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Public-Private Partnership and Financial Structure Development: Cointegration Lessons for selected sub-Sahara African Economies

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The financial system of sub-Sahara Africa provides weak support for its long-term real sector development. The bank-based finance option in these economies promotes non-competitive market mechanism, which result in high interest rate spread. The study applies an augmented Toda-Yamamoto causality technique to test the dynamic relationship between private participation in infrastructure, interest-rate spread, and institutions' regulatory quality in four sub-Saharan African economies of Kenya, Mauritius, South Africa, and Nigeria. The results provide evidence that private participation in infrastructure can induce interest-rate spread downward. The study recommends public-private partnership investments to deliver projects at lower marginal cost.

Key Words: Co-integration; Financial structure development; Public-Private partnership.

JEL Classification Numbers: C30, G23, H83.

1. INTRODUCTION

The quality of life in many sub-Sahara Africa economies and global developing world is increasingly being undermined by deteriorating state of power (energy), road and rail networks, housing, water and other basic social infrastructural necessities. In particular, development statistics reveal that in the vast municipalities and villages, poor living condition is rendering life unbearable as they lack access to state institutions of development, such that basic infrastructures more or less does not exist. The poor living conditions seem to have undermined the 'public sector performance perception and value. There is no other parameter to measure the success of past and present governments than the verdict of accelerated poverty

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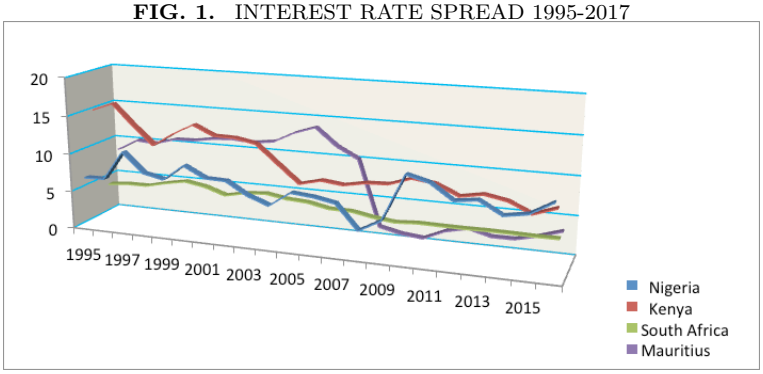
rate, such that the government is daily inundated with demand for basic infrastructures. Domestic needs for infrastructures and their international competitiveness appeal are awesome (Smit, 2010), as there is connection between funding structure, infrastructure, direct investments, productivity, and the state of poverty of a people. These are the reasons why there seem to be increasing developing governments' pronouncement on commitment to public-private partnership for infrastructure provision.

Sustainable financing mechanism could provide the economy the resilience for quality infrastructures to spur entrepreneurship, of which public-private partnering (henceforth PPP) is often explored. Beyond the PPP mechanism where public services are provided cheaper than what a sole private and a sole public entity can provide independently, the model may additionally assist to transmit influences for the longer-term financial structure development in many developing countries, given that their financial systems are somewhat 'maladapted' (Ojo, 2010).

Generally, financial markets in developing economies are characterized by market failures (Moszoro, 2010), weak and shallow for the private sector alone to garner the financing requirement of the infrastructural gap, such that the model's special purpose vehicle (SPV) consortium is usually the antidote. A SPVs bond market-based finance structure may deepen the long-term finance market segment than the bank-sponsored credit finance option, which has been characterized by relative high interest rate spread, as revealed in figure 1 below for Nigeria, South Africa, Kenya and Mauritius. Aside from high interest spread, interest rate instability present in Nigeria, Kenya and Mauritius negates market predictability and expectation. In particular, for reduced project finance risks, a bond finance public project would be better driven by public trust, and whose purpose, may be augmented by the public-private joint-institutional development mechanism, chiefly for the provision of the much needed social-economic infrastructures.

