The **Nature Of Causal Nexus Among The Stock Market Indices Of South Africa And Select African Markets**

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Abstract

The study aims to present the linkages or relationship among South African stock market and five other major stock markets in Nigeria, Morocco, Mauritius, Botswana and Kenya using various econometric techniques. The analysis relies on standard and well accepted techniques of ADF Test, Johansen cointegration test and Granger causality to uncover the long-run relationship among the variables using monthly data of six variables for a period of 11 years and 3 months. The responses of a variable to innovations in other variables are traced by simulating Impulse Response Function. This study reveals absence of cointegration between the selected markets. But a uni-directional causality is indicated from LMASI to LJSE, LJSE to LSEMDEX and LJSE to LBSE. Impulse Response Function shows that that a shock on LJSE solicits an increase in LBSE which is consistent with the Granger Causality.

Index Terms: African stock markets, cointegration, Granger causality.

I. INTRODUCTION

Integration leads to international risk sharing as investment restrictions are reduced. A higher degree of market segmentation will increase the level of risk, consequently affecting the local cost of capital and economic growth [1, 2, 3]. This can affect long-term economic growth by varying resource distribution and

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savings rates[4, 5, 6].

The figure and size of stock markets in Africa has been increased notably in the past decades. Interestingly the number of active African stock markets has increased from 5 in 1960 to 18 by the close of 2002 [7, 8]. At present, there are 29 formal stock markets in Africa. This substantial increase in stock Markets in Africa can be attributed to the broad financial sector reforms undertaken by a number of African countries [9].

II. LITERATURE REVIEW

Stock market linkages, integration or interdependence have been investigated by various researchers. Stock markets are understood to be integrated with an existence of correlation between markets. The previous studies shows mixed and inconsistent results which sometimes even contradict with each other.

The integration of African stock markets has been contemplated by various researchers Wang, Yang and Bessler [10, 11, 12]. (2003), Collins and Abraham (2004) and Piesse and Hearn (2005). [13] also studied the level of exposure of African stock markets to the Asian fiscal crisis. There is segmentation of African stock markets from global markets regardless of some structural adjustments and there exists country – specific local index fluctuations [14].

Many African stock markets have experienced significant improvement, rapid growth and liberalisation [15]. Liberalization and globalization of world markets have brought about inter-relatedness of financial markets and contagion global events [16].

It is behind this background that this study intends to identify the long-run relationship and linkages of the stock markets of South Africa and select African countries.

The South African market is well developed and liquid relative to other markets in Africa, and an analysis of its integration with other African markets enhances the conclusions and would add value to the existing literature.

III. RESEARCH QUESTIONS

Although researchers have been studying about the emerging markets, the studies related to African market is comparatively less. African markets are small in size [17] and this makes them susceptible to speculation and manipulation [18]. Decisively, they stay particularly illiquid, and sparingly traded, that affects their informational efficiencies[19, 20].

So, this study is done on the understanding that, there is a need for reliable evidence on the integration of African stock markets. According to studies by [21, 22], African economies are young and have low correlation with global stock markets. This investigation widens the present literature by suggesting additional evidence on the integration of selected African stock indices. The following research questions are considered for this study:

1. Are the selected African stock markets co-integrated?
2. What is the direction of dynamic interaction among the chosen stock market indices of Africa?
3. Is there any long-standing causal association between various African stock market indices considered for study?
4. Is there any short- run dynamics among the selected stock indices?

IV. DATA

In this paper, integration of South African stock market with five other major African stock markets viz., Nigeria, Morocco, Mauritius, Botswana and Kenya (chosen on the basis of data availability) is investigated using various econometric techniques. Monthly data is chosen since it avoids distortions [23]. In the estimated model, the Johannesburg Stock market (JSE) is the dependent variable while the stock markets of Nigeria, Morocco, Mauritius, Kenya and Botswana are the independent variables. Table 1 shows a brief description of variables considered for this study.

