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MONETARY POLICY AND THE STOCK PRICE - EXCHANGE RATE NEXUS: NEW INSIGHTS FROM INFLUENTIAL AFRICAN ECONOMIES

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ABSTRACT

The study examined the role of monetary policy in the stock price - exchange rate nexus in the three major financial markets in Africa between 2005 and 2017. Essentially, the study attempted to validate the trade balance approach (TBA) for the African stock markets and conducted analyses in the periods before and after the global financial crisis (GFC). The study focused on Nigeria, South Africa and Egypt and utilized data on nominal exchange rate, stock price, nominal interest rate and consumer price index sourced from the International Financial Statistics of the International Monetary Fund. The trend analysis revealed that stock price and exchange rate in South Africa moved in the same direction while the variables moved in different directions in Nigeria and Egypt. With the aid of the panel autoregressive distributed lag technique (PARDL), the study showed negative and significant relationship between exchange rate and stock price, validating the TBA for the full sample and the post GFC periods while the theory cannot be substantiated for the pre-GFC period.

Contribution/ Originality: This study contributes to the existing literature by examining the role of monetary policy in the stock price-exchange rate nexus in Africa's three largest economies. Using the Panel Autoregressive Distributed Lag Model, the study validates the TBA for the full sample in African stock markets.

1. INTRODUCTION

The stock market, which serves as a link to provide medium to long term funds for investment, is an important component of any growth-driven economy. Due to recent efforts (intellectual and policy actions) towards globalization and financial integration, the ensuing interdependence of global economies has made it possible for foreign investors and firms operating in a country to invest in other countries and become dividend entitled shareholders in those countries. These arguments serve as avenue for stock markets to be influenced by fundamentals in international economics. One of the relevance of such fundamentals is the exchange rate. The underlying argument is that exchange rates movements alter investors' behaviors as well as capital flows, currency cash flows, price stability and firms' profitability (see (Benita and Lauterbach, 2007; Mlambo *et al.*, 2013)).

In recent times, the connection between stock and foreign exchange markets has been further pronounced thanks to the impact of the Global Financial Crisis (hereafter, GFC). Often regarded as the most severe financial

crisis after the Great Depression of the 1930's, the GFC spread across many countries of the world, adversely affecting their financial markets, causing uncertainty in the foreign exchange market and several other spillover effects in its path (see (Neaime, 2012; Tsai, 2015; Ivanov *et al*., 2016)). The argument supporting the theoretical construct for tying the stock and foreign exchange markets with the GFC is such that the GFC increase the volatility of stock markets to the extent that the markets are integrated to the international financial system and these spurred investors into taking speculative investment decisions, which cause instability in foreign exchange markets.

Domestically, a careful look at the literature also specifies the linkage of stock price and foreign exchange, as macroeconomic variables, with the activities of the monetary institution in pursuance of its growth and stabilization goals; hence, monetary policy affects the performance of stock prices and exchange rates. However, the precise nature of these relationships is not readily clear. In the first case, monetary policy can be linked with stock prices through the impact of monetary policy rate via the real sector of the economy (Laopodis, 2013). Here, monetary policy affects stock prices through the liquidity channel; for instance when liquidity is low, firms' survival become difficult and demand for stocks are low or in situations when contractionary monetary (dear money) policy raises interest rates, this stiffens liquidity and the money supply in circulation (see (Mishkin, 2001; Rigobon and Sack, 2003; Bernanke and Kuttner, 2005; Ioannidis and Kontonikas, 2007; Sousa, 2010; Abouwafia and Chambers, 2015; Iddrisu *et al*., 2017)). This tightens net cash flows for economic agents (both individuals and firms) and discourages investment in stocks and tumbling stock prices. In the second case, monetary policy is linked with exchange rate via capital flow in and out of the economy. Given the case of contractionary monetary policy, this promotes the attractiveness of the domestic currency over the foreign currency (that is, exchange rate appreciation) since such favors increased capital inflow into the economy (see Abouwafia and Chambers (2015)).

Focusing on the stock price-exchange rate nexus, two theoretical approaches are relevant to highlight the relationship; namely the portfolio balance theory (hereafter, PBT) and the trade balance approach (hereafter, TBA). The former, PBT sees the direction of causation running from stock market performance to exchange rates where a performing stock market attracts foreign investors and capital inflows into the economy. In such situation, a higher demand for domestic stocks increases (real) stock prices and capital inflows from abroad and in essence, lead to domestic currency appreciation ((real) exchange rates depreciation) (see (Branson, 1983; Frankel, 1983; Kutty, 2010; Zivkov *et al*., 2016; Dahir *et al*., 2017; Wong, 2017)). On the other hand, the latter, TBA views the relationship running from (real) exchange rate to (real) stock prices where for instance, a fall in exchange rates increases the export competitiveness of local firms in terms of lower prices; induce increased sales of their products in foreign markets and therefore, raises the values of stock prices and profits of firms (see (Dornbusch and Fischer, 1980; Pan *et al*., 2007; Ulkü and Demirci, 2012)). Although we favor the TBA in this paper due to the reliance of the economies studied on capital inflow by nature, however, in both ways (portfolio balance theory and trade balance approach), we expect negative relationship between (real) stock prices and (real) exchange rate.

