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Financial Integration and Gross Capital Formation in Sub Sahara Africa

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Abstract

This study examined financial integration and gross fixed capital formation in Sub-Sahara Africa. Specifically, we ascertained the impact of foreign direct investment, foreign portfolio investment, exchange rate, trade openness and external debt on gross fixed capital formation in Nigeria, Kenya and South Africa. The nature of the study necessitated the use of secondary data covering the period of 1981 through 2019. We adopted a combination of Co-integration and Error Correction Model (ECM) in examining the impact of financial integration on gross fixed capital formation (GFCF) in Sub-Sahara Africa. The Augmented Dickey fuller (ADF) Unit root tests were used to ascertain the series properties of the variables. Having established the stationarity of the variables, the Johansen co-integration technique was used to test the short run dynamic behavior of the model. Thereafter, the Error Correction Model (ECM) regression was used for the analysis. The study revealed that Gross Fixed Capital Formation (GFCF) among Sub-Saharan African countries is influenced by Foreign Direct Investments (FDI). The study also revealed that Gross Fixed Capital Formation (GFCF) among Sub-Saharan African countries is negatively and significantly influenced by Foreign Portfolio Investments (FPI) in Nigeria and South Africa, but positive and insignificant in Kenya, and that a positive change in Exchange Rate (EXCHAR), Trade Openness (TOPN and External Debts (EXTD) impact significantly on Gross Fixed Capital Formation (GFCF) in Sub-Saharan African countries. We therefore recommend that strategies to expand Foreign Direct Investments be set up in Sub-Sahara Africa. These may include positive macroeconomic arrangements identifying with trade openness, exchange rate and so on so as to support and enhance Gross Fixed Capital Formation improvement in Sub-Sahara Africa.

Keywords: Financial Integration, Gross Fixed Capital Formation, Error Correction Model.

Introduction

With the liberalization of capital accounts and regional groupings across different economies of the world, debate among researchers in this academic field has somehow shifted from emphasis on the role financial integration plays on economic growth to the role of financial integration on total formation of gross capital among different nation This paradigm shift has become imperative especially because of the acknowledgement that financial integration could exert significant impact on the formation of total gross capital in the economy.

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Financial integration measures the extent or degree to which a country economy is open to the global or world market (Gochoco-Bautista & Mapa, 2010). It is the agreed economic interdependence among nations of the world which promote flow of savings, investments, technologies and capital across borders and an integrated process of financial and economic decision making that bothers on savings, investments as well as consumption across the world (World Bank, 2017). Hence, the real investments by economic units attracted through the financial integration process further enhance the accumulation of capital in a domestic economy and offer greater chances to develop production capacity, increased employment opportunities and income generation (Adegbite & Adetiloye, 2013).

Financial integration is extending its limelight to emerging market economies. Therefore, the emerging economies are experiencing more capital inflows in forms of direct investment that are foreign, portfolio investment that are foreign, trade openness and other external fund sources. In the theoretical sphere, it is expected that financial integration will facilitate the sharing of risk, further enhance specialization of products, foster the allocation of capital that is efficient, ensure the development of an improved financial system as well as ensure that capital flows from countries where capital is abundant to countries where capital is scarce and with output that is positive and significant.

However, we cannot fully analyze the very essence of financial integration without taking a careful look at the way it contributes to the total gross capital formed in the economy of a particular country. This is in view of the fact that it has been acknowledged that the total gross capital formed go a long way in determining the growth and development of different economies especially in Africa. It should be noted that capital has a natural role to play in the process of growth and development of an economy, overtime, and also it has been seen as an enhancing player of growth. The formation of capital goes a long way in determining the capacity to produce nationally and this in turn impact on the growth of the economy. Till date, the rising literature debate about the costs and benefits and hence the effect of financial integration on gross fixed capital formation in the economy of African countries is still unsettled as there is no consensus agreement amongst the researchers and academics on the relationship that exists between them (Barron & Obijiaku 2007; Usman, 2009). The insufficiency of gross fixed capital formation has turned out to be crucial characteristic problems of economic development in African countries despite laudable economic reforms, treaties and incredible rise in capital inflows from their various resources. It is on record that the flows of foreign capital investments into Africa remain low relatively and this impact negatively and significantly

on development. Subsequently the increase in capital expenditure in these African countries has not been satisfactorily explained to have impacted significantly on gross capital formed and consequently growth and development of the economy (Adekunle & Aderemi, 2012; Donwa & Odia, 2009; Chen & Quang, 2012). This study therefore assesses the impact of financial integration on gross fixed capital formation in Sub-Sahara African countries namely Nigeria, Kenya and South Africa.

Literature Review: Conceptual, Theoretical and Empirical Review

The Concept of Gross Fixed Capital Formation

In the finance and economic literature, capital formation is being referred to as the process whereby assets of value are stocked or amassed. It can also be referred to as capital accumulation resulting in increase in wealth or additional wealth creation. The formation of capital is different from savings because capital accumulation or formation has to do with increasing the stock of real investments that are really needed and of course, not necessarily all savings are invested. Also, in recent time though, it has been observed that many researchers have confused capital formation with investment. Investment is resulted from the capital formation of a particular country's economy It is imperative to realize that investment can be in human (capital) development, assets that are financial, assets that are real whether productive or unproductive. However it has been observed overtime that increase in investment through assets that are non-financial can lead to increase in value to the economy and a further increase in employment and hence a multiplier effect on the gross domestic product (Adekunle & Aderemi 2012).

Concept of Financial Integration

Financial integration is the process in which different economies and markets operating on regional, neighboring and international scales are financially linked in clear terms. Financial integration of different economies in the world can occur through a formal agreement in which the institutional authorities of those countries agree to come together to examine and proffer solutions to financial obstacles amongst the uniting nations (Adekunle & Aderemi 2012). There are different kinds of financial integration. These may include sharing of best management practices and benchmarking among financial and non-financial institutions, sharing of cutting edge technology. Financial integration also ensures viable creation of infrastructure that are mostly financial and this in turn curb the incidence of information asymmetries and help to drastically decrease moral hazard and the problems of adverse selection (Levine, 2001; Chen & Quang, 2012; Moritz & Steger, 2010; Samuel, 2010; Edison, Levine, Ricci, & Slok, 2002). Nevertheless, it should be noted that

financial integration could also impact negatively on growth by virtue of the fact that it could increase the possibility of market and financial especially when foreign capital flows suddenly reverses.

Components of Financial Integration

Foreign Direct Investment (FDI)

FDI is an investment that exists by virtue of control ownership in a business in a particular country by a business entity which is based in another economy or country. Broadly, foreign direct investment may also refer to mergers and acquisitions, building new facilities, reinvesting profits earned from overseas operations and intracompany loans (Binfigloli, 2007, Kariuk, 2015). When narrowly defined, foreign direct investment refers to the building new operating facility and management interest that will last (10% or more of voting rights) in a firm that is operating in an economy that is different from that of the investor. FDI comprises all equity capital, long-term sources of capital, and short-term sources of capital as is shown and evidenced in the balance of payments. Furthermore, FDI may also include participation in management, joint-venture arrangement, technology and expertise transfer (Igor, 2015; Akilou, 2011). Stock of FDI is the net cumulative FDI for a particular period (outward FDI minus inward FDI). Direct investment may not include investment through the purchase of equities and shares (Samuel 2010).

Foreign Portfolio Investment (FPI)

Foreign portfolio investment (FPI) in the finance and economic literature has been duly acknowledged to consist of investment securities and other assets used for financial transactions that are passively in the position of foreign investors by way of investment holdings. It does not make the investor, direct owners of financial assets and at times can be liquid in relative terms depending on how volatile the market is (Obiechina, 2010; Okonkwo, 2016). Although FDI provides a situation whereby companies maintain a better control ownership over and above the firm that is abroad, it might be a challenge when it comes to selling or disposing the firm at a premium price in the nearest future. Foreign portfolio investment is part of the capital account of a country and is always reflected on its balance of payments (BOP). The balance of payment measures the amount and value of money that flows from a specific country to another country on an annual basis. It may include the country's monetary transfers, investments that are capital based and the level and number of imports and exports of goods and services. Foreign portfolio investment (FPI) consists of securities that are traded financially such as, bonds, equities, futures, swaps and forwards, etc., traded on a financial market that is recognized internationally.

