

STOCK MARKET VOLATILITY INDICATOR AND HUMAN DEVELOPMENT INDEX IN SUB-SAHARAN AFRICA: AN EMPIRICAL ANALYSIS (1997-2017)

UGHERUGHE JOSEPH EDIRI

DEPARTMENT OF ACCOUNTING, BANKING AND FINANCE, FACULTY OF MANAGEMENT SCIENCES,
DELTA STATE UNIVERSITY, ASABA CAMPUS, ASABA

Corresponding Author's email: eugherughe@delsu.edu.ng



Abstract

This study examined the impact of the stock market volatility indicator on the human development index of three Sub-Saharan Africa (SSA) countries of Mauritius, Nigeria, and South Africa. The objectives are to examine the impact of stock market volatility on the human development index of SSA countries. Data for the study were collected from the World Bank and the United Nations Development Programme Databases for the period 1997 to 2017. The Ordinary Least Square (OLS) technique used reveals that stock market volatility was positive in two countries, Mauritius and Nigeria, and negative in South Africa. It was significant in Mauritius and insignificant in Nigeria and South Africa. The study concludes that the stock market is the most accessible market for long-term funds geared towards improving HDI in the SSA countries studied.

Keywords: Human Development Index, Ordinary Least Square, Stock Market Volatility, Mauritius, Nigeria, and South Africa.

Introduction

All over the world stock markets are established as a conduit for a wealth of savers to those who can put it to long-term productive use. Thus, the stock market provides long-term funds to the public and private sectors for productivity that leads to economic development vis-à-vis economic growth. It was as a result of this that most countries in Sub Saharan Africa (SSA) in the 1980s shifted away from borrowing from the various international clubs to the establishment of stock of market for the mobilisation of resources. These resources were mostly financial funds and how to allocate them for national development (Edame & Okoro, 2013).

Ibenta (2005) defines the stock market as a market for the supply of long-term capital to firms. Al-Fake (2006) describes the stock market as a network of specialised institutions, a series of mechanisms, processes, and infrastructure of various ways that bring suppliers of long-term funds to invest in socio-economic development projects. Instruments traded in the market include equities, government stocks, industrial loan stocks, etc. As such, a stock market is a financial market in which long-term debt (over a year) or equity-backed securities are bought and sold. In SSA, financial regulators like the apex bank, a commission like the Securities and Exchange Commission (SEC), and the Federal Ministry of Finance oversee stock markets to protect investors against fraud, among other duties. The stock market, therefore, is the hub for the efficient mobilisation and allocation of resources (Olagunde, Elumilade & Asaolu, 2006). Thus, making the stock markets a vital institution for the mobilisation and allocation of resources in any modern

economy. As a result of this, attention to the relationship between the stock market and economic development has become a focal point of most SSA countries. It is as a result of this that the World Bank Economic Review (2016) dedicated its main group report to the support of stock market development.

Some of the perceived benefits from the relationship between stock market indicators and economic development in an emerging economy include savings mobilisation, risk diversification and management, facilitating the exchange of goods and services, and ensuring corporate governance and control.

Being mindful of these perceived fundamental roles played by the stock market in an emerging economy, the government of many SSA countries established committees on how to establish a stock market and recommendations of such committees were implemented fully. This led to the establishment of various exchanges in the SSA countries.

The efforts of the SSA countries' government towards growing their economies by establishing the exchanges have added value and played significant roles in the financing of industries in the region that has shown a strong outlook in economic development. Despite this strong outlook, stock markets in SSA remain immature, except South Africa and Mauritius that have approximately 322% and 62% market capitalisation of listed domestic companies as a percentage of GDP respectively (World Bank Development Report-WBDR, 2018).

The aim of every government in the world is on how to improve its Human Development Index – HDI. In spite of the tremendous contributions of the stock markets in Sub-Saharan Africa (SSA), HDI for most countries in the region remain at the low ebb since the introduction by the United Nations Development Programme (UNDP) in 1990 to capture a more realistic human development factors (World Bank Development Report-WBDR, 2018).

The computation of HDI includes per capita income; literacy rate; employment rate; and life expectancy. Each part varies from zero (0) to one (1), zero being the lowest level of development and one being the highest and a country's score is represented by the value in percent that it scores. These variables in the calculation of HDI are used in the literature as a proxy for economic growth or economic development. Ruwaydah and Ushad (2015) posit that economic development is aimed at improving the general well-being of the people in an economy.

Since the introduction of the HDI, most of the studies (Ruwaydah & Ushad, 2015; Khetsi & Mongale, 2015; Rurangwa & Shukla, 2017; Okoye, Modebe & Okorie, 2016; Magwera & Mashamba, 2016; and Eleanya, Ugochukwu & Ishaku, 2016) are from content (i.e. on stock market and economic growth) different from this one on the stock market and HDI of SSA of countries under study. The time frame of these studies was short and also not consistent. The method of study is not robust enough because of the nature of the study. Again, findings from these studies have conflicting conclusions.

Therefore, this study examined the impact of the stock market volatility indicator on the economic development of SSA using HDI as a proxy for economic development. This study improves on the above shortcomings by using: more current data, panel data analysis, concentrating on three SSA countries, recent software development in the econometrics of panel regression analysis.

