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## Effect of Macroeconomic Variables on the Ghanaian Stock Market Returns: A Co-integration Analysis

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### Abstract

This study investigates the effect of macroeconomic variables on the Ghanaian stock market returns using monthly data over period January 1992 to December, 2008. Macroeconomic variables used in this study are consumer price index (as a proxy for inflation), crude oil price, exchange rate and 91 day Treasury bill rate (as a proxy for interest rate). The study employs the Johansen Multivariate Co-integration Procedure. The empirical results reveal that there is co-integration between the four macroeconomic variables and stock returns in Ghana indicating long run equilibrium relationship. Further, the results reveal that; in the short run, Treasury Bill Rate significantly influences the stock returns, with an elasticity of 0.005, implying that a 1% rise in the Treasury bill rate will lead to a 0.005% rise in the stock returns. The inflation rate is also significant at 1% with elasticity -0.135744, implying that a 1% increase in inflation rate will decrease stock returns by 0.14%. The residual value of 0.785548 of the Error Correction Model indicates that about 79% of the deviations of the stock returns are corrected in the short run, which is quite high and encouraging for an emerging market like the Ghana Stock Exchange. In the long run, however, the stock returns are significantly influenced by Inflation rate, Crude oil prices, Exchange rate, and Treasury bill rate, with elasticities of 0.5479, -0.03021, 0.05213, and 0.00322 respectively. Crude oil price is negatively related to stock returns; 1% rise in Crude oil prices will decrease returns by 0.03%. Also a 1% increase in inflation rate increases stock returns by 0.54%; and a 1% rise in exchange rate increases stock returns by 0.052%. The effect of Treasury bill rate is highly inelastic with elasticity of 0.003. In both the short run and the long run results, inflation rate appears to be the most influential macroeconomic variable affecting stock market returns in Ghana. The results also reveal that investors are not compensated for inflationary increases in the short run, but are compensated in the long run. These results have implications for financial analysts, fund managers and policy makers.

### Key words

Stock market returns, inflation rate, crude oil price, exchange rate, interest rate, Cointegration Analysis, Ghana.

### Introduction

Interest in financial markets and the efforts to forecast their performance has attracted significant attention of academicians, financial analysts, and policy makers. The Ghanaian economy has over the last decade witnessed relative macroeconomic stability in terms of GDP growth, significant reduction of interest rates, and stability of the cedi/dollar exchange rate, crude oil price and inflation. This relative stability has been attributed to the growth of major sectors of the economy including the money markets and the capital markets. The drop

of interest rate following declines in inflation and prime rates has shifted the attention of investors to the stock market as the better means of investments. Evidence from the Ghana Stock Exchange (GSE) indicates that the relative stability of the interest rates and other macroeconomics variables have been the contributory factor to the growth of the stock markets. The attention of most investors has been shifted from investing in Treasury bills and other financial instruments which are risk free, as a result of the stability of the interest rate. This has caused the returns on these investments to fall. As a result of this, most investors have shifted

their attention to the stock markets and so over the last decade stocks of some listed companies have been oversubscribed. Investing in stocks provides a higher return than the other financial instruments but there are also risks associated with these stocks. Most investors invest in the stock market with the objectives of maximizing their return without taken into consideration the effect of macroeconomic variables such as inflation, and exchange rate on the stock prices of companies listed. The relationship between macroeconomic variables and stock returns has been extensively studied, for instance, Chen et al., (1986) who examined US stock market. Fama (1981) report a positive relationship between stock returns and macroeconomic variables. In spite of increasing migration of capital from developed market to emerging markets and associated high returns, (see Ushad et al., (2008) and Osinubi (2004)), emerging stock markets in developing countries like Ghana have not been well studied. In 2006 for example, foreign equity accounted for 75.3% of the equity finance recorded in Ghana compared to 29.9% in 2001 according to Ghana Investment Promotion Centre quarterly report (December 2007). The growing interest and the performance of emerging markets have been attributed to the conduct of sound macroeconomic policies, privatization, stock market reforms and financial liberalization (Adams and Anokye, 2008). As African economies attempt to develop their private sectors, it is becoming clear that the growth of the stock markets can serve as an important catalyst for sustainable development and growth. The emerging stock markets in developing countries like Ghana have also attracted world attention as markets of the future with a lot of potential for investors; it has become necessary to extend this type of study to the Ghana stock market. This study might also be relevant to private investors, pension funds and governments as many long-term investors base their investment in equities on the assumption that corporate cash flows should grow in line with the economy.