Exchange Rate

Exchange rate is the price of a nation's currency in terms of another currency. Thus, an exchange rate has two components, the domestic currency, and a foreign currency, and can be quoted either directly or indirectly. In a direct quotation, the price of a unit of foreign currency is expressed in terms of the domestic currency. In an indirect quotation, the price of a unit of domestic currency is expressed in terms of the foreign currency. Exchange rates are quoted in values against the US dollar. However, exchange rates can also be quoted against another nation's currency, which is known as a cross currency, or cross rate (Ssekuma, 2011). In a developing country like Nigeria with great dependence on trade, the exchange rate has implications for balance of payments viability and the level of external debt. For example, when exchange rate is overvalued, it will result to unmaintainable balance of payments deficit, encourage capital flight and heighten external debt stock, which in turn will lead to weakening level of investment. However, with a real depreciation of exchange rate, the cost of imported capital goods increases, and because a huge investments in developing countries are imported, local investment will be likely diminish with a real depreciation (Iyoha, 1998).

Trade Openness

Trade openness is used to describe the orientation of a given country's economy either inwardly or outward. Outward orientation is term used to describe those economies that take advantage of the significant opportunities to engage in trade with other economies or countries. Orientation inwardly is used to describe those economies that may not care so much about taking advantage of significant opportunities to trade with other economies or countries. Trade openness boosts inputs and exports of goods and services, and improves domestic technology and expatriate. Hence, production process is more effective, reliable and productivity rises. As a result, economics that is open to world trade grow faster then closed ones. Increasing in trade openness is assumed to have a positive impact on growth (Adegboyega & Odusanya, 2014). Among the trade policies made by economies or countries that take advantage of outward or inward orientation are technologies, scale economies, trade barriers, market competitiveness, import-export infrastructure. The index of trade openness is an economic ratio that relates the sum of imports and exports to a country's gross domestic product. The higher the ratio of trade openness to GDP, the higher the impact of trade on local economic activities.

External Debts

External loan (or foreign debt) is used to describe the total level of debt that a particular country owes to their foreign counterparts coupled with the internal debt owed to lenders that operate domestically. External debt is that part or portion of a country's debt that was borrowed from foreign leaders such as commercial banks, governments or international financial institution such as international monetary fund and World Bank. These loans including interest, most usually be paid to the county in which the loan was borrowed from or made. External debt is considered a significant source of fund for developing nations. The evidence suggested that moderate and well invested fund from external debt will lead to economic growth and prosperity, while increased and unmanaged debt will lead to decline or dwindling in economic growth, pushing the country to the risk of high debt profile (Matinda, 2014; World Bank, 2018). It should be noted that when gross liability figures are used for countries which are the major centers for financial transactions (e.g. the United Kingdom due to London's role as a financial capital), it greatly distorts the ratio and may therefore not conform with net international investment position.

Review of Empirical Studies

Ugwuanyi, Efanga and Ogochukwu (2020) ascertained the impact of foreign direct investment on gross fixed capital formation in Nigeria between 1981 and 2018. Data employed for this study was elicited from World Bank Data Base-World Developmental Indicators of 2018 and Central Bank of Nigeria Statistical Bulletin of 2018. This study employed gross fixed capital formation as proxy for economic development in Nigeria, and exchange rate was employed as a controlled variable while data on foreign direct investment inflow to Nigeria was adopted as the explanatory variable. This study employed Auto Regressive Distributed Lag (ARDL) Model to analyze data; other diagnostic tests such as: stability test, Auto correlation test, Heteroskedasticity test and Breusch-Godfrey Serial Correlation LM test were also carried out and they confirmed the validity and reliability of the model employed. The inferential results pointed out that foreign direct investment impacted positively but insignificantly on gross fixed capital formation in Nigeria between 1981 and 2018.

Masturah, Norfaiezah, Zaidi and Siti (2020) examined the short-run and long-run relationship between macroeconomic indicators and FDI, from 1982 to 2015. The macroeconomic indicators were trade openness, real exchange rate, export goods and services, real gross domestic product (GDP), and gross fixed capital formation (GFCF). The co-integrating test had shown that FDI was significantly related to trade

openness, real exchange rate, export of goods and services, GDP, and GFCF. The findings of vector error correction model (VECM) indicated that a short-run relationship existed between FDI and variables like GDP and GFCF. This study found that there was long-run relationship between FDI and the macroeconomic indicators. Nwafor (2020) assess the effect of foreign portfolio investment on gross capital formation. Econometric techniques, including Descriptive Statistics, Augmented Dickey Fuller and Philip Perron Tests for Unit Roots were used while Ordinary Least Square (OLS) regression analysis was used to test the hypotheses. The results of the study indicate that foreign portfolio investment has positive and significant effect on gross capital formation.

Adegoriola and Agunbiade (2020) examined the impact of foreign portfolio and direct investment on the Nigerian gross fixed capital formation (1986-2017). Annual time series data were sourced from the Central Bank of Nigeria, National Bureau of Statistics and World Development Indicators and the estimation technique employed was Error Correction Mechanism (ECM). The result from Augmented Dickey-Fuller test shows that all the variables were not stationary at level but were stationary at first difference. The co-integration test showed that the key variables were co-integrated, which shows long run relationship among variables. The short-run dynamic property of ECM in this study is supported by Forecast Error Variance Decomposition tests which showed that FPI account for most of the variations and changes in gross fixed capital formation more than FDI which has less variation and changes in gross fixed capital formation. The ECM result shows that the ECM has the right signs (negative) which shows that the model correct short-run disequilibrium in the previous period to equilibrium in the current period. The estimated results of the model show that FPI and FDI have positive and insignificant impact on gross fixed capital formation.

Fredrick, Okeke and Sheriff (2013) assessed the relationship between fluctuations in exchange rate and inflow of capital into Nigeria from 1970 to 2010. The (GARGH) generalized autoregressive conditional Heteroskedasticity model was used to analyze the secondary data. The result showed that fluctuations in exchange rate has impact on the inflow of capital into Nigeria economy over the period investigated is little, whereas, trade openness is significantly related. Hence, the study, recommends formulation of trade openness policies to create opportunities for inducing optimal capital inflows needed to galvanize economic growth. Adegboyega and Odusanya (2020) examined the nexus between trade openness, foreign direct investment (FDI), capital formation, and economic growth rate in Nigeria which spanned over a period of 25 years (i.e.1986 - 2011), using time series data analysis. The stationarity tests were conducted since time

series data are assumed to produce spurious outcome. Hence, all variables of interest were tested using ADF and PP unit root test, and they were all found to be stationary at first differencing. Perhaps, the Johansen procedure is applied to establish the co-integrating relation between variables of interest. Subsequently, the result of the study showed a long-run equilibrium relationship of gross domestic growth rate and the explanatory variables. The study shows a significant positive effect between the degree of trade openness, level of capital formation while a positive but insignificant relationship exist between the volume of FDI and gross domestic product growth rate.

Theoretical Framework

The Theory of Global Financial Integration

The advocates of this theory postulate that foreign financial integration and globalization may foster a robust allocation of resources, improved specialization in products, facilitation of risk diversification, produce technological spin-offs, ensures financial systems development, improve rates of investment and a more resourceful allocation of capital among viable opportunities of investment and a significant boost to economic growth (Balae, Krylova, Hordahl, Ferrando 1954; Domar, 2014; World Bank, 2018). Contrarily, Eichengreen (2001), in his review opposes the advocates of global financial integration by postulating that financial integration causes several distortions in a way in which free flow of capital through liberalization of capital controls from abroad will hamper growth and optimal allocation of resources. For instance, trade distortion and liberalization may cause the flow of capital from the foreign scene into the sector of an economy in which a country has not competitive advantage. By the same token, it is argued that presence of financial integration in countries that are developing with weak policies and institutions, (poor legal and finance systems), really encourages leakages of capital from inadequate nations to nations that are rich in terms of capital with superior framework that are institutional. Therefore, many theories conclude that foreign financial integration will stimulate growth only in countries with stable institutions and policies framework (Edison, Levine, Ricci, & Slok, 2002; Boyd & Smith 1992). The Theory of global financial integration is therefore the framework on which this study is based.

