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Empirical investigation of the nexus between stock prices and exchange rates in Ghana

Osei-Fosu Anthony Kofi[#] and Osei-Fosu Augustine Kwabena[+]

[#]Department of Economics, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana. Email: oseifosuanthonykofi@yahoo.com

[+]Maharishi University of Management, Iowa, United States.
Email: ofak@mum.edu.

Abstract

This paper examines empirically the nexus between stock prices and exchange rates in Ghana using time series models. The Ghana Stock Exchange (GSE) All-Share Index is taken as the composite index for stock prices. The results affirm that there is no causal relationship between the foreign exchange rate (EXR) and stock prices for Ghana.

1. Introduction

Many households and firms are made worse off by currency depreciation. Depreciation of the domestic currency affects the general price level which is believed to spill over to the stock market. Due to the relevant role that the stock market plays in any economy, and the macroeconomic impact of currency fluctuations and its anticipated effects on stock market performance, the relevance of the nexus between stock markets and the exchange rates has attracted the attention of many researchers and financial analysts in the advanced world. However, the subject has not received much attention and hence adequate treatment from researchers in the emerging markets and developing economies such as Ghana. This paper aims to fill part of this gap in the literature by examining the nexus between the exchange rate and stock market performance in Ghana using standard statistical and econometric procedures.

The relevance of the financial sector of any economy cannot be over emphasized. This is reflected in the inclusion of the financial sector in many growth and development models. One metric of financial development is stock market performance. Consequently, financial sector developments and reforms in many Sub-Saharan Africa (SSA) countries aimed at complementing their bank-based systems with market-based systems, particularly over the last two decades.

For instance, there was no organized stock exchange until November 1990, when the Ghana Stock Exchange (GSE) was established. The performance of GSE was very brilliant in the early years of its establishment, being the sixth-best performer among emerging stock markets, with capital appreciation of 116 percent in 1993, as well as best performer among emerging stock markets, with capital appreciation of 124 per cent in 1994(See IMF,2000). There was, however, a slump in performance in 1995 following inflation staggering around 123 percent accompanied by a steep depreciation of the Ghanaian Cedi. In this paper we pose two main questions: can the poor stock market performance be blamed on the steep rise in inflation and currency depreciation, and are there potential feedback effects from stock market to the general price level and the exchange rate?

These questions are vital to policy makers and market analysts as well as exchange rate chartists. This paper therefore addresses the concerns of these questions using Ghanaian data.

Given that the interest rate parity condition holds, the existence of long run equilibrium relationship (cointegration) between the stock market and the foreign exchange market is a theoretically plausible one (see for instance Krugman and Obstfeld, 1997)). The *a priori* expectation is that shocks to the stock market influence foreign exchange markets, and changes in the latter are transmitted to the former. Thus, in any complete model, both the exchange rate and the stock price are endogenously determined. It thus worth probing into how a change in the price of one financial asset will impact the prices of other assets. The relationships among asset prices will more likely depend upon what kind of disturbances lead to the price movement.

This may affect decisions about monetary and fiscal policy. Gavin (1989) declares that a booming stock market has a positive effect on aggregate demand. If that is adequate, expansionary monetary or contractionary fiscal policies that target the interest rate and the real exchange rate will be neutralized. At times policy-makers advocate less expansive currency in order to boost the export sector. Policy makers and market analysts as well as exchange rate chartists should be aware whether such a policy might depress the stock market.

Foreign currency is more often being included as an asset in investment funds' portfolios. Knowing the link between currency rates and other assets in a portfolio is important for the performance of the fund. The Mean-Variance approach to portfolio analysis suggests that the expected return is implied by the variance of the portfolio. Therefore, accurate estimate of the variability of a given portfolio is needed. This requires estimate of the correlation between stock prices and exchange rates. Is the magnitude of this correlation different when the stock prices are the trigger variable or when the exchange rates are the trigger variable?

