Journal of Economics and International Finance

Volume 6 Number 2 February 2014
ISSN 2006-9812

Academic Journals

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Journal of Economics and International Finance

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academicJournals

Vol. 6(2), pp. 28-37, February, 2014
DOI: 10.5897/JEIF12.103
ISSN 2141-6672 © 2014 Academic Journals
http://www.academicjournals.org/JEIF

Journal of Economics and International Finance

Full Length Research Paper

The finance-growth nexus: Evidence from Malawi

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Accepted 04 February, 2014

Apart from assessing the impact of financial development on economic growth, economists have also delved to understand the direction of causality between the two variables. We examine the causal relationship between the two variables in the Granger causality sense and regress economic growth on financial development and a number of control variables. The Augmented –Dickey Fuller unit root test is used to test for non-stationarity of vairables and the Johansen Vector Autoregressive Cointegration test is utilised to explore the existence of a long-run equilibrium relationship among the variables. We find that all variables are integrated of order one and that they converge to a long-run equilibrium. In the light of these results, we employ an error-correction model. Causality and regression results confirm the contention of Robinson (1952) that the relationship between financial development and economic growth is *demand following* implying that *where enterprise leads, finance follows*. Additonally, results of the growth equation show that the population level, inflation, exchange rate, and openness to trade are significant in explaining economic growth in Malawi. The study suggests policies consistent with economic growth.

Key words: Non-stationarity, cointegration, financial development, economic growth.

INTRODUCTION

Financial development is defined as a process that marks improvements in quantity, quality and efficiency of financial intermediary services (Abu-Bader and Abu-Qarn, 2005). According to Levine (1997), the debate linking financial development and economic growth can be traced as far back as following Bagehot's (1873) observation that financial development played an important role in the process of industrialization in England. Bagehot claimed that financial development facilitated the necessary capital mobilization which enhanced industrialization. This basic argument was supported by Schumpter (1912), Hicks (1969) and Miller (1998) *inter alia*.

However, for Kar and Pentecost (2000), the seminal work of Patrick (1966) helped pave the direction of the debate. In his work Patrick argued that the causal relationship between financial development and growth is two-fold. On one hand, it is *demand following*. This implies that demand for financial services is a function of output growth and upon the transition to modernity. In general therefore this means that causation should move from growth to finance a conclusion that Robinson advanced in 1952 when he wrote *". . . where enterprise leads finance follows."*

On the other hand, it is *Supply leading*. This implies that it is the availability of financial services that stimulates demand. While this argument clearly contradicts Robinson's conclusion it reinforces the endogenous growth argument that financial development, precedes economic growth. Indeed Schumpeter (1912), Hicks (1969), Goldsmith

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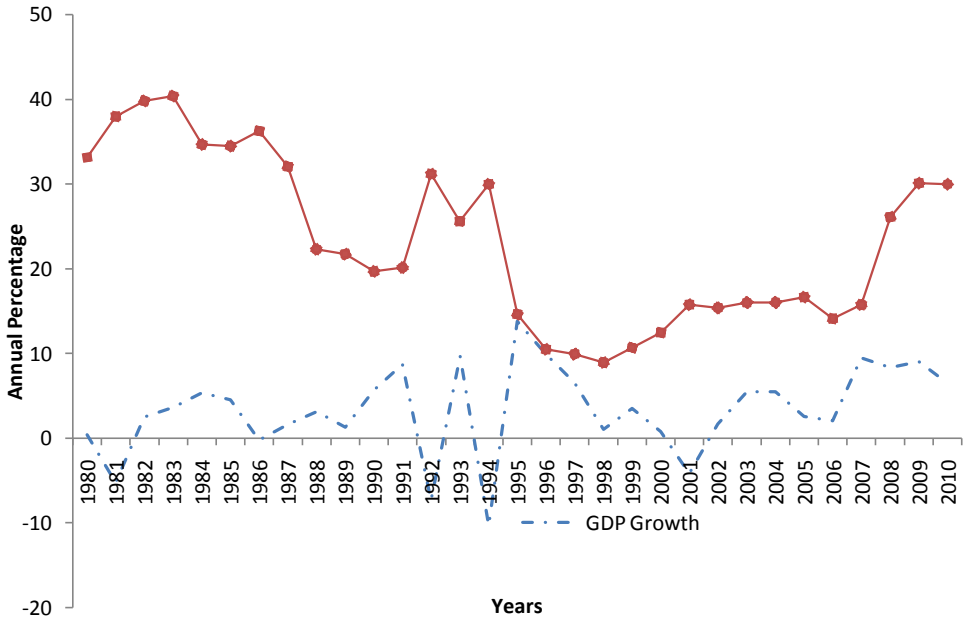

Figure 1. GDP growth and domestic credit (GDP%). Source: International Monetary Fund (IMF), World Economic Outlook Data Base (2013) and World Bank (WB), World Development Indicators (Various Issues).