Evidence from private participation in infrastructure (PPI) data (World Bank, 2017) indicates that the major financing source of the SPV consortium projects are by equity finance and bank credits (Kateja, 2012; Estache, Ellis, and Trujillo, 2007), which somewhat may have negated the pecking order theory of corporate capital structure decision (Rose, Westerfield, and Jaffe, 2009). Foreign financed SPV has its risk, as it may accentuate currency volatility through profit repatriation. Similarly, bank credit for infrastructure may inadvertently encourage financial mix-match and instability; thus revealing the need to use the PPP system to develop the nascent domestic bond market in sub-Sahara African economies. Developed local bond market has been advocated to reduce problem of 'original sin' associated with foreign credits. Managers on SPVs projects are expected to adopt skillful financing schemes that would reduce funding risks, to lower

FIG. 1. INTEREST RATE SPREAD 1995-2017



Source: Prepared by authors. Data from World Development Indicators (2016) at data.worldbank.org

the social marginal cost of projects; thereof enhance financial deepening, and improve welfare.

Indeed the sub-Sahara needs a strong infrastructure base if the economy is to assume its potentials, with excellent opportunity for private infrastructural investments. The increasing call on the private sector for investment in the medium to long-term, require the goodwill of governments. Presented in table 1 below is the PPI performance of selected sub-Sahara Africans relative to some emerging economies' peers from 1990-2017. In relativity, sub-Sahara African region produced lowest infrastructural investment compared with any of the emerging economies. The PPI per capita (see fig. 2 below) of major sub-Saharan Africa economies and the average ($166.25) are lower relative to any of the emerging economies. This lapse, perhaps, may be attributable to poor financing structure, which the bond market could ameliorate.

The literature on the PPP scheme have been growing overtime, however and indeed, studies are yet to account for the transmitting influence of PPP innovative financing options to the operating economy's financial system development. Thus, the relevant research questions are first, why would PPP scheme influence an economy's financial system structure, and secondly, to what extent can PPP financing arrangement assist to influence the interest rate spread in a bank-based economy. This study thus makes concurrent propositions that: That PPP scheme does not significantly influence an economy's financial system structure, and that PPP financing scheme may operate to reduce interest rate spread in the selected bank-based economies. Following the justification for the study, the remaining part of the paper is arranged in this order- the review of relevant litera-

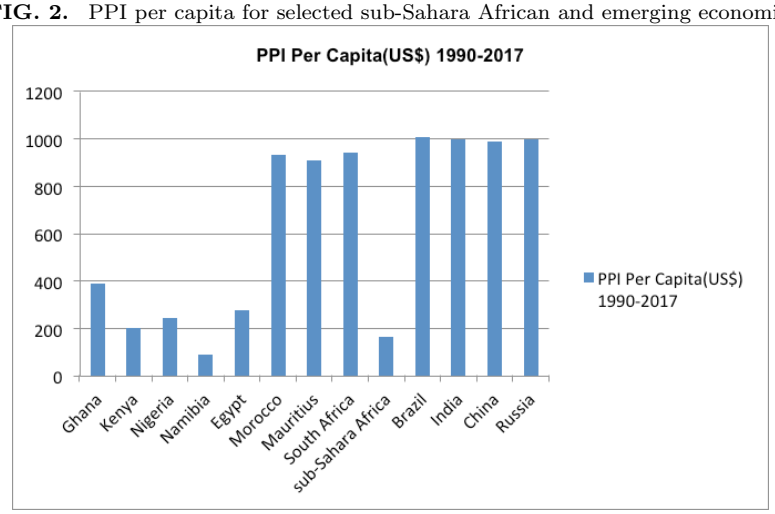
TABLE 1.

