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The Inflation-Stock market returns Nexus: Evidence from the Ghana Stock Exchange

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The relationship between inflation and stock market returns has been theoretically and empirically discussed albeit inconclusive results. Whereas some studies find a positive relationship, others find a negative relationship. This paper contributes to the empirical conversation using data (January 1992-December 2010) from the Ghana Stock Exchange (GSE) which is one of the emerging markets in Africa. Employing unit root tests, ARDL approach to co-integration and Granger Causality in the Error Correction Model for analysis, the study finds that there is a negative statistically significant relationship between inflation and stock returns in the short run and a positive statistically significant relationship in the long run. In terms of direction of causality, evidence is found in support of unidirectional causality running from inflation to stock returns, meaning inflation drives stock market returns towards long-term equilibrium.

Key words: Inflation, development, stock exchange, systematic risk.

INTRODUCTION

Common stock represents a contingent claim on the real assets of the firm. Thus, in the presence of inflation, the value of the contingent claims will see upward adjustment (Bilson et al., 2001). This hypothesis called the *Fisher Effect* which is attributed to Fisher (1930) predicts that there should be a positive relationship between stock market returns and inflation. It has been confirmed by previous studies including Boudoukh and Richardson's (1993) study which examines stock returns and inflation using one-year and five-year holding-period returns during 1802-1990 in the United States and the United Kingdom. However, some studies have raised questions about the validity of Fisher Effect. Chen et al. (1986); Fama and Schwert (1977); and Jaffe and Mandelker (1976) have since documented a negative relationship between stock price and inflation. The explanation attributed to the negative relationship between stock prices and inflation is that an increase in inflation increases the discount rate in the standard stock valuation model; therefore, inflation should negatively affect stock market returns (Mishra and Singh, 2011). In other words, common stock cannot be used as a hedge against inflation.

In Ghana, the relationship between stock returns and macroeconomic variables including inflation has been investigated. Recent investigations include Mireku et al. (2013); Issahaku et al. (2013); Kuwornu (2012); Owusu-Nantwi and Kuwornu (2011); Frimpong (2011); Adam and Tweneboah (2008); and Kyereboah-Coleman and Agyire-Tettey (2008). However, all these studies in Ghana and those from other parts of the world suffer from two deficiencies which cast doubt on the validity of their

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findings: multicollinearity problem and lack of direction of causality. This is because these previous studies have adopted multivariate design lumping up macroeconomic variables such as interest rate, exchange rate, foreign direct investment, money supply with inflation in one model. Unfortunately, these macroeconomic variables that are combined with inflation in one model are theoretically known to have strong correlations with the latter. For instance, nominal interest rate is the sum of real interest rates and expected inflation (Leibowitz et al., 1989; Fisher 1930). Besides the fundamental issue of multicollinearity, most of the studies especially those in Ghana except Issahaku et al. (2013) and Frimpong (2011) have failed to establish the direction of causality between stock returns and significant macroeconomic variables. Even the studies (Issahaku et al. 2013; Frimpong, 2011) that have transcended the hackneyed cointegration analysis to establish the direction of causality, their approach for investigating the direction causality is questionable. Engle and Granger (1987) and Granger (1988) posit that where there is cointegration between the variables under consideration, causality tests which fail to consider the error correction term obtained from the cointegration relationship are misspecified. These studies use I(1) variables but their models for establishing the direction causality do not include the error correction term.

It is our case in this paper that the two weaknesses in the above studies could be addressed by a paradigm shift from the multivariate analysis of the impact of macroeconomic variables on stock returns to bivariate analysis which eliminates multicollinearity problem and by formulating Granger causality models that account for the error correction term. The paper contributes to the literature in the following ways. One, it expands the frontiers of the empirical literature on the stock returns-inflation nexus in Ghana. Two, since the design of the current study overcomes the multicollinearity problem in the previous studies and its model for causality test addresses the model misspecification problem in the previous studies, its findings should provide a better understanding of the relationship between stock market returns and inflation in Ghana which may be useful for market participants. Three, internationally, since the current study is on the GSE, which is one of the emerging markets, it adds to the scanty evidence from the emerging markets on the relationship between stock returns and inflation. Four, since it is the first study on the GSE that tests the direction of causality in the error correction model, the current study introduces methodological innovation into the Ghanaian context.