(1969), McKinnon (1973), Shaw (1973) all maintain that essentially a country's financial system plays a critical role in allocating resources and promoting growth (Levine, 1997; Fatima 2004).

A sound understanding of the finance-growth relationship is likely to guide effective policy making in Malawi where the economy is still heavily reliant on agriculture and the financial system is yet to grow. Incontestably for a country like Malawi an early discovery of the puzzle is likely to be beneficial to the growth process.

Figure 1 shows trends in GDP growth and domestic credit provided by the banking sector in Malawi[1]. As is evident from the figure, although some years registered negative growth rates, economic growth has generally been positive but fluctuating. Between 1980 and 1990 for instance, negative growth rates of -5.2 percent and -0.215 were recorded, and while a high rate of growth was recorded in 1990 at 5.7 percent, growth in the period remained below 6 percent. Mixed results were also observed between 1991 and 2000. With negative rates obtaining in 1992 (-7.3 percent) and 1994 (-10.3 per cent), the highest rate was recorded in 1995 (13 percent). The period 2001 and 2010 was not different either. Starting off with negative growth of -4.0 percent in 2001, positive results were registered in all the years with the highest value being 9.5 percent in 2007. On average during the period 1980 to 2010, GDP growth rates averaged only 3.4 percent, an average too low for any meaningful development for a dveloping economy.

There was also a general decline in the provision of domestic credit by the banking sector. Between 1980 and 1990, the banking sector provided 33 percent of domestic credit (as percentage of GDP) but could only provide 19 percent by the end of 1990. While there was a temporary increase between 1991 and 1994, a sharp decline followed reaching a low value of 15 percent by the end of 2007. Nevertheless, an upward trend began to unfold again from 2008.

In terms of linking these two variables, studies on the finance-growth nexus have emphasized the one way causation coming from financial development to economic growth (Waquabaka, 2004; Allen and Ndikumana, 1998). Yet there is a possibility of a two-way causation and should this be the case then economic policy making linking the two variables has been greatly misleading. Economically a policy mismatch in one sector is likely to adversely affect other sectors and thus slow the much wanted economic growth.

Further, most studies on economic growth have been cross sectional (Hsu, Liu and Lee, 2004). Such studies hide the country specific peculiarities and therefore offer very little guidance to country-specific policy formulation. Furthermore most studies neglect the important assessment of unit roots which is a prevalent problem in most time series, the presence of which affects the application of asymptotic theory.

The present study therefore undertakes to add value to

[1] GDP growth rates are annual percentages of constant price GDP of year-on-year changes. It is expenditure based GDP which is the total expenditure at purchaser's prices. The level of financial development is depicted in the figure as the domestic credit provided by the banking sector as a percentage of GDP.

existing literature on the finance-growth nexus, by examining the two way causation of the finance and growth variables, examining the finance growth puzzle in a country specific case and testing for integration and co-integration of economic fundamentals.

The rest of the paper is organized as follows: section 2 presents an empirical survey; section 3 discusses the methodology and section 4 discusses the results. Section 5 concludes the paper.

EMPIRICAL REVIEW

A battery of econometric techniques have been used to study the finance-growth relationship. One strand has used cross-sectional or panel data while the other has used time series techniques. In this section we divide the empirical review into studies that have used panel data techniques and those which utilised times series techniques.

Panel studies

One prominent study in sub-Saharan Africa was conducted by Acaravci *et al.* (2005) who investigated the causality between financial development and economic growth for the period 1975-2005 using panel contegration and panel GMM estimation. The study found no long run relationship between financial development and economic growth. However a bi-directional causal relationship was established between the two variables.

Rachdi and Mbarek (2011) empirically invetsigated the direction of causlity between finance and growth using panel data cointegration and system GMM approaches. The analysis is based on a sample of 10 countries, 6 from the OECD region and 4 from the MENA region during 1990-2006. Results confirm a long term relationship between financial development and economic growth for the OECD and MENA countries. The GMM results show that financial development and economic growth are strongly linked. The error correction model shows that causality is bi-directional for the OECD countries and unidirectional for the MENA countries from growth to financial development. For European Union countries, Halko and Trigoni (2010) found that the financial system does not directly affect growth.

