

**Original Research Article**

## Relationship between stock market performance and macroeconomic variables in Ghana

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### INTRODUCTION

The question of whether or not stock prices can be predicted by macroeconomic indicators in an economy is of serious concern both to the academics as well as the practitioners all over the world. This line of thought is what researchers in the field of finance refer to as the macroeconomic approach. It is a method of using factor analysis technique to determine the factors affecting asset returns. Many scholars have used macroeconomic factors to explain stock return and found that changes in some macroeconomic variables are associated with risk premium. Ghana embarked on economic reforms in 1983 at a time when the country’s economy was virtually on the brink of collapse with inflation staggering around 123 percent. These reforms became necessary as Ghana’s macroeconomic policies over the years had been characterized by periodic lapses in financial discipline leading to a volatile and generally high inflation, large exchange rate swings and negative real interest rates for extended period and consequently the build-up of large and unsustainable chunk of non-performing assets on the books of many commercial banks. Coleman and Adgyire-Tettey (2008).

Several attempts have been made to identify or study the factors that affect stock prices. Some researchers have also tried to determine the correlation between selected factors (internal and external factors, market and non-market factors, economic and noneconomic factors) and stock prices. The outcomes of the studies vary depending on the scope of the study, the assets and factors examined. Al–Tamimi (2007) identified a number of company internal factors and external factors as influencers of asset prices. He developed a simple regression model to measure the coefficients of correlation between the dependent and independent variables as follows: $SP = f(EPS, DPS, OL, GDP, CPI, INT, MS)$; where, $SP$: Stock price; $EPS$: Earnings per share; $DPS$: Dividend per share; $OL$: Oil price; $GDP$: Gross domestic product; $CPI$: Consumer price index; $INT$: Interest rate and $MS$: Money supply. He discovered that the firm’s internal factors exercise the most significant impact on stock prices. Zaiane (2013) added that there is an
assocation between security trading volume and past market returns. This implies that apart from the macroeconomic activity effect, one can also trace the stock market performance to some extend, the past returns.

Scanning the existing literature indicates that stock market performance has attained significant role in global economics and financial markets in recent times, due to their impact on corporate finance and economic activity. For instance Adjasi and Biekpe (2006) state that stock markets enable firms to acquire capital quickly, due to the ease with which securities are traded. Stock markets activity, thus, plays an important role in helping to determine the effects of macroeconomic activities. The reviewed literature contains considerable number of studies that examine the stock price movements. Perhaps one important subject that has received increasing attention from economists, financial investors and policy makers is on the dynamic effects of macroeconomic indicators on stock prices. Ibrahim (1999) found that macroeconomic forces have systematic influences on stock prices via their influences on expected future cash flows.

Dailami and Atkin (1990) alluded that, the capital market serves as both an instrument of restructuring of the banking sector and as an integral part of the long term maturity of the financial system. Considering all the allusions espoused by extant literature, one will want to ask the following questions: To what extent and in what ways can movement in stock prices be determined by changes in macroeconomic variables in Ghana? Do macroeconomic indicators exert shock on stock prices? A number of studies have been conducted to examine the effects of macroeconomic variables on stock market of industrialized economies. Not much has being done on the emerging stock markets like Ghana Stock Exchange though they possess enormous profit potentials. The studies that have attempted work in this area on the developed economies include: Abdalla and Murinde (1997), Cheung et al (1998) and Darrat and Dickens (1999).

These studies identify factors such as industrial production, risk premiums, slope of the yield curve, inflation, interest rate, and money supply as being important in explaining stock price movement. Corrado and Jordan (2002) also argue that, some of the factors influencing stock price behavior include company profits; political factors; and economic performance. Others are interest rates; inflationary rate; Real Gross Domestic Product; and shareholder tax level. Coleman and Adgyire-Tettey (2008) examined the Ghanaian stock market to determine the impact of macroeconomic variables on theits performance. They argued that, lending rates from deposit have an inverse relationship with stock market performance. To build on the existing literature, this study is undertaken: To determine if there is a relationship between the macroeconomic variables and stock market performance; and examine how macroeconomic variables influence the performance of the Ghanaian stock market.