Understanding of the stock price-exchange rate relationship may prove helpful to foresee financial crisis. Khalid and Kawai (2003) as well as Ito and Yuko (2004), claim that the link between the stock and currency markets helped propagate the Asian Financial Crisis in 1997. It is believed that the sharp depreciation of the Thai baht triggered depreciation of other currencies in the region, which led to the collapse of the stock markets as well. Knowledge about such a relationship between the two markets would trigger preventive actions and measures before the spread of a crisis in the foreseeable future.

The remainder of the paper is structured as follows: Section 2 of the paper reviews the relevant literature. Section 3 presents the methodology including data sources and variable descriptions, econometric procedures for identification and estimations. Section 4 is devoted to the presentation and the discussion of the empirical results. Section 5 concludes the paper with summary of key findings and policy implications thereof.

2. Literature review

There is no theoretical harmony on the relationship between stock prices and exchange rates or on the direction of the relationship and this claim can be justified by the two schools of thought: The Portfolio balance models of exchange rate determination argue that exchange rates should reflect relative demand for domestic against foreign assets (Branson, 1983; Frankel, 1983). In these models individuals hold domestic and foreign assets, including currencies, in their portfolio and hence exchange rates play the role of balancing the demand for, and supply of assets. Rise in domestic stock prices lead individuals to demand more domestic assets. Local investors would simply dispose foreign assets, which are relatively less attractive after the increase, to buy more domestic assets, thereby causing local currency appreciation. Rises in domestic stocks prices affect exchange rates through direct and indirect pathways. Investors are encouraged to buy more domestic assets while at the same time selling foreign assets to obtain domestic currency required for buying new domestic stocks with an increase in price. The characteristic move in the demand for, and supply of currencies cause domestic currency appreciation. The indirect pathway ballasts on the following causality chain. Rise in wealth resulting from increase in domestic asset price prompts investors to increase their demand for money, which in turn increases domestic interest rates. If domestic interest rate is high enough, foreign capital reacts to the interest rate differentials by increasing inflows. The inflow starts increase in foreign demand for domestic currency and its inevitable appreciation. Therefore, stock price innovations may affect, or be affected by, exchange rate dynamics.

Theoretical annotations of the association between exchange rate and stock prices are centralized on the exchange rate determination models, which are generally categorized into two. "Flow-oriented" models of exchange rates (Dornbusch and Fischer, 1980) focus on the current account of the balance of payment. These models suggest that exchange rate changes affect international competitiveness and trade balance, impacting real income and output. Thus domestic currency depreciation makes local firms more competitive internationally, leading to a rise in their exports. Foreign exchange inflows in turn increase stock prices. Therefore, flow oriented models epitomize a positive relationship between stock prices and exchanges rates with the direction of causation running from exchange rates to stock prices.

Early empirical studies such as Franck and Young (1972) concluded that there is no link between stock prices and exchange rates using six different measures of exchange rates. Aggarwal (1981) used simple regressions to analyze the relationship between the dynamics of the dollar exchange rates and stock prices using data from 1974 to 1978 and presented a stronger short run positive relationship than in the long run. Contrary to the outcome of Aggarwal (1981), Soenen and Hanniger (1988) found a strong negative relationship between the value of the U.S. dollar and the change in stock prices for the period 1980-1986. However, when they examined the above relationship for a different period, they found a statistical significant negative impact of revaluation on stock prices.

However, recent studies, employing more robust econometric techniques, concluded that the observed mixed outcomes from the earlier studies might be down to non-stationarity of the financial variables used. These recent studies used cointegration and Granger causality to ascertain the direction of association between the variables. One of the first studies of this line of investigation is Bahmani-Oskooee and Sohrabian (1992). They claimed bidirectional causality between the stock and exchange rate markets only in the short-run; and that there is no long-run relationship between the two variables using cointegration analysis. Studies such as Ajayi and Mougoue, 1996; Yu (1997), Granger, Huang and Yang (2000), Muhammad and Rasheed (2002), Doong et al (2005) and Husam (2012) confirm the bidirectional causality story. More recently, Husam (2012) examined the bilateral relationship between these variables in Turkey between 2001 and 2009, and resulted in long run relationship and bidirectional causality.

Stavarek (2005) investigated the nexus between exchange rate and stock prices in EU and the USA over the period 1970 and 2003. He found that the direction of causality is not uniform across countries except for the UK and the USA that advocated a unidirectional causality from stock prices to exchange rate.