Another study that employed panel cointegration was undertaken by Christopoulous and Tsionas (2004), who investigated the long run relationship between finnacial depth and ecoomic growth using panel cointegration (fully modified aproach) for 10 developing countries. Empirical results provide clear support for the hypothesis that there is a single equilibrium relatioship between financial depth, growth and ancilary variables, and that the only co-integrating relation implies a unidirectioanl causality from financial depth to growth.

Using data from 286 Chinese cities over the period 2001-2006, Zhang *et al.* (2012) investigated the relationship between financial development and economic growth in China. The results from both traditional cross-sectional regressions, first-difference and system GMM suggest that traditional indicators of financial development are positively associated with economic growth. Similarly, Hassan *et al.*(2011) established a positive relationship between financial development and economic growth in developing countries and confirmed a two-way causality relatioship between finance and growth for most regions and one way causality for the poorest regions.

Using a Bayesian dynamic factor model, Pan and Wang (2013) examine the relationship between financial development and economic growth across 89 countries in industrial countries, emerging market economies and other developing countries over the period 1970-2009. Estimations of the common factor, country and idio-syncaratic factors driving the dynamics and co-movements of financial development and economic growth across the 89 countries indicated that the common factor plays a more significant role in explaining the variance of output growth in industrial countries and emerging market economies but not in the developing countries. In contrast financial development variability is mainly driven by country and idiosyncratic factors.

Time series

Some researchers have concentrated on country-specific studies results of which are grossly mixed. For instance, Akinlo and Egbetunde (2010) examined the long run and causal relationship between financial development and economic growth for ten countries in sub-Saharan Africa using a vector Error Correction Model. The study found that financial development is cointegrated with economic growth in the selected ten countries of sub-Saharan Africa and that financial development Granger causes economic growth in Central Africa Republic, Congo Republic, Gabon and Nigeria while economic growth Granger causes financial development in Zambia. Furhermore, bi-directional relationship between financial development and economic growth was found in Kenya, Chad, South Africa, Sierra Leone and Swaziland.

The study by Adamopoulos (2010) was also insightful. Investigating the relationship between financial development and economic growth for Ireland for the period 1965-2007 using a vector error correction model, the Granger causality tests indicated that economic growth causes credit market development while a bilateral causal relationship between stock market development and economic growth was found.

Hussain and Chakraborty (2012) demonstrated that finanacial development and economic growth are cointegrated and that financial development Granger-causes economic growth in Assam State of India. Ozcan

and Ari (2011) tested the relationship in Turkey for the period 1998-2009 and found a uni-directional relationship between financial development and economic growth coming from economic growth to financial development. These results for Turkey were in line with those of Kar and Pentecost (2000) who used the ratio of money to income, the ratio of banking deposit liabilities to income, the ratio of private sector credit to income, the share of private sector credit in domestic credit and the share of domestic credit to income to proxy level of financial development and their results showed that in general it is economic growth that causes financial development in Turkey and not vice versa. Similar results were established by Waquabaca (2004) in Fiji.

Using annual time series data from South Africa, Adusei (2012) tested the validity of Schumpeter's prediction that finance promotes growth. The study uses unit root tests, co-integration analysis, fully modified ordinary least squares regression, and two-stage least squares technique. Contrary to the prediction of Schumpeter that finance promotes growth, the empirical results suggest that financial development does not promote economic growth both in the short-run and long-run. However, the pairwise Granger causality test result supports the assertion that there is a uni-directional causality from financial development to economic growth in South Africa.

Hsu et al. (2004) examined the role of financial development in Taiwan, Korea and Japan using the Generalized Method of Moments (GMM) and Principal Components Analysis. The study established that finance was vital in propelling growth in Japan but had negative effects in Taiwan and Korea. Further, the study shows that unlike in Korea and Japan, stock market development had positive effects on the economic growth of Taiwan.

Fatima (2004) explored the causality between financial development and economic growth in Morocco for a period of 1970 to 2000. The study used three measures of financial development: the ratio of liquid liabilities (M3) to GDP, the ratio of domestic credit (provided by the banking sector) to GDP and the ratio of domestic credit (to private sector) to GDP. The study revealed causality running from economic growth to financial development when M3 and the ratio of domestic credit (provided by the banking sector) to GDP were used as measures of financial development. However causality runs from finance to growth when the other measure is used.