The objective of this study is to examine the effect of macroeconomic variables on stock market returns using cointegration analysis. This study is a follow up of Owusu-Nantwi and Kuwornu (2011); and Kuwornu and Owusu-Nantwi (2011).

The rest of the paper is organized as follows: section two focuses on the review of existing literature; Section three presents the methodology; section four presents and discusses the result of the study while section five provides the conclusions.

## **Literature Review**

Stock prices reflect expectations of the future performances of corporate profit. As a result, if stock prices reflect these assumptions, then they should be used as indicators of economic activities. So, the dynamic relationship between stock prices and macroeconomic variables can be used to guide a nation's macroeconomic policies (Maysami et al., 2004). Prices of stocks are determined by the net earnings of a company. It depends on how much profit, the company is likely to make in the long run or the near future. If it is reckoned that a company is likely to do well in the years to come, the stock price of the company will rise to reflect the positive expectation. On the other hand, if it is observed from trends that the company may not do well in the long run, the stock prices may decline. In other words, the prices of stocks are directly proportional to the performance of the company. In the event that inflation increases, the company earnings (worth) will also subside. This will adversely affect the stock prices and eventually the market returns.

Choudhry (2000) found a positive relationship between stock returns and inflation in four high inflation countries. Maysami et al., (2004) find a positive relationship between inflation rate and stock returns. This is contrary to other studies that suggest a negative relationship. The reason given by the authors is the active role of government in preventing price escalation after the economy continued to progress after the 1997 financial crises. Mohammed et al., (2007) studied the effect of macroeconomic variables on stock prices in Malaysia using error correctional model. The results indicate that there is a positive relationship between inflation rate and stock price. Engsted and Tanggaard (2002) find a moderately positive relationship between expected stock returns and expected inflation for the US and a strong positive relation for Denmark.

According to the "Fisher effect" expected nominal rates of interest on financial assets should move one-to-one with expected inflation (Fisher, 1930). Moreover, changes in both short-term and long-term rates are expected to affect the discount rate in the same direction through their effect on the nominal risk-free rate (Mukherjee and Naka, 1995). Therefore interest rates are expected to be negatively related to market returns either through the inflationary or discount factor effect (Abugri, 2008). Some previous studies have reported that it is not interest rate itself that is relevant but the yield and default spreads that are more likely to influence equity returns (eg., Chen et al., 1986).

However, the continued use of interest rates may be attributed to the absence of active secondary markets for bonds issues and government paper in many emerging markets (Bilson et al., 2001). Theoretically, French et al., (1987) found negative relationship between stock returns and both long-term and short-term interest rate. Furthermore, Bulmash and Trivoli (1991) found that the US current stock price is positively correlated with the previous month's stock price, money supply, recent federal debt, recent tax-exempt government debt, long-term unemployment, the broad money supply and the federal rate. However, there was a negative relationship between stock prices and the Treasury bill rate, the intermediate lagged Treasury bond rate, the longer lagged federal debt, and the recent monetary base. Abdullah and Hayworth (1983) find that stock returns are positively related with the money growth and inflation rate while interest rate reacts negatively on stock returns.

The link between exchange rates and equity returns is based on a simple financial theory. Exchange rate as an indicator of a currency as a monetary variable that affect the prices of stock in a way similar to inflation variables. When the domestic currency depreciates against foreign currencies, export product prices will decrease and, consequently, the volume of the country's export will increase, assuming that the demand for this product is elastic. The appreciation of a country's currency lowers the cost of imported goods, which in most cases constitute a large part of the production inputs for emerging market countries. According to Pebbles and Wilson (1996), an appreciating currency is generally accompanied by increases in reserves, money supply and a decline in interest rates. The resulting decline in cost of capital and/or imported inputs is expected to lead to an increase in local return. Such an expectation is also consistent with Bilson et al., (2001) conclusion that a devaluation of the domestic currency has a negative relationship with return. Mukherjee and Naka (1995) also confirmed that exchange rate positively relates to Japan and Indonesia stock prices, both two large export countries. Solnik (1987) employs monthly and quarterly data for eight industrial countries from 1973-1983 to examine the relation between real stock returns, exchange rates and reports a negative relation among variables. Employing monthly data, Aggarwal (1981) examines the relationship between stock market indexes and a trade weighted value of the dollar for the period 1974-1978 and finds that the stock prices and exchange rates are positively correlated. In contrast, Soenen and Hernigar (1988) also using monthly data, report a strong negative relation between US stock indexes

and fifteen currency weighted value of the dollar for the period 1980-1986. Bilson et al., (2001) tested whether local macroeconomic variables (money, goods prices and real activity) have explanatory power over stock return of 20 exchange emerging markets for the period 1985-1997. The results indicate that the exchange rate variable is clearly the most influential macroeconomic variables.