From the review of the empirical and theoretical literature, it is obvious that while many studies on financial integration and gross fixed capital formation have been conducted in the developed countries (Alessia, McMillan & Marco, 2017, Ugwuebe, Modebe & Onyeanu, 2014, Diacon, Starkey, O Brien & Odindo, 2002; Rosko, 2002) only a few have been conducted in developing countries in Africa (Barros & Obijiaku,

2007; Barros, Guglielmo & Ibiwoye, 2008). This study contributes to already existing literature by measuring the impact of financial integration on gross fixed capital formation in the economy of Nigeria, Kenya and South Africa using the period of 1981 to 2019.

Methodology

To examine the relationship and therefore the impact of financial integration on gross fixed capital formation in the economy of some selected Sub-Saharan African countries namely; Nigeria, Kenya and South Africa, we employ a longitudinal research design which is appropriate for a study of this nature. The choice of this design was based on the fact that the variables under consideration are historical in nature and therefore the researcher lacks the ability to manipulate the dependent and independent variables due to the fact that they have already occurred.

The choice of Nigeria, South Africa and Kenya to be studied in Africa is based on the need for this study to have a regional coverage and hence a scope that is wider. Besides, these countries have large markets with relatively strong economies. Secondary data covering a period of thirty-nine years (1981-2019) were collected in form of annual time series data from Central Bank of Nigeria (CBN) Statistical Bulletin and World Bank data online.

The financial integration and gross fixed capital formation relationship is determined using the the Error Correction Model (ECM) regression technique. The residual series of the estimated equation is tested for stationarity with Augmented Dickey-Fuller (ADF) unit root test in order to detect long-run relationship between financial integration variables and gross fixed capital formation. The time series properties of the variables are examined by ADF unit root test. ADF tests are used to test for the stationarity of the series so as to be sure that we are not analyzing inconsistent and spurious relationships. Granger causality concept is introduced to investigate whether observation of a variable like ratio of gross fixed capital formation in the economy to GDP is potentially useful in anticipating future movement in gross fixed capital formation (GFCF) and to test Granger Causality between financial integration (FI) and gross fixed capital formation (GFCF) in Sub-Sahara Africa. This is useful in determining the impact of financial integration on gross fixed capital formation in Sub-Sahara African countries.

The specification of the regression equation derives from the Ugwuanyi, Efanga & Ogochukwu (2020) foreign direct investment and gross fixed capital formation equation. The econometric model of this study is specified below:

$GFCF = \beta_o + \beta_1 FDI + \beta_2 EXR + e_t$

Where:

GFCF: Gross Fixed Capital Formation

FDI: Foreign Direct Investment

EXR: Exchange Rate

e_t: Error Terms

β_o: Constant

β_1 and β_2: coefficient of their respective variables

t: Time

However, the study adapt the scholarly work of Ugwuanyi, Efanga & Ogochukwu (2020) by employing additional financial integration variables such as Foreign Portfolio Investment (FPI), Trade Openness (TOP) and External Debt (EXTD) in order to deepen the scope due to the peculiarity of the region under investigation. Therefore the regression model is specified below:

Functional form is given as:

$GFCF_t = F\{FDI, FPI, TOPN, EXCHR, EXTD)$

The econometric form of the long run Error Correction Model (ECM) equation is specified as follow:

$$\Delta GFCF_t = \beta_o + \sum_{i=1}^{n} \beta_1 \Delta GFCF_{t-1} + \beta_2 \sum_{i=1}^{n} \Delta FDI_{t-1} + \beta_3 \sum_{i=1}^{n} \Delta FPI_{t-1} + \beta_4 \sum_{i=1}^{n} \Delta TOPN_{t-1} + \beta_5 \sum_{i=1}^{n} \Delta EXCHR_{t-1} + \beta_6 \sum_{i=1}^{n} \Delta EXTD_{t-1} + \beta_7 ECM(-1)_{t-1} + e_t$$

Where:

$GFCF_t$ = Ratio of gross fixed capital formation in the economy to GDP at time t

FDI_t= Ratio of foreign direct investments into the economy to GDP at time t

FPI_t= Ratio of foreign portfolio investments into the economy to GDP at time t

$TOPN_i$= Ratio of trade openness in the economy to GDP at time t

$EXCHR_t$= Exchange rate in the economy to GDP at time t

$EXTD_t$= Ratio of external debts in the economy to GDP at time t

Δ= Difference operator

ECM(-1)= Error correction term

t = Time

βo = Constant Term or Intercept

β_1, β_2, β_3, β_4 and β_5 = coefficients of the respective independent variables

e_t = idiosyncratic term is assumed to be normally and independently distributed with zero mean and constant variance, representing all explanatory variables not captured in the model but influence gross fixed capital formation in the economy of Nigeria, Kenya and South Africa.

Analysis of Results and Discussion of Findings

Descriptive Statistics for Nigeria

Table 1: Descriptive Statistics (Nigeria)

	GFCF	FDI	FPI	TOPN	EXCHR	EXTD
Mean	0.085142	0.001200	1.564526	0.180757	100.0364	0.205196
Median	0.004936	0.000198	0.002862	0.190555	100.8016	0.121018
Maximum	0.617180	0.010215	40.50539	0.346519	306.9537	0.598224
Minimum	0.000129	3.936236	-3.861641	0.044062	0.610000	0.012632
Std. Dev.	0.159811	0.001972	7.133280	0.084858	89.56252	0.202432
Skewness	2.116498	2.734625	4.629524	0.062488	0.756943	0.672340
Kurtosis	6.511143	12.29469	24.68233	2.060565	3.025855	1.961205
Jarque-Bera	49.15037	188.9940	903.2620	1.459504	3.725341	4.691795
Probability	0.000000	0.000000	0.000000	0.482029	0.155257	0.095761
Sum	3.320523	0.046793	61.01651	7.049538	3901.418	8.002640
Sum Sq. Dev.	0.970498	0.000148	1933.580	0.273635	304814.9	1.557192
Observations	39	39	39	39	39	39

Source: E-view 9.0 Output, 2021

The characteristics of the estimated variables are displayed in Table1 with the aid of descriptive statistics. A critical look at the result presented in Table 1 revealed that the dependent variable GFCF exhibited a

positive mean value vary from 0.000129 to 0.617180 signifying that GFCF of Nigerian economy positively skewed during the study period. Also the other independent variables [FDI, FPI, TOPN, EXCHR, EXTD] exhibited positive mean values of 0.001200, 1.564526, 0.180757, 100.0364 and 0.205196 correspondingly. The table 4.1 further revealed that the individual variable standard deviations reflected nominal distribution (±) from the values of the mean recorded; this can be considered extremely attractive (desirable). Furthermore, Jargue Bera test likelihood (probability) worth for majority of the factors are considerably lesser than the 0.05 signifying that the sequence are not consistently spread (distributed).

Descriptive Statistics for Kenya

Table 2: Descriptive Statistics (Kenya)

	GFCF	FDI	FPI	TOPN	EXCHR	EXTD
Mean	18.51367	0.798271	31788220	3.786511	57.31587	51.98275
Median	18.61133	0.467474	1805250.	3.607384	69.17532	48.61775
Maximum	22.87965	3.457310	95433512	31.52059	88.81077	131.8996
Minimum	15.38790	0.004721	-29288883	-10.64558	9.047498	21.38399
Std. Dev.	1.889610	0.843733	17258921	7.817424	28.29815	26.14336
Skewness	0.178564	1.522256	4.025161	1.186469	-0.567822	0.994744
Kurtosis	2.245555	4.522931	22.63611	5.932084	1.699202	3.669910
Jarque-Bera	1.132184	18.83111	731.8749	23.12042	4.845367	7.161114
Probability	0.567740	0.000081	0.000000	0.000010	0.088683	0.027860
Sum	722.0332	31.13256	12397405	147.6739	2235.319	2027.327
Sum Sq. Dev.	135.6838	27.05164	1.1319074	2322.260	30429.85	25972.06
Observations	39	39	39	39	39	39

Source: E-view 9.0 Output, 2021

The characteristics of the estimated variables are displayed in Table 2 with the aid of descriptive statistics. A critical look at the result presented in Table 2 revealed that the dependent variable GFCF exhibited a positive mean value vary from 15.38790 to 22.87965 signifying that GFCF of Kenya economy positively skewed during the study period. Also the other independent variables [FDI, FPI, TOPN, EXCHR, EXTD] exhibited positive mean values of 0.798271, 31788220, 3.786511, 57.31587 and 51.98275 correspondingly. The table 2 further revealed that the individual variable standard deviations reflected nominal distribution (±) from the values of the mean recorded; this can be considered extremely attractive (desirable). Furthermore, Jargue Bera test likelihood (probability) worth for majority of the factors are considerably lesser than the 0.05 signifying that the sequence are not consistently spread (distributed).