Table 1 Brief Description of Variables

Variable	Definition of variables
LJSE	Logarithms of Monthly average of Johannesburg Stock Exchange (JSE) All Share Index of South Africa
LNSE	Logarithms of Monthly average of Nigeria Stock Exchange (NSE) All Share Index of Nigeria
LMASI	Logarithms of Monthly Average of Morocco All Share Index (MASI)
LSEMDEX	Logarithms of monthly Average Stock Exchange of Mauritius index (SEMDEX) of Mauritius
LNSE_20	Logarithms of Monthly average of Nairobi Securities Exchange (NSE_20) of Kenya
LBSE	Logarithms of monthly average of Botswana Stock Exchange (BSE) of Botswana

Monthly data for a period of 11 years and three months (from January 2004 to March 2015) is considered. The data is compiled from www.investing.com website.

V. METHODOLOGY

Rooted in the above discussion, this study tries to probe into the long run linkages between the stock price indices of South Africa and five selected African stock markets. To conduct the empirical analysis, JSE stock index of South Africa is considered as the dependent variable. The following empirical model is estimated.

Xt = (LJSEt, LNSEt, LMASIt, LSEMDEXt, LNSE_20t, LBSEt,)

Where,

LOGJSE is the stock market index representing South Africa. LNSE, LMASI, LSEMDEX, LNSE_20 and LBSE are the stock market indices of Nigeria, Morocco, Mauritius, Kenya and Botswana respectively.

X is a 6×1 vector of variables.

A four stage approach is used in this paper. Given that the key area of interest is the dynamic relations between the variables, numerous multiple equation models of cointegration are integrated in this application.

i. The initial stage tests the existence unit root for the logarithms of the indices in levels and first differences so as to measure the order of integration of the series. Augmented Dickey Fuller (ADF) testing procedure is followed here.

ii. In the second stage a multivariate VAR system is constructed, with its corresponding VECM. Then in order to determine the number of cointegrating vectors, maximum likelihood tests of [24] Johansen and Juselius (1990) is used.

iii. The third stage investigates Granger causality to understand the direction of integration.

iv. The fourth stage follows Impulse Response Function to explore the dynamic relationship between the variables.

A. Unit Root Test – Augmented Dickey Fuller Test

The time series data analysis technique is employed to study the relationship between the South African and African stock market indices. The stationarity of the time series is examined by the popular method of Augmented Dickey-Fuller (ADF) unit root test put forth by American scholars Dickey and Fuller.

Every time series is tested separately to make certain non-stationarity at the levels of the data, and also run the unit root tests on the first differences to ensure I(1). The equation for the ADF is shown in (1).

$$\Delta y = \alpha_0 + \alpha_1 y_{t-1} + \sum_{i=1}^{n} \alpha_i y_{t-i} + \varepsilon_t$$

The additional lagged terms are incorporated to make sure that the errors are not correlated. The null hypothesis of the test is (H0): Y_t is not I (0).

B. Johansen Multivariate Cointegration Test

To test the long run equilibrium relationship between the stock price indices, the cointegration procedure introduced by [24] is utilized. Johansen method employs Trace test and Eigen value so as to find out the number of cointegrating relationships that may exist between the variables. A stable long run relationship between stock index and related variable does exist, if the hypothesis that there is no cointegration is rejected. The Johansen's estimation model is shown in equation (2).

$$\Delta X_t = \mu + \sum_{i=1}^{p} \Gamma_i \Delta X_{t-i} + \alpha\beta' X_{t-1} + \varepsilon_t$$

where, ΔX_t = (n x1) vector of all the non-stationary indices in our study.

Γ_t = (n x n) vector matrix of coefficients

α = (n x r) matrix of error correction coefficients where r is the number of cointegrating relationships in the variables, so that $0 < r < n$. This determines the speed at which the variables adjust to their equilibrium. (Also known as the adjustment parameter). β = (n x r) matrix of r cointegrating vectors, so that $0 < r < n$. This represents the long-run cointegrating relationship between the variables.

