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Macroeconomic Factors and Stock Market Movement: Evidence from Ghana

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Abstract

This study examines the role of macroeconomic variables on stock prices movement in Ghana. We use the Databank stock index to represent Ghana stock market and (a) inward foreign direct investments, (b) the treasury bill rate (as a measure of interest rates), (c) the consumer price index (as a measure of inflation), and (d) the exchange rate as macroeconomic stability variables. We analyze both long-run and short-run dynamic relationships between the stock market index and the macroeconomic variables from 1991.1 to 2006.4 using Johansen's multivariate cointegration test and innovation accounting techniques. We established that there is cointegration between macroeconomic variables identified and Stock prices in Ghana indicating long run relationship. Results of Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) indicate that the macroeconomic variables identified significantly influence share price movements in Ghana.

Keywords: Cointegration, Innovation Accounting, Foreign Direct Investment (FDI)
JEL Classification: C22, E44, G10

1. Introduction

The relationship between macro economic factors and stock market development has dominated in the academic and practitioners' literature over the past decades. Some fundamental macroeconomic variables such as exchange rate, interest rate, industrial out and inflation have been argued to be the determinant of stock prices. It is believed that government financial policy and macroeconomic event have large influence on general economic activities in an economy including the stock market. This motivates many researchers to investigate the dynamic relationship between stock returns and macroeconomic variables. For example, using, the Arbitrage Pricing Theory (APT), developed by Ross (1976), Chen et al. (1986) used some macroeconomic variables to explain stock returns in the US stock markets. Their findings showed industrial production, changes in risk premiums, and changes in the term structure to be positively related to the expected stock returns, while both the anticipated and unanticipated inflation rates were negatively related to the expected stock returns. Researchers such as Cheung and Ng (1998), McMillan and Humpe (1997), Mukherjee and Naka (1995), Kwon and Shin (1999) ,and Maysamai and Koh have employed cointegration analysis to examine the relationships between stock returns and macroeconomic variables in developed countries like Japan, US, Australia, Canada and European countries. In spite of increasing migration of capital from developed market to emerging markets and associate high return [see Ushad *et al (*2008) and Osinubi (2004)*];* emerging stock market in developing countries like Ghana has 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, privatisation, stock market reform and financial liberalization. In 1993 and 1994 when privatization and divestiture of state-owned enterprise increased in Ghana, Ghana stock market (GSE) emerged as sixth and best emerging stock market respectively. The stock market performed poorly between 1995 and 2000 when interest rate and inflation were high and started recovery following sound macroeconomic policies resulting economic stability.

The objective of the present study is to contribute to the existing literature by examining the effect of macroeconomic variables identified on the movement of Ghana stock market proxy by Databank stock Index (DSI).

Our results indicate that stock prices in Ghana is consistently influenced by changes in macroeconomic variables as found in both developed and emerging markets like the US, Japan, UK, Malaysia, New Zealand and Korea.

2. Trends in macroeconomic variables performance in Ghana

Ghana's macroeconomic indicators in the year 2006 showed an improvement in the performance of the economic activity. In spite of increase in overall government fiscal deficit from 6.6% to 12.4%, real GDP growth increased from 5.9% in 2005 to 6.2%in 2006. Net foreign direct investment increased from 1.6% of GDP in 2001 to 3.37% of GDP in 2006. This only surpassed by 1994 record of 4.28% when Ashanti Goldfield Company Limited (AGC) now Anglodold Ashanti was listed on the Ghana Stock Exchange. The AGC effect saw the market capitalization accounting for 34.37% of GDP in 1994 from 1.98% in 1993.

On monetary policy, the Bank of Ghana pursued its policy which aims at maintaining monetary stability, a strong and stable Ghana Cedi exchange rate, a low inflation rate, and low interest rates. The interest rates dropped from 40.95% by the end of 2001 to 9.95% by the end of 2006, the cedi /dollar deprecation decreased from 104.4% in 1999 to 2.0% in 2006.
Inflation dropped from 59.56% in 1995 to 32.91% in 2001 and then to 10.96% in 2006. As for the public finance performance, government overall fiscal deficit increased from 8.0% of the GDP in 2002 to 12.4% of GDP in 2006

3. Stock Returns and Macroeconomic variable: Literature Review

Probably the relationship between stock prices and macroeconomic variables is well illustrated by Miller and Modigliani (1961) Dividend Discount Model (DDM) than any other theoretical stock valuation model. According to the model the current prices of an equity share is equal to the present value of all future cash flow to the share. Thus, the determinants of share prices are the required rate of return and expected cash flows (see Oyama, 1997; Gan *et al* 2006; Humpe and Mcmillan, 2007; Leibowitz, Sorensen, Arnott and Hansen, 1989; and Tessaromatis, 2003). Therefore any economic factors which influence the expected future cash flow and required rate of return in turn influence the share.