Empirical literature on the nexus between exchange rates and stock market performance is vast albeit shrouded in controversies as regards focus, methodology and findings (examples include (Abdalla and Murinde, 1997; Ajayi *et al*., 1998; Granger *et al*., 2000; Smyth and Nandha, 2003; Phylaktis and Ravazzolo, 2005; Moore, 2007a;2007b; Kodongo and Ojah, 2012; Lin, 2012; Tsai, 2012; Mlambo *et al*., 2013; Itumelang and Eita, 2014; Moore and Wang, 2014; Salisu and Oloko, 2015; Aguda, 2016; Sensoy and Benjamin, 2016; Muhtaseb and Ghazi, 2017)). Elaborate discussions of the relevant literatures are the focus of the succeeding section. However, one of the major limitations of most of the studies is that they are mostly country specific while they also produce controversial findings. In the midst of these controversies, the present paper comes in with a number of innovations.

First, we improve to consider the role of monetary policy (interest rate) in the stock price-exchange rate nexus. This allows us to empirically explore the theoretical connection between stock price and exchange rate specified in the TBA which has been argued to be coordinated via the role monetary policy. Previous studies in our research

focus that have considered monetary policy in the nexus (for example (Abouwafia and Chambers, 2015; Gong and Dai, 2017)) are significantly different from our paper in ways discussed hereafter. Second, we also depart from previous studies by conducting in-depth analyses of the stock price-exchange rate nexus from the trade balance approach (TBA). In essence, we attempt to validate/refute the TBA and in this research exercise as conceived here, our paper is the pioneer. Third, the present paper is also unique in that it is a distinctive study on Africa given the strong financial link of the constituent countries (i.e. financial integration) with the international financial system in their drive to attract foreign portfolio and direct investments. Our sample among others include large and influential economies in Africa; Nigeria, Egypt and South Africa. These countries are also the top FDI destinations in Africa and coupled with the flow of investments, human resources (skilled labor) and movements of people among them, hence, the motivation for our choice of countries.

We adopt panel data structure with large N and large T which necessitates the relevance of non-stationary heterogeneous panel data model, on which the Autoregressive Distributed Lag (ARDL) framework is built. For robustness, we explore a number of possibilities. We estimate the symmetric variants of panel ARDL in line with the panel representations of Pesaran *et al.* (2001) to validate/refute the TBA for the sample countries.With the adopted methodology, we are able to produce both long-run and short-run estimates for the role of monetary policy in the stock price-exchange rate nexus.Given our previous argument on the role of the GFC, we situate the analysis to the period just prior the financial crisis.Working with these attractions, we are able to make significant contributions to the literature to reveal new insights to the dynamics between stock price and exchange rate.

The rest of the paperis structured as follows. The next section takes a look at the relevant empirical literature on exchange rate and stock price relationship. In Section 3, we present the methodology, which comprises the predictive model and the underlying estimation procedure. In Section 4, we offer some preliminary analyses prior to estimation. Section 5 contains the robust estimations and discussions of results. Section 6 concludes the paper.

2. MOTIVATION FOR STUDYING THE ROLE OF MONETARY POLICY IN THE STOCK PRICE – EXCHANGE RATE NEXUS

Three major strands on the role of monetary policy on the stock price – exchange rate nexus is discernible from the literature. The first strand attempts to establish the direction of causation and therefore establish the necessary condition for either TBA or PBT. For instance, Ai-Yee *et al.* (2009) using Toda-Yamamoto causality approach and data from 1993 to 2003 establish unidirectional causal relationship from stock prices to exchange rates for Thailand and Malaysia. Also, Mbutor (2010) with the aid of vector autoregressive (VAR) technique find that stock prices granger causes Naira exchange rate without the reverse effect. Apere and Karimo (2015) also find evidence of unidirectional causality running from share prices to exchange rate. With GARCH-BEKK model, Caporale *et al.* (2013) show unidirectional spillovers from stock returns to exchange rate changes in the US and the UK; from exchange rate to stock returns in Canada, and bidirectional spillovers in the euro area and Switzerland.