Private Participation in Infrastructure (PPI) in US$ (Million) 1990-2017 for selected sub-Sahara African and emerging economies

Economies	Airport	Electricity	ICT	Natural Gas	Port	Railway	Road	Water Sewerage	PPI Per Capita
Ghana	0	3,442	4,755	590	2,060	0	0	126	389
Kenya	21	2,352	6,952	0	47	404	0	0	201
Nigeria	200	2,507	28,486	679	7,171	6	382	0	246
Mauritius	383	109	613	0	43	0	0	0	908
Egypt	398	1,513	21,004	689	2,421	0	0	475	276.9
Morocco	0	15,431	14,603	2,300	400	0	0	114	931.15
Namibia	0	24	196	0	0	0	0	0	88.72
South Africa	203	13,945	31,855	1,216	0	2,483	0	88	940
sub-Sahara Africa	1,919	32,179	114,608	2,249	12,383	5,119	3,057	719	166.25
Brazil	28,269	198,749	177,638	10,531	12,506	35,976	49,517	16,300	1,006
India	5,111	145,998	100,231	1,015	8,883	7,920	77,025	426	998.96
China	2,973	54,002	14,518	4,578	14,702	22,882	31,818	12,870	988.98
Russia	2,120	33,924	90,138	12,993	882	4,519	9,995	3,180	999.82

Source: Data on Private Participation in infrastructure (PPI) was obtained from ppi.worldbank.org; data on population was from World Development Indicators (2016) at data.worldbank.org, accessed on Dec. 1, 2017; ppi per capita was computed by the authors.

FIG. 2. PPI per capita for selected sub-Sahara African and emerging economies



Source: Prepared by authors. Data from World Development Indicators (2017) at ppi.worldbank.org/data

ture; the theoretical framework; the data and methodology; the analysis of results; and the conclusion and recommendations.

2. LITERATURE REVIEW

The link between financial structure development and growth has its milieu in the backbreaking papers of Goldsmith (1955, 1969) and Patrick (1966). Both studies argue that a dynamic financial structure can shape economic relations, productivity and living standard, by easing access to capital, such that the mixture of innovative financial institutions, intermediaries and new instruments can offer robust financial services, that would accelerate the pace of economic development, with dynamic contemporaneously mechanism that flows from the real sector as the economy grows, and hence often change the state of the financial structure. Patrick (1966) argues that an expanding enterprise ought to be a pull factor on financial sector innovations. In furtherance, the PPP mechanism has become a growing innovative 'model solution' for harnessing the private sectors' technical know-how towards achieving quality public sector project/investment vehicle, and hence achieve Pareto-optimality (Moszoro, 2010). The risk-sharing framework produces optimal capital structure, a lower capital outlay that enhances public project success (Arrow and Lind, 1970). By harvesting the lower cost associated with the public interest combined with the market attitude and high quality output of the private sector, strong rationale for continued adoption of the PPP vehicle ensues. Research evidence suggests that the private sector experiences low operating cost by adopting the PPP option particularly in advanced economies of the US and UK (Moszoro, 2010; Wright, 1987; Viscusi, Vernon, and Harrington Jr.,2000).

The risk reduction theory is supported by the capital structure theory, and in particular the sub-argument of the pecking order theory. The pecking order opines that due to existence of asymmetric information and signaling theory, managers facing project finance dilemma should approach retained earnings, next debt finance, while equity should be of least consideration (Rose, Westerfield, and Jaffe, 2009). The 1963 capital structure reform opines that in the world of corporate income taxes debt finance of projects should be optimized (Vernimmen, Quiry, Dallocchio, Le Fur, and Salvi, 2011).

Off recent, new innovative financing structure and instruments aimed at sustainable growth in the European union through the PPP initiative attracts the European Union (Zaharioaie, 2012), just as the 2009 financial crises effectively exposed the traditional PPP project's bank credit risk and grants (Zaharioaie, 2012). The PP cooperation financing literature is adorned in varied Public-Private Sector contractual arrangements as solutions to build, operate, maintain or manage facilities or projects that pro-

vide public services. Schultz (2004) lists several forms of public-private co-operation arrangements to include: build/operate/transfer (BOT); build/transfer/operate (BTO); build/own/operate (BOO); provision and maintenance of special services; tax-exempt leases. Other arrangements includes design/build/operate (DBO); Sales/leaseback; and turnkey projects. The sponsor, that is SPV's consortium often adopt bank finance options, in their capital structure arrangement. However, the long-term successes of PPP sponsor of public projects may co-integrate with requisites of bond market. Moszoro (2010) opines that the PPP model can provide public infrastructure more efficiently where government macroeconomic policies are reasonably predictable; stability conditioning exist; combined with reliable contract enforcement system, which are the hallmark for building resilient financial market, particularly the longer-term bond market finance.

