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DYNAMICS OF EXCHANGE RATE AND STOCK PRICE INDEX IN EMERGING MARKETS: AN EMPIRICAL EVIDENCE FROM NIGERIA AND SOUTH AFRICA

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ABSTRACT

This paper investigates the dynamics of Exchange Rate and Stock Price Index in Nigeria and South Africa. To conduct this study, daily exchange rates of US dollar (USD), Euro (EUR), Japanese Yen (JPY), and Great British Pound Sterling (GBP) against the Nigerian Naira and South African Rand, and daily values of Nigerian Stock Exchange-All Share Index (NSE-ASI) and Johannesburg Stock Exchange-All Share Index (JSE-ASI) were considered for the period of January 2010 to September 2017. Johansen co-integration tests and Granger causality tests were employed to analyze the correlation between the two financial variables. The findings show no evidence of a co-integrating relationship between domestic stock prices and exchange rates for all the four currencies. Thus, test for a short-run in-sample causal relationship between domestic stock prices and exchange rates was conducted. The empirical results indicate that no causality exists between domestic stock prices and exchange rates of US dollar and Japanese Yen against Naira; while causality ensues from domestic stock prices to exchange rate of Euro and British Pound Sterling against Naira. Furthermore, unidirectional causality exists between domestic stock prices and exchange rates for Japanese Yen and British Pound Sterling against Rand; yet, there is an evidence of bidirectional causality between domestic stock prices and exchange rates for US dollar and Euro against Rand. This suggests that the diffusion progression between stock market and foreign exchange market is depicted by the "Stock" oriented

channel in Nigeria, while in South Africa, "Flow and Stock" oriented channels subsisted.

Keywords: *Exchange rates; Domestic stock prices; Co-integration; Causality; Nigeria; South Africa.*

INTRODUCTION

The correlation between exchange rates and stock prices cannot be overemphasized, as the literature that studies these two financial variables is far from conclusive, both theoretically, and empirically. The link between the foreign exchange market and the stock market has become more closely related in recent times. As capital market development thrives, the flexible/managed float exchange rate policies are increasingly adopted, and foreign capital controls are relaxed. Thus, further understanding of the linkage between these financial markets is of supreme importance for both domestic and foreign investors to make financial decisions, and policy-makers to formulate appropriate economic/financial policies. The role that exchange rate plays in stock prices is fundamental, especially on internationally held financial assets, where the value of currency affects domestic interest rate as well as foreign interest rate, with resultant effect on the present value of a firm's assets - particularly in an open economy (Nieh & Lee, 2001).

The two main sets of theoretical models, the "Flow and Stock" oriented models, have been espoused to study the nexus between stock prices and exchange rates. "*Flow" oriented model* (Dornbusch & Fischer, 1980), postulates that the major determinant of the exchange rate is trade flows; and that the trade balance affects the changes in exchange rate, which eventually affect real income and output. Taking present value theory into consideration, the present value of future cash-flows of firms is equal to the stock price, and that the stock prices ought to essentially mirror the economic potentials. That is, the value of a firm's equity is ultimately affected by the variations of exchange rates. Therefore, local firms should be more competitive as domestic currency depreciates; thereby making exports to increase, and in due course, the stock prices appreciate. Thus, the "flow" Branson, 1981; Branson, 1981; oriented model suggests that a positive relationship exists between stock prices and exchange rates, as current account and trade balance performance are considered to be the two main factors that determine exchange rates. In contrast, "*Stock" oriented model* (Frankel, 1992; Branson, 1981), is based on the conjecture that demand and supply of financial assets (capital account), such as equities and bonds are the main determinants of exchange rates. This model ("Stock" oriented model) can be classified into two sub-models:

the *portfolio balance model* and the *monetary model*. The portfolio balance model suggests that, a negative relationship exists the between exchange rates and stock prices, and that stock prices influence exchange rates. For instance, increase in stock prices moves up domestic currency interest rate with the resultant effect of depreciation in the exchange rate (Branson & Henderson, 1985). The model specifies that, the domestic assets, as well as foreign assets, including currencies, are held in individuals' portfolio, and that, the role of balancing the demand and supply of assets is played by exchange rates. Moreover, individuals demand more domestic assets as domestic stock prices increase. Thus, domestic investors would be led to selling foreign assets to buy more domestic assets and cause domestic currency appreciation. Hence, the portfolio balance model suggests a negative correlation between stock prices and exchange rates, as the drive from stock markets to foreign exchange market pushes stock prices and exchange rates to move in opposite directions. However, the monetary model by Gavin (1989), attempt to resolve the matter by asserting that there is no link between stock prices and exchange rates, except that certain common factors influence these two financial variables.