However, using monthly data for Nigeria, Aliyu (2009) find strong evidence of long run bidirectional relationship between stock prices and exchange rate. The paper by Parsva and Lean (2011) show bidirectional causality between the stock returns and exchange rate in both short-run and long-run for Egypt, Iran, and Oman. Hamrita and Trifi (2011) also reports bidirectional relationship between exchange rate returns and stock index returns especially at longer time horizons. In a different twist, Mozumder *et al.* (2015) indicates unidirectional volatility spillover effect running from stock prices to exchange rates in the developed countries while the direction of the volatility spillover between stock prices to exchange rates is opposite in the emerging countries. For Australia, Canada, England, Germany, Japan, Singapore, South Korea, Switzerland and Turkey, Buberkoku (2013) establish that stock prices affect exchange rates in Canada, Switzerland and Turkey while causality runs from exchange rates to stock prices in Singapore and South Korea but no causal relationship is detected for Australia, England, Germany and Japan.

The second thread of the empirical literature establish sufficient conditions that comprise studies that either examine the impact of stock price on exchange rate following the PBT or those that follow the TBA to assess the nexus from exchange rate to stock price. The study of Kollias *et al.* (2016) find evidence in support of Portfolio Balance Model (negative relationship between exchange rate and stock price) for selected eight European economies. Findings from Zivkov *et al.* (2016) on four East European emerging markets (Serbia, Poland, Hungary and Czech Republic) also supports the portfolio-balance approach and concludes that foreign exchange market volatility reduces stock market returns. Conversely, Adjasi *et al.* (2011) documents evidence in support of TBA where exchange rate depreciation leads to reduction in stock market prices. In essence, majority of the papers support evidence in favor of PBT above the TBA.

In further motivation for the present study, the literature also turn-up another thread that accounts for the role of monetary policy (interest rate) in the nexus. In this light, Laopodis (2013) examines monetary policy and stock market dynamics across monetary regimes in the US and establish that monetary policy instruments affect the real economy through financial markets, principally through stock prices. Sousa (2010) finds this as an inverse relationship between contractionary monetary policy and stock market performance in Europe. Later for five countries (including three GCC countries), Abouwafia and Chambers (2015) show that monetary policy induces real exchange rate depreciation in these countries. Further, Gong and Dai (2017) reports that the China stock market experienced herding behavior due to upsurge in interest rate and exchange rate depreciation. In a related study, with a structural VAR model, Yang (2017) show for four Asia-Pacific (Hong Kong, Taiwan, South Korea, and Singapore) countries that monetary policy shocks steadily impacted stock price changes in the economies while the exchange rate shocks prompted precipitous variation in the stock countries' prices. The aforementioned studies evidently point out that there is no consensus yet on the precise relationship between monetary policy, stock prices and exchange rates, leaving it an area that requires further probe.

3. METHODOLOGY

3.1. The Model and Estimation Technique

Based on the theoretical expositions for including monetary policy (interest rate) in the exchange rate-stock price nexus earlier discussed, the empirical model to examine the impact of monetary policy and exchange rate on stock price is written as:

$$SP_{it} = \alpha_i + \beta EX_{it} + \phi MP_{it} + \varepsilon_{it}\ ;\beta < 0 \qquad (3.1)$$

Where SP denote stock price, α denotes country – specific intercept, EX is exchange rate, MP denotes monetary policy captured by interest rate while i denotes the country, t is the time period and ε_{it} is a time varying error term.

This study adopts the panel autoregressive distributive lag model (PARDL) approach. This is against the choice of static panel models such as fixed effect, random effect, pooled OLS and GMM which are rendered inappropriate and inefficiency in the presence of unit-root problem when estimating large panels (see Ahmed *et al.* (2016)). However, the panel dynamic ARDL approach has a number of interesting features. First, the ARDL framework consider the heterogeneity of the dynamic panel setting, the short run dynamic and the long run equilibrium of the model (see (Demetriades and Law, 2006; Samargandi *et al.*, 2015)). Second, this method of estimating ARDL models are consistent in the face of I (0) and or I (1) variables; and also, it yields consistent estimates in the presence of endogeneity; and three, the short run and long run effects can be estimated simultaneously (see Pesaran *et al.* (1999)).

Panel ARDL framework encompass three techniques namely: the mean group (MG), the pooled mean group (PMG), and the dynamic fixed effect (DFE). The mean group (MG) estimator which is the first method of estimating panel ARDL was introduced by Pesaran and Smith (1995). It estimates the long-run parameters by taking an average of the long-run coefficients of each cross-section. The MG assumes heterogeneity in all coefficients (both short-run and long-run and the intercepts) across units. The dynamic fixed effect (DFE) estimator evolves from the fixed effects estimator, with the lagged term of the dependent variable incorporated as one of the independent variables. The DFE estimator assumes homogeneity in all coefficients (both short-run and long-run) across units except the intercepts. The pooled mean group (PMG) estimator proposed by Pesaran *et al.* (1999) is an intermediate estimator between DFE and MG. The PMG allows only the long-run slope coefficients to be homogeneous. The difference among these three estimators can be tested by using the Hausman test.