Descriptive Statistics for South Africa

Table 3: Descriptive Statistics (South Africa)

	GFCF	FDI	FPI	TOPN	EXCHR	EXTD
Mean	19.72771	0.953653	-43065482	2.674750	5.707514	19.53598
Median	19.11637	0.553086	-24897953	2.666215	6.359328	19.32575
Maximum	29.12272	5.983101	14302655	10.93811	10.54075	55.07741
Minimum	15.15028	-0.766120	-19627405	-17.02382	0.877579	0.000000
Std. Dev.	3.602484	1.242695	68594545	5.186405	3.088120	17.14159
Skewness	1.132529	1.989457	-0.029467	-1.235713	-0.054811	0.378821
Kurtosis	3.794355	8.176462	3.343622	6.552316	1.564414	2.147412
Jarque-Bera	9.362417	69.26972	0.197518	30.43120	3.368502	2.114004
Probability	0.009268	0.000000	0.905961	0.000000	0.185583	0.347496
Sum	769.3805	37.19247	-16795538	104.3153	222.5931	761.9031
Sum Sq. Dev.	493.1598	58.68310	1.787980	1022.154	362.3865	11165.70
Observations	39	39	39	39	39	39

Source: E-view 9.0 Output, 2021

The characteristics of the estimated variables are displayed in Table 3 with the aid of descriptive statistics. A critical look at the result presented in Table 3 revealed that the dependent variable (GFCF) exhibited a positive mean value vary from 15.15028 to 29.12272 signifying that GFCF of Kenya economy positively skewed during the study period. Also the other independent variables [FDI, FPI, TOPN, EXCHR, EXTD] exhibited positive mean values of 0.953653, -43065482, 2.674750, 5.707514 and 19.53598 correspondingly. The table 3 further revealed that the individual variable standard deviations reflected nominal distribution (±) from the values of the mean recorded; this can be considered extremely attractive (desirable). Furthermore, Jarque Bera test likelihood (probability) worth for majority of the factors are considerably lesser than the 0.05 signifying that the sequence are not consistently spread (distributed).

Unit root test

A grounded practice in singular (individual) time series work is to decide if the singular (individual) factors are non-fixed (stationary) (show unit roots) and to determine whether they are identified with each other in an unwavering long-run (co-integrated) association. Unit root test includes the trial of stationarity for the factors (time series) utilized in the regression examination. The significance of stationarity of time series utilized in regression boundaries on the reality that with a non-stationary time series is beyond the realm of imagination to expect to sum up to other time-frames separated from the present. This makes gauging dependent on such time series to be of minimal pragmatic worth. Also, regression of a non-stationary time

series on another non-stationary time series may create a misleading outcome. The Augmented-Dickey-Fuller (ADF) test and the Philip Perron test are utilized to investigate the unit roots. The outcomes are showed in levels and first difference. This is to allow us ascertain in actual terms the unit root amongst the time series as well as to achieve more healthy findings.

Table 4: Augmented Dicky-Fuller (ADF) Unit Root Test Results (Nigeria)

Unit root tests at levels			
Variable	**ADF-Test Statistic**	**95% Critical ADF Value**	**Remark**
GFCF	-3.617	-2.96	Stationary
FDI	-3.933	-2.96	Stationary
FPI	-6.396	-2.96	Stationary
TOPN	-2.017	-2.96	Non-Stationary
EXCHR	1.398	-2.96	Non-Stationary
EXTD	-0.998	-2.96	Non-Stationary
Unit root test at 1st difference			
Variable	**ADF-Test Statistic**	**95% Critical ADF Value**	**Remark**
GFCF	-4.415	-2.96	Stationary
FDI	-3.851	-2.96	Stationary
FPI	-6.400	-2.96	Stationary
TOPN	-4.995	-2.96	Stationary
EXCHR	-4.251	-2.96	Stationary
EXTD	-2.833	-2.96	Stationary

Source: Eviews 9.0 Output (2021).

Table 4 showed the ADF test outcome in levels without mulling over the pattern of the factors (variables). The justification is that an unequivocal trial of the moving example of the time series has not been done. In the outcome, the ADF test measurements for the factors are appeared in the subsequent section, while the 95% basic ADF worth is appeared in the third segment. The outcome demonstrates that three of the factors at levels have ADF esteems that are not exactly the 95% basic ADF worth of 2.96. Inspecting the factors at levels, the outcome is as per the following; GFCF(ADF=-3.617), FDI(ADF=-3.933), FPI(ADF=-6.396), TOPN(ADF=-2.017), EXCHR (ADF=-1.398), EXTD(ADF=-0.998). As observed only GFCF, FDI and FDI are appeared to be stationary at levels, the other variables are non-stationary at levels.

Pushing ahead, we obtain the first differences individual factors and play out the unit root test on every one of the resultant time series. The reasoning behind this methodology is that as per Box and Jenkins (1976) differencing non-fixed (stationary) time series will empower it to achieve stationarity. Thus, inspecting the

factors at first difference, the outcome is as per the following; GFCF(ADF=-4.415), FDI(ADF=-3.851), FPI(ADF=-6.400), TOPN(ADF=-4.995), EXCHR (ADF=-4.251), EXTD(ADF=-2.833), The aftereffect of the unit root test on these factors in first differencing shows that the ADF esteems in outright terms is more noteworthy than the 95% basic ADF esteems. With these outcomes, these factors are declared to be fixed (stationary). As such, it is fit for policy formulation (prediction).

Table 5: Augmented Dicky-Fuller (ADF) Unit Root Test Results (Kenya)

Unit root tests at levels			
Variable	**ADF-Test Statistic**	**95% Critical ADF Value**	**Remark**
GFCF	-2.818	-2.96	Non-Stationary
FDI	-4.160	-2.96	Stationary
FPI	-4.308	-2.96	Stationary
TOPN	-2.550	-2.96	Non-Stationary
EXCHR	-1.435	-2.96	Non-Stationary
EXTD	-1.265	-2.96	Non-Stationary
Unit root test at 1st difference			
Variable	**ADF-Test Statistic**	**95% Critical ADF Value**	**Remark**
GFCF	-5.600	-2.96	Stationary
FDI	-5.109	-2.96	Stationary
FPI	-4.369	-2.96	Stationary
TOPN	-10.661	-2.96	Stationary
EXCHR	-5.628	-2.96	Stationary
EXTD	-6.203	-2.96	Stationary

Source: Eviews 9.0 Output (2021).

Table 5 showed the ADF test outcome in levels without mulling over the pattern of the factors (variables). The justification is that an unequivocal trial of the moving example of the time series has not been done. In the outcome, the ADF test measurements for the factors are appeared in the subsequent section, while the 95% basic ADF worth is appeared in the third segment. The outcome demonstrates that three of the factors at levels have ADF esteems that are not exactly the 95% basic ADF worth of 2.96. Inspecting the factors at levels, the outcome is as per the following; GFCF(ADF=-2.818), FDI(ADF=-4.160), FPI(ADF=-4.308), TOPN(ADF=-2.550), EXCHR (ADF=-1.435), EXTD(ADF=-1.265). As observed only FDI and FPI are appeared to be stationary at levels, the other variables are non-stationary at levels.

Pushing ahead, we obtain the first differences individual factors and play out the unit root test on every one of the resultant time series. The reasoning behind this methodology is that as per Box and Jenkins (1976)

differencing non-fixed (stationary) time series will empower it to achieve stationarity. Thus, inspecting the factors at first difference, the outcome is as per the following; GFCF(ADF=--5.600), FDI(ADF=-5.109), FPI(ADF=-4.369), TOPN(ADF=-10.661), EXCHR (ADF=-5.628), EXTD(ADF=-6.203). The aftereffect of the unit root test on these factors in first differencing shows that the ADF esteems in outright terms is more noteworthy than the 95% basic ADF esteems. With these outcomes, these factors are declared to be fixed (stationary). As such, it is fit for policy formulation (prediction).