Summary of empirical survey

The picture that emerges from the empirical review is that the relatiosnhip between financial development and economic growth is not uniform accross countries. Within the different panels results are mixed. In some case there is no evidence that financial development propells growth, in others this evidence is apparent. Additionally while some studies establish bi-directioal causality others find one-way cauality. Moreover, some studies find causality moving from economic growth to fianancial development while others find the reverse. It is also important to note that some studies have exposed that different financial development proxies produce different results. This means that choice of the measure is an important factor in this kind of work.

METHODOLOGY

Model specfication

Several different measures have been used in literature to proxy the level of financial development. Pan and Wang (2013) used domestic credit as a percent of GDP and used the growth rate of real per capita GDP as the dependent variable. Acaravci *et al.,*(2009) used three indicators: domestic credit provided by the banking sector as a percent of GDP; domestic credit to the private sector asa percent of GDP; and liquid liabilities of the financial system-broad money (M3) as a percent of GDP. To proxy economic growth, the natural logarithm of real GDP per capita was used. Akinlo and Egbetunde (2010) used broad money (M2) as a percent of GDP while Christopuolos and Tsionas (2004) used total bank deposits liabilities to nominal GDP. Others have used stock market indices. For instance, apart from domestic bank credits to private sector, Adamopoulos (2010) uses general market stock index to investigate the relationship between financial development and economic growth for Ireland for the period 1965-2007. Other studies combine different financial variables to form composite indicators which are then used as a proxy of financial development. For example, Hussain and Chakraborty (2012) use a composite indicator of four different financial variables combined using the Principal Components Analysis. Anumber of control variables have been used in these studies including investment, inflation, interest rate among others.

With insights from these studies and depending on data availability we use level of domestic credit by the banking sector as a percent of GDP to proxy financial development. We control for population, inflation, exchange rate and trade openness. Thus the study employs a logarithmic model of the following form:

$$LY = \beta_o + \beta_1 LPOP + \beta_2 LINF + \beta_3 LER + \beta_4 LOPEN + \beta_5 LFINDC + \varepsilon_t \quad (1)$$

Where: LY is logarithm of real Gross Domestic Product;
$LPOP$ is logarithm of Population;
$LINF$ is logarithm of Inflation;
LER is logarithm of Exchange Rate;
$LOPEN$ is logarithm of Trade Openness;
$LFINDC$ is logarithm of Financial Development (proxied by level of Domestic Credit provided by the Banking Sector, % of GDP).

Data sources

The time series data set spans from 1970 to 2010 and sources included the various issues of the Reserve Bank of Malawi's Financial and Economic Review, the various issues of African Development Indicators, various issues of World Development

Indicators, various issues of World Bank Africa Data Base, and various issues of the IMF's International Financial Statistics (IFS) and the World Economic Outlook Data Base of 2013.

Unit root tests and cointegration

It has been shown in literature that in non-stationary series spurious correlation may arise despite the absence of any correlation between the underlying series. As argued by Banerjee et al. (1993), if two or more series are each growing they may be correlated even though they are increasing for entirely different reasons and by amounts that are uncorrelated. Thus a correlation between non - stationary series cannot be interpreted in the way that it could be if it arose among stationary series.
Technically, the components of an n-dimensional vector of time series $x_{t,}\left(x_{1t,}x_{2t,}...,x_{nt}\right)$, are said to be co-integrated of order d, b (denoted $x_t \sim I(d)$) if after differencing d times have stationary invertible non-deterministic Autoregressive Moving Average (ARMA) representation. Using this definition we can classify a stationary time series as being an I(0) process while a non-stationary time series will be an I(k) where k is a positive integer depending on the order of integration.

If $x_{1t}, x_{2t}..., x_{nt}$ are co-integrated they will tend to track each other through time forming a long-run equilibrium relationship with any deviation from the long-run lasting only for a finite period. These variables are said to be co-integrated of order d, b (denoted $x_t \sim CI(d-b))$ if $x_t \sim I(d)$ and there exists a vector α, such that:

$$Z_t = \alpha' x_t \sim CI(d-b), \alpha \neq 0, b > 0 \quad (2)$$

The co-integration of the components of x_t vector implies the existence of a restriction on the standard vector autoregresive (VAR) model. Hence the estimates obtained by the standard VAR model will be misspecified (Engle and Granger, 1987). To circumvent this problem, a vector error correction (VEC) model has been suggested. The VEC restricts the long-run behavior of the endogenous variable to converge to their co-integrating relationship while allowing a wider range of short-run dynamics.