Few authors have examined the relationship between these two variables in sub-Sahara. Osei (2006) investigated both the long run and the short run relationships between the Ghana stock market and macroeconomic variables. He establishes that there is cointegration between the macroeconomic variables and Ghana stock market.

In Nigeria, Oyinlola, Adeniyi, and Omisakin (2012) examined the long-run and short-run dynamics between stock prices and exchange rates the Johansen and Gregory-Hansen cointegration analyses. They show that there is no long run relationship between stock prices and exchange rate in Nigeria. Osamwonyi and Evbayiro-Osagie (2012) investigate the impact of six macroeconomic variables including exchange rate on stock prices between 1975 and 2005, they conclude that exchange rates are positively related to stock market in the short run but negative in the long run. Aliyu (2009) established a weak long run relationship with the Johansen cointegration approach and no cointegration with the Engle Granger method while bidirectional causality between the variables was found using pair wise Granger causality test.

Adaramola (2012) found unidirectional relationship running from stock prices to exchange rate. Okpara and Odionye (2012) used the VECM and pair wise Granger causality test and found long run relationship and unidirectional causality from stock prices to exchange rate.

The ascertained tendency in the contemporary studies tends to manifest array of methodological applications in analyzing the nature of the relationship between the two variables, which had been showed with mixed outcomes from the earlier studies. Importance is attached to studies that have considered different methods of investigating long run relationship between variables as well as the short run through the use of Granger causality test. From the studies reviewed the existence of a considerable interest on the nexus between the exchange rate and stock prices with the use of different methodologies and data sets is in vogue. While no unison has been reached on the robustness of the empirical evidences, it is appropriate to contribute to the debate so as to add a developing country's view point to the arguments. It is more admissible since the study couldn't fine literature on the subject about Ghana. Having a fair knowledge of the subject in the exact context of Ghana is pertinent: if stock prices and exchange rates are related and the causation runs from exchange rates to stock prices, then crises in the stock markets can be prevented by controlling the exchange rates. If on the other hand, the causation runs from stock prices to exchange rates, then authorities can tweak domestic economic policies to stabilize the stock market. Information of the interaction of the two markets can be utilized by investors to anticipate the behavior of one market using the information on the other market.

3. Methodology

The section consists of two parts. Part 1, discusses data sources, variable measurements and summary statistics for the full sample. Part 2 then presents econometric techniques and identification strategy. The econometric technique follows three steps. First, we examine the stationarity or otherwise of the individual series by applying standard unit root test to each of the time series. The second step involves testing for co-integration, given that the individual series are found to be nonstationary. The final step is to test for the existence of Granger causality between the variables.

3.1 Data and variable definition

The main variables of interest in this study are the Ghana Stock Exchange (GSE) All-Share Index and the exchange rate measured as cedi per United States dollars. The GSE All-share index is proxy for stock market performance while the exchange rate, denoted by EXR is the exchange rate (cedi-to-US$ rate). Since developments in the product market, the money market and the international crude oil markets spill over to both the stock market and the foreign exchange market, the study control for these shocks by augmenting the model with the general price level (price in the goods market) proxied by the rate of inflation (INFL), price in the money market; INTR, proxied by the interest equivalent of the 91-day treasury bill rate) and OILP to account for oil price shocks. The data on all these variables are monthly data spanning the period 1990:11-2009:08 obtained from the Ghana Stock Exchange, Bank of Ghana and International Financial Statistics of the IMF.