In the previous literature, theoretically and empirically, there is no evidence of consensus on the relations and causation between foreign exchange markets and stock markets. Though, several studies have found that these two financial variables have "predictive ability" for each other, but, the direction of causality appears to be determined by certain features of the countries studied; as these financial variables may have either long-run and short-run relationship or only short-run relationship. More so, they may have a bi-directional relationship, uni-directional relationship and sometimes no directional relationship. For example, there found to exists only short-run relation between stock prices and exchange rates along with bi-directional, uni-directional and no directional relationship between these two financial variables (Salisu & Oloko, 2015; Buberkoku, 2013; Wickremasinghe, 2012; Alagidede, Panagiotidis & Zhang 2011; Zhao, 2010; Rahman & Uddin, 2009). Similarly, long-run and short-run correlations were found to exist between stock prices and exchange rates. (Fowowe, 2015; Tsagkanos & Siriopoulos, 2013; Harjito & McGowan, 2011). Overall, the existing empirical literature lacked consensus on which of the markets leads the other. Whether the foreign exchange market leads to the stock market or stock market leads foreign exchange market is inconclusive. Though, from the review of more recent studies, it is evident that, in the short-run, stock prices and exchange rates are correlated, but

in the long-run, there is an evidence of weak or no relationship between these two financial variables. The link between these financial markets has become more convoluted and more essential for both domestic and foreign investors, hence, investigating the linkage between these two cannot be overemphasized. Therefore, further investigation and empirical research is conducted to find out if deductions, on which market leads the other, can be derived from Nigerian and South African financial markets. That is, which channel(s) is/are prevalent; either "flow," "stock" or "flow and stock" channel as the case may be.

This study is of importance as no existing or recent publications have considered simultaneously the effect of these multiple currencies (USD, EURO, JPY and GBP) against the domestic exchange rates on the domestic stock markets to explore the dynamic correlation between domestic stock prices and exchange rates in Africa, especially Nigeria and South Africa. This study contributes to the literature by complementing the existing experiential evidence on the topic, as an extended dataset is used, as well as updated and new empirical evidence on Nigeria and South Africa financial markets is presented, that can assist both domestic and foreign investors for decision making and policy-makers in formulating appropriate economic/financial policies.

LITERATURE REVIEW

Aggarwal (2003), employed monthly data for the period 1974 to 1978 to explore the correlation between stock prices and exchange rates. With the use of an aggregate index of stock prices and the exchange rate of USD, he revealed that there exists, a positive relationship between stock prices and exchange rates, as USD depreciation leads to stock price to decline. Soenen and Hennigar (1988), examined the reaction of stock prices of seven industrial sectors in the USA on the belief that they were heavily influenced by international trade. The findings reveal that there exists, a negative relationship between stock prices and exchange rates, as USD depreciates, it leads to more exports and more exports leads to more profits. Bahmani-Oskooee and Sohrabian (1992), employed monthly data for the period 1973 to 1988 on the index of S&P 500 and exchange rate of USD. The results show no evidence of a long-run relation between stock prices and exchange rates, but in the short-run, there is evidence of causality between the two financial variables. Granger, Huangb, and Yang (2000), employed daily data for the period 1986 to 1997 to explore the linkage between stock prices and exchange rates. With the application of Gregory-Hansen co-integration and

Granger causality tests, they examined the correlation between these two variables using data from Taiwan, Thailand, Singapore, Philippines, Malaysia, Korea, Japan, Indonesia, and Hong-Kong as sample countries. The findings show that, in Japan and Thailand, exchange rates affect stock prices. In Taiwan, stock prices affect exchange rates. For Indonesia, Korea, Malaysia and Philippines, a bi-directional relationship exists between stock prices and exchange rates. However, no relationship exists between these two financial variables in Singapore. However, there is an evidence that in eight out of the nine countries, exchange rates affect stock prices. Nieh and Lee (2001), employed daily data for the period 1993 to 1996 to investigate the correlation between stock prices and exchange rates, using the USA, Japan, Italy, Germany, France and Canada as sample countries. With the application of Engel-Granger and Johansen maximum likelihood methods of co-integration, the findings show that, in all these countries, no evidence of long-run relation was found between the two financial variables, but a significant relationship exists in the short-run. Smyth and Nandha (2003), employed daily data for the period 1995 to 2001 to examine the correlation between stock prices and exchange rates, using data from Sri-Lanka, Pakistan, India, and Bangladesh. Using Engel-Granger and Johansen co-integration methods, in all the four countries, the results show that, no long-run relationship exists between these two financial variables. It was also found that in Sri-Lanka and India, exchange rates cause stock prices, while no evidence of causality was found in Bangladesh and Pakistan. Lean, Halim and Wong (2005), employed weekly data for the period of 1991 to 2002 to examine the relationship between stock prices and exchange rates of Hong-Kong, Indonesia, Singapore, Malaysia, Korea, Philippines, and Thailand, with Japan included as for control purpose. Applying cointegration and bivariate causality techniques, the findings show that, no evidence of Granger causality exists between stock prices and exchange rates for all the countries investigated except the Philippines and Malaysia. Phylaktis and Ravazzolo (2005), used monthly data for the period 1980 to 1998 to explore the short-run and long-run relation between stock prices and exchange rates, using Thailand, Singapore, Philippines, Malaysia, Indonesia and Hong-Kong data. With the application of cointegration and Granger causality techniques, the findings show that there exists, a positive relation between stock prices and exchange rates. Obben, Pech, and Shakur (2006), employed weekly data for the period 1999 to 2005 to explore the relation between stock prices and exchange rates in New Zealand. With the application of cointegrating VAR method, the findings show that, between exchange rates