Fama and Gibbon (1982) find that expected real returns on bills and expected inflation rates are inversely related. This is due to positive correlation between expected real returns on financial assets and real activity. Using multi-factor APT framework, Hamao (1988) shows that inflation significantly influenced Japanese stock returns.

F a m a (1981) finds a strong positive correlation between common stock returns and real variables (i.e. industrial production, GNP, the money supply, lagged inflation and the interest rate) by investigates the relationships between stock prices and real activity, inflation, and money. Kaneko and Lee (1995) and Lee (1992) find similar results. By examining the relationship between inflation and stock prices 16 industrialized countries, Rapach (2002) agues that increase in inflation does not result in persistent depreciation of share real value.

Exchange rate as an indicator of a currency movement is a monetary variable that affect prices of stock in a way similar to the inflation variable. Depreciation of the local currency makes import expensive compared to export. Import companies increase production cost, all the cost can not be passing on to the consumers because of the competitiveness of the market. This reduces corporate earning, a determinant of stock prices according to the DDM. Adler and Dumas (1984) argue that even firms whose entire operations are domestic may be affected by exchange rates, if their input and output prices are influenced by currency movements. Some argue that depreciation of the local currency increase export and hence increase in stock prices. Luetherman (1991) found that depreciation of the local currency do not give home companies competitive advantage as argued. In the same way Solnik (1987) studies proved that exchange rate is non-significant factor in explaining development of stock prices. Jorion (1990) found some relationship between stock returns of US multinational companies and the effective

US dollar exchange rate for the period 1971-87
On the contrary, Soenen and Hennigar (1988) reported that US dollar effective exchange rate negatively affect US stock market index during 1980-86. Aggarwal (1981) finds positive relationship between revaluation of the US dollar and stock prices .Mukherjee and Naka (1995) also find that exchange rate positively relates to Japan and Indonesia stock prices both two large export countries.
According to the DDM, required rate of return and the share price are inversely related would decrease with the increase in the interest rate. Gan *et al* (2006) ague that opportunity costs of holding cash rises with increase in interest rate, and the trades off to holding other interest bearing securities would lead to a decrease in share price. Theoretically, French et al. (1987) find negative relationship between stock returns and both the long term and short term interest rates. Furthermore, positive correlation among previous month's US stock price, money supply, federal debt, tax-exempt government debt, long-term unemployment, the broad money supply and the federal were documented by Bulmash and Trivoli (1991). On the other hand 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 were found.
According to Alagidede (2008), the risk perceptions remains obstacle to increased access to capital markets in Africa; and are set apart from stock market from other regions due to the small size and highly illiquid nature. These negative effects that marred emerging stock market are likely to reduce if open to foreign investors. For example, large investment inflows to South East Europe (SEE) supported the economic growth rates and pushed up stock prices at the major equity markets in the region (SEE Investment Guide, (2006)). Oyama (1997) pointed out that the risk premium for Venezuela stock market, Jordan and Pakistan declined sharply between 1990 and 1992 following liberalization of stock investment by foreigners in 1990; and increase of the amount of home currency and foreign exchange that could betaken abroad by residents and non-residents .

4. **Ghana Stock Exchange**

The idea of establishing a stock exchange in Ghana dates back to 1968; the idea led to the to the promulgation of the Stock Market Act of 1971, which laid the foundation for the establishment of the Accra Stock Market Limited (ASML) in 1971. Unfavourable macroeconomic environment, political instability and lack of government support undermined the take off of Accra Stock Market Limited (ASML) remained a mirage
In spite of these early set backs, two stock brokerage firms, namely National Trust Holding Company Ltd (NTHC) and National Stockbrokers Ltd, now Merban Stockbrokers Prior to the establishment of the Ghana Stock Exchange in November 1990, did over-the-counter (OTC) trading in shares of some foreign-owned companies.

Under the surveillance of the IMF and World Bank, Ghana underwent structural reforms in 1983 to remove distortions in the economy together with other financial reforms including but not limited to deregulation of interest rates, removal of credit controls, and floating of exchange rates. After the financial liberalization and the divestiture of a host of state owned enterprise the need for stock market in Ghana became unavoidable
The Ghana Stock Exchange was incorporated in July 1989 as a private company under the Ghana companies' code, 1963(Act179). However, the status of the company was