Gazi and Hisham (2010) studied the relationship between macroeconomic variables and stock market returns in the Jordanian Stock Market. Using cointegration analysis, they find that the trade surplus, foreign exchange reserves, the money supply and oil prices are important macroeconomic variables which have long run effects on the Jordanian stock market. There is a negative relationship between crude oil price and stock market returns. This is also expected as increase in the price of oil will depress real economic activity, so a negative sign is justified. Interest rate does not affect the stock market.

Anokye and Tweneboah (2008) examined the role of macroeconomic variables on stock returns movement in Ghana. They used the Databank stock index to represent Ghana Stock market and the macroeconomic variables are; inward foreign direct investment, Treasury bill rate (as a measure of interest rate), consumer price index (as a measure of inflation) and exchange rate. They analyze both long-run and short-run relationships between the stock market index and the economic variables with quarterly data for the above variables from 1991 to 2006 using Johansen's multivariate cointegration test and innovation accounting techniques. They established that there is cointegration between macroeconomic variables identified and stock prices in Ghana indicating long run relationship. Result of impulse Response Function (IRF) and Forecast Error Variance decomposition (FEVD) indicate that interest rate and foreign Direct Investment (FDI) are the key determinants of the share price movements in Ghana.

## **Materials and Methods**

### **Data**

The empirical analysis is carried out using monthly data. The data period spans from January 1992 to December 2008 and the study was carried out using 204 monthly observations. The study employed GSE All Share Index (ASI) as a proxy for Ghana stock market returns. The macroeconomic variables are obtained in monthly intervals from the Central Bank of Ghana (BoG) and Ghana Statistical Services (GSS). The macroeconomic variables are

nominal interbank exchange rate (EXR), 91-day Treasury bill (T-bill) yield to proxy for Interest rate (TBR), crude oil price (CRO) and consumer price index to proxy for inflation (CPI). The data for the study are monthly from 1992 to 2008. All the macroeconomic data were obtained from the Central Bank of Ghana except the consumer price index which was obtained from the Ghana Statistical Services. The GSE All share Index was obtained from Ghana Stock Exchange (GSE). The brief description for each variable used is presented in the Table 1 below. In order to smooth the data all variables were converted to natural logarithm. The use of natural logarithm, rather than levels and percentage changes, mitigates correlations among the variables. Also, it helps in reducing heteroscedasticity as it compresses the scale in which variables are being measured. Selecting variables in similar studies is usually subject to criticism on the grounds of subjectivity. Fama (1981) has argued that such criticism is an unavoidable problem associated with this area of research. This study bases its selection of variables on theoretical propositions and evidence in the literature.

Four macroeconomic variables, namely, inflation (measured by the Consumer Price Index), 91-day Treasury bill rate used as proxy for interest rate and nominal inter-bank exchange rate (measured by the US\$/GH¢) and crude oil price (US\$ per barrel) have been selected as critical variables for this research. Our selection is influenced by the various works that have been carried out and reviewed in

the literature about their relationships with stock returns, in other economies like US, Japan, Sri Lanka, India, Jordan, Pakistan and UK.

### **Description of Variables**

#### *Inflation Rate*

Inflation is measured by changes in the Ghana Consumer Price Index (GCPI) which was collected from the Ghana Statistical Services database. High rate of inflation increase the cost of living and a shift of resources from investments to consumption. This leads to a fall in demand for market instruments which lead to reduction in the volume of stock traded. Also the monetary policy responds to the increase in the rate of inflation with economic tightening policies, which in turn increases the nominal risk – free rate and hence raises the discount rate model. High Inflation affects corporate profits, which in turn causes dividends to diminish. Consequently decreases in expected return of stocks cause stocks to depreciate in value. Conversely, low inflation implies lower cost of borrowing. Corporate performance goes up leading to increase in production and corporate profit. This results in the payment of attractive dividends by companies. The monthly inflation was computed as the natural logarithm of consumer price index at month  $t$ .