Hence, the above lacunas constitute a research gap, which this study intends to fill. The study, therefore, seeks to find out if: stock market volatility does not have a significant impact on the economic development of SSA countries. In light of this, the remaining part of the study is divided

into four, namely: literature review, research methodology, result and discussions, conclusion and recommendations.

Literature Review

Concept of Economic Development

The concept of economic development was given in terms of growth of output over time, but now in terms of per capita income, literacy and life expectancy (United Nation, 1990). The terms growth and development were used interchangeably by some researchers, this is not right. Economic growth is a means to economic development.

Economic development is, therefore, a multivariate concept; hence there is no single satisfactory definition of it. Economic development is a process where low-income national economies are transformed into modern industrial economies. It involves qualitative and quantitative improvements in a country's economy. Political and social transformations are also included in the concept of economic development in addition to economic changes (Aremu, Suberu & Ladipo, 2011).

Therefore, this study concludes that aggregate and per capita real incomes are not sufficient indicators of economic development. Rather, economic development is concerned with economic, social and institutional mechanisms that are necessary for bringing large scale improvements in the levels of living of the citizens.

The Impact of the Stock Market on Economic Development

The roles of the stock market in the development of the economy according to Aremu, Suberu and Ladipo (2011) include provision of opportunities for companies to borrow funds needed for long-term investment purposes, provision of avenue for the marketing of shares and other securities in order to raise fresh funds for expansion of operations leading to increase in output/production, provision of a means of allocating the nations real and financial resources between various industries and companies. Through the capital formation and allocation mechanism the stock market ensures an efficient and effective distribution of the scarce resources for the optimal benefit to the economy, reduction in the over-reliance of the corporate sector on short term financing for long term projects and also provision of opportunities for government to finance projects aimed at providing essential amenities for local investors. Also, the stock market can aid the government in its privatization programme by offering her shares in public enterprises to members of the public through the stock exchange. The stock market offers access to a variety of financial instruments that enable economic agents to pool, price and exchange risk. It encourages savings in financial form.

Increased economic growth would, in the long run, lead to economic development. Although economic growth does not by itself guarantee economic development, it makes economic development possible. Economic growth enables improvements or positive changes to take place in various areas of economic activity due to the increased production of goods and services.

Theoretical Framework

This study is theoretically underpinned to the Schumpeterian Theory and Endogenous Growth Theory credited to Romer (1986). Helpman (2004) argues that Schumpeterian or endogenous growth theory emphasized two significant channels for investment to affect economic growth: Firstly, through the impact of the range of available financial assets and their volatility, and

secondly, through the impact on the stock and price of new technology accessible for research and development (R&D).

Empirical Review

Nomfundo (2013) studies the long-run relationship between stock market development and economic growth of South Africa. The study used quarterly data covering the period from 1990Q1 to 2010Q4. The study empirically tests the link between the two variables, using Johnson's co-integration approach and Granger causality so as knowing the direction of the relationship. Vector Error Correction Model was also employed to capture both short-run and long-run dynamics. The results of the study reveal that a long-run relationship exists between all share indexes and economic development and the causality flows from economic growth to all share indexes (i.e. stock market development). Also, the extent to which of stock market development impacts of growth is statistically weak.

Onakoya (2013) examines the impact of Stock Market Volatility on Economic Growth in Nigeria from 1980 to 2010. The study investigated the asymmetric relationships between stock market volatility and macroeconomic variable volatility based on Nigeria data for thirty-one years. The Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) was employed. His study reveals that the volatility shock is quite continual in Nigeria and this might distort the growth of the economy.

Oladipo et al (2013) examine the link between capital market development and economic growth in Nigeria. The study applied co-integration and error correction modeling to the stock market and Macroeconomic time series data, the result revealed that the variables; All share Index, No of deals and market capitalization have an individual positive and significant combined impact on economic growth. All share-index has a positive coefficient and an insignificant effect on economic growth. The pair-wise Granger causality test shows that there exists a unidirectional causality running from all share-index to economic development.

Ishioro (2013) studies the link between stock market development and economic growth. He took his evidence from Zimbabwe using quarterly data from 1990Q₁ to 2010Q₄. The variables used for this study are: real GDP growth rate as a proxy for economic growth and market capitalization, value traded ratio, stock market volatility as a proxy for stock market development indexes. The study employed the statistical tool of Granger causality to test the link between the dependent and independent variables. The study found out that in line with the supply leading hypothesis, a bi-directional causality exists between economic growth and stock market volatility.

Shaibu, Osemwengie et al (2014) investigate the impact of capital market activities on economic growth in Nigeria using vector autoregressive (VAR) methodology. They adopt a VAR analysis and their result reveals that volatility in capital market activities contributed significantly to economic growth. Also, their findings show that there is a long-run relationship between economic growth and all shares index. Using the values of Mean Absolute Error (MAE) and Root Mean Squares Error (RMSE) the model appeared to possess a strong predictive ability.

David-Wayas (2014) uses quarterly time-series data of 1990Q₁ to 2010Q₄ to find the causal relationship between stock market performances and economic growth in Nigeria. The dependent variable for estimation is GDP and the independent variables are stock market capitalization, all share index, and value of shares traded. The methodology adopted a Pairwise Granger Causality to test within the multivariate co-integration and vector autoregressive model. The study reveals a long-run relationship exists between all share index and economic growth on

one hand and on the other a strong bidirectional causality running from all share index to economic growth and from economic growth to all share index.