changed to a public company under the company's Code in April 1994.The exchange was given recognition as an authorized stock exchange under the stock Exchange Act of 1971.Trading on the floor of the exchange commenced on November 12, 1990. The number of listed companies increased to 13 in 1991; 19 in 1995 and currently stands at 32 (GSE Quarterly Report, June 2007). The increase in the number of listings has also reflected in market capitalization. The Ghana stock market was voted sixth and best performing emerging market in 1993 and 1994 respectively. The GSE capital appreciated by 116% in 1993 and gained 124.3% in its index level in 1994 (GSE quarterly bulletin, March 1995). In 1995, the index grew 6.3%, this abysmal performance is partly attribute to high inflation and interest rate. At the end of 2004, market capitalization stood at US$ 2,644 million. Annual turnover ratio just remains about 3.2% in 2004, from an all-time high of 6.5% in 1998. As of October 2006 the market capitalization of the Ghana Stock Exchange was about $11.5billion. The Ghana Stock Exchange (GSE) holds trading every working day. All trading are carried on the floor of exchange except Ashanti Gold shares which can be traded both (i) through the GSE and (ii) over-the-counter after GSE trading hours, but all such trades must be subsequently reported to the GSE at the next trading session. The main indices are the GSE All Share index and the Databank stock index (DSI). Three new indices comprising the SAS index (SASI), SAS Manufacturing index (SAS-MI) and the SAS Financial index (SAS-FI) have also been published Strategic African Securities Limited.

5.0 **Data and Methodology**

5.1 Variables Justification and Hypothesis

Databank Stock Index (DSI)

This variable captures the performance of the market and it is the dependent variable in our regression analysis. It is the first ever index computed by Databank Group. Its selection is motivated by data availability

Inflation

High rates of inflation increase the cost of living and a shift of resources from investments to consumption. This leads to a fall in the 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 in the valuation model. DeFina (1991) agues that nominal contracts that disallow the immediate adjustment of the firm's revenues and costs prevent cash flow to grow at the same rate as inflation. We therefore expect negative relationship between inflation and stock market

Exchange rate

Ghana's import sector dominates the export sector; therefore depreciation of the Ghana cedi will lead to an increase in prices of production and thereby reduces cash flows to the import dominated companies. Repatriation of earning will be also relatively unattractive to foreign portfolio investors who play a major role on the GSE. We hypothesize negative impact on the performance of the exchange.

Interest Rate

The relationship between interest rates and stock prices is well established. An increase in interest rate will increase the opportunity cost of holding money and investors substitute

holdings interest bearing securities for share hence falling stock prices. The Treasury bill rate is used as a measure of interest rate in this study because investing in Treasury bill is seen as opportunity cost for holding shares. High-treasury bill rates encourage investors to purchase more government instruments. Treasury bills thus tend to compete with stocks and bonds for the resources of investors. The expected relationship between stock prices and Treasury bill rates is thus negative.

Net Foreign Direct Investment

Foreign capital inflows can make significant contributions to the host country's economic growth and development by lessening and cushion shocks resulting from low domestic saving and investment. Increase in net FDI therefore has positive effect on the liquidity and size of the Ghana stock exchange. Foreign equity finance account for over 70% of total equity investments in 2006. The market capitalization of the Ghana Stock Exchange increased from 1.98% of GDP in 1993 to 34.37% of GDP in 1994. This followed the opening of Ghana stock exchange to foreigners and non-resident Ghanaian in 1993. Net FDI increased from 2.10% of GDP to 4.28% of GDP over the same period. We hypothesize positive relationship between Net FDI and the exchange base on available information.

AG dummy

Dummy Values of 0 and 1 are assigned, respectively, to the period before and after the listing of AGC on the GSE to take care of the structural effect of the listing of Ashanti Goldfields Company (AGC) on the market. The AGC, now AngloGold Ashanti alone accounted for about 90% of total market capitalization when it was first listed on GSE in 1994 and it is therefore reasonable to discuss its expected influence on fundamental market attributes such as liquidity, volatility and turnover

5.2 Data Description and Source

The data for the study are quarterly from 1991.1 to 2006.4. All the macroeconomic data except Inward FDI were extracted from IFS statistics, June 2008. The data on Inward FDI were extracted from UNCTAD while the data DSI were obtained from Databank Group Research. . The FDI data were obtained in annually form and interpolated by the method proposed by Goldstein and Khan (1976). The brief description for each variable used is presented in Table below

Table 1: Description and source of data

Variable	Concept	Description	Units	Source
LDSI	Log of Databank Stock Index	Databank stock Index	30 Nov. 1990= 79.83	Databank Group Research
LFDI	Log of net Foreign Direct Investment Inflow	Volume of foreign capital invested in the economy	Millions of US Dollar	UNCTAD Database
LXR	Log of exchange rate	Principal rate(National Currency per USD)	Index number	IFS statistics
LCPI	Log of inflation	Consumer Price Index	Percentage Per annum (200=100)	IFS statistics
Ag		AG dummy, for 1994Q2 structural break	(0,1)	Databank Group Research
LTB	Log of Interest rate	91-day Treasury bill rate	Percentage per Annum	IFS statistics

5.3 Methodology

The principal method employed to analyse the time series behaviour of the data involves cointegration and the estimation of a VECM. We specifically employed Johansen maximum likelihood procedure for the present study. This has become a well established methodology when testing the long-run relationships among variables; therefore, the methodological aspects directly relevant to this study are only briefly explained and interested readers are referred to the relevant literature[1] for detailed discussion and advantages of this method.