<b>Variable</b>	<b>Concept</b>	<b>Description</b>	<b>Units</b>	<b>Source</b>
LASI	Natural logarithm of Ghana Stock Exchange Index	Ghana Stock Exchange All Share Index	1990 = 77.65 points	Ghana Stock Exchange
LCPI	Natural logarithm of consumer price index	Consumer Price Index	Percentage per month	Ghana Stock Exchange
LEXR	Natural logarithm of exchange rate	Principal rate (Gh¢ per US Dollar)	GH¢ per US\$	Bank of Ghana
LTBR	Natural logarithm of 91-day Treasury bill rate	91-day Treasury bill rate	Percentage per month	Bank of Ghana
LCRO	Natural logarithm of crude oil price	Crude Oil Price	US\$ per barrel	Bank of Ghana

Table 1: Data Description and Source.



### Interest Rate

The 91-Day Treasury bill rate is used as proxy for interest rate since Treasury bill serves as the opportunity cost of holding shares and as a benchmark for measuring interest rate. Chen et al., (1986), Beenstock and Chan (1988), Fifield et al., (2002), provide evidence on the relationship between interest rates and stock returns. High interest rate regimes lead to high cost of borrowing and hence a reduction in economic activity. This also affects corporate profit, future cash flow of business and dividend. According to the “Fisher effect”, expected nominal rate of interest on financial assets should move one-to-one with inflation (Fisher, 1930). Moreover, changes in both short term and long-term rates are expected to affect the discount rate in the same direction through their effect on the nominal risk-free rate (Mukherjee & Naka, 1995). Therefore interest rates are expected to be negatively related to market returns either through the inflationary or discount factor effect. However, the continued use of interest rates may be attributed to the absence of active secondary markets for bond issues and government paper in many emerging markets (Bilson et al., 2001). The interest rate is calculated as natural logarithms of three month T-bill rate at month  $t$ .

### Exchange Rate

In recent year, all businesses are directly and indirectly affected by international activities as a result of globalization. In other words, exchange rate changes may affect the competitive position of companies and hence industries operations. As a result, cost of goods and services, sales and cash flows may change with changes in exchange rate. Ozcam (1997) and Altay (2003) revealed that exchange rates influence stock returns. In Ghana the cedi-dollar exchange rate is important in assessing the stock market because, being the major international trading currency, any hike is translated in the cost of importing raw material, and other imports. Since Ghana’s economy is also import-demand driven, changes in the exchange rate affects most sectors of the economy as well as the pricing of goods and cost of production. The exchange rate therefore affects business cash flow and profitability. Investors may also evaluate this as an important risk factor. According to Pebbles and Wilson (1996), an appreciating currency is generally accompanied by increases in reserves, money supply and a decline in interest rates. The resulting decline in cost of capital and/or imported inputs is expected to lead to an increase in local returns. Such an expectation is consistent with

Bilson et al., (2001) conclusion that a devaluation of the domestic currency has a negative relationship with returns. The change in exchange rate is calculated as the natural logarithms of the exchange rate at month  $t$ .

### GSE All Share Index

The study included the GSE All Share index to proxy the state of Ghana Stock Market. GSE All Share Index which is the broad market indicator of the stock market measures the overall performance of the stock market. This index is computed by the Ghana Stock Exchange. The GSE All share index is calculated as natural logarithms of GSE All share index at month  $t$ .

### Crude Oil Price

Crude oil is an essential input for production and so the price of oil is included as a proxy for real economic activity. An increase in the price of oil in the international market means lower real economic activity in all sectors, which will cause stock returns to fall. The crude oil price is calculated as the natural logarithm of crude oil price at month  $t$ .

### Descriptive Statistics

Table 2 presents the descriptive statistics for the macroeconomic variables. All variables exhibit a positive mean return except for exchange rate. Also the sum squared deviation row represents the net change over the sample period. It shows that the exchange rate declined by about 217%. In terms of skewness, GSE All share Index and crude oil prices have return distribution that are positively skewed. Consumer Price Index, exchange rate and 91 day Treasury bill rate exhibit a negative skewness which implies that they have a long left tail. All the variables are relatively normally distributed as indicated by the  $p$  values of Jarque Bera statistic.