3.2 Empirical strategy

To undertake the empirical analysis of the causality between the stock market index and exchange rate after controlling for inflation, interest rates and crude oil prices, the model of interest takes the VAR specification in equations (1) and (2) :

$$GSE_t = \alpha_0 + \sum_{k=1}^{p} \alpha_k GSE_{t-k} + \sum_{k=1}^{p} \beta_k EXR_{t-k} + \sum_{k=1}^{p} \theta_k INFL_{t-k} + \sum_{k=1}^{p} \zeta_k INTR_{t-k} + \sum_{k=1}^{p} \vartheta_k OILP_{t-k} + \varepsilon_t \quad (1)$$

$$EXR_t = \varphi_0 + \sum_{k=1}^{p} \varphi_k GSE_{t-k} + \sum_{k=1}^{p} \phi_k EXR_{t-k} + \sum_{k=1}^{p} \delta_k INFL_{t-k} + \sum_{k=1}^{p} \psi_k INTR_{t-k} + \sum_{k=1}^{p} \xi_k OILP_{t-k} + u_t \quad (2)$$

where p is the optimal lag length; $\alpha_k's, \beta_k's, \varphi_k's, \theta's, \zeta's, \vartheta's, \delta's, \psi's, \xi's$ and $\phi_k's$ $k = 1, 2, ...p$ are parameters to be estimated; while ε_t and u_t usual disturbance terms with zero means and finite variances. The null hypothesis for equation (1) is that EXR does not Granger cause GSE. This reduces to testing the restricted hypothesis that:

$$H_0 : \beta_1 = \beta_2 = \cdots = \beta_p = 0 \quad (3)$$

Similarly, the null hypothesis from equation (2) is that GSE does not Granger cause EXR. The study tests this hypothesis by imposing the following restrictions on the parameters on lag changes in GSE in equation (3).

$$H_0 : \varphi_1 = \varphi_2 = \cdots = \varphi_p = 0 \quad (4)$$

Simultaneous rejection of both hypotheses in (3) and (4) implies bidirectional

Granger causal relationship between GSE and EXR. On the other hand, simultaneous acceptance of both hypotheses implies no causal relationship between these pair of variables. When the study rejects only one of the hypotheses, the implication is that there is unidirectional causal relationship running from either GSE to EXR or from EXR to GSE depending on which hypothesis is accepted (rejected).

The above VAR approach of testing causality works well with stationary variables. For I(1) variables this approach is only feasible with the first differences of the underlying variables. Since the underlying series may be non-stationary the study also test causality based on the vector error correction formulation. To apply the error correction approach to testing causality, however, requires pre-testing for the existence of cointegration (long run equilibrium) relationship among the variables. Given that the study have found that the underlying I(1) processes are cointegrated, the study re-specify models in equations (1) and (2) in an error correction form as in equations (5) and (6).

$$\Delta GSE_t = a_0 + \sum_{k=1}^{p} a_k \Delta GSE_{t-k} + \sum_{k=1}^{p} b_k \Delta EXR_{t-k} + \sum_{k=1}^{p} q_k \Delta INFL_{t-k} + \sum_{k=1}^{p} z_k \Delta INTR_{t-k} + \sum_{k=1}^{p} J_k \Delta OILP_{t-k} + l\, ECT_{t-1} + e_t \quad (5)$$

$$\Delta EXR_t = j_0 + \sum_{k=1}^{p} j_k \Delta GSE_{t-k} + \sum_{k=1}^{p} f_k \Delta EXR_{t-k} + \sum_{k=1}^{p} d_k \Delta INFL_{t-k} + \sum_{k=1}^{p} y_k \Delta INTR_{t-k} + \sum_{k=1}^{p} x_k \Delta OILP_{t-k} + h\, ECT_{t-1} + m_t \quad (6)$$

Where Δ is the difference operator and ECT_{t-1} is the error correction term derived from long-run cointegrating relationship between the I(1) process EXR_t and GSE_t These terms are estimated using the residuals from the cointegrating regression.

3.2.1 Unit root test

Standard econometric analysis of times series data begins with testing of the presence of unit roots in the underlying series, taken individually. The presence of unit roots in the data is an indication that the series are nonstationary, which implies that the variables are not mean reverting. This further implies that shock to the unit root process is permanent. On the contrary, absence of unit root implies that the series are stationary and shocks only have temporal effects. The study adopts the Augmented Dickey-Fuller (ADF) (1979) test and Phillips-Perron (1988) test. The time series properties of the variables are determined individually. The formal approaches used to ascertain the order of integration are the augmented Dickey-Fuller (ADF) (1979) test and the Phillips and Perron (PP) (1988) test. The ADF test and PP test are employed. All our variables were found to be I(1), justifying our next step, cointegration analysis.