C. Granger Causality Test

The causal linkages amid the variables in this study are determined by using the methodology based on [25]. The Granger tests estimation is carried out using the equations (3) and (4).

$$X_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} X_{t-i} + \sum_{l=1}^{m} \alpha_{2l} Y_{t-m} + \varepsilon_{1t}$$

$$Y_t = \beta_0 + \sum_{j=1}^{n} \beta_{1j} Y_{t-j} + \sum_{h=1}^{p} \beta_{2h} X_{t-h} + \varepsilon_{2t}$$

where,

ε_{1t} and ε_{2t} are assumed to be uncorrelated and $E(\varepsilon_{1t}\,\varepsilon_{1s}) = E(\varepsilon_{2t}\,\varepsilon_{2s})$ for all $s \neq t$.

These equations can be used to show the unidirectional causality from stock price index and macroeconomic variables. If the estimated coefficients α21 are statistically significant .i.e., α21≠0, then Y Granger causes X. Similarly, if β2h is statistically significant, i.e., β2h≠0, then X is the cause variable for Y. If both α21 and β2h are significant, there is a mutual dependency between these variables. If both α21 and β2h are statistically insignificant, then X and Y are independent.

D. Impulse Response Function

Impulse response captures the responsiveness of the endogenous variables in the VAR system when a shock is given to the error term of own variable and other variables. The recursive composition presumes that variables appearing first contemporaneously impact the latter variables but not vice versa.

VI. EMPIRICAL RESULTS

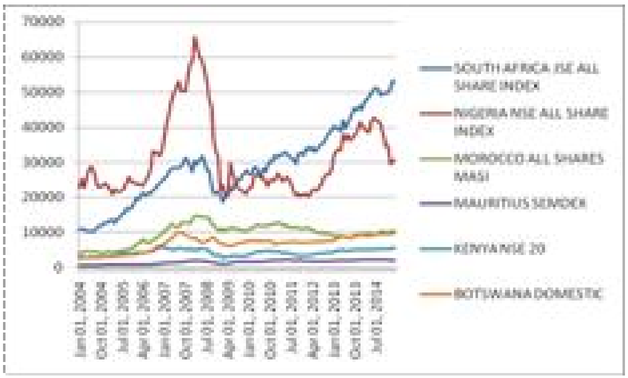

Figure 1 Movement of indices in the observed period

The above figure presents the movement of all the six indices in the observed period from Jan 2004 to March 2015.

A. Descriptive Statistics

Table 2 shows that the mean and median of all the indices are equal. The values of standard deviation indicates that LJSE is comparatively more volatile followed by LSEMDEX. It is also clear that LNSE_20 is the least volatile among the selected indices. It is evident that Skewness is negative for all the markets except LNSE. Kurtosis is positive for all markets. Thus table 2 shows that the selected variables are consistent with the conventional research norms.

Table 2 Descriptive Statistics

	LJSE	LNSE	LMASI	LSEMDEX	LNSE_20	LBSE
Mean	10.19	10.30	9.11	7.24	8.31	8.75
Median	10.26	10.17	9.23	7.43	8.34	8.88
Maximum	10.88	11.09	9.59	7.67	8.66	9.19
Minimum	9.22	9.89	8.24	6.36	7.81	7.83
Std. Dev.	0.43	0.31	0.35	0.40	0.23	0.39
Skewness	-0.56	0.77	-1.07	-0.83	-0.41	-1.06
Kurtosis	2.68	2.48	2.97	2.18	2.03	2.75
Jarque-Bera	7.73	14.83	25.73	19.17	8.96	25.53
Probability	0.02	0.00	0.00	0.00	0.01	0.00

B. Correlation

The correlation matrix indicates high level of correlation between JSE and SEMDEX and JSE and BSE. BSE and SEMDEX are highly positively correlated. These high correlation also points towards interdependence among these indices.

Table 3 Correlation matrix

	L JSE	LNSE	LMASI	LSEMDEX	LNSE_20	LBSE
L JSE	1					
LNSE	0.39	1				
LMASI	0.71	0.42	1			
LSEMDEX	0.93	0.37	0.83	1		
LNSE_20	0.66	0.71	0.47	0.54	1	
LBSE	0.91	0.51	0.87	0.92	0.62	1

C. Unit Root Test – Augmented Dickey Fuller Test

The Augmented Dickey Fuller (ADF) test is applied for testing the stationarity of LJSE, LNSE, LMASI, LSEMDEX, LNSE_20 and LBSE. Table 4 depicts the results on levels and first difference.