Adusei (2014) inquires into the question: Does stock market development, promote economic growth in Ghana? He uses the Autoregressive Distributed Lag (ARDL) bounds testing model to unravel the question employing the quarterly data of 2006Q₁ to 2013Q₂. Statistically, he employed GDP as a proxy for economic growth and the all-share Index as a proxy or stock market development indicator. The result of the study indicates that there is a long-run relationship between all share index and economic growth in Ghana. Thus the answer to the question is yes, stock market volatility does promote economic growth in Ghana.

Research Methodology

Research Design, Nature and Sources of Data

The study employs the ex-post-facto research design. The study is carried out on three (3) exchanges in the Sub-Sahara African countries for the period 1997–2017. The choice of the exchanges is based on the vibrancy and availability of data. The data used are classified as time-series data.

Method of Data Collection

Data for this study are collected from the World Bank Indicators Database, the United Nations Development Programme Database the Stock Exchange of Mauritius, the Nigerian Stock Exchange, and the Johannesburg Stock Exchange for the period 1997 to 2017.

Model Specification

The model specification is underpinned to the neo-classical, endogenous and Schumpeter theories of economic growth and is in line with the objectives of the study. The model is as follows:

Stock Market Volatility and Human Development Index Model

This model is used to test the third hypothesis and is adapted from the Shaibu, Osemwengie, and Oseme (2013) model:

$$ASI = f(RGDP, TRVAL, ASI)$$

Where: RGDP is a real gross domestic product, which measures economic growth, TRVAL is the trading value, ASI is all shares index in the capital market.

The motivating drive for this model is drawn from the Endogenous School of Thought position that stock prices move up and down as a result of their value about any system of stock valuation. The study removed RGDP and TRVAL. RGDP is considered a macroeconomic variable as a need not to be on the right hand of the model and TRVAL as a stock market variable of liquidity need not be under the consideration stock market volatility. Also, the volatility variable is expected to be affected by other country-specific; as such control variables (i.e. Inflation rate and lending rate) are introduced into the model. Again, ASI as independent was replaced with the human development index as a proxy for economic development.

The functional form of the model is thus:

$$HDI = f(ASI, INFR, LIR) \dots \dots \dots \text{Model 3}$$

The multivariate equation expression is thus:

$$HDI = a_0 + a_1ASI + a_2INFR + a_3LIR + \epsilon \dots \dots \dots \text{Equation 3}$$

Where: HDI = Human development index

ASI = All share index

INFR = Inflation rate

LIR = Lending interest rate

ε = Stochastic error term within a confidence interval of 5%

a_0 = Constant term

a_1, a_2 and a_3 = Coefficients of the independent variables

A priori expectation

a_1, a_2 and a_3 are expected to be greater than or equal to 0 for the equation.

Method of Data Analysis

The study employs the Augmented Dickey-Fuller (ADF) test of unit root test for stationarity, Johansen Co-integration test for long-run equilibrium relationship among the variables, and OLS-Ordinary Least Squares (i.e. NLS-Nonlinear Least Square and ARMA-Autoregressive-Moving-Average) to estimate the variables. All statistical tools are to be employed using E-views. The choices of these statistical tools are that they are easy to interpret and are easy to understand.

Result and Discussion

Augmented Dickey-Fuller (ADF) Unit Root Tests

An Augmented Dickey-Fuller (ADF) unit root test was employed to test the stationarity of the variables. The ADF tests were done at levels. The decision rule is to reject stationary if ADF statistics are greater than the values of critical values at 1%, 5% and 10% in absolute terms or accept stationary if ADF statistics are less than the critical value of 1%, 5% and 10% in absolute terms. If the results of the variables are stationary at 1 (0) according to Kozhan, 2010, one can proceed to estimate the variables. The results of the ADF test are presented below in tables 1, 2 and 3 for Mauritius, Nigeria, and South Africa respectively.

Table 1 Mauritius ADF Unit Root Test

Variables	ADF Statistics	1% Critical Values	5% Critical Values	10% Critical Value	Order of Integration	Level of Significance
HDI	-3.441545	-3.886751	-3.052169	-2.666593	1(0)	0.8806 (10%)
ASI	-4.674109	-3.808546	-3.020686	-2.650413	1(0)	0.0016 (5%)
INFR	-3.505303	-3.808546	-3.020686	-2.650413	1(0)	0.1290 (10%)
LIR	-3.606904	-3.808546	-3.020686	-2.650413	1(0)	0.8481 (10%)

Source: Researcher's Computation from E-Views.

Table 1 above shows the Mauritius Augmented Dickey-Fuller unit root test for stationarity of the variables. The result shows that HDI, INFR, and LIR have an ADF statistics value of -3.441545, -3.505303, and -3.606904 respectively that are greater than 5% and 10% critical level values in

absolute term. ASI has an ADF statistical value of -4.674109 that is greater than 1%, 5% and 10% critical values in absolute term. The result reveals that the variables are stationary at 1 (0). Thus, ordinary least squares of data estimation can be applied in the analysis of data.

Table 2 Nigeria ADF Unit Root Test

Variables	ADF Statistics	1% Critical Values	5% Critical Values	10% Critical Value	Order of Integration	Level of Significance
HDI	-7.170999	-3.808546	-3.020686	-2.650413	1(0)	0.0000 (5%)
ASI	-3.555715	-3.808546	-3.020686	-2.650413	1(0)	0.0170 (5%)
INFR	-3.145311	-3.808546	-3.020686	-2.650413	1(0)	0.0392 (5%)
LIR	-3.425578	-3.808546	-3.020686	-2.650413	1(0)	0.5491 (10%)

Source: Researcher's Computation from E-Views.