The rest of the paper is sectionalized as follows. The next section reviews the theoretical and empirical literature. This is followed by the methodology of the study. The penultimate section is results section. Last but not least is the conclusion and policy implications section.

LITERATURE REVIEW

Theoretical Explanation of Stock Returns-Inflation Nexus

Fisher's (1930) theory popularly known as *Fisher Effect* proposes that the expected rate of return should be composed of a real return plus an expected rate of inflation. The theory predicts positive relationships between stock market returns and expected inflation and changes in the expected inflation. The intuition is that in the presence of inflation, the value of the contingent claims will see upward adjustment (Bilson et al., 2001).

Fama's (1981) *Proxy Hypothesis* challenges the Fisher Effect stating that there is a negative relationship between stock market returns and inflation. It argues that this negative relationship is precipitated by the positive causal link between real output and stock returns coupled with the negative relationship between real output and inflation. Using a chain of macroeconomic linkages rooted in money-demand theory and quantity theory of money, the theory postulates that rising inflation rates reduce real economic activity and demand for money. A decreased real economic activity negatively affects corporate profits and stock prices. This negative relationship between stock returns and inflation occasioned by a reduction in real output is called *proxy effect*, in the sense that it indicates the adverse effect of inflation on real economic activity. Fama (1981) argues that this proxy effect disappears if inflation does not result in a reduction in real economic activity.

The standard stock price valuation model:

$$P_0 = \sum \frac{E(CF_t)}{(1+K_t)^t} \quad (1)$$

where P_0 represents the equity price, E (CF_t) the discounted future value of the expected cash flow, and k_t the required rate of return also offers explanation for the stock returns-inflation nexus (Schätz, 2010). The required rate of return k_t consists of two components: nominal risk-free interest rate and the corresponding risk premium of each asset (Naka et al. 1998). By extrapolation, macroeconomic variables affect both expected cash flows and the required rate of return. Thus, an increase in consumer prices means a rise in nominal risk-free investment which boosts the required rate of return, k_t (Maysami and Koh, 2000). A rising inflation implies rising wage claims, growing nominal capital expenditure and increasing energy costs. Unfortunately, companies cannot adapt their increasing nominal costs immediately. In the midst of rising inflation, cash flows do not rise to the extent as inflation (De Fina, 1991).Due to inability to enhance companies' productivity immediately in the midst of rising inflation, a rising inflation is predicted to have a negative effect on equity prices in the short run.

Empirical Studies

Dasgupta (2012) uses the Johansen and Juselius's co-integration test to examine the relationship between stock market returns and macroeconomic variables using data from Indian Stock market and reports, among other things, that inflation (proxied by wholesale price index) is negatively related to Indian stock market returns in the long run. The study, however, fails to establish short-run relationship between the Indian stock market and inflation.

Sohail and Hussain (2009) investigate the relationships between Lahore Stock Exchange and macroeconomic variables in Pakistan using monthly data from December 2002 to June 2008. The study finds a negative relationship between inflation (proxied by consumer price index) and stock returns.

Wongbampo and Sharma (2002) investigate the relationship between stock market prices and macroeconomic variables including inflation in five Asian countries (Malaysia, Indonesia, Philippines, Singapore and Thailand) using consumer price index as proxy for inflation and report that there is a negative relationship between stock prices and inflation in all the five Asian countries. Gunasekarage et al. (2004) investigate the impact of macroeconomic variables including inflation on stock equity values in Sri Lanka with the Colombo All Share Index as proxy for stock market and consumer price index as proxy for inflation. The study uses 17-year period data (January 1985 to December 2001) unit roots, cointegration, vector error correction models (VECM), impulse response functions (IRFs) and variance decompositions (VDCs) and reports, among other things, that inflation exerts a negative influence on the stock market in Sri Lanka.

Naik and Padhi (2012) examine the relationship between stock index and five macroeconomic variables (industrial production index, wholesale price index, money supply, treasury bills rates and exchange rates) from 1994:04 to 2011:06 in India and find, among other things, that short-term inflation is negatively and significantly related to stock market index.