and stock indices, bi-directional causality exists in the short-run and long-run. Yau and Nieh (2006), used monthly data for the period 1991 to 2005 to explore the relation between stock prices and exchange rates in Japan and Taiwan. Applying Granger causality, the findings reveal that a bi-directional causality exists between the two variables. Pan, Fok and Liu (2007), employed daily data for the period of 1988 to 1998 to investigate the correlation between stock prices and exchange rates, using Thailand, Taiwan, Singapore, Malaysia, Korea, Japan and Hong-Kong data. With the application of Granger causality and Johansen cointegration methods, the findings show that no long-run relationship exists between the two variables. Ismail and Bin Isa (2009), used monthly data for the period of 1990 to 2005 to investigate the non-linear relation between exchange rates and stock prices in Malaysia. With the application of Johansen cointegration technique, the findings show no co-integration. Rahman and Uddin (2009), used monthly data for the period of 2003 to 2008 to examine the relation between stock prices and exchange rates of Pakistan, India, and Bangladesh. Using Johansen co-integration and Granger causality methods, the findings show no evidence of a long-run relation between the two variables. Also, no causal relation was found between these two financial variables. Richards, Simpson, and Evans (2009), used daily data for the period of 2003 to 2006 to explore the relation between stock prices and exchange rates in Australia. Johansen co-integration test findings reveal no evidence of long-run cointegration between the study variables. Zhao (2010), employed monthly data for the period of 1991 to 2009 to investigate the correlation between the two variables in China and found no evidence of long-run relation. Alagidede, Panagiotidis and Zhang (2011), employed monthly data for the period 1992 to 2005 using United Kingdom, Switzerland, Japan, Canada and Australia data. Granger causality test findings show no evidence of a long-run relationship between the study variables. Also, there is causal linkage running from exchange rates to stock prices in Canada, Switzerland and United Kingdom, but for Japan, the causality runs from stock prices to exchange rates. Harjito and McGowan (2011), employed weekly data for the period of 1993 to 2002 to examine the relation between stock prices and exchange rates using Thailand, Singapore, Philippines, and Indonesia as sample countries. The findings show that, in Thailand and Singapore, a bi-directional causality exists. Also, between these two financial variables, a co-integrating relationship exists for all the four countries. Lean, Narayan and Smyth (2011), studied weekly data for the period of 1990 to 2005 to explore the relation between stock prices and exchange rates using data from

Thailand, Singapore, Philippines, Malaysia, Korea, Japan, Indonesia, and Hong-Kong. Applying Lagrange Multiplier (ML) cointegration, Gregory-Hansen co-integration and Granger causality methods, the findings show that the long-run relationship between exchange rate and stock price is insignificant. That is, the predictive power of these financial variables is limited only to short-run. Also, these two financial variables were cointegrated, only in Korea. Wickremasinghe (2012), employed monthly data for the period of 1986 to 2004 to explore the relationship between stock prices and the Sri-Lanka exchange rates against USD, GBP, JPY and Indian rupee. In Sri-Lanka, the findings show no evidence of a long-run relation between any of the four exchange rates and stock prices. Though, uni-directional causality runs from stock prices to Sri-Lanka exchange rate against USD. Buberkoku (2013), used monthly data for the period of 1998 to 2008 to explore the correlation between stock prices and exchange rates using Turkey, Switzerland, Korea, Singapore, Japan, Germany, England, Canada, and Australia data. Applying Engle-Granger, Johansen cointegration and Granger-causality methods, except in Singapore, the findings show that, no long-run relationship exists between these financial variables. Though, in Canada, Switzerland, and Turkey, stock prices affect exchange rates in the short-run. Also, in Singapore and Korea, causality runs from exchange rates to stock prices. However, no causal relationship between these financial variables in either direction in Australia, England, Germany, and Japan was found. Tsagkanos and Siriopoulos (2013), employed daily and monthly data of European Union and the USA for the period of 2008 to 2012 to explore the correlation between stock prices and exchange rates. Using structural non-parametric cointegrating regression, Johansen cointegration and Granger causality methods, the findings show that, in the long-run, changes in the stock prices affect changes in exchange rates in EU, but for short-run in the USA. Yang, Tu and Zeng (2014), employed daily data for the period of 1997 to 2010 to examine the correlation between stock returns and exchange rates using Thailand, Taiwan, Singapore, Philippines, Malaysia, Korea, Japan, Indonesia, and India as sample countries. With the application of Granger causality test in quantiles, the findings show that there exists, feedback relations between stock prices and exchange rates for all the countries except Thailand, where stock returns lead exchange rates. It is evinced that lots of studies have been conducted in Asian and advanced countries on the relationship between exchange rates and stock prices but very few studies have explored the nexus between these two financial variables in Africa, especially in Nigeria and

South Africa. Oyinlola, Adeniyi and Omisakin (2012), employed daily data for the period of 2002 to 2011 to explore the long-run and short-run relation between exchange rates and stock prices in Nigeria. Using Johansen, Gregory-Hansen cointegration and EGARCH, the results reveal no evidence of a long-run relationship between these financial variables. Zubair (2013), used monthly data for the period of 2001 to 2011 to explore the correlation between the stock market index and monetary indicators (exchange rate and money supply) in Nigeria. With the application of Johansen cointegration and Granger causality methods, the findings show no evidence of a long-run relationship between these financial variables. Salisu and Oloko (2015), used monthly data for the period 1999 to 2013 to explore the correlation between stock prices and exchange rates in Nigeria. Applying VARAM-AMGARCH models, the findings show that there is a substantial negative return and continual volatility spillover from stock to foreign exchange market. Also, there was evidence of short-term volatility spillover running from foreign exchange market to stock market. Fowowe (2015), used monthly data for the period 2003 to 2013 to explore the relation between stock prices and exchange rates using South Africa and Nigeria as sample countries. Using Johansen, Gregory-Hansen cointegration and Multivariate causality methods, the findings show evidence of a cointegrating relationship between these two financial variables in Nigeria, but for South Africa, no evidence of cointegrating relationship exists between exchange rates and stock prices. Also, while no evidence of causality was found between exchange rates and stock prices in South Africa, there is evidence of "flow" oriented channel in Nigeria.