### Literature review

History has shown that the price of shares and other financial assets are an important aspect of the dynamics of economic activity, performing a vital role in national economies. Stock prices can be an indicator of social mood and are used as a leading indicator of the real economic activity. Rising share prices, for instance, tend to be associated with increased business investment and vice versa. Share prices also affect the wealth of households and their consumption. Therefore, economic policy makers keep an eye on the control and behaviour of the stock market, as its smooth and risk free operation is essential for economic and financial stability. Several studies have found a correlation between changes in world economy and macroeconomic variables. These studies also suggest that the movement of stock market indices is highly sensitive to the changes in the fundamentals of the economy, to the changes in the expectation about future prospects. Generally, the barometers for measuring the performance of the economy include, among others, real Gross Domestic Product growth rate, rate of inflation, the exchange rate, the country’s fiscal position, the debt position and many other factors. These macroeconomic factors are the major determinants of the growth of an economy. Further, as the stock prices accurately reflect the underlying fundamentals, they should be employed as leading indicators of future economic activities.

### Macroeconomic variables that influence stock price performance

#### Interest rate

Interest rate is the most significant variable affecting the stock market. It is the cost of money (capital), which is used as one of the factors of production. It is also a discount factor in valuation models. Therefore, interest rates have a direct effect on cost and, as a result, profits of the firm and on the net present value (NPV) of the future cash flows. Higher interest rates lead to lower profits affecting the nominator and denominator of the valuation formula. Almost all individual stocks are sensitive to variations in interest rates. According to Nissim and Penman (2003), various studies have acknowledged that stock returns and interest rates are negatively related. They examined the relationship between a change in the interest rate, earnings and stock return using data from the US and found that unexpected changes in interest rates are positively related to unexpected earnings in the year of the interest rate change and in the following year. This relationship is due to a positive association between interest rates and operating income. Bohl et al. (2007) further suggested that the positive relationship relies on the heteroskedasticity in interest rates and stock returns. The covariance between Interest rates and stock return is positive when shock
creates great volatility in stock market.

**Inflation rate**

Inflation is one of the most important macroeconomic indicators to analyze the economic conditions of the economy. Few studies have addressed the linkage among the stock market and inflation, Fama (1990); suggests that macroeconomic variables have projecting power for the stock exchange performance, although he did not consent to the anticipating authority of stock performance for the economy. Aggarwal (1981), Soenen and Hennigar (1988) measured the relationship between inflation rates and stock prices. A common expectation is that the stock prices and inflation should be positively related. This is done with the mind that, common stocks should be a hedge against inflation because stocks represent the ownership of the real assets. Earlier on, Schwert (1981) found that consumer price index (CPI) has significant influence on stock market. This was reaffirmed by Gunasekara et al. (2004) using the Sri Lanka’s stock market. A negative effect has been found between CPI and stock prices. This can be explained as the results of the higher risk of future profitability. The increase in prices level will increase the cost of production, which in turn would reduce future profitability. However, there are still some other opinions that higher price level can also have a positive effect on stock prices due to the use of equity itself as equipment for hedging inflation.

**Exchange rate**

Akinnifesi (1987) used a disaggregated analysis to investigate the relationship between exchange rate and stock prices fluctuation. He found that a depreciating Naira exchange rate increases stock prices. Literature shows that any change in the exchange rates would affect corporate foreign business and profitability. These as a result, affect firms’ equity prices. Aggarwal (1981) documented a strong positive relationship between the US dollar and the US equity prices while Soenen and Hennigan (1988) found a considerable negative relationship. The exchange rate is the price of one currency in terms of another currency. As in any demand and supply model for goods and services, the exchange rate is determined in a freely operating market by the demand and the supply forces. From the perspective of the efficient market hypothesis, exchange rates reflect all the information regarding the overseas influences on the economy. The level of the Cedi (presumably) reflects the economy’s fundamentals. According to Jackson and McIver (2001) the major determinants which cause the demand and the supply change of the currency are as follows: Preferences, GDP differentials, Inflation differentials, Interest rate differentials and Speculation. Ghanaian economy is an open economy and thus the stock market return is expected to be related to the exchange rate movements.