The Johansen cointegration procedure is used to determine whether any long run relationship among the variables. In this procedure, trace and maximum eigenvalue statistics are computed, proposed by Johansen (1988) and Johansen and Juselius (1990). When performing trace and maximum eigenvalue test, the null hypothesis that, there are r or fewer cointegrating vectors are tested against at least $r+1$ cointegration vectors and $r+1$ cointegrating vectors, respectively. After establishing that the variables are cointegrated, the study estimates an error correction model by invoking Granger representation theorem which states that if two or more variables are cointegrated, then there exists an error correction representation that captures the short run dynamics. In case series are integrated different orders, for example I(0) and I(1) or are not cointegrated, it is not possible to investigate causality via error correction model. In this situation the one way to determine causality relationship between series is use of Toda-Yomamoto (TY) (1995) method. The integrated properties of series are not important in TY method, provided that the risk of misspecification of the order of integration of the series is minimized. Thus, the causality relationship between series which are of different order of integration can be investigated. In order to apply TY method, firstly, the VAR order, k, and the maximum order of integration of the variables, $d\max$, should be determined in the VAR model. The sum of k and $d\max$ is taken into consideration as the total order of VAR, that is (*k*+*d max*)*th* order of VAR is estimated. Then, in order to employ causality test, modified Wald test (MWALD), proposed by Toda and Yamamoto (1995), is applied to the first k VAR coefficients to investigate causality. This test has an asymptotic X^2 distribution when a VAR, (*k*+*d max*)*th* is estimated. A Monte Carlo experiment, presented in Zapata and Rambaldi (1997), provides evidence that the MWALD test has a comparable performance in size and power to the likelihood ratio and WALD tests if (i) the correct number of lags for estimating $k+d\max$ is identified and (ii) no important variables are omitted, provided a sample of 50 or more observations is available. According to that paper, the advantage of this procedure is that it does not require the knowledge of cointegration properties of the system.

4. Results and analysis

4.1 Long run relationship

The results support the implementation of the Johansen Cointegration technique discussed in the methodology, which shows long run equilibrium relationship between two or more non-stationary series; this confirms and conforms to the findings of Osei (2006). With the exception of inflation (INFL) and oil price (OILP), it is possible for there to be a linear relation among the other variables. Table 1 shows the results of the test statistics for cointegration in the models discussed in the methodology.

Table 1: Cointegration Test Result

Maximum rank	parms	LL	eigenvalue	Trace Statistics	5% Critical value
0	30	1627.9068	.	76.8798	68.52
1	39	1648.7325	0.16968	35.2285*	47.21
2	46	1655.6398	0.05981	21.4138	29.68
3	51	1660.2153	0.04003	12.2629	15.41
4	54	1663.5251	0.02912	5.6431	3.76
5	55	1666.3467	0.02488		

Note: * denotes the rejection of null hypothesis at 5% level of significance.

From the test results above, the null hypothesis that the cointegration rank is equal to zero is flatly rejected at the 5% level of statistical significance. However, the null hypothesis that the cointegration rank is at most one is not rejected. The study thus conclude that there is cointegration (long run equilibrium) relationship among the variables with maximum rank of 1 (r=1), at 5% level of significance based on the trace test statistics as well as the maximum Eigen value test. This means the variables in the sample show some long run equilibrium relationship among themselves. This implies that the integrated series never drift far apart from each other, which means the variables maintain equilibrium. The study therefore proceeds to develop an ECM to test for the short-run dynamics of each of the variables. The optimal lag length of the vector error correction model has been determined as one using "Akaike Information Criterion (AIC)."

4.2 Vector error correction model

The vector error correction model is used in this study to determine individual percentages each variable and the system as whole the extent to which they deviate from their equilibrium as well as percentage they take to restore to equilibrium when it is disequilibrium. Since the results of the Johansen Cointegration indicated the presence of a co-integrated relationship among the variables, the ECM specification stated in the methodology was estimated. The Engle-Granger representation theorem (Engel and Granger, 1987) stipulates that if two series are cointegrated then an ECM will represent them most efficiently, and furthermore, the dynamic specification will encompass any other dynamic specification including the partial adjustment model. Following Engel and Granger (1987), since the variables are cointegrated there is a long run relationship among them.