In estimating the cointegration we first consider whether each of the series is integrated of the same order, to do this we consider the standard Augmented Dickey-Fuller test, phillips- Perrons and Alkaike Information Criterion as leading indicator for lag selection. The number cointegration rank(r) in this study is tested with the maximum eigenvalue and trace test. The Maximum eigenvalue statistics test the null hypothesis that there are r cointegrating vectors against the alternative of r+1 cointegrating vectors. The trace statistics tests the null hypothesis of no cointegrating vector against the alternative of at least one cointegrating vector. The asymptotic critical values are given in Johansen (1991) and MacKinnon-Haug-Michelis (1999).

[1] See for example Johansen (1991, 1995) ,Johansen and Juselius(1990) ,Cheung and Ng (1998),

5.4 Model specification

From the above theoretical, intuitive, and empirical discussion, we postulate the relationship between stock prices and selected macro economic variables as

$$LDSI_t = \beta_0 + \beta_1 LCPI_t + \beta_2 LXR_t + \beta_3 LTB_t + \beta_4 LFDI_t + \xi_t \qquad (1)$$

Where *LDSI* is databank stock index, L*CPI* is consumer price index, LX*R* is GHS/USD exchange rate, L*XB* is 91-day treasury -bill rate, Ag is AGC dummy and L*FDI* is inward foreign direct investment

β_1,..... , β_4 are the sensitivity of each of the macroeconomic variables to stock prices. β_0 is a constant and ξ_t is error correction term.

The coefficients of LXR and LFDI are expected to be positive while LCPI and LTB are expected to be negative

4.1 Descriptive Statistics

Table 2 presents a summary of descriptive statistics of the variable. Sample mean, standard deviation, skewness and kurtosis, and the Jacque-Bera statistic and *p*-value have been reported. The high standard deviation of DLDSI with respect to the mean is an indication the high volatility in the stock market. From the p-values, the null hypothesis that DLCPI, LTB, LXR and LFDI are normally distributed at 10% level of significance can not be rejected.

Figure 1:Logarithms of Variables

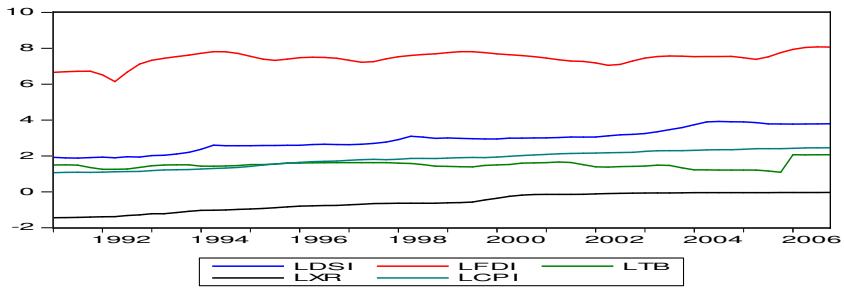


Table 2: **Summary Statistics of the Variable: 1991:1 to 2006:4**

	LDSI	LFDI	LCPI	LXR	LTB
Mean	2.898272	7.431932	1.828133	-1.316873	1.492419
Std. Dev.	0.613817	0.374028	0.453579	1.116258	0.203617
Skewness	0.011984	-1.147513	-0.302435	-0.351034	0.960284
Kurtosis	2.154169	4.691274	1.778526	1.750799	4.855756
Jarque-Bera	1.909346	21.67348	4.954311	5.475736	19.01977
Probability	0.384938	0.000020	0.083982	0.064708	0.000074
Sum	185.4894	475.6437	117.0005	-84.27985	95.51480

Sum Sq. Dev.	23.73658	8.813512	12.96126	78.49999	2.611972

4.2 Unit Root Test

Table 3 shows unit root test conducted to determine the stationarity of the variable. Augmented
Dickey-Fuller (ADF) and Phillips- Perron test were used. Both results indicate that all the data are non-stationary at levels but first differences are stationary at 5% significant level. We conclude that all the variables are I (1). The results are consistent with figure 1.