**Money supply**

Money supply represented by M2 in our study measures the degree of liquidity in the economy and any change in it is likely to influence the investment decisions of both individual and institutional investors. A study by Pearce and Roley (1985) argues that unanticipated announcements in monetary policy have a significant impact on stock prices while Jain (1988) documented that announcements about money supply and consumer price index are significantly associated with stock price changes. Boyle (1990) suggests that changes in monetary uncertainty modify the stock prices risk premium to replicate the added expected prices that investors demand for assuming the risk of keeping stocks. In this way, monetary uncertainty is supposed to depict a negative association with stock prices. The relationship between money supply and the stock market has been investigated empirically. Cheng (1995) and Groenewold (1997) showed that money supply affects stock market performance.

**Oil prices**

There is enough evidence provided for oil price being significant macroeconomic factor in predicting the movement of stock market prices. Literature documents that oil consumption, oil price shocks, and oil price volatility may have a negative impact on economic activities. Oil price changes have significant effects on the real economic activity and are very important to explain stock price changes. Because of that crude oil price is put into the model to explain the stock price movement. A study by Umut (2010) on the Turkish economy reveals that, oil price as an exogenous variable plays very important role during the decision making process of an investor. Jonas and Kaul (1996) studied the stock market’s reaction to oil price shocks in the United States, Canada, the United Kingdom and Japan and reached the conclusion that the American and Canadian markets reacted as expected by directly absorbing the oil price shocks into their current and expected future real cash flows. Pricing of oil is a mechanism very much decided by supply and demand and is highly correlated to the dynamics of macroeconomics and consequently affects the stock market.

**Gross domestic product**

GDP is the overall measure of the performance of an economy and there is a close and meaningful relationship between GDP and stock market return. There studies that have investigated the effects of GDP on stock returns empirically include Fama (1990) and Schwert (1990). Fama (1990) argues that the standard valuation model posits three sources of variation in stock returns: i) shocks to
expected cash flow, ii) predictable return variation due to variation through time in the discount rate that price expected cash flows; and iii) shocks to discount rates. Fama said on the average, large fractions of the (often more than 50 percent) of annual stock return variances can be traced to forecasts of variables such as real GNP, industrial production, and investments that are important determinants of the cash flows to the firms. The Real Gross Domestic Product (RGDP) which is the sum of the value added in the economy during a given period or the sum of incomes in the economy during a given period adjusted for the effect of increasing prices will impact on the liquidity of the capital market; hence its influence on stock prices. A study by Osei (2005) based on the Ghana Stock Exchange revealed that stock market performance granger causes economic growth. Interestingly, the study did not find a reverse causality, and this development was attributed to the low level of income as evidenced in most developing economies.

METHODOLOGY

Data type and sources

In order to address the issues raised in the paper, the study considered the period 1995-2011. Secondary data was used for the analysis. To accomplish the research objectives, quarterly time series data spanning from the first quarter of 1995 to last quarter of 2011 comprising 68 data points have been used for doing effective regression analysis. The market index and stock price data were obtained from the Ghana stock Exchange, whilst inflation rate, exchange rate, interest rate, Oil prices and money supply were obtained from Bank of Ghana.

Variables Definition

GSE all-share-index (GSI)

This variable captures the overall performance of the market and it is the dependent variable in the regression analysis.

Money supply

Average of monthly money supply (M2) is calculated to obtain quarterly values. Theses economic variables were selected on the following basis: money supply characterize by M2 gives a measure of liquidity in the economy and any change in money supply should therefore have an impact on the investment decisions of individual investors.

Exchange rate

Average of monthly exchange rate (in terms of the USD) is calculated to obtain quarterly values. The rise and fall in exchange rate make Ghanaian equity cheaper (expensive) for foreign investors and therefore, fluctuations in the exchange rate should have an impact on equity investment decisions for foreign investors. The study expects a negative relationship between exchange rate and the performance of the stock market.