On Karachi stock exchange in Pakistan, Hussain et al. (2009) report that inflation measured by wholesale price index has a negative significant relationship with stock prices in the long run. This has since been confirmed by Akbar et al. (2012) who explore the relationship between the Karachi Stock Exchange Index and macroeconomic variables for the period spanning from January 1999 to June 2008 using cointegration and Vector Error Correction Model (VECM) and report, among other things, that there is a negative relationship between inflation and stock prices.

Al-khazali (2003) investigates the short and long-term relationships between stock prices, inflation and output in 21 emerging capital markets. The countries are Australia, Bahrain, Egypt, Hong Kong; Jordan, Kuwait, India, Indonesia, Malaysia, Morocco, Oman, Pakistan, Philippines, Qatar, Saudi Arabia, South Korea, Singapore, Taiwan, Thailand, Tunisia, and Turkey. The study provides evidence to the effect that in the short run, there is a negative relationship between stock returns and inflation in all countries except Malaysia. The study reports that there is a long-run equilibrium between stock prices, inflation and real economic activity in the study countries which lends credence to the postulation that the Fisher effect and the proxy hypotheses are valid in the long run only(Al-khazali, 2003).

Bhattarai and Joshi (2009) delve into the dynamic relationship between the stock market and macroeconomic factors in Nepal and report that there is unidirectional positive short run causal relationship running from inflation proxied by consumer price index to stock index but reverse causality in the long run (from stock index to inflation).

Boyd et al., (2001) examine the impact of inflation on financial sector performance and report that there is a significant negative relationship between inflation and both banking sector development and equity market activity. They, however, they indicate that this relationship is nonlinear: As inflation grows, its marginal impact on bank lending activity and stock market development diminishes rapidly.

Khan and Yousuf (2013) explore the relationship between macroeconomic forces and stock prices with monthly data (1992m1-2011m6) from the Bangladesh Stock Market. The study uses the Dhaka Stock Exchange All-Share Price Index (DSI) as proxy for stock prices with deposit interest rates, exchange rates, consumer price index (CPI), crude oil prices and broad money supply (M2) as macroeconomic variables and reports, among other things, that inflation does not show any significant impact on stock prices.

In Ghana, the stock returns-macroeconomic variables nexus has received some appreciable empirical attention. However, a critical scrutiny of these studies shows that evidence on the relationship between inflation and stock returns is mixed. Kyereboah-Coleman and Agyire-Tettey (2008) find that inflation has a negative effect on stock returns. Adam and Tweneboah (2008) investigate the relationship between macroeconomic variables and stock returns with quarterly data for the period (1991.1 to 2007.4). Using the consumer price index (as the measure of inflation) and employing co-integration test and vector error correction model (VECM) as analytical techniques, the study finds, among other things, that the lagged values of inflation have negative significant effects on the stock market (Adam and Tweneboah, 2008). Issahaku et al. (2013) confirm the negative relationship between inflation and stock returns in Ghana showing that inflation has a negative statistically significant relationship with stock returns in the short run and a positive statistically

significant relationship with stock returns in the long run. In terms of direction of causality, the study reports that there is a unidirectional causality running from inflation to stock returns (Issahaku et al., 2013). The causality test by Frimpong (2011) has also reported a unidirectional causality running from inflation to stock returns.

Owusu-Nantwi and Kuwornu (2011) examine the relationship between macroeconomic variables and stock returns with monthly data (January 1992 to December 2008) from the GSE and report that there is a positive statistically significant relationship between inflation and stock returns. Studies by Kuwornu (2012) and Mireku et al. (2013) which use monthly data spanning from January 1992 to December 2008 and 1991.4 to 2010.8 respectively, have since confirmed the positive relationship between inflation and stock returns on the GSE.

It is observable from the foregoing, that the evidence on the relationship between inflation and stock returns in Ghana is mixed. The justification of the current study hinges on this cacophony of evidence. Is there a relationship between inflation and stock returns in Ghana? If there is, what kind?

A snapshot of the findings of the previous studies on the relationship between inflation and stock market returns is presented in Table 1.

MATERIALS AND METHODS

Data

Monthly data spanning from 1992.1 to 2010.12 collected from the GSE and Bank of Ghana have been used for analysis. Stock prices are end-of-period closing share price indices. All data have been transformed into natural logarithms in line with previous studies (Barbić and Čondić-Jurkić, 2011).