Table 3: ADF and PP unit Root Test

Variables	**ADF Unit Root Test**		**PP Unit Root Test**	
	Levels	*First Difference*	*Levels*	*First Difference*
LDSI	-1.124073	-4.604914**	-0.755972	-4.604914**
LXR	-1.941035	-3.618842**	-1.867166	-3.713154**
LFDI	-2.548019	-4.099517**	-1.988769	-4.259959**
LCPI	-1.877965	-2.981643**	-1.835472	-3.277407**
LTB	-1.943722	-7.682588**	-2.220418	-7.682616**

4.3 Cointegration Test and Vector Error Correction Model

The next step involves estimating the model and determining the rank, r to find the number of cointegrating relations in our model. The model lag length selection was determined by both Schwarz (SIC) and Akaike (AIC) Information Criterion using 5 lags in the general VAR model. The aim is to choose the number of parameters, which minimizes the value of the information criteria. The SIC has the tendency to underestimate the lag order, while adding more lags increases the penalty for the loss of degrees of freedom. To make sure that there is no remaining autocorrelation in the VAR model, AIC is selected as the leading indicator. The model lag length reported in table 4 indicates appropriate lag length as 4.

We proceed to test for the presence of cointegrating long-run relationship among the using Johansen's Maximum Likelihood approach among the Databank stock Index(DSI), Foreign Direct Investment(FDI), Treasury Bill(TB), Exchange Rate(XR), Consumer Price Index(CPI) and AGC Dummy(AG) using lag length of 4. An intercept and no trend are specified for the cointegration test. The trace statistic suggests four cointegrating vectors, and the maximum eigenvalue statistic one cointegrating vector at the 5% significance level. Given evidence in favour of at least one cointegration relation, a test of zero coefficients on each factor in the cointegrating vector is conducted to determine whether the coefficients for all factors in the cointegrating VAR model are significantly different from zero. LR test rejects the null hypothesis of a zero restriction for all the five macroeconomic factors at the 95% level, except for *AG* ($\chi^2(1)$ = 3.443, with probability value 0.064). The result suggests that AG may not be long run forcing variable at 95% level but there may be still short run interactions between AG and stock market development in Ghana. Furthermore, weakly exogeneity test is carried out on AG at 95% level ($\chi^2(1)$ =0.0549, with probability value 0.8147) and the result indicates that AG is weakly exogeneity (i.e. not error correcting).

With the AG included as an exogenous variable, both trace test and the maximum eigenvalue test suggest two cointegrating vectors at the 5% significance level (see table 4). This indicates co-movement between stock market index and macroeconomic variables in a long-run equilibrium path. The cointegration graph (see figure) confirms that there are more than "one" mean reversion effect in the cointegration vector over the period. This signifies good error correction behaviour in the cointegration system. Consequently, the estimated long-run relationship via cointegration analysis and the error correction coefficients are appropriate. The long-run cointegrating relation between the macroeconomic factors and stock prices normalised on LDSI is given by

$$\begin{matrix} Y_t \\ \beta' \end{matrix} = \begin{pmatrix} LDSI_t & LFDI_t & LTB_t & LXR_t & LCPI_t & C \\ 1.000 & -0.4031 & 0.7472 & 0.6873 & -1.9038 & 2.8675 \end{pmatrix} \quad (2)$$

Thus, the cointegration relationship can be re-expressed as:

$$LDSI_t = 0.4031\ LFDI_t - 0.7472\ LTB_t - 0.6873\ LXR_t + 1.9038\ LCPI_t - 2.8675 \quad (3)$$

[-7.60271] [8.06367] [5.01753] [-11.3490]

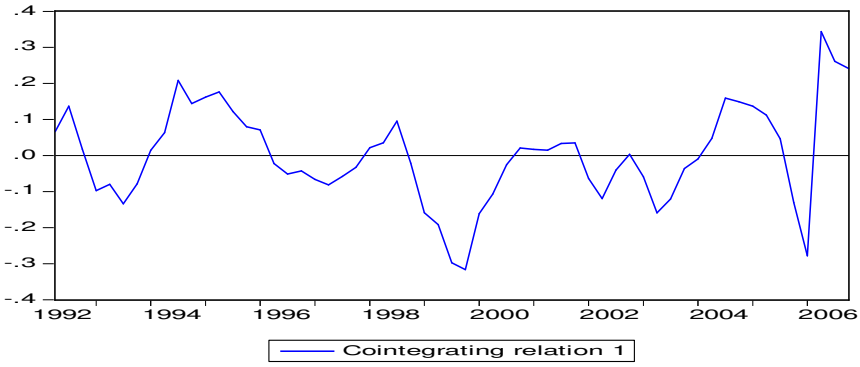
Table 4: Multivariate Johansen cointegration Test

	Lag	r = 0	r ≤ 1	r ≤ 2	r ≤ 3	r ≤ 4
λ_{trace}	4	99.68**[69.81]	59.50**[47.85]	23.14[29.79]	10.33[15.49]	3.32 [3.84]
$\lambda_{\max}$	4	40.17** [33.87]	36.36**[27.58]	12.80[21.13]	7.01 [14.26]	3.32 [3.84]