Inflation rate

Average of monthly inflation rate is calculated to obtain quarterly values. The rise and fall in inflation reduces or increases the purchasing power of investors and thus should have an impact on equity investment decisions of local investors.

Interest rate

The 91-day Treasury bill interest rates are used as a proxy for the interest rate. The Treasury bill rate acts as the rate of return offered by risk free asset and the shifting of funds between risky equity and risk free assets by portfolio managers. The study hypothesise an inverse relationship.

Oil prices

Average of monthly oil prices is calculated to obtain quarterly values. A report from the six oil producing countries of the Gulf Cooperative Council (GCC) shows that there should be a link between oil price and stock returns. The study expects a positive relationship.

Model specification

For the purpose of empirical analysis, this paper specifies a regression model to carry out various econometrics tests. Our model is based on the model adopted by Coleman and Agyire-Tettey (2008). The study therefore specifies the following empirical model to be estimated.

\[ Y = \alpha_0 + \alpha_1X_1 + \alpha_2X_2 + \alpha_3X_3 + \ldots + \varepsilon_t \]

Where:
- \( Y \) = dependent or unexplained variable
- \( \alpha_0 \) = constant of the model
- \( \alpha_1 + \alpha_2 + \alpha_3 \) = coefficient of the model.
- \( X_1 + X_2 + X_3 \) = Independent explanatory variables.
- \( \varepsilon \) = stochastic variable or error term.

The basic assumptions for this work are:
- Null hypothesis (H0): Inflation rate, exchange rate, interest rate, oil prices and money supply do not have any influence on the overall performance of the Ghanaian stock market.
- Alternative hypothesis (H1): Inflation rate, exchange rate, interest rate, oil prices and money supply have influence on the overall performance of the Ghanaian stock market.
the right and have a flatter 'bell shaped'. In this regard we fail to reject the null hypothesis that the data sets are normally distributed since their respective p-value of the Jarque-Bera Statistic is less than 0.05. As required in time series analysis if the data sets are found not to be stationary, it is important to make them stationary so that meaningful estimations can be made from them. In this regard, the data sets of the entire variables understudy were transformed by taking natural log of all of them and in another instance the difference in log of the variables. In this transformation, all the variables became normal except exchange rate. This conclusion was arrived at from the Jarque-Bera Statistic values with their respective probability in Table 1. By this transformation the data sets became much stationary with manageable means and standard deviations.

A comparative study of their trend reveal an increasing movement with fluctuations. Log of all share index has the biggest average for the entire study period followed by log of money supply. Log of exchange rate recorded a negative average for the period. The rest of the variables fluctuates between an average of 2 and 4 throughout the study period. See Figure 1 below.

Unit Root Test

The objective of the unit root test is to check for stationarity given an unstable time series data. After transforming the data, it is appropriate to test for stationarity in the data. The Augmented Dickey-Fuller (ADF) test statistic was employed to test for stationarity (no unit root).

For each of the coefficient of the variables, the null hypothesis of unit root exist (meaning data sets are not stationary) against the alternative, there exist no unit root in the data set (meaning the data sets are stationary). We reject the null hypothesis whenever the absolute value of the ADF statistic is greater than the critical
Table 2. Results of the ADF Unit Root Test