To capture the short run behavior of the variables, the error correction term (ECT) is included in the equation. All the coefficient falls within their confidence intervals;

a strong indication that the estimates are very precise. Using 5% level of significance, all the estimates are significant. There are only two exceptional situations that the estimates are not significant, thus the difference against the variable itself and this happened only in the case of the interested variables. From these results, we obtain two VECM equations, GSE against the other variables as well as EXR against the other variables:

$$\Delta \ln GSE_t = 0.01313 + 0.34035 \Delta \ln GSE_{t-1} - 0.00709 \Delta \ln EXR_{t-1} + 0.53065 \Delta \ln INTR_{t-1} + 0.21401 \Delta \ln INFL_{t-1} + 0.00430 \Delta \ln OILP_{t-1} - 0.00148 ECT_{t-1} \quad 5.1$$

$$\Delta \ln EXR_t = 0.00773 - 0.00593 \Delta \ln GSE_{t-1} + 0.55863 \Delta \ln EXR_{t-1} + 0.00533 \Delta \ln INTR_{t-1} + 0.00278 \Delta \ln INFL_{t-1} - 0.00073 \Delta \ln OILP_{t-1} + 0.00085 ECT_{t-1} \quad 5.2$$

Looking at the coefficients, in equation 5.1, we show that GSE adjust to any discrepancy between, GSE and the other macroeconomic variables in the previous period at a speed of 0.34035, whiles immediate effect of EXR on GSE independent of the equilibrium relationship between the two is 0.00709.The estimated coefficients can be interpreted as the short run elasticities. 0.00148 is the error correction term derived from long-run cointegrating relationship between the I(1) process EXR_t and GSE_t. In equation 5.2, EXR adjust to any discrepancy between EXR and the other macroeconomic variables in the previous period at a speed of 0.55863, which means EXR adjust to any discrepancy between EXR and the other macroeconomic variables in the previous period faster than the GSE. The immediate effect GSE may have on EXR independent of the equilibrium relationship between the two processes is 0.00593. Also, the immediate effect the GSE may have on EXR independent of the equilibrium relationship between the two processes is less than the other way round. And 0.00148 and 0.00085 are the pure shocks of both models, GSE and EXR respectively. The adjusted R^2 of 17 percent is indicative of the fact that 17 percent of the variations in the GSE are explained by inflation, exchange rate, interest rate and the oil price, while EXR adjusted R^2 is 59 percent is indicative of the fact that 59 percent of the variations in the EXR are explained by stock returns, inflation, interest rate and the oil price. The normality test indicates that the distribution of the error term is independently and homoskedastically normal with no specification error. It is shown that the VEC model is closely linked to the Johansen's cointegration test, and since all the variables are cointegrated the VEC model can be established. The error correction terms are significant and have the correct signs. The contemporaneous short-run effect of GES to the exchange rate is still inversely proportional to one another but highly insignificant. The short-run effects of oil price and on market exchange is negative but insignificant. This result is consistent with the theory since the ECM represents the speed of adjustment of the system to its long-run equilibrium following a shock.

In addition to the short run elasticities obtained from the vector error correction model, it is important to examine the long run counterpart of these elasticities that impose equilibrium relationship among the variables. The results of these long run elasticities are therefore presented in Table 2. Interestingly all the estimated elasticities are highly significant as could be seen from the very high *z-statistic* and very low *p*-values. The result also shows that the model is precise since all the coefficients fall within their confident interval. Another interesting thing about the long run results is that all the estimated coefficients have the expected sign.

Table 2: Normalized long-run coefficient of the cointgrated equation

Beta	Coef.	Std. Err.	Z	P>|Z|	[95% Conf. Interval]
Lnexr	-3.054898	.6017531	-5.08	0.000	-4.234313 -1.875484
Lnintr	13.48123	2.059647	6.55	0.000	9.444392 17.51806
Lninfl	-5.966129	1.508136	-3.96	0.000	-8.92202 -3.010237
Lnoilp	8.898413	1.68311	5.29	0.000	5.599577 12.19725
_cons	-65.97087	.	.	.	.