We specify the general autoregressive distributed lag (ARDL) (p, q) as follows:

$$SP_{i,t} = \mu_i + \sum_{j=1}^{p} \gamma_{ij} SP_{i,t-j} + \sum_{j=0}^{p} \theta_{ij}^{'} X_{i,t-j} + \varepsilon_{it} \; ; \; X_{i,t} = \left(EX_{i,t}, MP_{i,t} \right), \tag{3.2}$$

Where, i =1, 2, ..., N indicates the cross sectional unit, and t = 1, 2, 3,...T indicates time dimension (monthly). In addition, j represents the number of time lags. In Equation 3.2, $SP_{i,t}$ represents stock price for i countries and t period, *SP* as dependent variable; the vector $X_{i,t}$ includes the key explanatory variables; exchange rate (EX), MP measure monetary policy, μ_i denotes country fixed effects. Equation 3.2 can be re-parameterized into:

$$\Delta SP_{i,t} = \mu_i + \phi_i y_{i,t-j} + \vartheta_i^{'} X_{i,t} + \sum_{j=1}^{p} \gamma_{ij} SP_{i,t-j} + \sum_{j=0}^{p} \theta_{ij}^{'} X_{i,t-j} + \varepsilon_{it} \tag{3.3}$$

$$\phi_i = -1 \left(1 - \sum_{j=1}^{p} \gamma_{ij} \right) \tag{3.4}$$

$$\vartheta_i = \frac{\sum_{j=0}^{q} \theta_{ij}}{\left(1 - \sum_{j=1}^{p} \gamma_{ij} \right)}, \quad \gamma_{ij}^{*} = - \sum_{m=j+1}^{p} \gamma_{ij} \text{ and } \theta_{ij}^{*} = - \sum_{m=j+1}^{q} \theta_{ij} \tag{3.5}$$

Error correction model of Equation 3.3 in level forms can be specified as:

$$\Delta SP_{i,t} = \mu_i + \phi_i (y_{i,t-j} - \vartheta_i^{'} X_{i,t}) + \sum_{j=1}^{p} \gamma_{ij} SP_{i,t-j} + \sum_{j=0}^{p} \theta_{ij}^{'} X_{i,t-j} + \varepsilon_{it} ; \phi_i < 0 \tag{3.6}$$

Where $\phi_i (y_{i,t-j} - \vartheta_i^{'} X_{i,t})$ is the adjustment in stock price to the deviation from its long-run relationship with the explanatory variables. Furthermore, γ_{ij}^{*} and θ_{ij}^{*} are short-run coefficients connecting with its lag values and with determinants X_{it} vectors. Lastly, the error-correction coefficient ϕ_i estimates the speed of adjustment of

$GR_{i,t}$ toward its long-run equilibrium ensuing a change in X_{it}. The condition $\phi_i < 0$ ensures that a long-run relation exists. Therefore, a significant and negative value of ϕ_i is regarded as evidence of cointegration between $SP_{i,t}$ and X_{it}.

3.2. Data and Preliminary Analysis

Our data set consists of monthly time series of nominal exchange rate, stock price, interest rate and the consumer price index (CPI) of three large and influential African countries: Nigeria, South Africa, and Egypt. Data on nominal exchange rate, stock price, nominal interest rate and consumer price index are sourced from the International Financial Statistics of the International Monetary Fund.

4. PRELIMINARY ANALYSIS

For the preliminary analyses, we first present the descriptive statistics see Tables 1 and thereafter we attempt to plot the trends in exchange rate, stock price indexes and monetary policy (interest rate) for the three countries over the period under consideration. We conclude this section by performing Panel unit root tests given the time series dimension of our data. The results are presented in Table 2. Let us begin with the descriptive statistics.

As expected by standard practice in the study of time series, both the individual and group time series statistical properties of the dataset is considered. For the group descriptive statistics, the mean statistics shows that average exchange rate and monetary policy in the period of study is significantly lower than the average value of stock prices in the countries. Also, monetary policy is found to be the least volatile, followed by exchange rate while stock price is found to be the most volatile among the variables. We can infer from this that stock prices in the three countries is more susceptible to shocks (domestic and external), as it experienced more fluctuations over the period of study.