In this study, the order of integration of a time series will be found by applying a unit root test while the order of co-integration of a vector of time series will be obtained by applying a co-integration test.

The Augmented Dickey Fuller Test (Time Series Properties)

To test for the order of integration the study employed the Dickey Fuller Augmented Test. The test uses the following AR(1) process:

$$y_t = \mu_t + \rho y_{t-1} + \varepsilon_t \quad (3)$$

where μ_t and ρ are parameters and ε_t is assumed to be white noise. y_t is a stationary series if -1< ρ <1. If ρ =1, y_t is a nonstatinary series. The hypothesis of a stationary series can be evaluated by tesing whether the absolute value of ρ is stirclty less than 1. The Dickey Fuller Test therefore takes the unit root as the Null hypothesis $H_0 : \rho = 1$ against a one sided alternative $H_1 : \rho < 1$. However the actual test is carried out by estmimating an equation with y_{t-1} subtracted from both sides of the equation:

$$\Delta y_t = \mu_t + (\rho - 1) y_{t-1} + \varepsilon_t \quad (4)$$

where $\Upsilon = \rho - 1$ and the null and alternative hypotheses are: $H_0 : \Upsilon = 0$ and $H_1 : \Upsilon < 0$. More generally the ADF approach controls for higher order correlation by adding lagged difference terms of the dependent variable y_t to the right hand side of the regression:

$$\Delta y_t = \mu_t + \Upsilon y_{t-1} + \delta_1 \Delta y_{t-1} + \delta_2 \Delta y_{t-2} + ... + \delta_{p-1} \Delta y_{t-p+1} + \varepsilon_t \quad (5)$$

This augmented specification is then used to test:

$H_0 : \Upsilon = 0$, $H_1 : \Upsilon < 0$ in this regression.

The Johansen Co-integration Test (Long-Run Equilibrium)

Given that we had a group of non-statioanry series we were interested in determining whether the series are cointegrated and if they are, in identifying the cointegrating (long-run) relationships.We use a VAR-based cointegration tests using the methodology developed by Johansen (1991,1995).

The Johansen's Cointegration Test considers a VAR of order p:

$$y_t = \mathrm{A}_1 y_{t-1} + ... + \mathrm{A}_p y_{t-p} + \mathrm{B} x_t + \varepsilon_t \quad (6)$$

where y_t is a $k-$ vector of non-stationary I(1) varaibles, x_t is a vector of deterministic variables, and ε_t is a vector of innovations. The VAR can be re-written as:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \mathrm{B} x_t + \varepsilon_t \quad (7)$$

where $\Pi = \sum_{i=1}^{p} \mathrm{A}_i - I$ and $\Gamma_i = -\sum_{j=i+1}^{p} \mathrm{A}_j$

Granger's representation theorem asserts that if the coefficeint matrix Π has reduced rank $r < k$, then there exists $k \times r$ matrices α and β each with rank r such that $\Pi = \alpha\beta'$ and $\beta' y_t$ is stationary. r is the number of cointegrating relations (the cointegrating rank) and each column of β is the cointegrating vector. The elements of α are known as the adjustment parameters in the Vector Error Correction Model. Johansen's method is to estimate the Π matrix in an unrestricted form, then test whether we can reject the restrictions implied by the reduced rank of Π.

Table 1. Unit root tests in levels and associated critical values.

Variable	ADF Test Statisitic
LY	1.524556
LPOP	-1.873115
LINF	-2.522843
LER	1.073024
LOPEN	-0.826733
LFINDC	-1.718393

Critical values: -3.6496(1%); -2.9558(5%) and -2.6164 (10%).

Table 2. Unit root tests in first difference and associated critical values.

Variable	ADF Test Statisitic
∆LY	-3.044010
∆LPOP	-3.162857
∆LINF	-6.716030
∆LER	-3.284222
∆LOPEN	-6.843875
∆LFINDC	-2.883559

Critical values: -3.6576 (1%); 2.95.91 (5%) and -2.6181 (10%).