RESEARCH METHODOLOGY

This study employed daily exchange rates of US dollar (EX_{USD}), Euro (EX_{EUR}), Japanese Yen (EX_{JPY}) and Great British Pound Sterling (EX_{GBP}); and daily closing values of the Nigerian Stock Exchange - All Share Index (NSE-ASI) and Johannesburg Stock Exchange - All Share Index (JSE-ASI) for the period of January 4, 2010 to September 26, 2017; proving 2,017 daily observations. All the exchange rates are expressed in terms of local currency for Nigerian Naira and South African Rand. Daily data was used, as weekly, monthly or quarterly data would not adequately encapsulate the information on correlation. The data were sourced from the DataStream.

To confirm the flexibility and volatility of Nigerian Naira and South African Rand, exchange rates against the USD, EURO, JPY, and GBP;

figure 1 and 2 present the correlation for the period January 2010 to September 2017 for the two countries respectively. While figure 3 presents the series for the Nigeria Stock Exchange - All-Share Index (NSE-ASI) and Johannesburg Stock Exchange - All-Share Index (JSE-ASI) for the period January 2010 to September 2017 respectively.

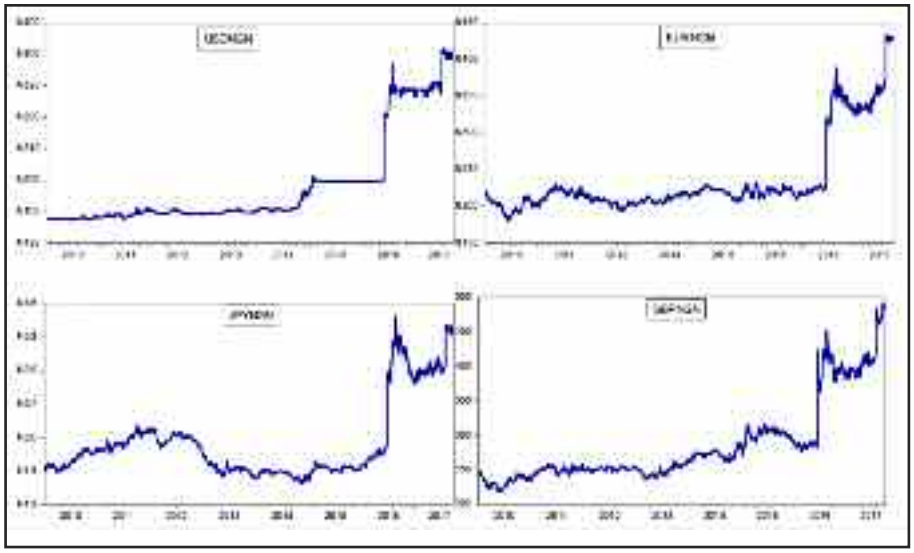

Figure 1. *Nigerian Naira exchange rates against the USD, EURO, JPY and GBP for the period January 2010 to September 2017.*

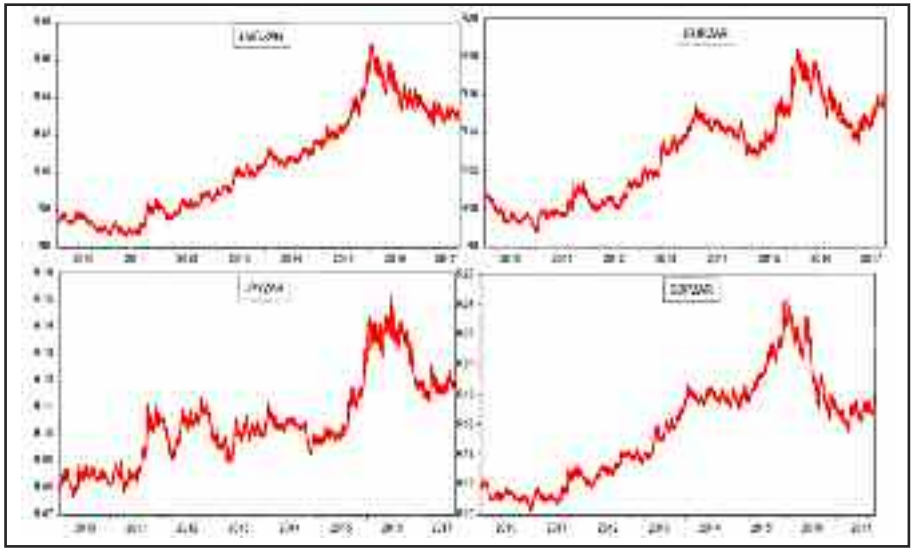

Figure 2*. South African Rand exchange rates against the USD, EURO, JPY and GBP for the period January 2010 to September 2017.*