The relationship to be investigated between stock market returns and macroeconomic variables is specified in equation (1) below.

$$\ln ASI_{it} = \beta_0 + \beta_1 \ln CPI_{it} + \beta_2 \ln EXR_{it} + \beta_3 \ln TBR_{it} + \beta_4 \ln CRO_{it} + \varepsilon_{it} \quad (1)$$

Where  $\ln$  is the natural logarithm,  $ASI$  is the GSE All share Index (return on stock portfolio  $i$ ),  $CPI$  is the change in consumer price index,  $TBR_t$  is 91-day Treasury bill rate,  $EXR_t$  is the nominal exchange rate,  $CRO_t$  is the international crude oil price,  $\beta_0$  is

Statistic	Variables				
	LASI	LCPI	LCRO	LEXR	LTBR
Mean	6.903504	4.07489	3.329112	-1.0655	3.244853
Median	6.766509	4.155852	3.171364	-0.54988	3.360722
Maximum	9.295674	5.603828	4.940427	0.193382	3.869742
Minimum	4.108508	2.02792	2.347558	-3.24419	2.256541
Std. Dev.	1.45156	1.079273	0.597055	1.036062	0.500429
Skewness	0.111867	-0.38563	0.806761	-0.54516	-0.61132
Kurtosis	2.072223	1.938091	2.654122	1.911149	2.246309
Jarque-Bera	7.742022	14.6411	23.1462	20.18243	17.53475
Probability	0.020837	0.000662	0.000009	0.000041	0.000156
Sum Sq. Dev.	427.7265	236.4605	72.36435	217.905	50.83712
Observations	204	204	204	204	204

Table 2: Descriptive Statistics of the variables.

the intercept of the regression and is the constant term representing risk free rate,  $\beta_1, \beta_2, \beta_3, \beta_4$  are the coefficient of variables,  $\varepsilon_t$  is the error term. The procedure followed in this study is as follows. First, four macroeconomic variables were selected and the GSE All share Index and their monthly logarithmic returns over the period of study are computed. Descriptive statistics for the variables are derived after which the stationarity of the variables are checked using the Augmented Dickey Fuller test. Finally, Error Correction Modeling and Johansen Cointegration analysis are performed using EViews Statistical package.

## Results and discussion

ADF test indicates that the series are not stationary at levels but stationary at first differences. The fact that the series are stationary at first difference requires the use of Cointegration and Vector Error Correction Modeling (Johansen and Juselius, 1990, 1992).

### Stationarity of the Time Series - Unit root tests

In empirical analysis using time series data it is important that the presence or absence of unit root is established. It is necessary to consider the nature of the processes that generate the time series data variables. This is because contemporary econometrics has indicated that regression analysis using time series data variables with unit root produce spurious regression results. As a requirement for cointegration analysis the data was tested for series stationarity and to determine the

order of integration of the individual variables. For cointegration analysis to be valid all series must be integrated of the same order usually of order one (Townsend, 2001).

All data series were found to be non-stationary at levels and stationary after first differencing. LCRO and LEXC were stationary at first difference with linear trend. The results of the unit root tests are presented in Tables 3 and 4 below.

The results in table 4 reveal that the time series variables are integrated of order one. The next step in the process of analysis is to determine the existence or otherwise of cointegration in the series. This is to establish the existence of valid long-run relationships between variables.

The Johansen approach cointegration test (Johansen and Juselius, 1990, 1992) is based on the following vector autoregressive model:

$$Z_t = A_1 Z_{t-1} + \dots + A_k Z_{t-k} + \mu_t \tag{2}$$

Where  $Z_t$  is an  $(n \times 1)$  vector of  $I(1)$  variables (containing both endogenous and exogenous variables),  $A_i$  is  $(n \times n)$  matrix of parameters and  $\mu_t$  is  $(n \times 1)$  vector of white noise errors.

First, the Vector Error Correction Model (VECM) procedure using the Johansen method involves defining an unrestricted Vector Autoregression (VAR) using the equation above.

Likelihood Ratio (LR) tests were conducted with maximum of one lag due to the short time series.

Series	ADF test statistic	Mackinnon critical value	Lag-length	p-value	Conclusion
LASI	-0.839969	-3.584743	3	0.7978	Non-stationary
LCPI	-1.923455	0.3190	3	0.3190	Non-stationary
LCRO	3.180390	-4.004425	3	1.0000	Non-stationary
LEXC	4.747315	-4.057910	3	1.0000	Non-stationary
TBR	-2.125304	-3.581152	3	0.2360	Non-stationary

Table 3: Unit root test results at levels.

Series	ADF test statistic	Mackinnon critical value	Lag-length	p-value	Conclusion
LASI	-10.61638	-3.584743	3	0.0000	I(1)
LCPI	-8.614832	-3.581152	3	0.0000	I(1)
LCRO	-4.800080	-6.320195	3	0.0010	I(1)
LEXC	-7.817471	-4.886426	3	0.0002	I(1)
TBR	-5.442783	-3.584743	3	0.0000	I(1)

Table 4: Unit root test results at first difference.