Causality

To establish the direction of causality between economic growth and financial development in Malawi, the *Granger Causality Test* was employed. The Granger (1969) approach to the question of whether x causes y is to see how much of the current y can be explained by past values of y and then to see whether adding lagged values of x can improve the explanation. Y is said to be Granger-caused by x if x helps in the prediction of y or equivalently if the coefficeienets on the lagged x's are statistically significant. This method measures precedence and information content. The test runs bivariate regressions of the form:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + ... + \alpha_t y_{t-t} + \beta_1 x_{t-1} + ... + \beta_t x_{t-t}$$
$$x_t = \alpha_0 + \alpha_1 x_{t-1} + ... + \alpha_t x_{t-t} + \beta_1 y_{t-1} + ... + \beta_t y_{t-t} \quad (8)$$

For all possible pairs. The reported F-stastics are the Wald Statistics for the joint hypothesis,

$\beta_1 = ... = \beta_t = 0$ for each equation. The null hypothesis is therefore that *x does not Granger-cause y* in the first regression and that *y does not Granger-cause x* in the second regression.

Diagnostic checks

In order to check whether the model we developed is correct and is without error several tests were carried out. These included the Breusch-Godfry Serial LM test which tested for the presence of autocorrelation in the residuals, the Histogram-Normality Test which tested for normality of residuals, the White Heteroscedasticity Test which tested for homogeneity of variance of residuals, and the Ramsey RESET test which tested for the well specification of the model.

RESULTS AND DISCUSSION

Unit root results (Time Series Properties)

In order to establish the order of integration the study used the ADF test under the null hypothesis of nonstationarity. The first step involved applying the test on level variables the results of which are are reported in Table 1. It is clear from the table that the hypothesis of nonstationarity cannot be rejected at any conventional levels and therefore it was necessary to expose the variables to the ADF test in first difference results of which are captured in the Table 2 shows that ∆LY achieves stationarity at 5%, ∆LPOP at 5% , ∆LINF at 1%, ∆LER at 5% , ∆LOPEN at 1% and ∆LFINDC at 10%. Since the variables achieve stationarity after first difference, we conclude that all the variables in the study are integrated of order One.

Cointegration results

Granger and Newbold warned that regressing one I(1) variable on another leads to spurious regression (Griffiths *et al.,*1993). Granger however identified a situation when the regression of an I(1) process on an I(1) process was not spurious. This is a situation when the variables are cointegrated. In such a case the least squares estimator works better, in that it converges to the true parameter value faster than usual. The present study tested for Cointegration by the Johansen Vector Autoregressive Test, the results of which are given in Table 3. The results of the Johansen procedure indicate 2 cointegrationg vectors thereby confirming Cointegration (the variables have a long run equilibrium to which they converge). In this case, these results justify a short-run errror correction model.

Causality results

The results of the Pairwise Granger Causality Test are given in Table 4. With a p-value of 0.62763, the null hypothesis that the LFINDC does not Granger Cause LY is upheld but with a p-value of 0.04225 which is less than 0.05, the hypthesis that LY does not Granger Cause LFINDC is rejected. The results therefore indicate that for Malawi, the causal relationship between financial development and economic growth is demand following. Causality runs from growth to financial development. This means that financial services are a function of output

Table 3. Johansen cointegration procedure.

Eigen Value	Likelihood ratio	5% critical value	1% critical value	Hypothesised N0. of CE(s)
0.738984	111.6764	94.15	103.18	None**
0.558956	68.69477	68.52	76.07	At most 1*
0.419999	42.49921	47.21	54.46	At most 2
0.318063	25.06801	29.68	35.65	At most 3
0.312097	12.81784	15.41	20.04	At most 4
0.026103	0.846405	3.76	6.65	At most 5

*(**) denotes rejection of the hypothesis at 5%(1%). Series: LY LPOP LINF LER LOPEN LFINDC.

Table 4. Pairwise Granger Causality Tests.

Pairwise Granger Causality Tests	F-Stat	Prob
Null hypothesis		
LFINDC does not Granger Cause LY	0.4739	30.62763
LY does not Granger Cause LFINDC	3.5657	40.04225

growth and as argued by Kar and Pentocost(2000). The results are also in line with studies by Akinlo and Egbetunde (2010), Fatima (2004) and Ozcan and Ari (2011).