Table 6: Augmented Dicky-Fuller (ADF) Unit Root Test Results (South Africa)

Unit root tests at levels			
Variable	**ADF-Test Statistic**	**95% Critical ADF Value**	**Remark**
GFCF	-3.327	-2.96	Stationary
FDI	-4.616	-2.96	Stationary
FPI	-4.008	-2.96	Stationary
TOPN	-5.775	-2.96	Stationary
EXCHR	-1.072	-2.96	Non-Stationary
EXTD	0.313	-2.96	Non-Stationary
Unit root test at 1st difference			
Variable	**ADF-Test Statistic**	**95% Critical ADF Value**	**Remark**
GFCF	-3.919	-2.96	Stationary
FDI	-5.388	-2.96	Stationary
FPI	-5.595	-2.96	Stationary
TOPN	-5.732	-2.96	Stationary
EXCHR	-4.983	-2.96	Stationary
EXTD	-6.664	-2.96	Stationary

Source: Eviews 9.0 Output (2021).

Table 6 showed the ADF test outcome in levels without mulling over the pattern of the factors (variables). The justification is that an unequivocal trial of the moving example of the time series has not been done. In the outcome, the ADF test measurements for the factors are appeared in the subsequent section, while the 95% basic ADF worth is appeared in the third segment. The outcome demonstrates that three of the factors at levels have ADF esteems that are not exactly the 95% basic ADF worth of 2.96. Inspecting the factors at levels, the outcome is as per the following; GFCF(ADF=-3.327), FDI(ADF=-4.616), FPI(ADF=-4.008), TOPN(ADF=-5.775), EXCHR (ADF=-1.072), EXTD(ADF=0.313). We observed that four of the variables used for the purpose of this study GFCF. FDI, FPI and TOPN appeared to be stationary at levels, the other variables are non-stationary at levels.

Pushing ahead, we obtain the first differences individual factors and play out the unit root test on every one of the resultant time series. The reasoning behind this methodology is that as per Box and Jenkins (1976) differencing non-fixed (stationary) time series will empower it to achieve stationarity. Thus, inspecting the factors at first difference, the outcome is as per the following; GFCF(ADF=--3.919), FDI(ADF=-5.388), FPI(ADF=-5.595), TOPN(ADF=-5.732), EXCHR (ADF=-4.983), EXTD(ADF=-6.664). The aftereffect of the unit root test on these factors in first differencing shows that the ADF esteems in outright terms is more noteworthy than the 95% basic ADF esteems. With these outcomes, these factors are declared to be fixed (stationary). As such, it is fit for policy formulation (prediction).

Pairwise Granger Causality

To determine the character of the causality among all the time series factors especially among GFCF and the different final integration indices, we utilized the Pair Wise Granger Causality Tests. The outcomes appeared in Table 7 below.

In experimenting for Granger causality, two factors (variables) are typically explored jointly, while experimenting for their association. All the possible results of the analyses are four:

i. Unidirectional Granger causality from variable Y_t to variable X_t.
ii. Unidirectional Granger causality from variable X_t to Y_t
iii. Bi-directional causality and
iv. No causality

Here, we present the main results obtained from the Pairwise Granger-causality analysis done in the study. Fifteen (15) pairs of variables (financial integration indicators) were modeled as seen in table below:

The variables examine in this study are represented as follows:

Gross Fixed Capital Formation (GFCF)

Foreign Direct Investments (FDI)

Foreign Portfolio Investments (FPI)

Trade Openness (TOPN)

Exchange Rate (EXCHR)

External Debts (EXTD)

Table 7: Pairwise Granger Causality for Nigeria

Pairwise Hypothesis	Obs.	F-Statistics	P-value	Decision	Type of Causality
FDI does not Granger Cause GFCF	37	0.33889	0.7151	Accept Ho	No Causality
GFCF does not Granger Cause FDI	37	0.25763	0.7745	Accept Ho	No Causality
FPI does not Granger Cause GFCF	37	0.56746	0.5726	Accept Ho	No Causality
GFCF does not Granger Cause FPI	37	0.29187	0.7488	Accept Ho	No Causality
TOPN does not Granger Cause GFCF	37	1.77568	0.1857	Accept Ho	No Causality
GFCF does not Granger Cause TOPN	37	1.31976	0.2814	Accept Ho	No Causality
EXCHR does not Granger Cause GFCF	37	0.30976	0.7358	Accept Ho	No Causality
GFCF does not Granger Cause EXCHR	37	0.74150	0.4844	Accept Ho	No Causality
EXTD does not Granger Cause GFCF	37	0.34815	0.7086	Accept Ho	No Causality
GFCF does not Granger Cause EXTD	37	1.43081	0.2540	Accept Ho	No Causality
FPI does not Granger Cause FDI	37	21.4327	1.E-06	Reject Ho	Uni-directional Causality
FDI does not Granger Cause FPI	37	0.16957	0.8448	Accept Ho	Uni-directional Causality
TOPN does not Granger Cause FDI	37	0.35599	0.7032	Accept Ho	No Causality
FDI does not Granger Cause TOPN	37	0.08362	0.9200	Accept Ho	No Causality
EXCHR does not Granger Cause FDI	37	0.39300	0.6782	Accept Ho	No Causality
FDI does not Granger Cause EXCHR	37	1.12533	0.3371	Accept Ho	No Causality
EXTD does not Granger Cause FDI	37	0.18967	0.8282	Accept Ho	No Causality
FDI does not Granger Cause EXTD	37	0.35501	0.7039	Accept Ho	No Causality
TOPN does not Granger Cause FPI	37	0.32658	0.7238	Accept Ho	No Causality
FPI does not Granger Cause TOPN	37	0.03061	0.9699	Accept Ho	No Causality
EXCHR does not Granger Cause FPI	37	0.63767	0.5351	Accept Ho	No Causality
FPI does not Granger Cause EXCHR	37	0.11712	0.8899	Accept Ho	No Causality
EXTD does not Granger Cause FPI	37	0.30604	0.7385	Accept Ho	No Causality
FPI does not Granger Cause EXTD	37	0.09633	0.9084	Accept Ho	No Causality
EXCHR does not Granger Cause TOPN	37	11.9412	0.0001	Reject Ho	Bi-directional Causality
TOPN does not Granger Cause EXCHR	37	5.46535	0.0091	Reject Ho	Bi-directional Causality

EXTD does not Granger Cause TOPN TOPN does not Granger Cause EXTD	37 37	1.94255 2.17844	0.1599 0.1297	Accept Ho Accept Ho	No Causality No Causality
EXTD does not Granger Cause EXCHR EXCHR does not Granger Cause EXTD	37 37	0.49016 5.02504	0.6171 0.0127	Accept Ho Reject Ho 	Uni-directional Causality Uni-directional Causality

Source: Eviews 9.0 Output, 2021

We used fifteen (15) VAR models/pairs of variables to test for Pairwise Granger (non) causality among the variables and the following results were obtained:

No causality exists between FDI and GFCF. No causality exists between FPI and GFCF, No causality exists between TOPN and GFCF, No causality exists between EXCHR and GFCF, No causality exists between EXTD and GFCF, Uni-directional causality exists between FPI and FDI, No causality exists between TOPN and FDI, No causality exists between EXCHR and FDI, No causality exists between EXTD and FDI, No causality exists between EXCHR and FPI in the eleventh model, No causality exists between EXTD and FPI. Bi-directional causality exists between EXCHR and TOPN, No causality exists between EXTD and TOPN in the fourteenth model, Uni-directional causality exists between EXTD and EXCHR in the last VAR model.

More specifically, we can see that the following uni-directional and bi-directional causality exists between some selected variables: FPI Granger causes FDI, EXTD Granger causes EXCHR, the bi-directional causality results are: EXCHR Granger causes TOPN. The results here confirms the earlier co-integration tests that depicts we have at least five cointegrated equations in the study. However, as expected, given the Granger causality test results, few linkages between the series can be established in line with economic theory and postulations.