Individually, average stock price is significantly higher than average exchange rate and average monetary policy in each of the three (3) countries. Similarly, stock price is found to be more volatile than exchange rate and monetary policy in each of the observed countries. As a way of comparison, average stock price in Egypt is found to be significantly higher than that of Nigeria and South Africa but it is significantly less volatile than stock prices in Nigeria and South Africa respectively. This could be an indication that the Egyptian stock market is relatively more stable and developed than the stock markets of Nigeria and South Africa. Also, Nigeria has the highest average exchange rate and monetary policy values coupled with the highest volatilities among the observed countries. This implies that the Nigerian currency experiences more fluctuations and is also the least stable compared to Egypt and South Africa respectively.

As a way of further examining the dataset used in this paper, we employ the use of graphs because it allows us to visually examine the co-movement between stock prices and exchange rate in each of the three (3) countries. In Nigeria and Egypt, there is no evidence of co-movement between exchange rate and stock prices from the graph as both variables moved in different directions, although stock prices are found to be more volatile than exchange rates in both countries, as it fluctuated more during the period of study. However, there is a clear evidence of co-movement between stock prices and exchange rates in South Africa. This implies that there is a very strong positive movement between stock price and exchange rate in South Africa, unlike Nigeria and Egypt where both variables moved in different directions in the observed graphs.

Also, it is expected in standard practice to carry out panel unit root tests for macro panels with Large T in order to know the order of integration of the variables, as a way of avoiding spurious results. In doing this, we consider three (3) types of panel unit root tests. The first involves testing unit roots with the null hypothesis of

common unit roots (see (Breitung, 2000; Levin *et al.*, 2002)). Here, two of the variables, namely; exchange rate and interest rate are stationary at their first difference (I1) at one percent (1%) significance level except for stock price that is significant at both its level form and at first difference (I(0) and I(1)), for the HT test. The second test involves testing unit roots with the null hypothesis of individual unit root process (see (Maddala and Wu, 1999; Im *et al.*, 2003)) and we found all the variables to be stationary at their first difference at 1% significant level, although stock price is found to also be stationary at level, at 5% significance level. Lastly, the third test which involves testing unit root with the null hypothesis of no unit root with common unit root process (Hadri, 2000) Lagrange Multiplier test) found all the variables to be stationary at level. The difference between the first and second test compared to the third test is that the former assumes the null hypothesis of non-stationary while the latter assumes stationary in its null hypothesis. The implication of this is that the findings of these tests strengthen the effectiveness and correctness of the panel-ARDL method employed in this study.

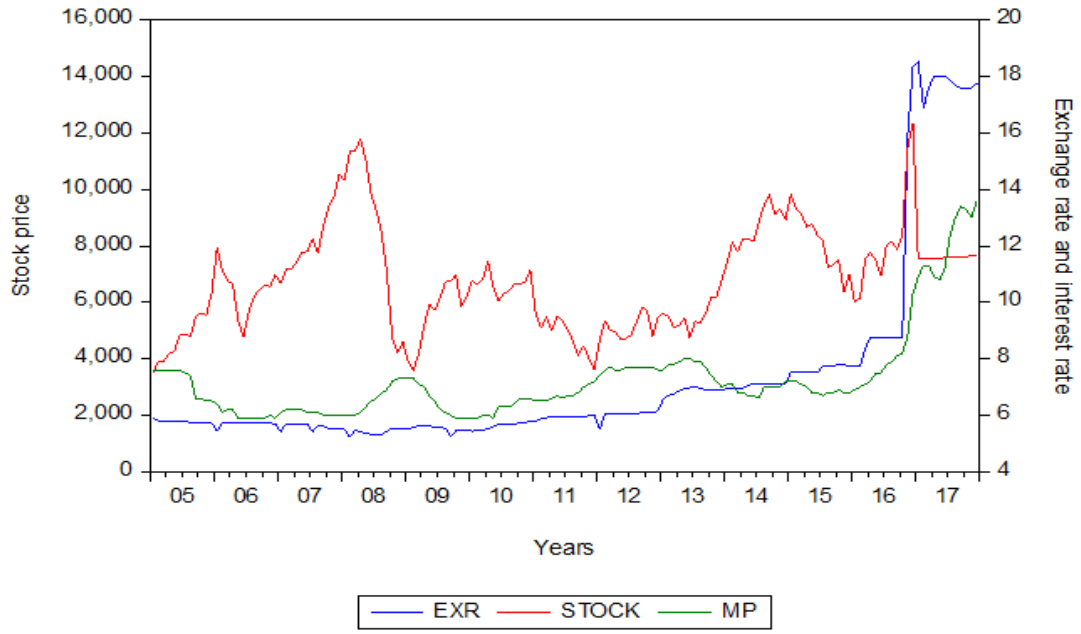

Figure-1. Trend of Stock price, exchange rate and interest rate in Egypt.
Source: Data on stock price, exchange rate and monetary policy are from International Financial Statistics.