Table 2 above shows the Augmented Dickey-Fuller unit root test for stationarity of the variables. The result shows that HDI has ADF statistics value of -7.170999 that is greater than 1%, 5% and 10% critical level values in absolute term while ASI, INFR, and LIR have ADF statistics value of -3.555715, -3.145311, and -3.425578 respectively that are greater than 5% and 10% critical level values in absolute term but less than 1% critical level values in absolute term. The result reveals that the variables are stationary at I (0). Thus, the ordinary least square of data estimation can be applied in the analysis of data.

Table 3 South Africa ADF Unit Root Test

Variables	ADF Statistics	1% Critical Values	5% Critical Values	10% Critical Value	Order of Integration	Level of Significance
HDI	3.045122	-3.808546	-3.020686	-2.650413	1(0)	0.9953 (10%)
ASI	-4.733675	-3.808546	-3.020686	-2.650413	1(0)	0.0014 (5%)
INFR	-4.160451	-3.831511	-3.029970	-2.655194	1(0)	0.0050 (5%)
LIR	-3.915669	-3.857386	-3.040391	-2.660551	1(0)	0.3182 (10%)

Source: Researcher's Computation from E-Views.

Table 3 above shows the Augmented Dickey-Fuller unit root test for stationarity of the variables. The result shows that ASI, INFR, and LIR have ADF statistics value of -4.733675, -4.160451 and -3.915669 respectively that is less than 1%, 5% and 10% critical level values in absolute term. HDI has an ADF statistics value of 3.045122, which is greater than 5%, and 10% critical level values in the absolute term but less than 1% critical value in absolute term. The result reveals that the variables are stationary at 1 (0). Thus, ordinary least squares of data estimation can be applied in the analysis of data.

Johansen Co-integration Test

Johansen co-integration test is conducted to ascertain the existence of the long-run relationship among the variables for each of the models in the study. The Johansen co-integration test contains two types of co-integration tests. These are unrestricted co-integration, rank test (Trace) and

unrestricted co-integration, rank test (Maximum Eigenvalue). According to Johansen, 1991, the decision rule is to accept the null hypothesis if the probability of the critical value is greater than the 5% level of significance. Otherwise, we reject the null hypothesis.

Table 4 Mauritius Result of the Co-integration among Variables of Stock Market Volatility Model, HDI =f (ASI, INFR, LIR)

Hypothesized No of CE(s)	Eigenvalue	Unrestricted Cointegration Rank Test (Trace)			Unrestricted Cointegration Rank Test (Maximum Eigenvalue)		
		Trace Statistics	5% Critical Value	Prob.**	Maximum Eigenvalue Statistics	5% Critical Value	Prob.**
None*	0.843774	76.97977	47.85613	0.0000	35.27252	27.58434	0.0042
At most 1*	0.813451	41.70725	29.79707	0.0014	31.90220	21.13162	0.0011
At most 2	0.402804	9.805049	15.49471	0.2960	9.794684	14.26460	0.2258
At most 3	0.000545	0.010366	3.841466	0.9186	0.010366	3.841466	0.9186

Trace test indicates 1 co-integrating icon at the 0.05 level
Max-eigenvalue test indicates 1 co-integrating equation at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Researcher's Computation from E-Views.

The stock market volatility model that examined the long-run relationship between stock market volatility variables; all share index and economic development; human factor development were tested for the null hypothesis of no co-integration on the assumption of the linear deterministic trend. The model includes HDI, ASI, INFR, and LIR (INFR and LIR are control variables). The result of the co-integration is presented in table 4. The results from the Trace and Maximum-Eigen probability show one (1) co-integration equation. The results are based on the probability of the critical values less than 5% level of significance. The study then indicates that there is co-integration among the variables in the stock market volatility model. This connotes that there is a long-run relationship between stock market volatility and economic development in Mauritius.

Table 5 Nigeria Result of the Co-integration among Variables of Stock Market Volatility Model, HDI =f (ASI, INFR, LIR)

Hypothesized No of CE(s)	Eigenvalue	Unrestricted Cointegration Rank Test (Trace)			Unrestricted Cointegration Rank Test (Maximum Eigenvalue)		
		Trace Statistics	5% Critical Value	Prob.**	Maximum Eigenvalue Statistics	5% Critical Value	Prob.**
None*	0.903431	97.13742	47.85613	0.0000	44.41240	27.58434	0.0002
At most 1*	0.749767	52.72502	29.79707	0.0000	26.32193	21.13162	0.0085
At most 2*	0.613911	26.40310	15.49471	0.0008	18.08204	14.26460	0.0119
At most 3*	0.354642	8.321056	3.841466	0.0039	8.321056	3.841466	0.0039

Trace test indicates 1 co-integrating equation at the 0.05 level
Max-eigenvalue test indicates 1 co-integrating equation at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Researcher's Computation from E-Views.