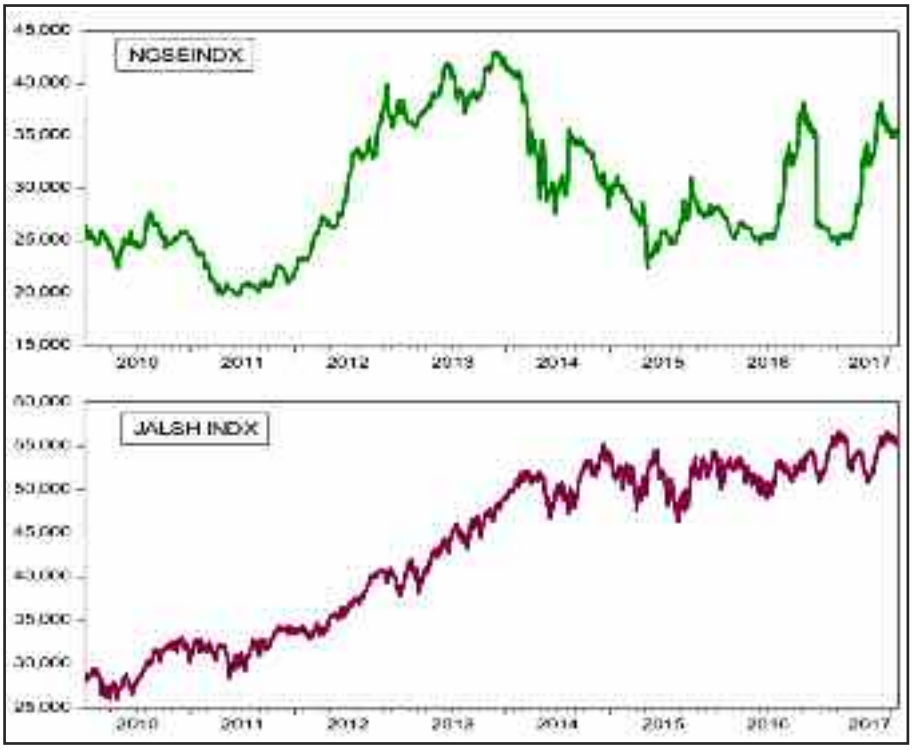

***Figure 3**. Series for the Nigeria Stock Exchange-All Share Index (NSE-ASI) and Johannesburg Stock Exchange-All Share Index (JSE-ASI) for the period January 2010 to September 2017.*

The exchange rate of Nigerian Naira was relatively stable between 2010 and 2014, however, from 2015 to 2017 the rates depreciated consistently and astronomically. For instance, the rate was USD/N160 in 2014 and depreciated to USD/N300 in 2017. The same trend applies to Euro, JPY, and GBP against Naira for the period under consideration. The index for NSE-ASI increased rapidly between 2012 and 2013, but had a sharp drop between 2014 and 2016, however, picked-up in 2017. Likewise, the exchange rate of South African Rand was relatively stable between 2010 and 2014, however, between 2015 and 2016 the rates depreciated rapidly and started to appreciate towards the last quarter of 2016 onwards. For instance, the rate was USD/R10 in 2014 but depreciated to USD/R16.9 in 2016 and later appreciated to USD/R13.4 in 2017. The same trend applies to Euro, JPY, and GBP against Rand for the period under consideration. The index for JSE-ASI increased speedily from 2012 and maintained constant and steady growth onward for the period covered by this study.

Model specification

Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) tests are employed to explore the stationarity of the time series data. ADF test is achieved with the following regression:

$$\Delta Y_t = \beta_1 + \beta_2 + \gamma Y_{t-1} + \delta_i \sum_{t=1}^{n} \Delta Y_{t-1} + \varepsilon t \quad (1)$$

The difference operator is represented by Δ; while the coefficients to be estimated are represented by β, y and δ; the variable whose time series properties are analyzed is represented by Y and error term at time is represented by εt

Phillip-Perron (PP) test proposes a non-parametric technique of adjusting for higher order autocorrelation in a series and is centered on AR (1) process:

$$\Delta Y_t = \delta + \beta Y_{t-1} + \varepsilon_t \quad (2)$$

The difference operator is represented by Δ; the constant is represented by δ; the slope is represented by β and the first lag of the variable Y is represented by Y_{t-1}

However, it is imperative to test for cointegrating relation where two data series are cointegrated of the same order. Therefore, we apply Johansen cointegration to test for the likelihood of a cointegrating relationship. The VAR model specification is given as:

$$\Delta Y_t = K + \sum_{i=1}^{p} \Gamma \Delta Y_{t-1} + \Pi Y_{t-1} + \upsilon_t \quad (3)$$

Vector of non-stationary variables is represented by Y_t; the difference operator is represented by Δ; the coefficient matrices are represented by Γ and Π; the lag length is denoted by ρ and the constant term is denoted by K.

However, where no cointegrating relationship is found between the two financial variables, Granger causality test can be employed using the following equations:

$$\Delta SP_t = \alpha_0 + \beta_1 \Delta SP_{t-1} + \beta_2 \Delta EX_{t-1} + \varepsilon_{1t} \quad (4)$$

$$\Delta EX_t = \alpha_0 + \beta_1 \Delta EX_{t-1} + \beta_2 \Delta SP_{t-1} + \varepsilon_{2t} \quad (5)$$

In which stock prices and exchange rates are represented by SP_t and EXt; the uncorrelated stationary random process is denoted by ε_{1t} and ε_{2t}, and the time period is denoted by t.