Table 8: Pairwise Granger Causality for Kenya

Pairwise Hypothesis	Obs.	F-Statistics	P-value	Decision	Type of Causality
FDI does not Granger Cause GFCF	37	1.69313	0.2000	Accept Ho	No Causality
GFCF does not Granger Cause FDI	37	0.99784	0.3799	Accept Ho	No Causality
FPI does not Granger Cause GFCF	37	1.50596	0.2371	Accept Ho	No Causality
GFCF does not Granger Cause FPI	37	0.59308	0.5586	Accept Ho	No Causality
TOPN does not Granger Cause GFCF	37	2.63661	0.0871	Reject Ho	Uni-directional Causality
GFCF does not Granger Cause TOPN	37	0.25452	0.7768	Accept Ho	Uni-directional Causality
EXCHR does not Granger Cause GFCF	37	1.30163	0.2861	Accept Ho	No Causality
GFCF does not Granger Cause EXCHR	37	0.82792	0.4461	Accept Ho	No Causality
EXTD does not Granger Cause GFCF	37	0.64044	0.5337	Accept Ho	No Causality
GFCF does not Granger Cause EXTD	37	1.19546	0.3157	Accept Ho	No Causality
FPI does not Granger Cause FDI	37	0.00814	0.9919	Accept Ho	Uni-directional Causality
FDI does not Granger Cause FPI	37	4.54601	0.0183	Reject Ho	Uni-directional Causality
TOPN does not Granger Cause FDI	37	1.09508	0.3467	Accept Ho	No Causality
FDI does not Granger Cause TOPN	37	2.03856	0.1468	Accept Ho	No Causality
EXCHR does not Granger Cause FDI	37	1.63566	0.2107	Accept Ho	No Causality
FDI does not Granger Cause EXCHR	37	0.78607	0.4642	Accept Ho	No Causality
EXTD does not Granger Cause FDI	37	2.63049	0.0876	Reject Ho	Uni-directional Causality
FDI does not Granger Cause EXTD	37	0.78111	0.4664	Accept Ho	Uni-directional Causality
TOPN does not Granger Cause FPI	37	0.31474	0.7322	Accept Ho	No Causality
FPI does not Granger Cause TOPN	37	0.19908	0.8205	Accept Ho	No Causality
EXCHR does not Granger Cause FPI	37	0.28493	0.7540	Accept Ho	Uni-directional
FPI does not Granger Cause EXCHR	37	0.01391	0.9862	Accept Ho	Causality Uni-directional Causality

EXTD does not Granger Cause FPI FPI does not Granger Cause EXTD	37 37	0.36144 0.01847	0.6995 0.9817	Accept Ho Accept Ho	No Causality No Causality
EXCHR does not Granger Cause TOPN TOPN does not Granger Cause EXCHR	37 37	0.41754 3.63788	0.6622 0.0377	Accept Ho Reject Ho	Uni-directional Causality Uni-directional Causality
EXTD does not Granger Cause TOPN TOPN does not Granger Cause EXTD	37 37	0.14936 1.02715	0.8619 0.3695	Accept Ho Accept Ho	No Causality No Causality
EXTD does not Granger Cause EXCHR EXCHR does not Granger Cause EXTD	37 37	0.52249 4.46061	0.5980 0.0196	Accept Ho Reject Ho	Uni-directional Causality Uni-directional Causality

Source: Eviews 9.0 Output, 2021

We used fifteen (15) VAR models/pairs of variables to test for Pair wise Granger (non) causality among the variables and the following results were obtained:

No causality exists between FDI and GFCF. No causality exists between FPI and GFCF, Uni-directional causality exists between TOPN and GFCF, No causality exists between EXCHR and GFCF, No causality exists between EXTD and GFCF, Uni-directional causality exists between FPI and FDI, No causality exists between TOPN and FDI, No causality exists between EXCHR and FDI, Uni-directional causality exists between EXTD and FDI, No causality exists between TOPN and FPI in the tenth model. Uni-directional causality exists between EXCHR and FPI in the eleventh model, No causality exists between EXTD and FPI. Uni-directional causality exists between EXCHR and TOPN, No causality exists between EXTD and TOPN in the fourteenth model, Uni-directional causality exists between EXTD and EXCHR in the last VAR model.

More specifically, we can see that the following uni-directional and bi-directional causality exists between some selected variables: TOPN Granger causes GFCF, FPI Granger causes FDI, EXTD does not granger causes Foreign Direct Investment, EXCHR Granger causes FPI, EXCHR Granger causes TOPN, EXTD does not granger causes EXCHR. The results here confirms the earlier co-integration tests that depicts we have at least three cointegrated equations in the study.

However, as expected, given the Granger causality test results, few linkages between the series can be established in line with economic theory and postulations.

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Table 9: Pairwise Granger Causality for South Africa

Pairwise Hypothesis	Obs.	F-Statistics	P-value	Decision	Type of Causality
FDI does not Granger Cause GFCF	37	0.35488	0.7040	Accept Ho	No Causality
GFCF does not Granger Cause FDI	37	2.84731	0.0728	Reject Ho	No Causality
FPI does not Granger Cause GFCF	37	1.89858	0.1663	Accept Ho	No Causality
GFCF does not Granger Cause FPI	37	0.65651	0.5255	Accept Ho	No Causality
TOPN does not Granger Cause GFCF	37	1.90503	0.1653	Accept Ho	Uni-directional Causality
GFCF does not Granger Cause TOPN	37	5.57124	0.0084	Reject Ho	Uni-directional Causality
EXCHR does not Granger Cause GFCF	37	0.48291	0.6214	Accept Ho	No Causality
GFCF does not Granger Cause EXCHR	37	0.57930	0.5661	Accept Ho	No Causality
EXTD does not Granger Cause GFCF	37	0.55866	0.5775	Accept Ho	No Causality
GFCF does not Granger Cause EXTD	37	0.23583	0.7913	Accept Ho	No Causality
FPI does not Granger Cause FDI	37	4.06974	0.0266	Accept Ho	No Causality
FDI does not Granger Cause FPI	37	1.65833	0.2064	Accept Ho	No Causality
TOPN does not Granger Cause FDI	37	1.25467	0.2988	Accept Ho	No Causality
FDI does not Granger Cause TOPN	37	1.26220	0.2967	Accept Ho	No Causality
EXCHR does not Granger Cause FDI	37	2.95223	0.0666	Accept Ho	Uni-directional Causality
FDI does not Granger Cause EXCHR	37	14.6361	3.E-05	Reject Ho	Uni-directional Causality
EXTD does not Granger Cause FDI	37	1.54581	0.2286	Accept Ho	No Causality
FDI does not Granger Cause EXTD	37	3.27183	0.0510	Accept Ho	No Causality
TOPN does not Granger Cause FPI	37	0.40060	0.6732	Accept Ho	Uni-directional Causality
FPI does not Granger Cause TOPN	37	12.2814	0.0001	Reject Ho	Uni-directional Causality
EXCHR does not Granger Cause FPI	37	2.98781	0.0646	Accept Ho	Uni-directional Causality
FPI does not Granger Cause EXCHR	37	7.35207	0.0024	Reject Ho	Uni-directional Causality

EXTD does not Granger Cause FPI	37	4.36705	0.0210	Reject Ho	Uni-directional Causality
FPI does not Granger Cause EXTD	37	1.04727	0.3626	Accept Ho	Uni-directional Causality
EXCHR does not Granger Cause TOPN	37	1.62708	0.2123	Accept Ho	No Causality
TOPN does not Granger Cause EXCHR	37	2.68158	0.0838	Accept Ho	No Causality
EXTD does not Granger Cause TOPN	37	1.17409	0.3221	Accept Ho	No Causality
TOPN does not Granger Cause EXTD	37	2.46619	0.1009	Accept Ho	No Causality
EXTD does not Granger Cause EXCHR	37	1.98589	0.1538	Accept Ho	No Causality
EXCHR does not Granger Cause EXTD	37	0.84178	0.4403	Accept Ho	No Causality

Source: Eviews 9.0 Output, 2021

We used fifteen (15) VAR models/pairs of variables to test for Pairwise Granger (non) causality among the variables and the following results were obtained:

No causality exists between FDI and GFCF. No causality exists between FPI and GFCF, Uni-directional causality exists between TOPN and GFCF, No causality exists between EXCHR and GFCF, No causality exists between EXTD and GFCF, No causality exists between FPI and FDI, No causality exists between TOPN and FDI, Uni-directional causality exists between EXCHR and FDI, No causality exists between EXTD and FDI, Uni-directional causality exists between TOPN and FPI in the tenth model. Uni-directional causality exists between EXCHR and FPI in the eleventh model, Uni-directional causality exists between EXTD and FPI. No causality exists between EXCHR and TOPN, No causality exists between EXTD and TOPN in the fourteenth model, No causality exists between EXTD and EXCHR in the last VAR model.