The stock market volatility model that examined the long-run relationship between stock market volatility model variables; all share index and economic development; human factor development were tested for the null hypothesis of no co-integration on the assumption of the linear deterministic trend. The model includes HDI, ASI, INFR, and LIR (INFR and LIR are control variables). The result of the co-integration is presented in table 5. The results from the Trace and Maximum-Eigen probability show three (3) co-integration equations. The results are based on the probability of the critical values less than 5% level of significance. The study then indicates that there is co-integration among the variables of the stock market volatility model. This connotes that there is a long-run relationship between stock market volatility and economic development in Nigeria.

Table 6 South Africa Result of the Co-integration among Variables of Stock Market Volatility Model, HDI =f (ASI, INFR, LIR)

Hypothesized No of CE(s)	Eigenvalue	Unrestricted Cointegration Rank Test (Trace)			Unrestricted Cointegration Rank Test (Maximum Eigenvalue)		
		Trace	5%	Prob.**	Maximum	5%	Prob.**
		Statistics	Critical Value		Eigenvalue Statistics	Critical Value	
None*	0.846381	79.67507	47.85613	0.0000	35.59235	27.58434	0.0038
At most 1*	0.779874	44.08272	29.79707	0.0006	28.75758	21.13162	0.0035
At most 2*	0.547634	15.32514	15.49471	0.0530	15.07199	14.26460	0.0372
At most 3	0.013235	0.253147	3.841466	0.6149	0.253147	3.841466	0.6149

Trace test indicates 1 co-integrating equation(s) at the 0.05 level
 Max-eigenvalue test indicates 1 co-integrating equation(s) at the 0.05 level
 * denotes rejection of the hypothesis at the 0.05 level
 **MacKinnon-Haug-Michelis (1999) p-values

Source: Researcher's Computation from E-Views.

The stock market volatility model that examined the long-run relationship between stock market volatility model variables; all share index and economic development; human factor development were tested for the null hypothesis of no co-integration on the assumption of the linear deterministic trend. The model includes HDI, ASI, INFR, and LIR (INFR and LIR are control variables). The result of the co-integration is presented in Table 6. The results from the Trace and Maximum-Eigen probability show two (2) co-integration equations. The results are based on the probability of the critical values less than the 5% level of significance and rejection of the null hypothesis. The study then indicates that there is co-integration among the variables of the stock market volatility model. This connotes that there is a long-run relationship between stock market volatility and economic development in South Africa.

Granger Causality Test

Granger causality test is carried out to show the direction of the variables in each of the models formulated. The direction here could be bi-directional, unidirectional or no-direction. The decision rule is to accept the null hypothesis when the F-probability is greater than the 5% level of significance. Otherwise, reject the null hypothesis.

Table 7 Mauritius Result of the Granger Causality among Variables of Stock Market Volatility Model, $HDI = f(ASI, INFR, LIR)$

Null Hypothesis:	Observations	F-Statistic	Prob.	Decision
ASI does not Granger Cause HDI	19	0.81638	0.4620	No Causality
HDI does not Granger Cause ASI		0.37196	0.6960	
INFR does not Granger Cause HDI	19	1.28103	0.3084	No Causality
HDI does not Granger Cause INFR		2.04380	0.1664	
LIR does not Granger Cause HDI	19	0.32579	0.7273	No Causality
HDI does not Granger Cause LIR		2.70582	0.1015	
INFR does not Granger Cause ASI	19	0.97112	0.4028	No Causality
ASI does not Granger Cause INFR		2.92751	0.0867	
LIR does not Granger Cause ASI	19	1.48694	0.2597	Unidirectional Causality
ASI does not Granger Cause LIR		5.16678	0.0209	ASI → LIR
LIR does not Granger Cause INFR	19	4.24235	0.0363	Unidirectional Causality
INFR does not Granger Cause LIR		2.29013	0.1379	LIR → INFR

Source: Researcher's Computation from E-Views.

Table 7 shows the pair-wise Granger causality test for the stock market volatility model. Based on the decision rule, two unidirectional relationships were revealed: the flow from all share-index to lending interest rate and lending interest rate to inflation rate are significant.

Thus, the results specifically showed that:

- i. There is no causality between all share-index and human development index as a proxy for economic development.
- ii. There is no causality between inflation rate, lending interest rate and human development index as a proxy for economic development and inflation rates and all share-index.
- iii. There is a unidirectional causality that flows from all share-index to lending interest rate and another that flows from lending interest rate to the inflation rate.

Thus, the study concluded that there is no causality between the stock market volatility variables and economic development in Mauritius. However, there is a causal relationship between the stock market volatility variable and a control variable, and causality between two of the control variables employed in the model in Mauritius.

Table 8 Nigeria Result of the Granger Causality among Variables of Stock Market Volatility Model, HDI =f (ASI, INFR, LIR)

Null Hypothesis:	Observations	F-Statistic	Prob.	Decision
ASI does not Granger Cause HDI	19	0.28122	0.7590	No Causality
HDI does not Granger Cause ASI		0.00835	0.9917	
INFR does not Granger Cause HDI	19	0.55940	0.5838	No Causality
HDI does not Granger Cause INFR		0.78317	0.4760	
LIR does not Granger Cause HDI	19			Bi-directional
		10.6600	0.0015	Causality
HDI does not Granger Cause LIR		6.47628	0.0102	LIR↔HDI
INFR does not Granger Cause ASI	19			Unidirectional
		5.56434	0.0167	Causality
ASI does not Granger Cause INFR		0.05724	0.9446	INFR → ASI
LIR does not Granger Cause ASI	19	0.36222	0.7025	No Causality
ASI does not Granger Cause LIR		0.36016	0.7038	
LIR does not Granger Cause INFR	19			Unidirectional
		1.38581	0.2824	Causality
INFR does not Granger Cause LIR		5.72524	0.0152	INFR → LIR

Source: Researcher's Computation from E-Views.