Nevertheless, if a cointegrating relationship exists between SP and EX, Vector error correction model is essential in testing Granger causality as:

$$\Delta SP_t = \alpha_0 + \beta_1 \Delta SP_{t-1} + \beta_2 \Delta EX_{t-1} + \delta_1 D_{t-1} + \varepsilon_{1t} \quad (6)$$

$$\Delta EX_t = \alpha_0 + \beta_1 \Delta EX_{t-1} + \beta_2 \Delta SP_{t-1} + \gamma_1 D_{t-1} + \varepsilon_2 t \quad (7)$$

The error correction term obtained from the cointegrating equation is represented by D_{t-1}, as D_t represents the past values as a result of changes in SP_t and EX_t. Δ represents the first difference operator; δ_1 and γ_1 represent error correction coefficients and they are required to encapsulate the adjustments of SP_t and EX_t with respect to long-run equilibrium; while the coefficients on ΔSP_{t-1} and ΔEX_{t-1} are required to encapsulate the short-run dynamics of the model.

EMPIRICAL RESULTS AND DISCUSSION

The stationary of the data is checked, and Table 1 presents the results of the unit root test are presented in table 1. The tests show that the null hypothesis cannot be rejected with level data. However, at first difference, the null hypothesis can be rejected for both countries. This confirms that the variables are stationary as process for *I* (1) the two countries-Nigeria and South Africa.

Table 1. Unit Root Analysis

Variables	ADF Test				PP Test			
	Level		1st Difference		Level		1st Difference	
	Constant	Constant &Trend	Constant	Constant &Trend	Constant	Constant &Trend	Constant	Constant &Trend
PANEL A: NIGERIA								
SP(N-ASI)	-1.6460	-1.7595	-34.4432***	-34.4350***	-1.5587	-1.6836	-34.3787***	-34.3703***
EXN_{USD}	0.8443	-1.0164	-50.0351***	-50.0968***	1.0311	-0.9056	-50.4005***	-50.5714***
EXN_{EUR}	1.3480	-0.3174	-38.4047***	-38.5104***	1.1395	-0.5126	-51.3800***	-51.7471***
EXN_{JPY}	-0.0472	-0.7553	-21.4549***	-21.4985***	0.0006	-0.7253	-52.5695***	-52.6368***
EXN_{GBP}	0.0056	-2.0370	-23.8567***	-23.9392***	0.9493	-1.1994	-48.6491***	-49.0348***
PANEL B: SOUTH AFRICA								
SP(J-ASI)	-1.2922	-2.9505	-34.1909***	-34.1861***	-1.2203	-2.6744	-46.0392***	-46.0317***
EXN_{USD}	-0.9454	-2.5479	-44.2723***	-44.2613***	-0.8372	-2.3521	-44.6733***	-44.6606***
EXN_{EUR}	-1.0023	-2.7276	-43.7726***	-43.7628***	-0.9439	-2.6541	-43.8189***	-43.8088***
EXN_{JPY}	-1.9595	-2.9125	-44.6592***	-44.6501***	-1.8025	-2.6905	-45.0715***	-45.0633***
EXN_{GBP}	-1.2009	-1.6232	-43.5504***	-43.5430***	-1.2060	-1.6449	-43.5309***	-43.5233***

Note: *This table reports the unit root test of the variables. Variables Abbreviation: Stock Price-All Share Index (SP-ASI: Nigerian Stock Exchange: N-ASI for Nigeria and Johannesburg Stock Exchange: J-ASI for South Africa), Local exchange rate (Naira (N) for Nigeria and Rand (R) for South Africa) against the United States of American dollar (?EX?_USD), European currency, Euro (EX_{EUR}), Japanese Yen (EX_{JPY}), British Pound Sterling (EX_{GBP}). 1% level is denoted by *** represent the level of statistical significance.*

Table 2. presents the summary of descriptive statistics and correlation matrix. Our findings indicate that all the variables fail the Jarque-Bera (JB) test. Meaning that all the variables depart from normality. The skewness for all the variables is less than 2 for Nigeria and less than 1 for South Africa.

Table 2. Descriptive Statistics and Correlation Matrix

PANEL A: NIGERIA					
Stratum A: Summary Statistics					
Variables	SP(N-ASI)	EXN_{USD}	EXN_{EUR}	EXN_{JPY}	EXN_{GBP}
Observations	2017	2017	2017	2017	2017
Mean	29534.94	193.6149	235.9166	1.9447	286.3004
Std. Dev.	6108.354	60.7339	54.5834	0.4692	60.4471
Skewness	0.4595	1.5720	1.9569	1.5153	1.5208
Kurtosis	2.0972	3.9522	5.6469	4.1319	4.2973
JB Normality test	139.4874 (0.0000)***	906.9608 (0.0000) ***	1876.209 (0.0000) ***	879.5196 (0.0000) ***	918.9747 (0.0000) ***
Stratum B: Correlation Matrix					
SP(N-ASI)	1.0000	0.0715	0.1145	-0.0457	0.0977
EXN_{USD}	0.0715	1.0000	0.9530	0.8583	0.9758
EXN_{EUR}	0.1145	0.9530	1.0000	0.9085	0.9533
EXN_{JPY}	-0.0457	0.8583	0.9085	1.0000	0.8274
EXN_{GBP}	0.0977	0.9758	0.9533	0.8274	1.0000
PANEL B: SOUTH AFRICA					
Stratum A: Summary Statistics					
Variables	SP(J-ASI)	EXN_{USD}	EXN_{EUR}	EXN_{JPY}	EXN_{GBP}
Observations	2017	2017	2017	2017	2017
Mean	43516.10	10.4058	12.7777	0.1043	15.6211
Std. Dev.	9381.898	2.7320	2.4239	0.0161	3.4555
Skewness	-0.3500	0.3286	0.0893	0.6596	0.2606
Kurtosis	1.5468	1.8654	1.8261	2.9208	2.0875
JB Normality test	218.6625 (0.0000)***	144.4796 (0.0000) ***	118.4919 (0.0000) ***	146.7984 (0.0000) ***	92.7966 (0.0000) ***
Stratum B: Correlation Matrix					
SP(J-ASI)	1.0000	0.8948	0.9120	0.7187	0.8859
EXN_{USD}	0.8948	1.0000	0.9518	0.8704	0.9362
EXN_{EUR}	0.9120	0.9518	1.0000	0.8374	0.9550
EXN_{JPY}	0.7187	0.8704	0.8374	1.0000	0.7702
EXN_{GBP}	0.8859	0.9362	0.9550	0.7702	1.0000