More specifically, we can see that the following uni-directional causality exists between some selected variables: TOPN Granger causes GFCF, EXCHR Granger causes FDI, TOPN does not granger causes Foreign Direct Investment (FDI), EXCHR Granger causes FPI, External Debts (EXTD Granger causes FPI. The results here confirms the earlier co-integration tests that depicts we have at least no cointegrated equations in the study.

However, as expected, given the Granger causality test results, few linkages between the series can be established in line with economic theory and postulations.

Cointegration Testing

After the establishment of the stationarity properties as it relate to the individual series, the next thing is to test the linear combinations of the incorporated series for co-integration. The variables will be considered co-integrated should the linear combination of each non-stationary series generate a stationary statistics (data) series, and for this reason they explain equilibrium associations. When a linear combination of variables is stationary, then, the relationship between dependent variable and a linear combination among these variables can be thought to be co- integrated. The equation is interpreted as a long-run steady and proportional relationship among the variables (Enders, 2004). Such a linear combination defines a co-integrating equation with co-integrating vector of weights characterizing the long-run relationship between the variables. Estimates of a linear combination of individual series tend to be reliable and constant and are fit for describing the steady-state relationships. The cointegrated relation between variables is interpreted as their long run equilibrium. The study utilizes the Johansen co-integration methodology in conducting the cointegrating properties of the data.

Table 10: Johansen Co-integration Result

Hypothesized No of Cointegrating Relations	Lag Length	Trace Statistic	5% critical Value	Prob.
Estimation 1 (Nigeria)				
$H_0: r = 0$	2	218.5865	95.75366	0.0000
$H_0: r \leq 1$	2	126.1898	69.81889	0.0000
$H_0: r \leq 2$	2	70.36743	47.85613	0.0001
$H_0: r \leq 3$	2	38.43667	29.79707	0.0040
$H_0: r \leq 4$	2	17.08644	15.49471	0.0286
$H_0: r \leq 5$	2	7.728252	3.841466	0.0054
Estimation 2 (Kenya)				
Hypothesized No of Cointegrating Relations	Lag Length	Trace Statistics	5% critical Value	Prob.
$H_0: r = 0$	2	181.6209	95.75366	0.0000
$H_0: r \leq 1$	2	98.62900	69.81889	0.0001
$H_0: r \leq 2$	2	50.38825	47.85613	0.0283
$H_0: r \leq 3$	2	23.93611	29.79707	0.2031
$H_0: r \leq 4$	2	9.212251	15.49471	0.3461
$H_0: r \leq 5$	2	2.095387	3.841466	0.1477

Hypothesized No of Cointegrating Relations	Lag Length	Trace Statistic	5% critical Value	Prob.
Estimation 3 (South Africa)				
$H_0: r = 0$	2	95.60938	95.75366	0.0512
$H_0: r \leq 1$	2	60.00278	69.81889	0.2353
$H_0: r \leq 2$	2	33.51858	47.85613	0.5283
$H_0: r \leq 3$	2	15.94507	29.79707	0.7161
$H_0: r \leq 4$	2	5.835986	15.49471	0.7148
$H_0: r \leq 5$	2	0.171872	3.841466	0.6784

Source: Researcher's compilation (2021).

The result of the trace statistics utilized for the purpose of this study confirmed the rejection of the null hypothesis, which means that there is no co-integrated vector, with this result we can conclude that the variables used in this study are co-integrated. Based on this result, we advanced to denote the long run and short run dynamic equation. According to Engle and Granger (1987), "when a set of variables are I (1) and are co-integrated then short-run analysis of the system should incorporate error correction term (ECT) to model the adjustment for the deviation from its long-run equilibrium. The error correction model (ECM) is therefore characterized by both differenced and long-run equilibrium models, thereby allowing for the estimates of short-run dynamics as well as long-run equilibrium adjustments process. This indicates that if the variables are co-integrated, then they share a long-run relationship which can be modelled using the error correction methodology".

Error Correction Model (ECM) Regression Result

The ECM is an overall structure used to depict the unique connections amongst stationary variables. Where a co-integrated connection is present among variables, the long run behaviour, short run behaviour and the speed of adjustment can be modeled. The result of the ECM is presented below;

Table 11: ECM Regression Result

Explanatory Variables	Model 1 (Nigeria) Dep variable = GFCF	Model 2 (Kenya) Dep variable = GFCF	Model 3 (South Africa) Dep variable = GFCF
C	-5870.08 (3338.5) {0.091}	2.009 (4.342) {0.647}	-2532.13 (3087.03) {0.419}
D(FDI)	-0.0146 (0.002) {0.000}	1.67E-06 (2.57E-06) {0.520}	-0.008 (0.003) {0.014}

D(FPI)	-95807.17 (5429.47) {0.000}	1.1222 (7.027) {0.874}	-37218.1 (5097.49) {0.000}
D(TOPN)	-582.585 (150.664) {0.000}	-0.349 (0.194) {0.085}	-116.75 (187.47) {0.539}
D(EXCHR)	-95571.37 (5427.5) {0.000}	1.6074 (7.024) {0.8208}	-36873.8 (5103.94) {0.000}
D(EXTD)	27.752 (4.251) {0.000}	0.0123 (7.0279) {0.024}	10.845 (6.189) {0.092}
Error correction coefficient			
ECM(-1)	-0.917 (0.117) {0.000}	-0.58 (0.167) {0.002}	-0.350 (0.400) {0.002}
R-squared	0.973	0.380	0.871
Adjusted R-squared	0.966	0.238	0.836
S.E. of regression	17217.05	25.5099	17186.9
F-statistic	129.4199	2.663	24.323
Prob(F-statistic)	0.00	0.000	0.000
Durbin-Watson stat	1.7	1.5	2.1

Source; Researcher's Compilation (2021) ( ) are standard errors, { } are p-values.

To capture both the long run and the short run dynamics, we estimate an error correction model (ECM). This study employs ECM technique to estimate the models. To avoid spurious regression results, stationarity of variables and co-integration test have already been conducted before the error correction model is estimated.

As shown in the table above, Model 1 (Nigeria) estimations show the impact of financial integration on gross fixed capital formation in Nigeria. The R^2 of the model is 97.3% with and adjusted R^2 value of 96.6%.The F-stat is 129.4199 (p-value = 0.00) is significant at 5% this implies that we cannot reject the proposition of a considerable linear connection among the dependent and independent variables. It is additionally demonstrative of the joint factual meaning of the model. The D. W insights of 1.7 shows the shortfall of stochastic reliance in the model. Commenting on the presentation of the primary coefficients, the coefficient and p-values of the variables used for the purpose of this study FDI, FPI, TOPN, EXCHR and EXTD are given as follows; -0.01461{0.0001}, -95807.17{0.000}, -95571.37.{0.000} and 27.751 {0.000} correspondingly. The appraisals uncover that all financial integration apply critical effect on GFCF at 5% level. Be that as it may, just EXTD seems to have the normal positive sign. The error correction component {ECM (-1)} is high and has anticipated negative sign (- 0.917) and is additionally huge at 5 %

(p=0.00). "The size of the error correction term indicates the speed of adjustment of any disequilibrium towards a long-run equilibrium state" (Engle and Granger, 1987). Given that the error correction term has the normal negative sign and is additionally genuinely huge at 5%, we are certain of the between transient soundness of the model and subsequently short-run changes will combine at the long-run gauges at a normal speed of about 91.7% every year.