Application of the group interest theory would reveal the shortcomings of the bank credit sponsored PPP, as bank sponsored projects financing might be inordinately increasing project cost through high lending rate, and hence suboptimal financing system (Rajan and Zingales, 2003). Commercial banks traditionally operate in the short-end of the financial system. Bank financing for long-term public project is usually at higher interest cost, just as private sector required return on investment is usually higher than the projects social marginal cost (Moszoro, 2010). This may be one of the reasons for overpricing public projects, as the higher cost is often transferred to the project cost, at the public expense, thus revealing the suboptimal nature of bank financing for long-term public projects. The capitalization of the public interest, with enormous 'internalization of the financial advantage' thereof may help lower the project cost in a market sponsored financing option of public project.

Kateja (2012) examines the trend in PPI model from 1991 to 2011 in emerging economies of Brazil, Russia, India and China (BRIC), with evidence revealing tremendous infrastructure provision. The study discovers that despite increasing success in infrastructure provisioning, projects are concentrated in less risky sectors, perhaps due to financing risk, chiefly sourced from international banks. This paper thus informs that efforts be targeted at encouraging private capital that requires providing guarantee for longer tenured direct finance for broader risk taking of social-economic infrastructure projects in sub-Sahara developing countries, such as in water and electricity.

2.1. Theoretical framework

The economic relation that produces long-term infrastructure, necessary for optimal productivity and high growth, combines capital and labour forces. Adegbite (2016) opines that the financial system actively influences productivity and growth through two channels, the technological innovation

channels and the capital accumulation channel. An efficient PPP initiative that is endogenously conceptualised evolves through these two channels, by human capital as productive resource-skill, experience, and best practice, with the requisite financial capital. The financial capital relates to the ways and means for capital formation, a stock expected to have accumulated overtime (Jhingan, 2007). Endogenous theoretical framework of the Romer's model of technological change claims that the forces of innovation and invention are home grown through research that specializes in the production of ideas (Jhingan, 2007). By adapting the Romer (1990) model, the technological production function is as follows:

$$\Delta A = F(K_A, H_A, A) \tag{1}$$

Where ΔA indicates change in technology of production, K_A is the amount of capital invested in the production of new design (or technology), while H_A indicates the human capital in a PPP sponsored infrastructure. This study modifies the Romer model to accommodate the conceptualized debt-based finance strategy for long-term public infrastructure projects as follows:

$$\Delta A = F(K_A^{\gamma}, H_A, A) \tag{2}$$

Where the coefficient γ indicates the bond finance technology required that should moderate K_A as sustainable capital for critical social and economic infrastructure development, such as roads, railway, hospital, etc.

3. DATA AND METHODOLOGY

The study adopts a panel data set from Nigeria, Kenya, South Africa and Mauritius from secondary sources, which describes a series of observations across these countries, studied over time from 1995-2016. An observation is studied in pair of the entities and times such that in variables x_{it}, y_{it}; i and t subscripts denotes individual country and time respectively. In justification of the study's sampled economies South Africa, Nigeria and Mauritius economies produces above 90 percent of total sub-Sahara bond market capitalization as at 2016 (World Federation of Exchanges, 2016). It is an unbalanced panel data set as some countries have omitted observations in some years, that is:

$$\{x_{it}, y_{it}\} : \text{ for } i = 1, \ldots, N; t = \underline{t_i}, \ldots, \overline{t_i} \tag{3}$$