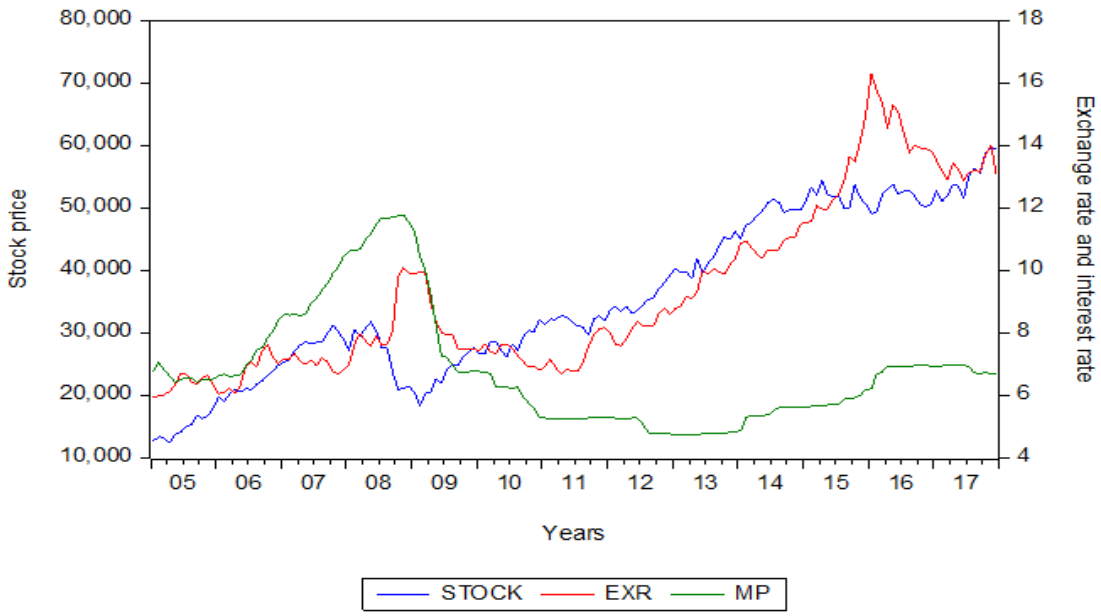

Figure-2. Trend of Stock price, exchange rate and interest rate in South Africa.
Source: Data on stock price, exchange rate and monetary policy are from International Financial Statistics.

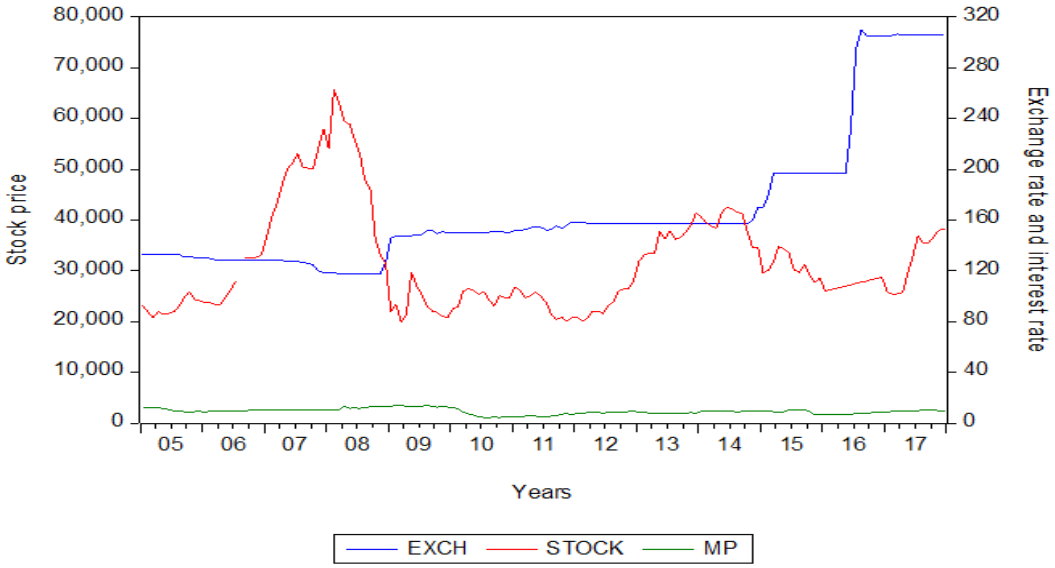

Figure -3. Trend of Stock price, exchange rate and interest rate in Nigeria.

Source: Data on stock price, exchange rate and monetary policy are from International Financial Statistics.

Table-1. Descriptive Statistics.