Methodology

Measures of Stock Returns and Inflation

In line with the previous studies, stock market is proxied by GSE All-Share Index (*Ln*GSE) (Khan andYousuf, 2013; Akbar et al., 2012; Naik and Padhi, 2012). The most popular measure of inflation in the literature is consumer price index (e.g. Issahaku et al. 2013; Adam and Tweneboah, 2008; Gunasekarage et al. 2004). Thus, in keeping with the trend of the literature we use consumer price index as proxy for inflation (*Ln*INFL).

Analytical Approach

Cointegration and Granger Causality test in the Error Correction Model are used for the analysis. To perform cointegration analysis, we need to establish the presence of unit roots which will indicate whether the series under consideration are nonstationary. It is required that the series must be integrated of the same order. To ascertain the presence or otherwise of unit roots we employ Augmented Dickey- Fuller (ADF) procedure as well as Phillips-Perron (PP) test of unit root. To establish whether there is a long-run relationship between inflation and stock market returns, we employ autoregressive distributed lag (ARDL) bounds testing approach to cointegration developed by Pesaran et al. (2001).

The ARDL approach to cointegration is considered superior to other methods of cointegration: the residual-based Engle and Granger (1987) and maximum likelihood based Johansen (1988, 1991) and Johansen and Juselius (1990) tests for two main reasons. One, unlike other cointegration tests approaches, the ARDL approach can be applied irrespective of the stationarity properties of the variables under consideration. Specifically, the ARDL approach can be applied regardless of whether the series are I(0), I(1) or fractionally integrated (Pesaran and Pesaran, 1997 and Bahmani-Oskooee and Ng, 2002). Thus, the approach eliminates the challenges involved in non-stationary time series data (Laurenceson and Chai, 2003). Second, the ARDL approach uses lags of variables to capture the data generating process in a general to specific framework (Laurenceson and Chai, 2003). It uses $(p+1)^k$ number of regressions in order to obtain optimal lag-length for each variable, where p is the maximum lag to be used, and k is the number of variables in the equation.

Pesaran et al. (2001) provide two sets of critical values for cointegration test. The lower critical bound assumes that all the variables are I(0), meaning that there is no cointegration among the variables, while the upper bound assumes that all the variables are I(1). If the F-statistic is greater than the upper critical bound, then the null hypothesis is rejected, suggesting that there is a cointegrating relationship between the variables under consideration. If the F-statistic falls below the lower critical bounds value, it suggests that there is no cointegrating relationship. If the F-statistic lies within the lower and upper bounds, then the test is inconclusive.

To explore the long- and short-run relationships between stock market returns and inflation, the following equation in the ARDL form is used:

$$\Delta LnGSE_t = C + \sum_{i=1}^{p} \alpha_i \Delta LnGSE_{t-i} + \sum_{i=1}^{p} \beta_i \Delta LnINFL_{t-i} + n_1 LnGSE_{t-1} + n_2 LnINFL_{t-1} + e_t \quad (2)$$

Where $\Delta LnGSE_t$ represents change in natural logarithm of GSE All-Share Index as proxy for stock market returns; C is the intercept of the equation; $\Delta LnINFL$ represents change in the natural logarithm of inflation proxied by consumer price index. In equation 1, the terms with summation signs represent the error correction dynamics whilst the ones with *n* signs represent long-term relationship. *Ln* means natural logarithm of the variables under consideration. Thus, for example, *LnINFL* means natural logarithm of inflation. The term *et* is the *stochastic* error term. The symbol Δ is the change operator.

Granger Causality Analysis

The presence of cointegration between variables suggests causal relationship between them but the direction of causality is unknown. Engle and Granger (1987) and Granger (1988) argue that where there is cointegration between the variables under consideration, causality tests which fail to consider the error correction term (ECT) obtained from the cointegrating relationship are mis-specified. They suggest that in the presence of cointegration, the Granger Causality model should be re-parameterized in the equivalent error correction model. Thus, if cointegrating relationship is established between stock returns and inflation, Granger causality test will be done in the error correction model as follows:

$$\Delta LnGSE_t = C_1 + \rho_1 e_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta LnGSE_{t-i} + \sum_{i=1}^{p} \beta_i \Delta LnINFL_{t-i} \quad (3)$$