Table 4 Results of ADF test for unit root

ADF(Augmented Dickey Fuller) Test		
Variables	Levels	First Difference
LJSE	-1.839736	-11.94246
LNSE	-1.491222	-10.05146
LMASI	-1.455864	-10.74925
LSEMDEX	-2.560595	-8.636863
LNSE_20	-1.610455	-10.51047
LBSE	-1.747751	-7.226810

The critical values for unit root tests at 1%, 5% and 10% significance levels are -3.99,-3.42 and -3.13 (with trend) for ADF. ADF test results indicates that variables are stationary and integrated of order I(1). This indicates that Johansen multivariate cointegration test can be applied to observe whether these variables are co-integrated.

D. Lag Length Selection

Table 5 VAR Lag Order Selection Criteria

LLag	LogL	LR	FPE	AIC	SC	HQ
0	243.42	NA	9.58e-10	-3.73	-3.60	-3.68
1	1290.24	1978.25	1.17e-16	-19.66	-18.72*	-19.27*
2	1340.72	90.61	9.35e-17*	-19.88*	-18.14	-19.17
3	1363.07	38.01	1.17e-16	-19.67	-17.12	-18.63
4	1391.03	44.91	1.35e-16	-19.54	-16.18	-18.18
5	1431.46	61.14	1.30e-16	-19.61	-15.45	-17.92
6	1460.34	40.93	1.52e-16	-19.50	-14.53	-17.48
7	1500.83	53.56*	1.50e-16	-19.57	-13.79	-17.22
8	1534.76	41.67	1.69e-16	-19.54	-12.95	-16.86

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

An empirical analysis is carried out by estimating an unrestricted VAR. A lag order test is performed to find out the optimal lag length for the estimations. The test identified lag two (AIC) as the optimal lag length for the estimations as shown in table 5.

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E. Cointegration test results - Johansen test results

Table 6 provides the test statistics for cointegration and critical values at 5% level. The result shown in the table is obtained by considering 2 lags and without any trend term. The differenced variables are transformed into logs.

Table.6 Results of Trace Test - Johansen cointegration

Hypothesized No.of CE(s)	Trace Statistic	0.05 Critical Value	Prob.**	Significance at 5% level
None	94.07	95.75	0.0649	-
At most 1	63.61	69.82	0.1415	-
At most 2	38.95	47.85	0.2621	-
At most 3	18.03	29.79	0.5636	-
At most 4	6.09	15.49	0.6847	-
At most 5	1.16	3.84	0.2821	-

Trace test indicates no cointegration at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

The Trace Test result in Table 6 indicates that there does not exist any cointegrating equation at 5% level. No linear combination exists between variables that force these indices to have a relationship over the entire time period, despite potential deviation from equilibrium levels in the short-term.

Table.7 Results of Max-Eigen Value Test - Johansen cointegration

Hypothesized No. of CE(s)	Max-Eigen Statistic	0.05 Critical Value	Prob.**	Significance at 5% level
None	30.46	40.08	0.39	-
At most 1	24.66	33.88	0.40	-
At most 2	20.92	27.58	0.28	-
At most 3	11.94	21.13	0.55	-

At most 4	4.93	14.26	0.75	-
At most 5	1.16	3.84	0.28	-

Max-eigenvalue test indicates no cointegration at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

The Maximum Eigen Value Test also shows that there are no cointegrating equations at the 5% level confirming the Trace Test.

Five different specifications of the model linking the variables were tested. Although trace test indicates one cointegrating equation for three models, Max–Eigen value suggests absence of cointegration between the variables as depicted in Table 8.

Table.8 Selected Number of Cointegrating Relations by Model at 5 per cent level of significance.

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
No. C.E.[1]					
Trace	1	1	0	0	1
Max-Eig	0	0	0	0	0

*Critical values based on MacKinnon-Haug-Michelis (1999)

[1] no. of co integrating equations.