The Error- Correction Model

Prior to developing this error correction model we developed a long run equation from which residuals or innovations were obtained. These residuals formed the Error Correction Mechanism represented as $LY - L\hat{Y}$. The error-correction model we develop here contains differenced varaibles and the error correction mechanism as follows,

$$\Delta LY = \beta_0 + \beta_1 \Delta LPOP + \beta_2 \Delta LINF + \beta_3 \Delta LER + \beta_4 \Delta LOPEN + \beta_5 \Delta LFINDC + \beta_6 \left(LY - L\bar{Y} \right)_{-1} + \varepsilon_t \quad (9)$$

Where ΔLY is the differenced logarithm of Gross Domestic Product;

$\Delta LPOP$ is the differenced logarithm of Population;

$\Delta LINF$ is the differenced logarithm of Inflation;

ΔLER is the differenced logarithm of Exchange Rate;

$\Delta LOPEN$ is the differenced logarithm of the Sum of Exports and Imports as a ratio of GDP which is a proxy for openness;

$\Delta LFINDC$ is the differenced logarithm of the ratio of domestic credit by the banking sector to GDP which is a proxy for Financial Development and $\left(LY - L\bar{Y} \right)_{-1}$ is the One-Period Lagged Error Correction Mechanism.

Δ is the difference operator.

The results of this formulation are given in Table 5.

Interpretation of the Error-Correction Regression Results

We start interpreting the results by considering the model's explanatory power. Generally high explanatory ability is a hallmark of a good model. The Adjusted R-squared of 0.822958 implies that the independent variables are explaining about 82 percent of the variation in the dependent variable. This means that the stochastic component only accounts for 18 percent. This may imply that the independent variables that were chosen for this model are vital in explaining the behaviour of the dependent variable.

Related to the R-Squared is the F-Statistic. The results indicate a relatively high F-Statistic which has an associated p-value of 0.000000. This shows that the variables are jointly significant in affectting or influencing the dependent variable. Such a high F-Statistic also indicates that generally the model is well specified. The well specification of the model may imply that the right mathematical form was used and that theoretically important variables have not been ommitted.

Of vital consideration are the diagnostic checks for model. The results show no presence of both first order and second –order autocorrelation (*Durbin-Watson Stat; BGSLM Test*); no presence of heterscedasticty (*WH F-*

Table 5. Error-correction regression results.

Variable	Coefficient	Std.Error	t-Statistic	Prob (P-value)
C	0.116383	0.047434	2.453586	0.0221*
$\Delta LPOP$	1.093128	0.391231	2.794077	0.0103*
$\Delta LINF$	-0.019739	0.005134	-3.844483	0.0008**
ΔLER	0.421755	0.120905	3.488319	0.0020**
$\Delta LOPEN$	-0.373695	0.064646	-5.780648	0.0000**
$\Delta LFINDC$	-0.078821	0.059543	-1.323767	0.1986
$\left(LY - L\hat{Y}\right)_{-1}$	-0.703260	0.210357	1.962609	0.0028**
$AR(1)$	0.477135	0.243112	1.962609	0.0619
$MA(1)$	0.949792	0.033295	28.52633	0.0000**

(**) denotes significance at 5% (1%). R-Squared: 0.868647; Adjusted R-Squared: 0.822958; Durbin-Watson Stat: 1.59450; F-Statistic:19.01252; Prob(F-Statistic), 0.000000; BGSLM Test Obs R-Squared, 0.637962;p-value, 0.726889; Hist-Norm Jarque-Bera, 0.493732; p-value, 0.781245; WH F-Stat, 0.247509; P-value, 0.989241;Ramsey RESET Log likelihood Ratio, 1.054871; p-value, 0.568974.

Stat), that the model is well-specified (*Ramsey RESET*) and that the residuals are normally distributed (*Hist-Norm*).

The main variable in this model is financial development since the aim of the paper is to examine the finance-growth nexus. As has already been mentioned to proxy financial development the study used the ratio of domestic credit by the banking sector to GDP. Many studies have used this formulation before, arguing that availability and access of loanable funds from the banking sector indicate that banks are able to play their intermediation role. This is undoubtedly a characteristic of a growing financial system. It is therefore expected that a viable financial system should lead to positive economic growth. The expected sign therefore is positive. However, the results in the present study show contrary results. The coefficient of financial development is negative and insignificant statistically. Insignificant results were also obtained by Halko and Trigoni (2010), Adusei (2012) and like in the present case Hsu et al. (2004) found negative coefficients for Taiwan and Korea. The negative sign and the statistical insignificance of the variable is not surprising considering that the granger causality result have indicated a uni-dierctional causality coming from growth to financial development.