Table 8 shows the pair-wise Granger causality test for the stock market volatility model. Based on the decision rule, one bi-directional relationship and two unidirectional relationships were revealed. The bi-directional causality is between LIR and HDI. The unidirectional relationship flows from: inflation rate to all share-index and inflation rate to lending interest rate. Thus the results specifically showed that:

- i. There is no causality between all share-index and human development index as a proxy for economic development.
- ii. There is no causality between the inflation rate and the human development index as a proxy for economic development and inflation rates and all share-index.
- iii. There is no causality between the lending interest rate and all share-index.
- iv. There is bi-directional causality is between the lending interest rate and the human development index.
- v. The first unidirectional causality flows from an inflation rate to all share-index while the second flow from an inflation rate to the lending interest rate.

Thus, the study concluded that there is no causality between the stock market volatility variable and economic development in Nigeria. However, there is a bi-directional causality relationship between the lending interest rate as a control variable and the human development index. Again, unidirectional causality between inflation rate and all share- index on one hand and inflation rate and the lending interest rate on the other in Nigeria.

Table 9 South Africa Result of the Granger Causality among Variables of Stock Market Volatility Model, $HDI = f(ASI, INFR, LIR)$

Null Hypothesis:	Observations	F-Statistic	Prob.	Decision
ASI does not Granger Cause HDI	19	1.36035	0.2885	No Causality
HDI does not Granger Cause ASI		2.57859	0.1113	
INFR does not Granger Cause HDI	19	0.62820	0.5479	No Causality
HDI does not Granger Cause INFR		0.03741	0.9634	
LIR does not Granger Cause HDI	19	2.92541	0.0868	No Causality
HDI does not Granger Cause LIR		1.59373	0.2379	
INFR does not Granger Cause ASI	19	0.81876	0.4610	No Causality
ASI does not Granger Cause INFR		0.86924	0.4407	
LIR does not Granger Cause ASI	19	0.94429	0.4124	No Causality
ASI does not Granger Cause LIR		0.04085	0.9601	
LIR does not Granger Cause INFR	19	0.04471	0.9564	No Causality
INFR does not Granger Cause LIR		3.40766	0.0623	

Source: Researcher's Computation from E-Views.

Table 9 shows the pair-wise Granger causality test for the stock market volatility model. Based on the decision rule:

- i. There is no causality between all share-index and human development index as a proxy for economic development.
- ii. There is no causality between the inflation rate and the human development index as a proxy for economic development and inflation rates and all share-index.
- iii. There is no causality between the lending interest rate and all share-index.

Thus, the study concluded that there is no causality between the stock market volatility variable and economic development in South Africa. However, there is no causal relationship between the lending interest rate as a control variable and the human development index. Again, there is no causality between inflation rate and all share- index on one hand and inflation rate and the lending interest rate on the other in South Africa.

Result of the Ordinary Least Square (OLS) Estimation of Models

Six models were formulated. These are: stock market size model, stock market liquidity model, stock market volatility model, mutual fund asset model, foreign direct investment (equity capital) model, and combined stock market indicators are estimated and the impact is reported below for each of the countries; Mauritius, Nigeria, and South Africa.

Table 10 Mauritius Result of the OLS Estimation of the Stock Market Volatility Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.828483	0.013183	62.84715	0.0000
ASI	0.000415	0.000158	2.626100	0.0177
INFR	-0.000652	0.002327	-0.280227	0.7827
LIR	-0.006759	0.000943	-7.169327	0.0000
R-squared	0.818756			
F-statistic	25.59882	Durbin-Watson stat	1.731912	
Prob. (F-statistic)	0.000002			

Source: Researcher's Computation from E-Views.

Table 10 shows the result of the estimated stock market volatility model based on the ordinary least squares (OLS) technique. The analysis shows the contribution of each of the variables of stock market volatility in the economic development of Mauritius. The result shows that ASI has a significant positive impact on economic development (probability = 0.0177 and coefficient = 0.000415). INFR as a control variable has an insignificant negative impact on economic development (probability = 0.7827 and coefficient = -0.000652). Also, LIR as a control variable has significant negative impact on economic development (probability = 0.0000 and coefficient = -0.006756).

The coefficient of determination, R-squared (R^2) is 0.818756 and indicates that about 82% of the changes in economic development are explained by the variation in stock market volatility indicator (ASI). The F-statistic explains the overall significance of the variable of stock market volatility (ASI) on economic development. The F-statistic is 25.59882 with a probability value of 0.000002 less than a 5% level of significance. Based on the F-probability, the study concludes that the stock market volatility variable has an overall significant impact on economic development in Mauritius. The coefficient of Durbin-Watson is 1.731912 and is approximately 2. This shows that the model is free of autocorrelation.

Table 11 **Nigeria Result of the OLS Estimation of the Stock Market Volatility Model**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.825555	0.210744	3.917339	0.0011
ASI	0.000702	0.000729	0.962224	0.3494
INFR	0.014737	0.007366	2.000539	0.0617
LIR	-0.031616	0.011654	-2.712969	0.0148
R-squared	0.370889			
F-statistic	3.340746	Durbin-Watson stat		1.647143
Prob. (F-statistic)	0.044071			

Source: Researcher's Computation from E-Views.