Panel Desriptive Statistics					
Variable	**Obs**	**Mean**	**SD**	**Min**	**Max**
Exch	468	56.58	69.64	5.23	197.07
Stk	468	24505.84	15858.5	3507.99	65652.38
MP	468	7.77	2.1849	4.13	14.31
Nigeria					
Exch	156	153.16	22.63	117.72	197.07
Stk	156	6798.65	10151.5	19851.89	65652.38
MP	156	9.22	2.265	4.13	14.31
Egypt					
Exch	156	7.29	3.391	5.23	18.522
Stk	156	6798.65	1844.41	3507.99	12344.89
MP	156	7.26	1.58	5.9	13.6
South Africa					
Exch	156	9.29	2.72	5.95	16.32
Stk	156	35442.26	12910.03	12555.96	59772.82
MP	156	6.83	1.861	4.74	11.8

Note: Exch, stk and MP representsnominal exchange rate, stock price indexes and monetary policy (interest rate) respectively.

Table-2. Panel Unit Root Tests.

Test Method	**Exch.**		**Stock Price**		**Interest Rate**	
	Level	**First Diff**	**Level**	**First Diff**	**Level**	**First Diff**
Null hypothesis: Unit root with Common process						
LLC	1.0082	-12.5195***	-2.0601**	-16.2128***	2.2752	-6.5613***
Breitung	1.6779	-12.6142***	1.3355	-12.0702***	-0.006	-7.7898***
HT	1.9323	-67.1002***	-69.2983***	-1.30E+02***	6.257	-73.5038***
Null hypothesis: Unit root with Common process						
IPS	3.0384	-12.7361***	-6.2322**	-16.4257***	3.0719	-11.6845***
ADF Fisher	0.8376	62.222***	20.6332**	98.2926***	6.0306	31.7552***
Null hypothesis: No unit root with common unit root process						
Hadri	124.39***	2.079**	15.1043***	-1.892	48.7702***	1.3759*
No. of cross-section	3	3	3	3	3	3
No. of periods	156	156	156	156	156	156
Total Observation	468	468	468	468	468	468

Note 1: Exch, Stock Price and Interest rate represent exchange rate, stock price and monetary policy (proxied by interest rate).

Note 2: ***, **, * indicate statistical significance at 1%, 5% and 10% respectively. All the variables here are expressed in natural logs.

Table-3. Panel ARDL Result on Stock-Exchange rate nexus.

	Full sample			Pre-GFC			Post-GFC		
Variables	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**
ECT	-0.0499**	-0.0523**	-0.0413***	-0.0572***	0.0200	-0.0514**	-0.0630**	-0.0637**	-0.0662***
	(0.0248)	(0.0228)	(0.0121)	(0.0125)	(0.0383)	(0.0202)	(0.0307)	(0.0300)	(0.0198)
Δlexch	-0.259	-0.259	0.0727	-1.556***	-1.852**	-0.787***	-0.161	-0.159	0.271***
	(0.376)	(0.377)	(0.0925)	(0.579)	(0.726)	(0.251)	(0.388)	(0.388)	(0.0996)
Lexch	-0.00606	0.119	0.165	0.214	-16.84*	1.364	0.0769	0.292	0.234
	(0.254)	(0.203)	(0.348)	(1.357)	(9.887)	(2.104)	(0.232)	(0.219)	(0.258)
Constant	0.471**	0.496***	0.390***	0.524***	-2.811	0.313	0.578**	0.520**	0.607***
	(0.205)	(0.189)	(0.108)	(0.107)	(1.841)	(0.359)	(0.254)	(0.258)	(0.169)
Observations	461	461	461	136	136	136	322	322	322
Hausman	PMG vs MG	MG vs DFE		MG vs PMG		PMG vs DFE	PMG vs MG		PMG vs DFE
Chi2 (1)	0.67	0.00		0.01		0.00	8.21		0.00
Prob.	0.4133	0.9657		0.1082		0.9710	0.0042		0.9723

Note 1: Exch represent exchange rate. **Note 2:** Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table-4. Panel ARDL result on Stock-Exchange nexus: the role of monetary policy.