Table 1. Snapshot of Previous Studies on Stock Returns-Inflation Nexus

Author(s)	Year of Publication	Country of Study	Nature of relationship between inflation and stock returns
EVIDENCE FROM OTHER PARTS OF THE WORLD			
Boyd, Levine and Smith	2001	Argentina, Australia, Austria, Belgium, Bangladesh, Brazil, Canada, Switzerland, Chile, Cote d'Ivoire, Colombia, Costa Rica, Germany, Denmark, Egypt, Arab Rep., Spain, Finland, France, United Kingdom, Greece, Hong Kong, India, Israel, Italy, Jamaica, Jordan, Japan, Korea, Republic of, Luxembourg, Morocco, Mexico, Malaysia, Netherlands, Norway, New Zealand, Pakistan, Peru, Philippines, Portugal, Singapore, Sweden, Thailand, Trinidad and Tobago, Turkey, Taiwan, Uruguay, United States, South Africa, Zimbabwe.	Negative
Wongbampo and Sharma	2002	Philippines, Singapore, Thailand, Indonesia and Malaysia	Negative
Al-khazali	2003	Australia, Bahrain, Egypt, Hong Kong; Jordan, Kuwait, India, Indonesia, Malaysia, Morocco, Oman, Pakistan, Philippines, Qatar, Saudi Arabia, South Korea, Singapore, Taiwan, Thailand, Tunisia, Turkey.	Negative
Gunasekarage, Pisedtasalasai,and Power	2004	Sri Lanka	Negative
Sohail and Hussain	2009	Pakistan	Negative
Bhattarai and Joshi	2009	Nepal	Short run negative; long run positive
Hussan, Lal and Mubin	2009	Pakistan	Negative
Akbar, Ali and Khan	2012	Pakistan	Negative
Dasgupta	2012	India	Negative
Naik and Padhi	2012	India	Negative
Khan and Yousuf	2013		Insignificant
EVIDENCE FROM GHANA			
Kyereboah-Coleman and Agyire-Tettey	2008	Ghana	Negative
Adam and Tweneboah	2008	Ghana	Negative
Frimpong	2011	Ghana	Unidirectional causality running from inflation to stock returns
Owusu-Nantwi and Kuwornu	2011	Ghana	Positive
Kuwornu	2012	Ghana	Positive
Issahaku, Ustarz and Domanban	2013	Ghana	Negative short run, positive long run. Unidirectional causality from inflation to stock returns
Mireku, Sarkodie and Poku	2013	Ghana	Positive

Source: Author's compilation, 2013.

Table 2. ADF and PP Unit Root Tests Results.

	ADF			PP Test		
Variable	**Test Statistic**	**Lags**	**Order of Integration**	**Test Statistic**	**Bandwidth**	**Order of integration**
LnGSE	-1.677613	1	-	-1.547732	8	-
ΔLnGSE	-9.736273	0	I(1)	-9.938101	6	I(1)
LnINFL	-2.296102	1	-	-2.55503	8	-
Δ LnINFL	-5.482778	1	I(1)	-7.250172	2	I(1)

Table 3. Results of Equation 2. Dependent Variable: Δ*Ln*GSE.

Variable	Coefficient	t-statistic	p-value
Constant	0.1188	3.797292	0.0002***
Δ*Ln*GSE-1	0.4248	6.212284	0.0000***
Δ*Ln*GSE-2	-0.0612	-0.829253	0.4079
Δ*Ln*GSE-3	0.0058	0.078219	0.9377
Δ*Ln*GSE-4	0.2128	2.911749	0.0040***
Δ*Ln*GSE-5	0.0166	0.239340	0.8111
Δ*Ln*INFL-1	-0.6774	-2.093188	0.0375**
Δ*Ln*INFL-2	0.8812	2.436722	0.0157**
Δ*Ln*INFL-3	0.1040	0.280202	0.7796
Δ*Ln*INFL-4	-0.3771	-1.030649	0.3039
Δ*Ln*INFL-5	-0.5899	-1.784379	0.0758*
*Ln*GSE-1	-0.0381	-3.030919	0.0027***
LnINFL-1	0.0407	2.508608	0.0129**
N=222, R^2 Adjusted R^2=0.24; Durbin-Watson Stat.=2			