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F. Granger Causality Tests

Table 9 Pairwise Granger Causality Tests

Null Hypothesis	F-Statistic	Prob.
LNSE does not Granger Cause LJSE	2.58	0.07
LJSE does not Granger Cause LNSE	1.50	0.22
LMASI does not Granger Cause LJSE	3.35**	0.03
LJSE does not Granger Cause LMASI	1.37	0.25
LSEMDEX does not Granger Cause LJSE	1.51	0.22
LJSE does not Granger Cause LSEMDEX	3.38**	0.03
LNSE_20 does not Granger Cause LJSE	0.36	0.69
LJSE does not Granger Cause LNSE_20	1.04	0.35
LBSE does not Granger Cause LJSE	0.61	0.54
LJSE does not Granger Cause LBSE	5.22**	0.00

** denotes significance at 5 per cent

The null hypothesis H_0 is for no causal relation

Optimal lag length is 2, this was selected based on Akike Information criteria (AIC)

As there is absence of co integration among the six stock market indices, Granger Causality test is used to find out the direction of causality. The results indicate uni-directional causality from LMASI to LJSE, LJSE to LSEMDEX and LJSE to LBSE.

G. Impulse response functions

The short run dynamics is evaluated with the help of impulse response functions. Impulse response function is used to investigate the effect of a shock to one endogenous variable on the other variables in VAR.

The result of impulse response function shows that there is considerable response to own shock (self response) for all the variables. A one standard deviation shock to LJSE results in a positive response on LNSE and it is almost steady all over the period.

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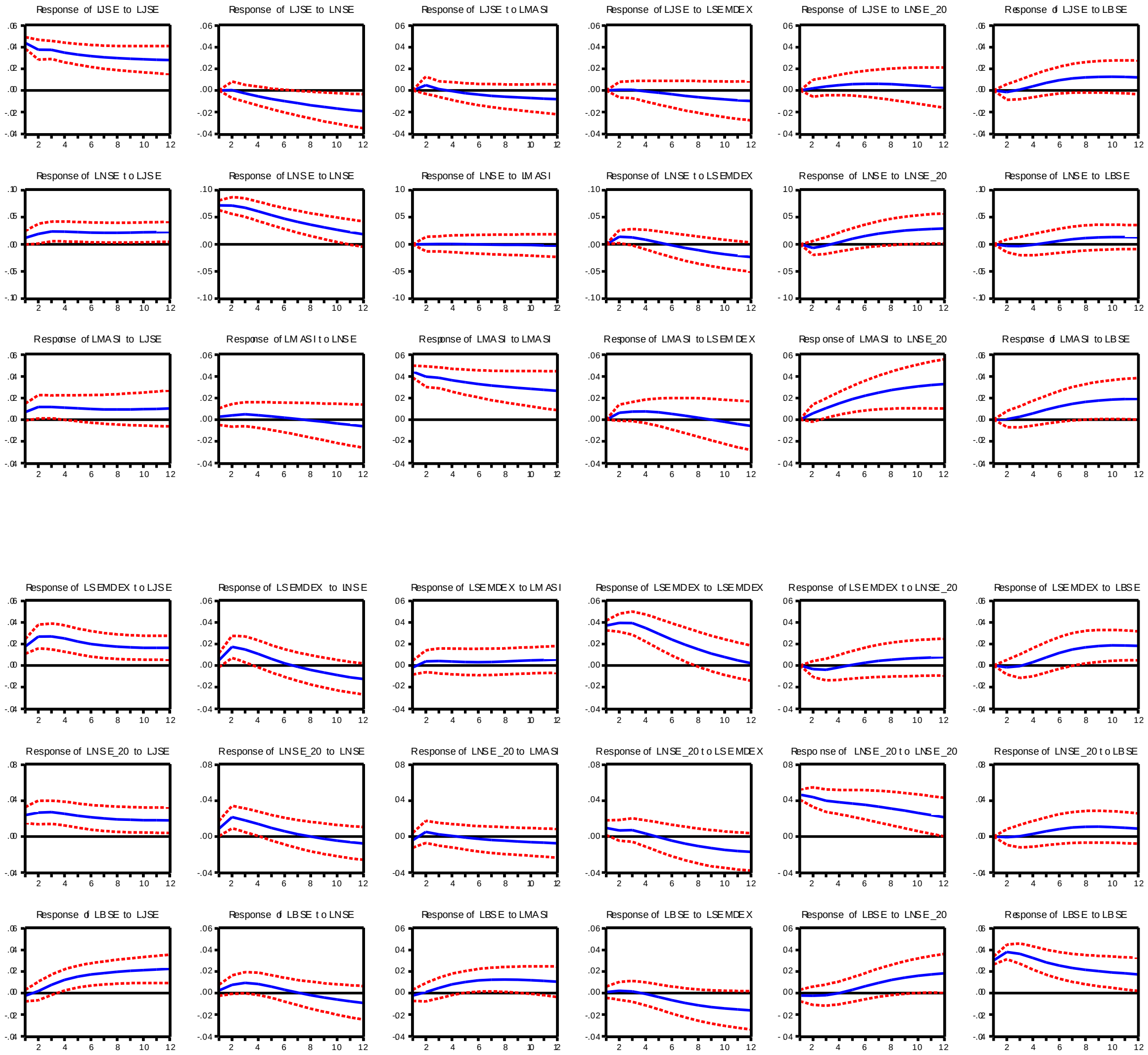