The results for the co-integration test imply that the trace test and the maximum eigen value test selects the presence of one co-integrating vector. Thus, it can be concluded that the variables in the model are have a long run equilibrium relationship, with one co-integrating vector. The Johansen model is a form of Error Correction Model. When only one co-integrating vector is established its parameters can be interpreted as estimates of long run co-integrating relationship between the variables (Hallam and Zanolì, 1993). This implies that the estimated parameter values from this equation when normalised on the stock returns are the long run elasticities for the model. Eviews automatically produces the normalised estimates. These coefficients represent estimates of elasticities LASI with respect to LCPI, LCRO, LEXC, and TBR variables. The normalised equation is presented as follows;

$$LASI = 0.054786LCPI - 0.030205LCRO + 0.052131LEXC + 0.003219TBR - 21211.96 \quad (3)$$

If cointegration is established among the variables, then the ECM framework is the ideal basis for stock market returns analysis because it provides information about the speed of adjustment to long-run equilibrium and avoids the spurious regression problem (Engle and Granger, 1987). We can then estimate the short run elasticities as follows.

$$\Delta LASI = \delta_0 + \sum_1^3 \delta_{1i} LCPI + \sum_1^3 \delta_{2i} LCRO + \sum_1^3 \delta_{4i} LEXC + TBR - \alpha EC_{i-1} \quad (4)$$

$$\text{Where } \alpha EC_{i-1} = \alpha(LASI_{t-1} - \beta_1 LCPI_{t-1} + \beta_2 LCRO_{t-1} + \beta_3 LEXC_{t-1} + \beta_4 TBR_{t-1})$$

In equation (4), the right hand side difference terms are lagged. The  $\delta_{i_s}$  explain the short-run effect on the dependent variable of changes in the explanatory variables. The  $\beta_{i_s}$  represent the long-run equilibrium effects.  $\alpha EC_{i-1}$  is the error correction term and correspond to the residuals of the long-run cointegration. The negative sign on the error correction term indicates that adjustments are made towards restoring long run equilibrium. This method provides estimates for the short-run elasticities, that is the coefficients of the difference terms whereas the parameters from the Johansen cointegration are the estimates of the long run elasticities (e.g., Townsend and Thirtle, 1994).

**Short run relationships between stock market returns and macroeconomic variables**

In the short run, Treasury Bill Rate significantly influences the stock returns, with an elasticity of 0.005. This means that a 1 % rise in the Treasury



Variable	Coefficient	Standard error	t-statistic	p-value
$\Delta$ LASI(-1)	0.037984	0.096488	0.393660	0.7139
$\Delta$ LCPI(-1)	<b>-0.135744</b>	<b>0.017208</b>	<b>-7.888581</b>	<b>0.0014</b>
$\Delta$ LCRO(-1)	0.000188	0.001048	0.179345	0.8664
$\Delta$ LEXC(-1)	0.001497	0.000800	1.870480	0.1348
$\Delta$ LTBR(-1)	<b>0.005418</b>	<b>0.001943</b>	<b>2.788024</b>	<b>0.0494</b>
<b>Residual</b>	<b>0.785548</b>	<b>0.079719</b>	<b>9.853991</b>	<b>0.0006</b>
<b>C</b>	<b>991.4737</b>	<b>321.0339</b>	<b>3.088376</b>	<b>0.0366</b>
R-Squared	0.988			
Adjusted R-Squared	0.961			
F-statistic	35.34186			
Prob(F-statistic)	0.001823			

Table 5: Error Correction Model estimates for the effect of macroeconomic variables on stock returns.

bill rate will lead to a 0.005 % rise in the stock returns. This result implies that investors do not view Treasury bill with the associated interest rates as alternative investment opportunities. Thus, increases in Treasury bill rates leads to increased investment in stocks causing stock returns to rise. This result is somewhat consistent with Engsted and Tanggaard (2002).

The inflation rate is also significant at 1% with elasticity -0.135744, implying that a 1% increase in inflation rate will decrease stock returns by 0.14 %. The negative relation implies investors are not compensated for inflationary increases in the short run. This result is somewhat consistent with Bulmash and Trivoli (1991), Chatrath et al., (1997), Zhao (1999), Omran and Pointon (2001).

The residual value of 0.785548 indicates that about 79 % of the deviations of the stock returns are corrected in the short run. This percentage of error correction in the short run is quite high and encouraging for an emerging market like the Ghana Stock Exchange.