In Table 11 the result of the estimated stock market volatility model based on ordinary least squares (OLS) technique was analyzed to show the contribution of each of the variables of stock market volatility on the economic development of Nigeria. The result shows that ASI has an insignificant positive impact on economic development (probability = 0.3494 and coefficient = 0.000702). INFR a control variable has an insignificant positive impact on economic development (probability = 0.0617 and coefficient = 0.014737). LIR another control variable in the model has a significant negative impact on economic development (probability = 0.0148 and coefficient = -0.031616).

The coefficient of determination, R-squared (R^2) is 0.370889 and indicates that about 37% of the changes in economic development are explained by the variation in stock market volatility indicator (ASI). The F-statistic explains the overall significance of the variables of stock market volatility (ASI) on economic development. The F-statistic is 3.340746 with a probability value of 0.044071 less than a 5% level of significance. Based on the F-probability, the study concludes that the stock market volatility variable has an overall significant impact on economic development in Nigeria. The coefficient of Durbin-Watson is 1.647143 and is approximately 2. This shows that the model is free of autocorrelation.

Table 12 South Africa Result of the OLS Estimation of the Stock Market Volatility Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.664512	0.022335	29.75185	0.0000
ASI	-0.000173	0.000198	-0.875761	0.3934
INFR	0.000920	0.003151	0.292092	0.7738
LIR	-0.002360	0.001658	-1.423766	0.1726
R-squared	0.144543	Durbin-Watson stat		1.998480
F-statistic	0.957473			
Prob. (F-statistic)	0.435285			

Source: Researcher's Computation from E-Views.

In Table 12 the result of the estimated stock market volatility model based on ordinary least squares (OLS) technique was analyzed to show the contribution of each of the variables of stock market volatility on the economic development of South Africa. The result shows that ASI has an insignificant negative impact on economic development (probability = 0.3934 and coefficient = -0.000173). INFR as a control has an insignificant positive impact on economic development (probability = 0.7738 and coefficient = 0.000920). Another control variable LIR has an insignificant negative impact on economic development (probability = 0.1726 and coefficient = -0.002360). The coefficient of determination, R-squared (R^2) is 0.144543 and indicates that about 14% of the changes in economic development are explained by the variation in stock market volatility indicator (ASI). The F-statistic explains the overall significance of the variables of stock market volatility (ASI) on economic development. The F-statistic is 0.957473 with a probability value of 0.435285 greater than a 5% level of significance. Based on the F-probability, the study concludes that the stock market volatility variable has an insignificant impact on economic development in South Africa. The coefficient of Durbin-Watson is 1.998480 and is approximately 2. This shows that the model is free of autocorrelation.

Validation of Hypotheses

The study examined one objective using the Johansen co-integration test, the Pair-wise Granger Causality test, and the Ordinary Least Square test. In this sub-section, the study used the results of the tests above to address the hypotheses formulated. The null hypothesis is formulated as follows:

Ho₁: Stock market volatility does not contribute significantly to the economic development of SSA countries.

However, the hypothesis is addressed below in line with the objective of the study. The hypothesis is examined and concluded by the SSA countries; Mauritius, Nigeria, and South Africa in the study as follow:

Impact of Stock market volatility on the economic development of SSA countries

Test of hypothesis 3: Stock market volatility does not contribute significantly to the economy development of SSA countries.

The result that tests whether there is a long-run relationship between stock market volatility and economic development in SSA countries is presented in Tables 4, 5 and 6 for Mauritius, Nigeria, and South Africa respectively. The result of the Johansen co-integration test for the three countries; Mauritius, Nigeria, and South Africa show that there is co-integration among the

variable of the stock market volatility model. This implies that there is a long-run relationship between stock market volatility and the human development index as a proxy for economic development in Mauritius, Nigeria, and South Africa.

The pairwise Granger causality test to show the direction of the stock market volatility variable in this model is presented in Tables 7, 8 and 9 for Mauritius, Nigeria, and South Africa respectively. The result of the pairwise Granger causality test indicated that ASI does not have a causal relationship with HDI as a proxy for economic development in Mauritius, Nigeria, and South Africa.

The results of coefficient of determination (R^2) or F-probability from the OLS techniques showed that stock market volatility could significantly explain only: 82% or 0.000002, 37% or 0.044071, 14% or 0.435285 of the factors that influence human development index as a proxy for economic development in Mauritius, Nigeria, and South Africa respectively. In the overall assessment, combined variables of this model were significant at the 5 % level of significance in Mauritius and Nigeria, but insignificant in South Africa. Thus, the study accepted the alternative hypothesis that stock market volatility does contribute significantly to economic development (i.e. human development factor) of SSA countries as indicated in Mauritius and Nigeria while in South Africa, the study accepted the null hypothesis that the stock market does not contribute significantly to economic development in SSA countries.

Conclusion

The study accepted that all the variables of stock market volatility model indicators have a significant impact on the human development index in the three SSA countries; Mauritius, Nigeria, and South Africa. Stock market volatility has a significant positive impact on economic development in two SSA countries; Mauritius and Nigeria while in South Africa stock market volatility have an insignificant positive impact on her economic development. Here, only 82%, 37% and 14% in Mauritius, Nigeria, and South Africa respectively can explain changes in the economic development (i.e. human development index) of these countries. This implies that the remaining 18%, 63% and 86% change in economic development (human development index) of Mauritius, Nigeria and South Africa respectively can be explained by other variables that are excluded from this model.