Model 2 (Kenya) estimations show the impact of financial integration on gross fixed capital formation in Kenya. The R^2 is 38% while the adjusted R^2 is 0.238% this means that the model explain about 23.8% of the systematic variations in the dependent variable. The F-stat is 2.663 (p-value = 0.00) is significant at 5% this implies that we cannot reject the proposition of a considerable linear connection among the dependent and independent variables. It is additionally demonstrative of the joint factual meaning of the model. The D. W insights of 1.5 shows the shortfall of stochastic reliance in the model. Commenting on the presentation of the primary coefficients, the coefficient and p-values of the variables used for the purpose of this study FDI, FPI, TOPN, EXCHR and EXTD are given as follows; 1.67E-06{0.5204}, 1.1222,{0.874}, -0.348907{0.0846}, 1.6074{0.8208}and 0.0123{0.024}correspondingly. The appraisals uncover that all financial integration apply critical effect on GFCF at 5% level. Be that as it may, just EXTD seems to have the normal positive sign. The error correction component {ECM (-1)} is high and has anticipated negative sign (-0.581) and is additionally huge at 5 % (p=0.00). The size of the error correction term indicates the speed of adjustment of any disequilibrium towards a long-run equilibrium state (Engle & Granger, 1987). Given that the error correction term has the normal negative sign and is additionally genuinely huge at 5%, we are certain of the between transient soundness of the model and subsequently short-run changes will combine at the long-run gauges at a normal speed of about 58% every year.

Model 3 (South Africa) estimations show the impact of financial integration on gross fixed capital formation in South Africa. The R^2 of the model is 0.871% with and adjusted R^2 value of 83.6%. The F-stat is 24.323 (p-value = 0.00) is significant at 5% this implies that we cannot reject the proposition of a considerable linear connection among the dependent and independent variables. It is additionally demonstrative of the joint factual meaning of the model. The D.W. insights of 2.1 show the shortfall of stochastic reliance in the model. Commenting on the presentation of the primary coefficients, the coefficient and p-values of the variables used for the purpose of this study FDI, FPI, TOPN, EXCHR and EXTD are given as follows; -0.00823{0.0142, -37218.1{0.0008}, -116.755{0.5390}, -36873.8{0.002} and 10.845 {0.0920}

correspondingly. The appraisals uncover that all financial integration apply critical effect on GFCF at 5% level. Be that as it may, just EXTD seems to have the normal positive sign. The error correction component {ECM (-1)} is high and has anticipated negative sign (-0.350) and is additionally huge at 5 % (p=0.00). The size of the error correction term indicates the speed of adjustment of any disequilibrium towards a long-run equilibrium state (Engle & Granger, 1987). Given that the error correction term has the normal negative sign and is additionally genuinely huge at 5%, we are certain of the between transient soundness of the model and subsequently short-run changes will combine at the long-run gauges at a normal speed of about 35% every year.

Comparative Analysis of Financial Integration and GFCF in Nigeria, Kenya and South Africa

In order to effectively examine the relationship between Financial Integration and GFCF in Nigeria, Kenya and South Africa, the researcher deemed it fit to carry out a separate analysis on the selected countries in Sub-Saharan Africa (Nigeria, Kenya and South Africa) for the period under investigation. This separate analysis was done to give room for a clearer understanding of the comparism made.

With respect to individual relationship of the variables in the models, it is seen that foreign direct investment has significant relationship with gross fixed capital formation in Nigeria and South Africa, but in the case of Kenya, it has insignificant association with GFCF, this goes to show that while Foreign Direct Investment (FDI) enhances GFCF in Nigeria and South Africa, it reduces GFCF in Kenya counterpart. In other word, a unit change in foreign direct investment increases GFCF by 0.0001 and 0.0142 percent in Nigeria and South Africa; while a unit change in Foreign Direct Investment (FDI) reduces GFCF by 0.5204 percent in Kenya.

On the other hand, the probability (p-value) of foreign portfolio investment appears to be significant in Nigeria and Kenya, but failed the 5 percent significant level in the case of South Africa. This also means that in Nigeria and Kenya, the foreign portfolio investment is a significant determinant of the level of GFCF.

In the case of exchange rate, the probability (p-value) revealed a significant relationship between the variable of exchange rate and gross fixed capital formation in Nigeria and South Africa, but the variable was statistically insignificant in the case of Kenya, with this result we can say that the Sub-Saharan countries of Nigeria and South Africa are doing well very in terms of exchange rate than their Kenya counterpart. In

other word, a unit change in exchange rate increases GFCF by 0.0008 and 0.0028 percent in Nigeria and South Africa; while a unit change in exchange rate reduces GFCF by 0.8208 percent in Kenya.

Similarly, the probability (p-value) of trade openness appears to the significant in Nigeria and Kenya, but failed the 5 percent significant level in the case of South Africa. This means that Nigeria and Kenya are more exposed to international trade as well as globalization than their South Africa counterpart.

In terms of external debt, the probability (p-value) exhibited a significant relationship between external debt and GFCF among the selected Sub-Saharan African countries of Nigeria, South Africa and Kenya (0.0000, 0.0243 and 0.0920) respectively. This means that the issue of external debt is not peculiar to one country in Sub-Saharan African countries, hence Sub-Saharan African country leaders are to work assiduously to reduce the debt profile of their respected countries.

Summary of Findings

The findings of the study indicate existence of significant relationship between FDI and GFCF in Nigeria and South Africa, while the variable exhibits an insignificant association with GFCF in Kenya context. Secondly, the study revealed the existence of significant relationship between FPI and GFCF in Nigeria and South Africa, while the variable exhibited an insignificant association with GFCF in Kenya. Thirdly, the study also revealed the existence of significant relationship between EXCHR and GFCF in Nigeria and South Africa, while the variable exhibited an insignificant association with GFCF in Kenya. Fourthly, it was gathered that TOPN is statistically significant in explaining the variations in GFCF in Sub-Sahara African countries of Nigeria, and Kenya, but statistically insignificant in explaining the variations in GFCF in South Africa. Lastly, it was also observed that EXTD is positively and statistically significant in explaining the variations in GFCF in Sub-Sahara African countries of Nigeria, South Africa and Kenya respectively.

Recommendations

Based on the findings from this study, the following five recommendations which are imperative for policy decisions are herein made. Foremost, Governments should create more investment opportunities particularly in the Sub-Saharan African region. It is also recommended that Sub-Saharan Africa government should create the enabling environment (in terms of legal framework, security, and polity) in order to attract and retain foreign investors. Secondly, since there is significant relationship between foreign portfolio

investment and gross fixed capital formation, the study recommends that policies of government on foreign portfolio investment should be improved and sustained. Adequate policies that would encourage investment in domestic financial instruments by foreign investors should be formulated in Sub-Saharan African countries, as this will help to lubricate the financial hub of the Sub-Saharan African countries.

Thirdly, the importance of exchange rate fluctuation should be taken into account. Hence, government and regulators of Sub-Saharan African countries should try to either prevent or reduce the level of fluctuation in the market. They should also try to prevent a currency crisis by expanding the stock market and putting all necessary legal and regulatory framework in place to attract capital inflow from outside the country either in form of foreign direct investment or foreign portfolio investment in order to deepen and broadening the market and thus stimulating the growth and development of the Sub-Saharan African countries.

Fourthly, the government of Sub-Saharan African countries should control and regulate the level of trade openness in the continent in order to boost trading activities and returns in their respective stock market. Lastly, for debt to promote growth in Sub-Saharan African and other highly indebted countries, fiscal discipline and high sense of responsibility in handling public funds should be the watchword of these countries' leaders. External debt can only be reduced to the barest minimum by increasing output level of Gross Fixed Capital Formation.

Conclusions

The broad objective of this study was to examine financial integration and GFCF in Sub-Sahara Africa. Although study on this subject matter has been well researched in Nigeria and some other countries, but are still very scanty in terms of cross-country studies especially in Sub-Sahara Africa. For this reason, the study employs the Error Correction Model analysis on five financial integration variables such as FDI, FPI, TOPN, EXCHR and EXTD to examine the GFCF of the economy of Sub-Saharan Africa countries of Nigeria, Kenya and South Africa for a period of thirty-nine (39) years (i.e. 1981 to 2019). The results from the empirical analysis showed that foreign direct investment, foreign portfolio investment and rate of exchange significantly associated with gross fixed capital formation in Sub-Sahara economy as it relate to Nigeria and South Africa, but was insignificant in the case of Kenya. On the other hand, the study revealed a significant relationship between trade openness, external debts and gross fixed capital formation in Sub-Sahara Africa economies of Nigeria, Kenya and South Africa.

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