This is in consistency with the Granger Causality results. It leads to an initial increase in LMASI, LSEMDEX and LNSE_20 which gradually declines in these twelve months. It can be noted that a shock on LJSE solicits an increase in LBSE which gradually increases throughout the twelve months. LJSE do not show any response in the initial 3 months after which it shows negative response.

The impact of a shock on LNSE solicits negative response from LJSE. LMASI, LSEMDEX, LNSE-20 and LBSE show similar responses i.e, an initial positive response which gradually decreases and becomes negative in 7 to 8 months.

The LMASI shocks result in an initial positive response from LJSE and LNSE_20 which subsides after 3 to 4 months and becomes negative. LSEMDEX shows a positive response to LMASI shocks which remains stable throughout twelve months. LBSE shows a positive response which gradually starts declining after 9 months.

LNSE, LNSE_20 and LBSE show a slight positive response to shocks on LSEMDEX, which turns negative after 4 to 5 months. LSEMDEX has a positive effect on LMASI which turns negative after 9 months. LMASI shows a positive as well as increasing response to a shock on LNSE_20. Although LJSE shows a positive response it subsides after twelve months. LNSE_20 shock results in similar responses shown by LNSE, LBSE and LSEMDEX. They turn negative first and then positive. LJSE, LNSE, LNSE_20 and LSEMDEX react negatively in the first 2 to 3 months and then positively to a shock on LBSE. LSEMDEX shows positive response after two months.

The result is consistent with the Granger Causality test results that LJSE solicits an increase in LBSE and LSEMDEX. Similarly LJSE responds to LMASI.

VII. CONCLUSION

The empirical results obtained bear various implications on the dynamic linkages between the South African stock markets and the select African markets. The absence of cointegration among the indices under study indicates the unpredictability of these indices at least in the long-run and this signifies the efficiency of these markets. Although granger causality test shows causality from LMASI to LJSE, LJSE to LSEMDEX and LJSE to LBSE, it is only unidirectional. The result of the impulse response function confirms that these indices do not have long-run co- movement. From these results it is obvious that most of the selected markets are independent of each other. It also shows that investors can invest in these markets without the fear of repercussions, even though they are still not fully developed avenues. In future, research can be extended by examining the impact of macroeconomic variables on the various African markets using econometric tools.