The Adjusted R-squared value of 0.961 implies that about 96 % of the variations in the stock returns are explained by variations in the macroeconomic variables. Further, the F-statistic value of 35.34 (with a p-value of 0.001823) indicates that the macroeconomic variables jointly and significantly affect the stock returns.

**Long run relationships between stock market returns and macroeconomic variables**

*In the long run*, the stock returns are significantly influenced by Inflation rate, Crude oil prices, Exchange rate, and Treasury bill rate, with

elasticities of 0.5479, -0.03021, 0.05213, and 0.00322 respectively.

A 1 % increase in inflation increases stock returns by 0.54 %. The positive relationship between inflation and stock returns is consistent with Choudhry (2000); Mohammed et al., (2007) 2007); Owusu - Nantwi and Kuwornu (2011). The positive relation implies investors are compensated for inflationary increases. The rationale for this pattern is related to the inadequacy of hedging role of stock against inflation. This rationale would be suggested for the Ghana stocks. That is, Ghana stocks cannot be used as a hedge against inflation, since the positive coefficient implies a higher expected return is required for higher inflation rate. However, this result is not consistent with the bulk of empirical evidence (e.g., Chatrath et al., (1997), Zhao (1999), Omran and Pointon (2001)) that inflation rate negatively affects stock returns. The reason given by the authors is the active role of government in preventing price escalation after the economy continued to progress after the 1997 financial crises.

Crude oil price is negatively related to stock returns. A 1 % rise in Crude oil prices will decrease returns by 0.03 %. This result is consistent with Gazi and Hisham (2010), which is not surprising since Ghana is a net importer of oil. For oil importing countries, oil price is hypothesized to impact stock returns negatively. In this respect, increases in oil prices would cause a rise in production costs and a subsequent fall in aggregate economic activity. This would ultimately cause lower stock returns.

A 1% rise in exchange rate increases returns by 0.052%, which is consistent with Mukherjee and Naka (1995). In Ghana, the effect of exchange rate on the volume of exports appears to be positive

(i.e., appreciation of the exchange rate encourages exports, via increased economic activity of firms). Thus, a positive relationship is observed between stock returns and exchange rate. The appreciation of a country's currency lowers the cost of imported goods, which in most cases constitute a large part of production inputs for emerging market countries. According to Pebbles and Wilson (1996), an appreciating currency is generally accompanied by increases in reserves, money supply and a decline in interest rates. The resulting decline in cost of capital and/or imported inputs is expected to lead to increases in economic activities and hence stock returns. This result is consistent with Bilson et al., (2001) conclusion that a devaluation of the domestic currency has a negative relationship with returns. Soenen and Hernigar (1988) also using monthly data, report a strong negative relation between US stock indexes and fifteen currency weighted value of the dollar for the period 1980-1986.

The effect of Treasury bill rate, though positive, is highly inelastic with elasticity of 0.003. This result is somewhat consistent with Engsted and Tanggaard (2002). However, a negative relationship between Treasury bill rate (i.e., interest rate) and stock market returns is expected for the Ghanaian stock market. In Ghana, Treasury bill with the associated interest rates represents alternative investment opportunities. As the interest rate rises, investors tend to invest less in stocks causing stock prices to fall. When Treasury bill rate is high, rational investors tend to invest in less risky asset with high returns and vice versa. This was the case in Ghana between 1995 and 1999. This affected the performance of the Ghana Stock Exchange.

## **Conclusions**

This paper investigates the effects of macroeconomic variables on the stock market returns in Ghana using Johansen Multivariate Cointegration Analysis, and monthly data over the period January 1992 to December, 2008. Macroeconomic variables used in this study are consumer price index (as a proxy for inflation), exchange rate, crude oil price, 91 day Treasury bill rate (as a proxy for interest rate) and Ghana Stock Exchange (GSE) All share index.

The results reveal that; *in the short run*, stock return is significantly influenced by Treasury Bill Rate and Inflation rate. The positive relation implies investors are compensated for inflationary increases. The rationale for this pattern is related to the inadequacy of hedging role of stock against inflation. This rationale would be suggested for the Ghana stocks. That is, Ghana stocks cannot be used as a hedge against inflation, since the positive

coefficient implies a higher expected return is required for higher inflation rate.