***, ** and * represent 1%, 5% and 10% significance levels respectively.

$$\Delta INFL_t = C_2 + \rho_2 et_{-1} \sum_{i=1}^{p} \alpha_i \Delta LnINFL_{t-i} + \sum_{i=1}^{p} \beta_i \Delta LnGSE_{t-i} \quad (4)$$

Where $\Delta LnGSE_t$ represents change in natural logarithm of *GSE* at time t, C is the constant term; et_{-1} is the error correction term representing the long-run relationship between stock returns and inflation; ρ measures the sensitivity of the error correction term; α and β represent sensitivity of *GSE* and INFL; $\Delta LnGSE_{t-i}$ and $\Delta LnGSEt_{-i}$ represent lagged change in GSE and *INFL.* A negative and significant coefficient of the error correction term indicates that there is a long-run causal relationship between stock returns and inflation. If the coefficient of et_{-1} is negative and significant in both equations it means there is a bi-directional causality. If, for example, only ρ_1 is significant, it indicates a unidirectional causality from inflation to stock market returns, implying inflation drives stock returns toward long-run equilibrium but not the other way around (Ahmad and Husain, 2007).

RESULTS AND DISCUSSIONS

Table 2 displays the results of the ADF and PP unit root tests. As can be observed, stock market returns and inflation are stationary at their difference form. Having established that the variables under consideration are I (1) variables, ARDL approach is used to determine cointegrating relationship. Lag length of VAR model is selected at 5 on the basis of Akaike Information Criterion (AIC), Final Prediction Error and sequential modified LR test statistic. The results of the cointegration test using ARDL approach are presented in Table 4. As can be observed, the F-statistic exceeds the upper critical bound value at 5% significance level. We, therefore, conclude that there is a long-run relationship between inflation and stock market returns.

The short run and long-run relationships between stock market returns and inflation are shown in Table 3. In the short run, inflation has a negative statistically significant relationship with stock market returns. However, in the long-run this negative relationship becomes significantly positive. These findings confirm those of Bhattarai and Joshi (2009) in Nepal and Issahaku et al. (2013) in Ghana. The negative short run relationship between inflation and stock returns implies that a rise in inflation results in a fall in stock prices. Generally, most of the

Table 4. Cointegration Test. Dependent Variable: Δ*Ln*GSE.

	Critical value bounds of the F-statistics			
F-Statistic	**5% Level**		**10% Level**	
5.916163	I(0)	I(1)	I(0)	I(1)
	4.94	5.73	4.04	4.78

Source: Author's calculations. Critical Values are from Pesaran *et al*. (2001), Table CI(iii) Case III: Unrestricted intercept and no trend.

Table 5. Granger Causality in the Vector Error Correction Model.

Results of Equation 3-Dependent Variable: *Ln*GSE				**Results of Equation 4-Dependent Variable: *Ln*INFL**			
Variable	**coefficient**	**t-statistic**	**p-value**	**Variable**	**coefficient**	**t-statistic**	**p-value**
Constant	0.017154	2.346915	0.0199	Constant	0.006897	4.354153	0.0000***
et_{-1}	-0.038241	-3.031915	0.0027	et_{-1}	0.002581	0.944163	0.3462
Δ*Ln*GSE-1	0.431837	6.304580	0.0000	Δ*Ln*GSE-1	-0.004391	-0.295827	0.7677
Δ*Ln*GSE-2	-0.056268	-0.760227	0.4480	Δ*Ln*GSE-2	0.005711	0.356035	0.7222
Δ*Ln*GSE-3	0.009391	0.126814	0.8992	Δ*Ln*GSE-3	-0.008011	-0.499208	0.6182
Δ*Ln*GSE-4	0.218116	2.976875	0.0033	Δ*Ln*GSE-4	0.006530	0.411297	0.6813
Δ*Ln*GSE-5	0.020732	0.298849	0.7654	Δ*Ln*GSE-5	-0.025904	-1.723150	0.0863*
Δ*Ln*INFL-1	-0.604091	-1.878517	0.0617	Δ*Ln*INFL-1	0.506163	7.263387	0.0000***
Δ*Ln*INFL-2	0.904568	2.494169	0.0134	Δ*Ln*INFL-2	0.236998	3.015541	0.0029***
Δ*Ln*INFL-3	0.107497	0.288536	0.7732	Δ*Ln*INFL-3	0.039225	0.485845	0.6276
Δ*Ln*INFL-4	-0.365183	-0.994687	0.3210	Δ*Ln*INFL-4	-0.195395	-2.455981	0.0149***
Δ*Ln*INFL-5	-0.531974	-1.612791	0.1083	Δ*Ln*INFL-5	0.038773	0.542441	0.5881
N=222, R^2=23; Adjusted R^2=0.27; Durbin-Watson Stat=2				N=222, $R^{2=}$43; Adjusted R^2=0.40; Durbin Watson Stat=1.98			