REFERENCES

1. Bekaert, G & Harvey, C.R., "Time-Varying World Market Integration." The Journal of Finance, Vol.43, 1995, pp.403–444.
2. Bekaert, G. "Market Integration and Investment Barriers in Emerging Equity Markets." The World Bank Economic Review, Vol.9(1), 1995, pp.75-107.
3. Han Kim, E. & Singal, V. "Stock Market Openings: Experience of Emerging Economies." The Journal of Business, Vol.73(1), 2000, pp.25-66.
4. Obstfeld, M. "Risk-Taking, Global Diversification, Growth." American Economic Review, vol.84, 1995, 1310-29.
5. Bracker, K., Docking, D. & Koch, P. "Economic determinants of evolution in international stock market integration." Journal of Empirical Finance, Vol.6(1), 1999, pp.1-27.
6. Stulz, R. "Globalization of Equity Markets and the Cost of Capital." SSRN Electronic Journal., 1999
7. UNDP. "African Stock Markets Handbook." United Nations Development Programme, New York, 2003.
8. Ntim, C., Opong, K., Danbolt, J. & Senyo Dewotor, F. "Testing the weak- form efficiency in African stock markets." Managerial Finance, vol.37(3), 2011, pp.195-218.
9. Kenny, C. & Moss, T. "Stock markets in Africa: Emerging lions or white elephants?." World Development, 26(5), 1998, pp.829-843.
10. Wang, Z., Yang, J. & Bessler, D. "Financial crisis and African stock market integration." Applied Economics Letters, vol.10(9), 2003, pp.527-533.
11. Collins, D. & Abrahamson, M. "African equity markets and the process of global financial integration." South African Journal of Economics, Vol.72(4), 2004, pp.658-683.
12. Piesse, J. & Hearn, B. "Regional integration of equity markets in Sub-Saharan Africa." The South African Journal of Economics, vo.73(1), 2005, pp.36-52.
13. Collins, D. & Biekpe, N. "Contagion: a fear for African equity markets?" Journal of Economics and Business, Vol.55(3), 2003, pp.285-297.

14. Agyei-Ampomah, S. "An Empirical Examination of the Inter-Linkages between African Stock Markets." SSRN Electronic Journal. Available athttp://dx.doi.org/10.2139/ssrn.1311325, 2008.
15. Allen, F., Otchere, I. & Senbet, L. "African financial systems: A review." Review of Development Finance, Vol. 1(2), 2011, pp.79-113.
16. Catherine, S.F. "Domestic Macroeconomic Fundamentals and World Stock Market Effects on ASEAN Emerging Markets." International Journal of Economics and Management. Vol.5(1), 2011, pp. 1-18.
17. Kenny, Charles and Todd Moss "Stock Markets in Africa: Emerging Lions or White Elephants?" World Development, 1998, Vol. 26, No. 5
18. Magnusson, M. & Wydick, B. "How Efficient are Africa's Emerging Stock Markets?." Journal of Development Studies, Vol. 38(4), 2002, pp.141-156.
19. Mlambo, C. & Biekpe, N. "Thin Trading on African Stock Markets: Implications for Market Efficiency Testing." Investment Analyst Journal, vol. 61, 2005, pp.29-40.
20. Ntim, C., Opong, K. & Danbolt, J. "An Empirical Re-Examination of the Weak Form Efficient Markets Hypothesis of the Ghana Stock Market Using Variance-Ratios Tests". African Finance Journal, Vol. 9(2), 2007, pp.1- 25.
21. Moin, S. "New Frontier Markets tempt Investors." African Review of Business and Technology, vol.1, 2007, pp.1-7.
22. Alagidede, P. "Equity market integration in Africa." African Review of Economics and Finance. Vol. 1(2), 2010, pp. 88-119.
23. Marashdeh, H & Shrestha, M. "Stock market integration in GCC countries." International Research Journal of Finanace and Economics, vol.37, 2010, pp.104-114. Retrieved from http;//www.eurojournals.com/irjfe_37_11.pdf
24. Johansen, S. & Juselius, K. "Maximum Likelihood Estimation and Inference on Cointegration-with Application to the Demand for Money." Oxford Bulletin of Economics and Statistics, vol.52, no.2, 1990, pp.169-210.
25. Granger, C.W.J., "Developments in the Study of Cointegrated Economic Variables." Oxford Bulletin of Economics and Statistics, vol.48, 1986, pp. 213-228.

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