Note: The null hypothesis for these two tests here is that the data generating processes under consideration are not cointegrated. Critical values in [] for both trace and maximum-eigenvalue statistics at the 5% level are given by MacKinnon-Haugh-Michelis(1999). ** denotes the rejection of the hypothesis at the 1% level

Cointegration Vector normalised on GDP

Figure 2: A Plot of Cointegration Vector normalised on LDSI



The coefficients of LTB, LXR and LFDI are correctly sign; contrary to our expectation, LCPI has positive signs. The negative relationship between LTB and LDSI is expected

This is because Treasury bill acts as the rate of return offered by the risk-free asset and the shifting of funds between risky equity and risk-free assets by portfolio managers is expected. When T-bill rate is high rational investors tend to invest in less risky asset with high returns. This was the case in Ghana between 1995 and 1999. This affected the performance of the Ghana Stock Exchange. The opening of the market to non-resident Ghanaians and foreigners in June 1993 was a big boost to the development of the market. Exchange Control permission was given to foreigners and non-resident Ghanaians to invest through the Exchange without prior approval. This has attracted a number of top-rated foreign institutional buyers, thus positive relationship between LFDI and LDSI. A positive relation LCPI and LDSI is not expected. This is probably in support of Fisher (1930) hypothesis. It is argue that in stock returns, Fisher hypothesis implies a positive one-to -one relationship between stock returns and inflation.

The positive relationship implies that investors are compensated for inflationary increase in prices. The negative relationship between LDSI and LXR can be explained by the following factors: depreciation of the Ghana Cedi (GHS) makes unattractive to more investors to invest in the Ghana stock market. The other possible explanation to this long run negative relationship is that the cost of imported goods becomes expensive to producers. Ghana is import dominated economy and that depreciation of the GHS is a curse to the economy, hence the positive relation.
The Ashanti Goldfield Company dummy (Ag) used in our study has negative and significant impact on stock price in Ghana.

Given the evidence in favour of at least one cointegrating vector, we proceed to estimate the Vector Error correction model (VECM) to examine the causal relationship between the market index and macroeconomic variables. The result of the VECM estimation is reported in table 5.

Table 5: VECM estimation for $\Delta LDSI_t$

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\Delta LDSI_{t-1}$	0.729174	0.157590	4.627022***	0.0000
$\Delta LDSI_{t-2}$	0.558718	0.180464	3.096006***	0.0038
$\Delta LDSI_{t-3}$	0.496105	0.184872	2.683511**	0.0109
$\Delta LDSI_{t-4}$	0.324128	0.160000	2.025795*	0.0502
$\Delta LFDI_{t-1}$	-0.196295	0.080999	-2.423434**	0.0205
$\Delta LFDI_{t-2}$	-0.248719	0.092020	-2.702895**	0.0104
$\Delta LFDI_{t-3}$	-0.231987	0.084651	-2.740500***	0.0095
$\Delta LFDI_{t-4}$	-0.112185	0.078916	-1.421566	0.1638
ΔLTB_{t-1}	0.450398	0.112992	3.986099***	0.0003
ΔLTB_{t-2}	0.424169	0.103010	4.117734***	0.0002
ΔLTB_{t-3}	0.329496	0.084872	3.882286***	0.0004
ΔLTB_{t-4}	0.396377	0.177179	2.237159**	0.0316
ΔLXR_{t-1}	-0.876689	0.355169	-2.468369**	0.0185
ΔLXR_{t-2}	0.655371	0.367197	1.784793*	0.0827
ΔLXR_{t-3}	-0.030850	0.380552	-0.081067	0.9358
ΔLXR_{t-4}	-0.826456	0.345708	-2.390616**	0.0222
$\Delta LCPI_{t-1}$	0.231517	0.565233	0.409596	0.6845
$\Delta LCPI_{t-2}$	-1.622915	0.629976	-2.576154**	0.0142
$\Delta LCPI_{t-3}$	1.078012	0.692906	1.555785	0.1285
$\Delta LCPI_{t-4}$	0.185066	0.554621	0.333679	0.7406
AG	-0.121866	0.028345	-4.299323***	0.0001
C	-3.393073	0.774212	-4.382617***	0.0001
ECM(-1)	-0.609677	0.137399	-4.437284***	0.0001
R-squared	0.704394	Prob(F-statistic)	0.000149	
F-statistic	3.899252	Durbin-Watson stat	1.851355	

Table 5 shows vector error correction model for LDSI with significant error correction term in the Databank stock index equation, showing explicit information on the short-run dynamic interactions among those variables. The information about the short-run dynamic of the process is indicated by the sign and magnitude of this error correction coefficient. It indicates the direction and speed of adjustment towards the long-run

equilibrium path; it should be negative and significant, which is the case here. The negative sign implies that with absence of variation in the independent variables- the model's deviation from the long run relation is correct by increase the dependant variable. Bannerjee *et al.* (1998) holds that a highly significant error correction term is further proof of the existence of a stable long-term relationship. The estimated coefficient of the ECM (–1) is -0.609[P-value=0.000] suggesting that with absence of changes in independent variables (i.e. FDI, TB, XR and CPI) deviation of the model from the long-term path is corrected by 60.9 per cent increase in DSI per quarter. This means that deviation from the long run relationship takes less than two quarters to be corrected.