Due to the requirements of regression analysis, it was impossible to estimate an equation with only one independent variable. This prompted the researcher to include acceptable control variables in the model. These included population, inflation, exchange rate, and openness of the economy. As can be observed from the regression results the coeffcient of population has the expected positive sign and it is significant at 5% level. This shows that the labour force is an important variable in the growth process in Malawi. It is important to note that the production system in Malawi is more labour intensive and therefore the growth of a labour force should indeed show a positve influence.

In terms of inflationary effects on growth the results exhibit an expected negative sign. The coefficent is also signifcant at 1% level. The present results are in concomitant with the findings of of Rousseau and Wachtel (2002) in the United States. The negative impact of inflation on growth can be due to direct and indirect effects through the financial sector. Direct effects include the higher transactions and information costs in an inflationary environment that inhibit economic growth. For example economic agents will find planning difficult when inflation makes nominal values uncertain. Firms and individuals will be reluctant to enter contracts when inflation is imperfectly predicted and judgements about absolute and relarive prices are uncertain. The reluctance to enter contracts over time will inhibit investment and entrepreneurship. Thus inflation will have a dircet effect on resource allocation and economic growth.

The indirect channel for the negative effects of inflation on growth is through its effects on financial sector development. High inflation will inhibit any long term financial contracting and financial intermediaries will tend to maintain very liquid portifolios. Thus in an inflationary environment intermediaries will be less eager to provide long-term financing for capital formation and growth.

The coefficient of nominal exchange rate is positive and significant at the 1% level. This points to the fact that a depreciated exhange rate is amenable to the growth

process, though care must be taken on the rate and extent of depreciation. This result highlihts efficient exchange rate management in Malawi. Theoretically a depreciated exchange rate should trigger domestic production and accelerate exports while reducing imports.

With globalisation, most countries have now fully openned up their economic boundaries. Contrary to other empirical studies such as that of Ndebbio (2004) which established a positive link with growth, trade openness has registered a negative sign in our study. The coefficeient is significant at the 1% level perharps to emphasise the fact that trade restrictions are still important for small economies like Malawi. When a country is too open production is hampered and the economy becomes *distributive* rather than *productive.*

The one-period lagged error term is negative and statistically significant at 1% level. Its coefficient which is approximately-0.70 implies that about 70% of the discrepancy between actual and equilibrium income is corrected each period. Thus there are economic forces in the economy which operate to restore the long-run equilibrium path of the income level following short-run disturbances.

SUMMARY, CONCLUSION AND POLICY RECOMENDATIONS

The study uses data from Malawi to examine the link between financial development and economic growth. The study set out to examine this link by carrrying out unit root tests of all variables. The results of these tests confirmed that the variables are integrated of order one - I(1). The study then carried out the Johansen VAR Co-integration Test and established two cointegrating vectors thereby confirming cointegration. This justfied the development of a an error correction model. In its examination of the causal link between financial develop-ment and economc growth the study established that the relationship is *demand following*. To achieve this the Pairwise Granger Causality Test was used.

The study also carried out several diagnostic checks to be in conformity of the requirements of least squares regression. The results showed that the residuals were not correlated, the residuals had variance homogeneity, the residuals were normally distributed, that the model was well specified.

The results showed that population inflation, exchange rate were significant in influencing income in Malawi. The Financial Development variable had a pervase sign and was insignifiant at conventional levels.

The results of this empirical work have vital policy implications. The variable representing financial development has a negative coefficient and it is statistically insignificant. This, along with the Granger Causality results which show causality running from growth to financial development, it is evident that the finance-growth relationship in Malawi is *demand following*. Therefore, for Malawi, "*where enterprise leads finance follows."* Thus policies consistent with economic growth should be encouraged. To this end, economic theory enlightens us that policies for growth are broadly diveded into two: demand-side policies and supply-side policies. For example, government can use fiscal policy in a demand-side framework, such as cutting taxes which will increase disposable income, encourage consumer spending and contribute to the growth of the economy, or use supply-side policies that attempt to increase productivity and efficiency of the economy. For instance, privatisation and deregulation may increase efficiency as private firms have a greater profit incentives to cut costs and boost productivity.

ACKNOWLEDGEMENT

The author is grateful for the useful comments from anonymous referees who commented on an earlier draft of this paper and whose insights have greatly shaped the final version.

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academicJournals

Vol. 6(2), pp. 38-46, February, 2014
DOI: 10.5897/JEIF2013.0556
ISSN 2141-6672 © 2014 Academic Journals
http://www.academicjournals.org/JEIF

Journal of Economics and International Finance

Full Length Research Paper

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

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Accepted 13 February, 2014

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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