<table>
<thead>
<tr>
<th>Type of Test</th>
<th>Variable</th>
<th>Deterministic term</th>
<th>Lag length</th>
<th>Test Value</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level ADF</td>
<td>log(ALSI)</td>
<td>Constant</td>
<td>1</td>
<td>-1.580757</td>
<td>-3.5332</td>
<td>-2.90621</td>
<td>-2.59063</td>
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<tr>
<td></td>
<td>log(EXR)</td>
<td>Constant</td>
<td>1</td>
<td>-1.961133</td>
<td>-3.5332</td>
<td>2.90621</td>
<td>2.59063</td>
</tr>
<tr>
<td></td>
<td>log(INFL)</td>
<td>Constant</td>
<td>1</td>
<td>-2.639765</td>
<td>-3.5332</td>
<td>2.90621</td>
<td>2.59062</td>
</tr>
<tr>
<td></td>
<td>log(M2)</td>
<td>Cont &amp; Trend</td>
<td>1</td>
<td>-3.297168</td>
<td>-4.1032</td>
<td>3.47937</td>
<td>3.1674</td>
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<tr>
<td></td>
<td>log(OP)</td>
<td>Constant</td>
<td>1</td>
<td>-0.966813</td>
<td>-3.5332</td>
<td>2.90621</td>
<td>2.59063</td>
</tr>
<tr>
<td></td>
<td>log(TB)</td>
<td>Constant</td>
<td>1</td>
<td>-1.463105</td>
<td>-3.5332</td>
<td>2.90621</td>
<td>2.59063</td>
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<tr>
<td>First Difference ADF</td>
<td>D(log(ALSI))</td>
<td>Constant</td>
<td>1</td>
<td>-4.879811</td>
<td>-3.53487</td>
<td>-2.90692</td>
<td>-2.59101</td>
</tr>
<tr>
<td></td>
<td>D(log(EXR))</td>
<td>Constant</td>
<td>2</td>
<td>-4.138055</td>
<td>-3.53659</td>
<td>-2.90766</td>
<td>-2.59139</td>
</tr>
<tr>
<td></td>
<td>D(log(INFL))</td>
<td>Constant</td>
<td>1</td>
<td>-4.548392</td>
<td>-3.53487</td>
<td>-2.90692</td>
<td>-2.59101</td>
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<tr>
<td></td>
<td>D(log(M2))</td>
<td>Constant</td>
<td>2</td>
<td>-10.02398</td>
<td>-3.53659</td>
<td>-2.90766</td>
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<td></td>
<td>D(log(OP))</td>
<td>Constant</td>
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<td>-4.413742</td>
<td>-4.41374</td>
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<td>-2.5914</td>
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<td></td>
<td>D(log(TB))</td>
<td>Constant</td>
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<td>-4.032173</td>
<td>-3.53659</td>
<td>-2.90766</td>
<td>-2.5914</td>
</tr>
</tbody>
</table>

value for each of the variables under study. From Table 2 we can observe that the absolute value of the ADF statistic is greater than the critical value at the 1%, 5% and 10% levels, for the log difference of the variables. This enable us to conclude that the variables are stationary (meaning there exist no unit root in these time series. The stationarity of the variables were restored on first differencing.

Cointegration and error correction model

The results from the estimation of the Error Correction Model (ECM) presented in Table 3 below shows that oil prices and money supply are statistically significant at 1% level in explaining the variations in the performance of Ghana stock Exchange. The overall result therefore indicates that there is a co integration relationship among the variables. Since the market index and the macroeconomic variables have at least some co integrating vectors, it is reasonable to assume that they move together in the long run equilibrium path. Money supply represented by M2 in the study measures the degree of liquidity in the economy and any change in it is likely to influence the investment decisions of both individual and institutional investors. The coefficient of money supply is negative on average and it is statistically significant at lagged1 indicating a negative influence on stock prices. On the other hand when money supply took a positive coefficient at lagged 2, it is statistically significant at 1%. This implies
that growth in money supply appears to exert a positive impact on share prices. Our study reaffirms the findings of Pearce and Roley (1985) and Jain (1988), they documents that unexpected announcement in monetary policy have significant impact on stock prices.

From the study, the estimation recorded a positive coefficient for oil prices at lagged one but this is not statistically significant. When it was lagged at two the coefficient changed from positive to negative at 1% level of significance. A study by Nandha and Faff (2008) argues that market reaction to an increase in oil prices for exporting countries is positive while that of importing countries tends to be negative. It can also be argued that increases in oil prices are likely to depress most firms that consume oil as the energy in production and manufacturing of goods and services. It ultimately affects the stock prices and lower stock market returns. From our study it is established that oil prices do have influence on the performance of the stock market. The study documented a negative relationship between stock market performance and interest rate at both lagged 1 and 2. This is not surprising giving that high lending rate tend to discourage companies from financing projects through loans and thus resort to a less expensive means but equally efficient equity financing hence promoting stock market activities. On the other hand a high Treasury bill rate tends to encourage investors to purchase more government instrument. Treasury bill tends to compete with stocks and bonds for the resources of investor. This tends to reduce the demand for stock market instruments and causes an eventual reduction in stock prices hence exhibiting a negative relation. Exchange rate and inflation rate exhibited the same pattern of negative relationship with the stock market performance.