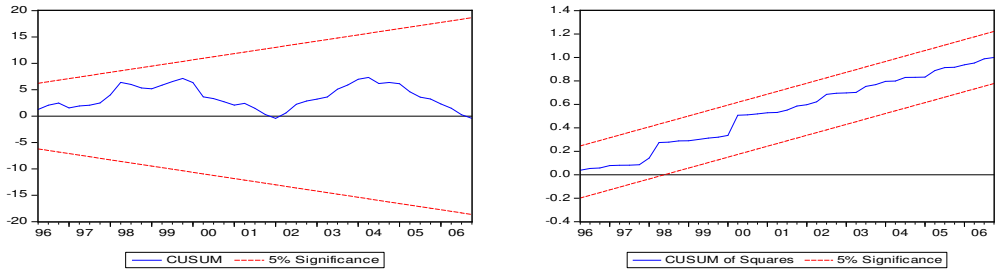
The results also show that all the variables significantly explain the variation in the performance of the DSI.
The listing of the AGC on the market has been thought too have cause major transformation of the Ghana exchange but our result is contrary to that. The AGC dummy (AG) has negative impart on the performance of DSI. It is indication of negative effect of AGC high concentration on the market; rendering the market inactive and for that matter illiquid. Lack of liquidity on the exchange would affect ability of the listed firms on the market in raising the needed long-term capital to finance investment and production

The key regression statistics shows that R^2 is high implying that overall goodness of fit of the VEC model is satisfactory. The test statistics shown in table 6 indicates that the model passes the diagnostic tests against serial correlation, functional form misspecification, non-normal errors and heteroscedasticity test at 5%. The cumulative sum (CUSUM) and cumulative sum of squares (CUSUMQ) plots (fig.2) from a recursive estimation of the model also indicate stability in the coefficients over the sample period.

Table 6: VECM Model Diagnostic Tests

Serial Correlation F(2, 34)=0.391996[0.6782]	Functional Form F(2, 34)=2.5492[0.0930]
Heteroskedasticity F(22, 36)=0.51219[0.7571]	Normality $\chi^2(2)$=0.245425[0.884518]

Figure 3: Plots of CUSUM and CUSUM of Squares of Recursive residuals



4.4 Innovation Accounting

The cointegration analysis only captures the long-run relationship among the variables; it does not provide information on responds of variables in the system to shocks or innovations in other variables. To find how the Stock market in Ghana responds to shocks or innovation in the macroeconomic variables we evaluate Innovation Accounting such as impulse response function and Variance decomposition base on Vector Error Correction Model (VECM). Figure 4 shows impulse responds Function while the Variance decomposition is presented in table 7.

From figure 4 we observe that LCPI have immediate effect on LDSI. The result implies that the market efficiently allocate resources by adjusting to general increase in price levels in the long run.

The responses of LDSI to LXR and LTB are in line with findings by other researcher in both advanced and emerging markets. A shock in LTB leads to a sharp reduction in LDSI after 5 quarters; this explains the strong inverse relation between the t-bill and stock market investment in Ghana. The negative impact of the shock in exchange supports the cointegration results. From figure 4, we can also observe that a shock in LFDI increase LDSI, peaked after seven quarters and latter declines. This support the Oyama (1997) claim that increase in foreign investors increase the liquidity of the stock market and reduce the risk premium.

We observe from table 7 that the variations in LDSI are mainly attributing to its own variations at the end of the first quarter; LFDI and LCPI account for 8.95% and 9.85% respectively. After 4 quarters LXR and LCPI become dominant factors through to 8 quarters explaining a total of 50% in the fourth quarter and about 72% of LDSI variation in 8th quarter. The variation in LDSI is significantly explained by LTB after 12 quarters accounting for 14%. However, the fraction that is accounted for by FDI dropped to less than 5% after 12 quarters. The LCPI and LTB prove to be the most significant factors that explain the movement in stock prices in the long run respectively accounting for 40.7% and 52.5% at the end of 24 quarters. The Ghana equity market seems to respond well to both the shocks in real activities and monetary shocks.

Figure 4: Impulse Response Function of LDSI to Shocks in System Macroeconomic Variables.