Recommendations

Here, the recommendation is based on the findings from the analysis of the model as follows:

Stock Market Volatility

Stock market volatility has a significant positive impact on economic development in Mauritius and Nigeria but an insignificant positive impact on economic development in South Africa. To curb the insignificant positive position of South Africa and improve upon the significant positive positions of Mauritius and Nigeria, uncertainty about the prices of stock in the future should be reduced and confidence of investors of any kind in the stock markets restored. For this to come about, the government should put in place stringent laws on insider trading and implementation of appropriate penalties for companies' failure to submit annual reports and other vital information to the stock market authorities as at when due for proper flow of information (i.e. efficient market hypothesis).

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References

- Adusei, M. (2014) Does Economic Growth Promote Financial Development? *Research in Applied Economics*, (6)2, (Retrieved from [https:// www. macrothink.org/journal/index.php/rae/article/viewFile/5106/4753](https://www.macrothink.org/journal/index.php/rae/article/viewFile/5106/4753) on 28/08/2018).
- Al-Fake, M. (2006). The Nigeria capital market and socioeconomic development. *Paper presented at the 4th Distinguished Faculty of Social Science Public Lecture, University of Benin 26 July*, pp. 9-16.
- Aremu, O.S., Suberu, O.J. & Ladipo, O.O. (2011). Impact of the Nigerian capital market operations on the local investments in Nigeria, *Journal of Research in International Business Management* Vol. 1(8): 258-261.
- David-Wayas, O.M. (2014). The causal relationship between stock market performance and economic growth in Nigeria. *Innovate Journal of Social Science* Vol. 2, Issue
- Edame, G. E. & Okoro, U. (2013). The impact of the capital market on economic growth in Nigeria. *Public Policy and Administration Research* Vol.3, No.9, 2013.
- Eleanya, K.N., Ugochukwu, E.A. & Ishaku, R.N. (2016). Investigating the causal relationship between the stock market and aggregate economic performance of South Africa. *Asian Economic and Financial Review*, 2016, 6(4): 218-227
- Helpman, E. (2004): *The mystery of economic growth*. Harvard University Press, MA.
- Ibenta, S.N. (2005). *Investment analysis and financial management strategy*. Enugu: Institute for Development Studies. Pp. 435.
- Ishioro, B.O. (2013). Stock market development and economic growth: Evidence from Zimbabwe. *Ekon. MisaoPraksa DBK. GOD XXII. BR. 2. (343-360)*
- Khetsi, Q.S. & Mongale, I.P. (2015). The impact of capital markets on the economic growth in South Africa. *Journal of Governance and Regulation*, 4(1)
- Kozhan, R. (2010), *Financial Econometrics with Eviews*. Ventus Publishing. Available from: <http://bookboon.com/en/financial-econometrics-eviews-ebook>. [Accessed: 5th September 2018].
- Magwera, R. & Mashamba, R. (2016). Stock market development and economic growth: An empirical analysis of Zimbabwe (1989-2014). Retrieved from https://is.muni.cz/do/econ/soubory/aktivita/fai/66372847/FAI2016_03-02.pdf on 28/08/2018
- Nomfundo, P. V. (2013). The impact of stock market development on economic growth: Evidence from South Africa. *An unpublished dissertation submitted to the Faculty of Management and Commerce, The University of Fort Hare (East London Campus)*.
- Okoye, L.U., Modebe, N. J. & Okorie, U.E. (2016). Capital market development and economic growth - The case of Nigeria. *Institutional Frameworks, Building, and National Development (IFBND) Conference*.
- Oladipo, T. & Bashorun, T. A. B. (2013). Capital market development and economic growth: Evidence from Nigeria. *International Journal of Humanities and Social Science Invention*, Volume 2 Issue 12, PP.01-13.

Olagunde, A.O., Elumilade, D.O. &Asaolu, T.O. (2006). Stock market capitalization and interest rate in Nigeria: A time series analysis. *International Research Journal of Finance and Economics*, Issue 4.

Onakoya, A.B. (2013). Stock market volatility and economic growth in Nigeria (1980-2010), *International Review of Management and Business Research*, 2 (1), 201 –209.

Romer, P.M. (1986): Increasing returns and long-run growth. *Journal of Political Economy*, Vol. 94, No. 5.

Rurangwa, G. & Shukla, J. (2017). Capital market development and economic growth: Evidence from Rwanda. *International Journal of Economics, Commerce, and Management*, Vol. V, Issue 10

Ruwaydah, A. &Ushad, S.A. (2015). Effects of stock market development on economic growth: The case of SADC countries. *Third Middle East Conference on Global Business, Economics, Finance and Banking*.

Shaibu, I.B., Osemwengie, P.K. &Oseme, S.A. (2014). Capital market activities and economic growth in Nigeria: Further evidence from VAR methodology. *International Journal of Business and Management Review* 2 (3) 32-47.

World Bank Development Report, 2018, <https://www.worldbank.org/en/.../wdr2018/brief/world-development-report-2018-data>
Accessed: 08/07/2018.

World Bank Economic Review, 2016, **Volume 30, Issue 1**, <https://elibrary.worldbank.org/loi/wber>
Accessed: 08/07/2018.