Treasury bill rate significantly influences the stock returns, with an elasticity of 0.005. This means that a 1 % rise in the Treasury bill rate will lead to a 0.005 % rise in the stock returns. A negative relationship between Treasury bill rate (i.e., interest rate) and stock market returns is expected for the Ghanaian stock market. In Ghana, interest rates represent alternative investment opportunities. As the interest rate rises, investors tend to invest less in stocks causing stock prices to fall. When Treasury bill rate is high, rational investors tend to invest in less risky asset with high returns and vice versa.

The inflation rate is also significant at 1 % with elasticity -0.135744, implying that a 1 % increase in inflation rate will decrease stock returns by 0.14 %. The negative relation implies investors are not compensated for inflationary increases in the short run.

The residual value of 0.785548 of the Error Correction Model indicates that about 79 % of the deviations of the stock returns are corrected in the short run. This percentage of error correction in the short run is quite high and encouraging for an emerging market like the Ghana Stock Exchange.

The Adjusted R-squared value of 0.961 implies that about 96 % of the variations in the stock returns are explained by variations in the macroeconomic variables. Further, the F-statistic value of 35.34 (with a p-value of 0.001823) indicates that the macroeconomic variables jointly and significantly affect the stock returns.

*In the long run*, the stock returns are significantly influenced by Inflation rate, Crude oil prices, Exchange rate, and Treasury bill rate, with elasticities of 0.5479, -0.03021, 0.05213, and 0.00322 respectively.

Inflation rate is positively related to stock return. A 1 % increase in inflation increases stock returns by 0.54 %. The positive relation implies investors are compensated for inflationary increases in the short run.

Crude oil price is negatively related to stock return. A 1 % rise in Crude oil prices will decrease returns by 0.03 %. This result is not surprising because Ghana is a net importer of oil. For oil importing countries, oil price is hypothesized to impact stock returns negatively. In this respect, increases in oil prices would cause a rise in production costs and a subsequent fall in aggregate economic activity. This would ultimately cause lower stock returns.

A 1 % rise in exchange rate increases returns by

0.052 %. In Ghana, the effect of exchange rate on the volume of exports appears to be positive (i.e., appreciation of the exchange rate encourages exports, via increased economic activity of firms). Thus, a positive relationship is observed between stock returns and exchange rate. The appreciation of a country's currency lowers the cost of imported goods, which in most cases constitute a large part of production inputs for emerging market countries. This is expected to lead to increases in economic activities and hence stock returns.

The effect of Treasury bill rate, though positive, is highly inelastic with elasticity of 0.003. This result implies that investors do not view Treasury bill with the associated interest rates as alternative investment opportunities. Thus, increases in Treasury bill rates leads to increased investment in stocks causing stock returns to rise.

In both *the short run and the long run* results, inflation rate appears to be the most influential macroeconomic variable affecting stock market returns in Ghana. The results also reveal that investors are not compensated for inflationary increases in the short run, but are compensated in the long run.

The empirical results in this study have implications for financial analysts, fund managers, and policy makers.

This paper makes an empirical contribution to the ongoing debate on the effect of macroeconomic variables on stock market returns.

In view of the findings from the study, the following recommendations are provided:

Returns from investment in Ghana Stock Exchange (GSE) should be made more attractive than the rate of return from Treasury bill. This is so because investors are supposed to view treasury bills as alternative assets to stocks and would switch to

the Treasury bill if the rate of returns from the Ghana Stock Exchange is lower. This requires instituting prudent measures that will bring about cost minimization and increase productivity for the listed companies. Once operational expenses are less, all other things being equal, more in terms of returns on equity can be given to the shareholders.

The listed firms should strive to make their stocks attractive to investors as the firms stocks seem to be a good hedge over a long period for investors. This means the firms should undertake projects that are viable to boost their performance over time, as investors are motivated to invest in companies with good financial performance. Once it is realized by investors that listed firms have a superior performance coupled with the fact that returns on their shares increases as inflation goes up, the shares may be preferred assets when investors have to hedge against the risk of inflation.

The effect of macroeconomic variables on stock market returns has attracted much attention in developed and emerging economies due to their implications in the financial markets. Investors may use this study as a guide in forecasting stock market viability and to decide whether it is worthwhile to invest in it.

At the policy level, this study may provide some insights on how the formulation and implementation of appropriate monetary and fiscal policies could help to stabilize the financial market. Furthermore, financial sector reform and the institution of a regulatory regime for the listed companies and the Ghana Stock Exchange will also be important.

Finally, although a rich set of macroeconomic variables are used in this study; the macroeconomic variable set employed is not exhaustive. Some other macroeconomic variables would provide more information about the stock returns - economic activity relationship.

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