	FULL SAMPLE			PRE-GFC			POST-GFC		
Variables	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**
ECT	-0.135*	-0.148**	-0.169***	-0.0935	-0.332***	-0.0784	-0.264	-0.300*	-0.233***
	(0.0736)	(0.0681)	(0.0233)	(0.0621)	(0.0585)	(0.0516)	(0.171)	(0.157)	(0.0286)
Δlexch	-3.549**	-3.563**	-4.549***	-3.309	1.647	-0.566	-3.586**	-3.669**	-5.058***
	(1.480)	(1.454)	(0.537)	(2.820)	(1.137)	(1.236)	(1.786)	(1.680)	(0.397)
Δlrate	0.275	0.112	0.237	0.571	0.0860	9.441	-0.809	-1.017	0.192
	(0.167)	(0.155)	(0.422)	(0.803)	(1.102)	(10.21)	(0.764)	(0.751)	(0.306)
Lexch	1.433***	0.585	1.481***	2.382	-18.32	-0.253	1.445***	1.874***	1.383***
	(0.498)	(0.414)	(0.480)	(4.415)	(14.75)	(4.295)	(0.224)	(0.432)	(0.317)
Lrate	-1.250*	-0.634	-0.251	5.376*	1.739	-0.0198	-2.120***	-1.538	-0.922***
	(0.644)	(0.929)	(0.525)	(2.902)	(2.107)	(0.337)	(0.387)	(1.004)	(0.354)
Constant	0.631	0.668***	0.227	-1.050	33.52	-1.638	1.769	1.250	0.688***
	(0.468)	(0.159)	(0.289)	(0.709)	(30.28)	(2.051)	(1.336)	(1.608)	(0.247)
Observations	461	461	461	136	136	136	322	322	322
Hausman Test	PMG vs MG	MG vs DFE	PMG vs DFE	MG vs PMG	MG vs DFE	PMG vs DFE	MG vs PMG	MG vs DFE	PMG vs DFE
Chi	5.25	0.58	0.21	1.20	0.01	0.01	3.17	0.02	0.17
Prob	0.0724	0.7487	0.9015	0.5487	0.9945	0.9967	0.2055	0.9888	0.9180

Note 1: Exch and rate represents exchange rate and monetary policy (proxied by interest rate). **Note 2:** Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

5. DISCUSSION OF RESULTS

The empirical estimates are discussed under three main headings. First, we evaluate the stock price-exchange rate nexus from the trade balance approach (TBA). In essence, we attempt to validate/refute the TBA approach by partitioning the estimation period into pre and post global financial crisis in order to evaluate the significance or otherwise of the crisis in the stock price-exchange rate nexus (in line with Neaime (2012); Tsai (2015); Ivanov *et al.* (2016)). Second, we assess the role of monetary policy (interest rate) in the stock price-exchange rate nexus. This allows us to empirically explore the theoretical connection between stock price and exchange rate specified in the TBA which has been argued to be coordinated via the role monetary policy.

We estimated the panel ARDL models and obtained the MG, PMG and DFE estimates compared using the Hausman test. In the comparison between the MG and PMG, the MG is the unrestricted model while the PMG is the restricted model. Also, the DFE is more restricted than the PMG. The rejection of the null for the Hausman tests indicates the choice of the less restricted model; otherwise, we choose the more restricted model. In all, the MG and PMG are favored above the DFE. In Table 3, we choose the PMG for full sample and pre GFC and MG for the post GFC. We have evidence of negative short run impact of exchange rate on the stock price in the pre GFC but no significant effect can be found for the long run nor for the post GFC period. We therefore have little evidence to support the argument that exchange rates movements could alter investors' behaviors and affect stock price (see (Stern and Chew, 2003; Benita and Lauterbach, 2007; Mlambo *et al.*, 2013)).

When we account for the role of monetary policy see Table 4, we prefer the MG for the full sample and PMG for pre and post GFC. With the inclusion of interest rate series as a proxy for monetary policy (as in Abouwafia and Chambers (2015); Gong and Dai (2017); Iddrisu *et al.* (2017)) we validate the trade balance approach in the short run for the full sample and the post GFC given evidence of negative short run impacts of exchange rate on the stock price in the full sample and post GFC periods. The coefficients for the pre GFC are however insignificant. The validation of the TBA for the periods lends empirical support to the trade balance theory expose in Dornbusch and Fischer (1980); Pan *et al.* (2007); Ulkü and Demirci (2012); (Mitra, 2017).

6. CONCLUSION

In this study, we analyzed the role of monetary policy in the stock price-exchange rate nexus in the three largest economies in Africa namely, Nigeria, South Africa and Egypt. We paid attention particularly to the extent to which the relationship between the variables is affected by the global financial crisis of 2007, by carrying out our analysis for both the pre-GFC and the post-GFC periods, using monthly time series data between January 2005 and December 2017. The preliminary analysis carried out showed that the average of stock price is higher than average monetary policy and exchange rate in these countries for the group statistics while stock price is the most volatile among the countries. Individually, Egypt has the most stable stock markets while exchange rate and monetary policy displayed the highest volatilities among the three countries.

The trend analysis revealed that stock price and exchange rate in South Africa moved in the same direction while the variables moved in different directions in Nigeria and Egypt. Furthermore, the result of the panel ARDL showed that there is a negative and significant relationship between exchange rate and stock price in the short run in the pre-GFC period, but an insignificant relationship in the long run and the post-GFC period. Finally, our result established the validation of the TBA for the three countries for the full sample and the post GFC periods.

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