hence, it is believed that the results contribute to a better understanding of stock market forces in a manner that is distinct from those of developed economies and their stock markets. Therefore, the results of this study can be employed for generalization with emphasis on economies similar to the sub-Saharan African region and economic blocs.

## CONCLUSIONS

This study sought to relate stock market performance to the macroeconomic environment in SSA countries. The exceptionalism of the study lies in the fact that it inclined developing stock markets against a developing macroeconomic environment. Whilst employing the pooled mean panel estimation technique, the study evaluated the long run and short run elasticities of the studied relationship, including an appraisal of the error correction and dynamic profile of the relationship.

One of the key takeaways from this study is the discovery that stock market indicators are relatively responsive to changes in the macroeconomic indicators in the long run and not in the short run. Hence, a percentage change in real interest rate caused a long run decrease in market capitalization and volume of stock traded, respectively. Conversely, it was found that both market capitalization and volume of stock traded are positively significant functions of inflation rate. The nexus between broad money supply and the dependent variables for the two models was found to be a mixed one. While market capitalization had a positive and significant impact on broad money supply, the volume of stock traded was found to be a negatively significant function of broad money supply. This confirms that stock market variables generally exhibit long run elasticity profiles. It is clear that financial assets that are traded in the stock market are long term in nature; hence, their responsiveness to their influencing variables should have the same effect. This discovery spells the need for policy impact to be expected more over the long term than the short term. Market capitalization was found to adjust to the dynamics of the studied macroeconomic variables, similar to the volume of stock traded.

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## Зв’язок показників фондового ринку з макроекономічними змінними в країнах, що розвиваються

**Анотація.** Враховуючи унікальність фондового ринку в країнах Африки на південь від Сахари та той факт, що емпіричні висновки завжди робилися на основі більш розвинених фондових ринків, виникає необхідність дослідити зв’язок між показниками фондового ринку та окремими макроекономічними змінними в країнах Африки на південь від Сахари та той факт, що емпіричні висновки завжди робилися на основі більш розвинених фондових ринків, виникає необхідність дослідити зв’язок між показниками фондового ринку та окремими макроекономічними змінними в країнах Африки на південь від Сахари. Унікальність та актуальність цієї роботи полягає в тому, що вона розглядає фондові ринки, що розвиваються, в макроекономічному середовищі, що розвивається, і охоплює період з 1997 по 2018 рік. В якості методу оцінки було використано панельну авторегресійну модель з розподіленим лагом, підтриману значною кількістю методів попередньої та кінцевої оцінки, а набори даних, які мають вторинний характер, були отримані з Індикаторів світового розвитку. Результати дослідження показали, що індикатори фондового ринку відносно добре реагують на макроекономічні показники в довгостроковій перспективі та пристосовуються до шоків і динаміки мінливого макроекономічного середовища. Результати дослідження підтвердили, що зв’язок між широкою грошовою масою та залежними змінними обох моделей має змішаний характер. Висновки, що випливають з цього дослідження, свідчать про те, що короткострокове пристосування показників фондового ринку до змін макроекономічних змінних є важливим для уряду для інтерпретації та розробки політики щодо поточних ефектів та прогнозування динаміки фондового ринку та макроекономічних зв’язків

**Ключові слова:** економічний розвиток, гіпотеза ефективного ринку, ринкова капіталізація, процентна ставка, рівень інфляції