Notes*: The table presents the summary of descriptive statistics then correlation matrix of the variables. P-values are reported in parenthesis. 1% level is denoted by *** represent the level of statistical significance.*

Table 3. reports the Johansen cointegration tests results. The cointegration rank test (Trace and max eigenvalue statistics) analyzes the propositions at maximum number of cointegrating relations of the variables. The subscript represents the number of significant cointegrating vectors. For the two countries, the results show no evidence of cointegrating relationship between domestic stock prices and exchange rates for all the four currencies considered in this study. Hence, the null hypothesis of no cointegration is accepted in all cases for the two countries as shown by trace and max eigen value tests results. Thus, there is an absence of long-run relation between domestic stock prices and exchange rates. This implies that, for these two countries examined, none of these two financial variables can be predicted based on their past values.

Table 3. Cointegration Analyses

Variables	H_0	Trace Statistic	5% Critical values	Prob.	Max-eigenvalue Statistic	5% Critical values	Prob.
PANEL A: NIGERIA							
EXN_{USD}/ N-ASI	r=0	5.0103	15.4947	0.8077	4.5344	14.2646	0.7991
	r≤1	0.4758	3.8414	0.4903	0.4758	3.8414	0.4903
EXN_{EUR}/ N-ASI	r=0	5.2044	15.4947	0.7867	4.1879	14.2646	0.8390
	r≤1	1.0164	3.8414	0.3134	1.0164	3.8414	0.3134
EXN_{JPY}/ N-ASI	r=0	7.6630	15.4947	0.5021	6.5603	14.2646	0.5424
	r≤1	1.1027	3.8414	0.2937	1.1027	3.8414	0.2937
EXN_{GBP}/ N-ASI	r=0	3.3678	15.4947	0.9477	3.1421	14.2646	0.9368
	r≤1	0.2257	3.8414	0.6347	0.2257	3.8414	0.6347
PANEL B: SOUTH AFRICA							
EXR_{USD}/ J-ASI	r=0	9.3556	15.4947	0.3335	8.5568	14.2646	0.3249
	r≤1	0.7988	3.8414	0.3714	0.7988	3.8414	0.3714
EXR_{EUR}/ J-ASI	r=0	13.2217	15.4947	0.1069	12.6036	14.2646	0.0900
	r≤1	0.6181	3.8414	0.4317	0.6181	3.8414	0.4317
EXR_{JPY}/ J-ASI	r=0	7.5013	15.4947	0.5201	6.0757	14.2646	0.6035
	r≤1	1.4256	3.8414	0.2325	1.4256	3.8414	0.2325
EXR_{GBP}/ J-ASI	r=0	8.8754	15.4947	0.3770	7.7498	14.2646	0.4047
	r≤1	1.1256	3.8414	0.2887	1.1256	3.8414	0.2887

Source: Authors' calculations.

***Notes**: The table reports the result of Johansen cointegration analyses. The cointegration rank test (trace and maximum eigenvalue statistics) analyze the propositions at maximum r number of cointegrating relations of the variables. r denotes the cointegrating vectors number of significance.*

The absence of a cointegrating relation between domestic stock prices and exchange rates for the two countries under study suggests that can we proceed to test for causality between the two financial variables. Hence, the channel linked via the foreign exchange market and stock market were tested using Granger causality tests to find out if any causal relation between domestic stock prices and exchange rates subsist.

Table 4. Pairwise Granger Causality Tests

PANEL A: NIGERIA				
Null Hypotheses	**F-Statistic**	**Probability**	**Decision**	**Direction of causality**
SP(N-ASI) $\Longrightarrow EXN_{USD}$	1.2123	0.2335	DRNH	NC
$EXN_{USD} \Longrightarrow$ SP(N-ASI)	0.8815	0.6117	DRNH	
SP(N-ASI) $\Longrightarrow EXN_{EUR}$	1.6571	0.0336**	RNH	UDC
$EXN_{EUR} \Longrightarrow$ SP(N-ASI)	0.7113	0.8181	DRNH	
SP(N-ASI) $\Longrightarrow EXN_{JPY}$	0.9143	0.5686	DRNH	NC
$EXN_{JPY} \Longrightarrow$ SP(N-ASI)	0.4584	0.9806	DRNH	
SP(N-ASI) $\Longrightarrow EXN_{GBP}$	1.6158	0.0412**	RNH	UDC
$EXN_{GBP} \Longrightarrow$ SP(N-ASI)	1.0936	0.3487	DRNH	
PANEL B: SOUTH AFRICA				
SP(J-ASI) $\Longrightarrow EXR_{USD}$	3.8221	0.0220**	RNH	BDC
$EXR_{USD} \Longrightarrow$ SP(J-ASI)	3.3875	0.0340**	RNH	
SP(J-ASI) $\Longrightarrow EXR_{EUR}$	4.7506	0.0087***	RNH	BDC
$EXR_{EUR} \Longrightarrow$ SP(J-ASI)	3.6176	0.0270**	RNH	
SP(J-ASI) $\Longrightarrow EXR_{JPY}$	1.6292	0.1963	DRNH	UDC
$EXR_{JPY} \Longrightarrow$ SP(J-ASI)	3.2251	0.0400**	RNH	
SP(J-ASI) $\Longrightarrow EXR_{GBP}$	2.5741	0.0765*	RNH	UDC
$EXR_{GBP} \Longrightarrow$ SP(J-ASI)	2.0055	0.1349	DRNH	