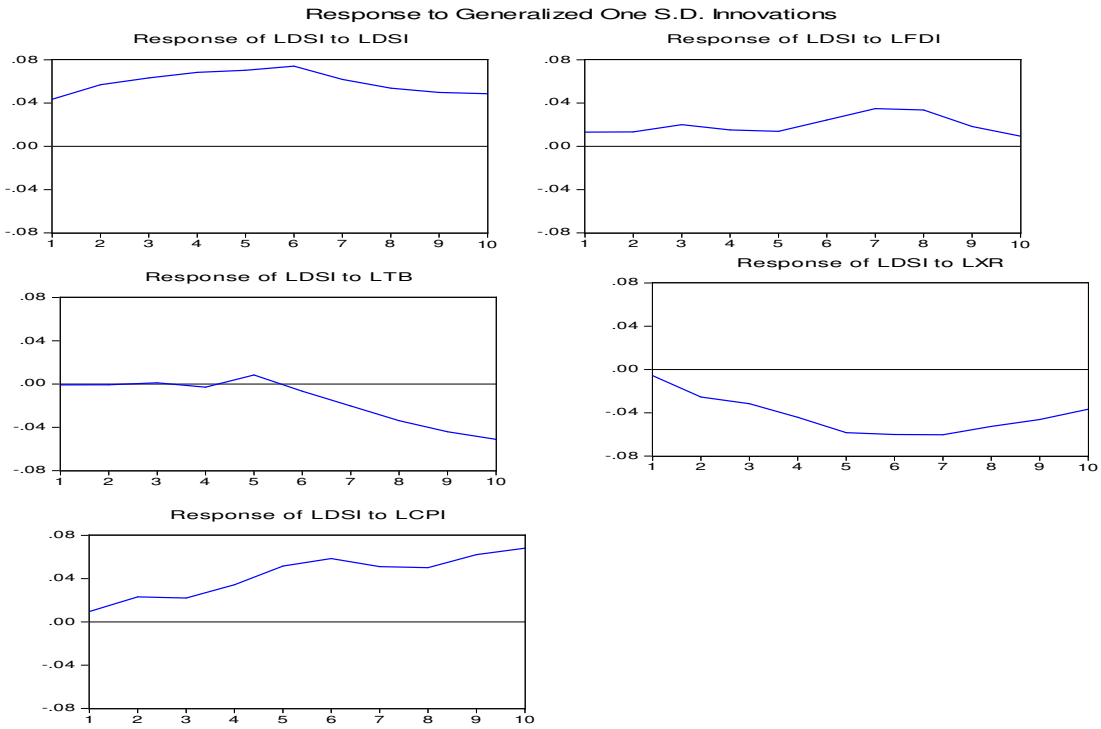


Table 7: Variance Decomposition

Period	LDSI	LFDI	LTB	LXR	LCPI
1	77.09627	8.951709	0.392020	3.704633	9.855362
4	43.13519	5.676167	0.251513	26.15218	24.78495
8	16.84772	6.598742	3.816597	34.19638	38.54056
12	10.31674	4.254649	14.96876	25.54465	44.91520
16	6.160229	2.374609	30.86365	14.22490	46.37661
20	3.134374	1.371480	44.51238	7.017151	43.96462
24	1.582157	1.247678	52.52673	3.917016	40.72642
Cholesky Ordering: LFDI LTB LXR LCPI LDSI					

5.0 Conclusion

In this study we examine the role of macroeconomic variables in stock market movement during the period of January 1991 to December 2006. We employed Databank Stock Index (DSI), interest rate, inflation, net foreign direct investment and exchange rate. We examined the long run relationship between share prices and group of macroeconomic variables using Johansen's multivariate cointegration tests. Short run dynamics were traced using impulse response function and forecast error variance decomposition

analysis.
Cointegration analyses provide evidence in support of long run relationship between share prices and macroeconomic variables identified over the time horizon in this study. Contrary to our hypothesis, inflation positively correlates with share prices. This implies that the stock market provide partly or full hedge against inflation. Our finding is consistent with Firth (1979); Anari and Kolari (2001); Luintel and Paudyal (2006); and Gultekin (1983).
The FEVD test results indicate interest rate and exchange explain small proportion of the variation of the share prices in the first quarter compared to inflation rate and net FDI inflow. The elimination of the ten percent (10%) limit placed on non-resident foreign investors' holdings in securities listed on the Ghana Stock Exchange and 74% limit on holdings of all non-resident foreign investors in any security listed security under the Foreign Exchange Act of 2006 (Act 723) is a positive signal to boost investments in the Ghana stock market
Our suggestion base on the result is that potential investors should pay more attention to inflation rate followed by exchange rate and net FDI inflow rather than interest rate in the short run. However, long run attention should focus on interest rate and inflation.

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