**Conclusion**

Employing the ECM and the ADF Co-integration analysis on quarterly time series data, the study examined the dynamic connection between macro-economic variables such as money supply, Treasury bill (proxy for interest rate), inflation rate, exchange rate and oil prices were used to represent economic forces while the Ghana All Share Index was used to represent the stock market. The main findings of the study revealed that oil prices and money supply are statistically significant at 1% level in explaining the variations in the performance of Ghana stock Exchange. The finding of the work establishes that there is a long run Relationship between some of the macro-economic

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**Table 3. Error Correction Model**

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Res</td>
<td>0.027382</td>
<td>0.012963</td>
<td>2.112344</td>
<td>0.0355</td>
</tr>
<tr>
<td>ΔALSI_{t-1}</td>
<td>0.474788</td>
<td>0.107041</td>
<td>4.435592</td>
<td>0.0000</td>
</tr>
<tr>
<td>ΔALSI_{t-2}</td>
<td>-0.114934</td>
<td>0.110726</td>
<td>-1.038007</td>
<td>0.3001</td>
</tr>
<tr>
<td>ΔOP_{t-1}</td>
<td>-5.779443</td>
<td>9.473103</td>
<td>-0.610990</td>
<td>0.5423</td>
</tr>
<tr>
<td>ΔOP_{t-2}</td>
<td>38.11285</td>
<td>10.19537</td>
<td>3.738251</td>
<td>0.0002</td>
</tr>
<tr>
<td>ΔEXR_{t-1}</td>
<td>0.474788</td>
<td>0.107041</td>
<td>4.435592</td>
<td>0.0000</td>
</tr>
<tr>
<td>ΔEXR_{t-2}</td>
<td>-0.474788</td>
<td>0.107041</td>
<td>-4.435592</td>
<td>0.0000</td>
</tr>
<tr>
<td>ΔINFL_{t-1}</td>
<td>-20.03718</td>
<td>21.26237</td>
<td>-0.942377</td>
<td>0.3467</td>
</tr>
<tr>
<td>ΔINFL_{t-2}</td>
<td>26.26878</td>
<td>19.34507</td>
<td>1.357905</td>
<td>0.1755</td>
</tr>
<tr>
<td>ΔTB_{t-1}</td>
<td>-30.90705</td>
<td>31.69273</td>
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<tr>
<td>ΔTB_{t-2}</td>
<td>-7.82359</td>
<td>28.11131</td>
<td>-0.278301</td>
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</tr>
<tr>
<td>ΔM 2_{t-1}</td>
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<td>0.436269</td>
<td>-4.075796</td>
<td>0.0001</td>
</tr>
<tr>
<td>ΔM 2_{t-2}</td>
<td>2.661630</td>
<td>0.560440</td>
<td>4.749177</td>
<td>0.0000</td>
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<td>C</td>
<td>-202.2227</td>
<td>202.9645</td>
<td>-0.996345</td>
<td>0.3199</td>
</tr>
</tbody>
</table>

R-squared               | 0.637832    | Mean dependent var  | 0.45760 |
| Adjusted R-squared     | 0.545514    | S.D. dependent var   | 1011.474 |
| S.E. of regression     | 681.8909    | Sum squared resid    | 23713736 |
| Durbin-Watson stat     | 2.146785    |                        |        |
variables and the stock market. With these results it is important to highlight that there is the need to implement prudent macroeconomic policies in order for the country to derive maximum benefits from stock markets. In order to enable the capital market in general and stock market in particular to take full advantage of the various opportunities and cope with challenges, interest rates, inflation, must be reduced. This must be done in relation to appropriate monetary policies to ensure macroeconomic stability.

REFERENCES