Notes: *Abbreviations: Do not reject the null hypothesis (DRNH), Reject null hypothesis (RNH), Bidirectional causality (BDC),*

*Unidirectional causality (UDC), No causality (NC). 1%, 5%, and 10% level is denoted by ***, **, * represent the level of statistical significance.*

Table 4. presents Granger causality tests results for the two countries. For Nigeria, causality runs from domestic stock prices to exchange rate of Euro and British Pound Sterling against Naira; while no evidence of causality between stock prices and exchange rates of US dollar and Japanese Yen against Naira. This suggests that the diffusion progression between domestic stock market and foreign exchange market is

represented by the "stock"-oriented channel. However, for South Africa, there is evidence of bi-directional causality between domestic stock prices and exchange rates of US dollar and Euro against Rand; while unidirectional causality subsists between domestic stock prices and exchange rates for Japanese Yen and British Pound Sterling against Rand. Causality runs from an exchange rate of Japanese Yen against Rand to domestic stock prices; likewise, causality runs from domestic stock prices to exchange rate of British Pound Sterling against Rand. This suggests that the diffusion progression between domestic stock market and foreign exchange market is represented by "flow" and "stock"-oriented channels.

The policy implication is unproblematic for South Africa, as causality is Bidirectional, running from the Rand/USD and Rand/Euro to JSE-ASI and vice versa; and uni-directional relation from domestic stock prices to the exchange rate of British Pound Sterling (Rand/GBP) and from exchange rate of Japanese Yen (Rand/JPY) to domestic stock prices respectively. Here, the predictions of the "flow" and "stock" theories uphold. In effect, while changes in domestic stock prices influence the exchange rate, the changes in exchange rates also influence domestic stock prices in South Africa. The mixed evidence found here can be elucidated thus: given that appreciation of Rand/USD and Rand/Euro reduces the international competitiveness of South African goods, thereby cause income to reduce and subsequent fall in domestic stock prices. Similarly, when the Rand/USD and Rand/Euro exchange rate depreciate, South African exporters benefit through an increase in exports sales revenue, thereby cause the domestic stock price to rise. This evidence that "flow and stock" theories are upheld simultaneously for South Africa. However, for Nigeria, causality runs from domestic stock prices to exchange rate of Euro (Naira/Euro) and British Pound Sterling (Naira/GBP) against Naira; while no evidence of causality was found between domestic stock prices and exchange rates of US dollar (Naira/USD) and Japanese Yen (Naira/JPY) against Naira. In sum, the empirical evidence of the mixture of causality running from the foreign exchange market to stock market and vice versa for South Africa; and for Nigeria, running from the stock market to foreign exchange market agrees with the studies of Fowowe (2015); Zubair, (2013); Harjito and McGowan (2011), Alagidede et al., (2011); Yau and Nieh (2006), and Granger et al., (2000).

CONCLUSION

This paper examines the dynamic relationship between domestic stock prices and exchange rates in Nigeria and South Africa. Using cointegration approach and an extended data sets, empirical evidence of no long-run relationship between domestic stock prices and exchange rates for all the four currencies considered in this study was presented. Hence, the focus of the study was on the nature of the short-run relationship. The study results of no cointegration refute the general belief among the domestic and international investors that there is a correlation between exchange rates and domestic stock prices, and that these two financial variables can be used to predict one another based on their past values. Though the foreign exchange markets and stock markets have witnessed the significant transformation in both countries. However, no empirical evidence of cointegrating relationship was found between domestic stock prices and the exchange rate for all the four currencies examined for the period researched. The results of Granger causality tests show no evidence causality between domestic stock prices and exchange rates of US dollar and Japanese Yen against Naira; while causality runs from domestic stock prices to exchange rate of Euro and British Pound Sterling against Naira. This suggests that the diffusion progression between domestic stock market and foreign exchange market is connoted by the "stock" oriented channel in Nigeria. However, for South Africa, while uni-directional causality exists between domestic stock prices and exchange rates of Japanese Yen and British Pound Sterling against Rand, likewise, there is evidence of bi-directional causality between domestic stock prices and exchange rates of US dollar and Euro against South African Rand. This suggests that the diffusion progression between domestic stock market and foreign exchange market is represented by "flow and stock" oriented channels in South Africa. Our results confirm some of the previous studies. Therefore, we conclude that no long-term prognostic conjectures can be made between these two financial variables; domestic stock prices and exchange rates; likewise, no policy interventions in these financial markets can be implemented to achieve long-term economic results. Hence, the policymakers must be conscious of the effect of foreign exchange policies on domestic stock markets.

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