The equation is normalized on the log of the GSE All Share Index

According to our estimates, a one percentage point appreciation of the Ghana cedi causes the GSE index to decrease by about -3.1 percent. The results also indicate very high interest rate elasticity, specifically, a one percent increase in the interest rate causes the GES All-share index to increase by approximately 13.5%. This is consistent with mean-variance analysis since stocks are riskier than interest bearing assets. In equilibrium, stocks should command higher price than interest bearing assets such as bonds and bills. Inflation increases volatility and uncertainty hence have negative effect on stock prices in the long run. The results give credence to this view since the elasticity of the stock market index with respect to the rate of inflation is -5.97. Surprisingly, high oil prices have positive impact on stock prices. The estimated elasticity of the GSE All-Share Index with respect to oil price is 8.9. This means that a percentage change in crude oil prices induces the GSE All-Share Index to increase by about 8.9 percent in the long run. The reason why this could happen is that oil is a major input in the economy - it is used in critical activities such as fueling transportation, electricity generation, etc - and if input costs rise, so should the cost of end products, which could be transmitted to the stock market (Brealey, Myers & Marcus, 2009).

4.3 Granger causality test

Granger causality test is conducted to establish the direction of causality between Ghana stock market (GSE) and foreign exchange rate (EXR) as well as other macroeconomic variables. The results from both the Vector Error Correction Model

(VECM) and Vector Autoregression model (VAR) are presented in Table 3. From the test result of both models the study fails to reject the null hypothesis in each of the test and model, the simultaneous failure of rejection of both hypotheses implies no Granger causal relationship exist between these pair of variables ($GSE|EXR$). This means there is no Granger interdependence between the two variables, thus neither GSE leads to EXR nor do EXR leads to GSE.

Table 3: Granger Causality Test

GRANGER CAUSALITY: BASED ON THE VECM ESTIMATES			
Model	Null Hypothesis	CHI SQ. Statistics	Prob
GSE/EXR	EXR does not Granger cause GSE	0.213486	0.8988
	GSE does not Granger cause EXR	4.538747	0.1034
GRANGER CAUSALITY: BASED ON THE VAR ESTIMATION			
GSE/EXR	EXR does not Granger cause GSE	4.4853	0.106
	GSE does not Granger cause EXR	0.4694	0.791

It needs to be pointed out that although the Granger-Causality may exhibit some statistical relations, it is sometimes difficult to interpret the underlying fundamental economic relation based on those results. It is likely that the results may be generated from other structural relations, i.e., via interest rate parity condition or IS-LM-related policies. For example, some recessionary shocks or unfavorable information on the country will cause a stock price decrease and exchange rate depreciation. In this case the timing relation between the stock price and exchange rate will be generated from the relative efficiency of the stock market and foreign exchange market. Thus, if there is any effect on Ghana Stock Exchange as well as this study is concerned, then it is possible that macroeconomic variables significantly affect the long term growth of the Ghana Stock Exchange rather than foreign exchange rate. With this model, investors now know that there is no Granger causality between foreign exchange rate and stock market in Ghana. For that matter when there is a movement in one of these variables it might not cause panic among investors to make a move as far as Granger causality is concerned. It is important to highlight that there is the need to implement prudent macroeconomic policies in order for the country to derive maximum benefits from the stock market. In order to enable the capital market in general and stock market in particular to take full advantage of the various opportunities and cope with challenges, then interest rates and inflation, must be kept at reasonable levels. This must be done in relation to appropriate monetary policies to ensure macroeconomic stability.

5. Conclusion

This study examined linkages between the foreign exchange rate and stock market in Ghana, using data on exchange rates and stock prices from November 1990 to August 2009. The study found that all variables have unit roots. The tests indicated that there are long-run relationship between stock prices and exchange rates in Ghana. The empirical findings based on the Granger causality test showed that there is no granger causality between these two variables. Thus the traditional notion that the foreign exchange rate leads to stock market index, and vice versa is not confirmed for Ghana for the period under study.

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