***, ** and * represent 1%, 5% and 10% significance levels respectively.

previous studies have found a negative relationship between inflation and stock market returns (e.g., Akbar et al., 2012; Dasgupta, 2012; Naik and Padhi, 2012; Sohail and Hussain, 2009; Bhattarai and Joshi, 2009; Hussain et al., 2009; and Gunasekarage et al., 2004). Theoretically, this negative relationship is in tandem with proxy hypothesis which is attributed to Fama (1981) and the standard stock valuation model which predict a negative relationship between inflation and stock market returns.

There has been a postulation in the literature that the Fisher effect is valid only in the long run (Al-khazali, 2003). The positive long run relationship between inflation and stock market returns strikes a chord with this postulation. It suggests to us that as inflation rises investors on the GSE are compensated for it in the long run.

The presence of cointegrating relationship between stock returns and inflation implies that equations 2 and 3 can be estimated. The results of the estimation are presented in Table 5. The negative and statistically significant coefficient of the error correction term (et_{-1}) in equation 2 suggests that there is a unidirectional causality running from inflation to stock market returns. In other words, inflation drives stock market returns towards equilibrium in the long run. However, as can be observed, the speed of adjustment to long-term equilibrium is extremely slow. The recent studies by Issahaku et al. (2013) and Frimpong (2011) on the GSE have investigated the direction of causality between inflation and stock returns and have reported a unidirectional causality from inflation to stock returns, meaning inflation drives the stock market to long-term equilibrium. Thus, our finding is in congruence with their finding. The implication is that investors on the GSE are compensated for inflation and that GSE cannot be used as a hedge against inflation.

The study provides some policy implications. One policy implication is that the GSE cannot be used as hedge against inflation in the long run since investors demand compensation for inflation in the long run. Additionally, the unidirectional causality from inflation to stock returns hints of inefficiency of the GSE which suggests that monitoring past values of inflation could provide opportunities for abnormal gains from the GSE. This contradicts the Efficient Market Hypothesis which postulates that

capital markets are efficient. Three main factors might have accounted for the inefficiency of the GSE. The small number of market participants could be a factor. It is believed that the higher the number of active market participants the better the efficiency of the market. The intuition is that as a market records more active participants the probability that any price anomalies will be identified and eradicated is high. On the face of it, one can say that the number of participants on the GSE is small partly due to relatively low financial literacy among Ghanaians especially in terms of investment literacy. Even the active participation of listed companies on the exchange is questionable. A study has shown that the average listed Ghanaian company finances its growth with short-term debt (Yartey, 2009). The second possible reason is poor information dissemination on the exchange. Timely and adequate access to relevant information on listed securities helps in making proper pricing of such securities. Thus, where information dissemination is poor one should expect the market to be inefficient. The third factor is transactional and other costs associated with trading and analysis. If transactional and other costs are high, the market is likely to be inefficient because high costs of, for example, searching for information may deter market participants from seeking relevant information for proper pricing of securities leading to market inefficiency.

CONCLUSION

This paper contributes to the empirical conversation on the inflation-stock returns nexus using data (January 1992-December 2010) from the GSE which is one of the emerging markets. The study uses unit root tests, ARDL approach to cointegration and Granger Causality in the Error Correction Model for analysis and finds that there is a negative statistically significant relationship between inflation and stock returns in the short run and a positive statistically significant relationship in the long run. In terms of direction of causality, the analysis shows that there is a unidirectional causality running from inflation to stock returns. These findings suggest that inflation as a macroeconomic variable is a significant determinant of stock market returns in Ghana.

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