The variables' types, sources, justification and *a priori* are presented in tables 2 below:

TABLE 2.
Description of Variables, Data Sources, Measurements, Justification and their A priori

Variable description	Type/Source/Measurement	Literature justification	Parameter's A priori
PPI=Private participation in infrastructure	Secondary/World Bank/ Private Participation in public infrastructure (PPI)	Alpana Kateja (2012)	> 0
IRS= Interest rate spread, a proxy for financial structure	Secondary/ World Bank/ Difference between bank lending and deposit rates	Janet Olatudun Adelegan and Bozena Razewicz-Bak (2009), Barry Bosworth (2014), Yibin Mu, Peter Phelps and Janet Stotsky (2013)	< 0
IQX= Institutions' quality index	Secondary/ computed from Worldwide Governance Indicators/Composite of regulatory quality, rule of law and govt. effectiveness (WGI, 2017):www.govindicators.org	Diana Ayala, Milan Nedeljkovic and Christian Saborowski (2015), Simeon Djankov, Caralee McLiesha and Andrei Shleifer (2007)	> 0

Sources: Prepared by the authors

3.1. Model Specification

The methodology developed and adopted is augmented Toda-Yamamoto (ATY) model in a Panel framework. The dynamic panel model version can help to account for probable dynamic changes or adjustments across the selected African countries. Its specification (Arellano and Bond, 1991) can be stated as follows:

$$y_{it} = \phi y_{i,t-1} + x'_{it}\beta + u_{it} \quad i = 1, \ldots, N \quad t = 1, \ldots, T \tag{4}$$

Where i is the country and t is time. Moreover, ϕ is a scalar, x'_{it} is $1 \times K$ and β is K by 1, and further assuming that the u_{it} is of the one-way error component model, that is:

$$u_{it} = \mu_i + \nu_{it} \tag{5}$$

where: $\mu_i : IID(0, \sigma^2_\mu)$ and $\nu_{it} : IID(0, \sigma^2_\nu)$ are independent of each other and among themselves. However, there is tendency for dynamic panels

to generate errors from two sources overtime (Arellano and Bond, 1991; Baltagi, 2008), namely through autocorrelation problem, as a result of lagged regressands among the regressors, and problem of heterogeneous characteristics or interaction effects among individual countries. Arellano and Bond (1991) propose differencing the dynamic model to eliminate the effect of bias and inconsistent estimator such that equation (4) becomes:

$$y_{it} - y_{i,t-1} = \phi(y_{i,t-1} - y_{i,t-2}) + (x'_{it} - x'_{i,t-1})\beta + (\varepsilon_{it} - \varepsilon_{i,t-1}) \qquad (6)$$

with the assumption that $(\varepsilon_{it} - \varepsilon_{i,t-1})$ complies with first order moving average (MA(1)) process with unit roots.

Empirical literature suggests the application of Manuel Arellano and Stephen Bond (1991)'s generalised method of moments (GMM) as an attempts to overcome problems inherent in use of the ordinary least square (OLS), fixed effect (FE) or least square dummy variable (LSDV) and random effect (RE) or the generalized least square (GLS). Generally, literature opines that the GMM estimator is more efficient where heteroscedasticity exists than the simple instrumental variable (IV) estimator (Oyinlola, 2012).

3.2. Panel Granger—VAR model specification

In standard explicit and semi-log form, the dynamic multivariate Panel Granger-VAR system is as follows in equations (7) to (9):

$$\Delta Irs_{it} = \alpha_1 + \sum_{j=1}^{P} \theta_{1j} \Delta Ppi_{it-j} + \sum_{j=1}^{P} \delta_{1j} \Delta Irs_{it-j} + \sum_{j=1}^{P} \gamma_{1j} \Delta Iqx_{it-j} + \varepsilon_{it}, \quad (7)$$

$$\Delta Ppi_{it} = \alpha_2 + \sum_{j=1}^{P} \theta_{2j} \Delta Ppi_{it-j} + \sum_{j=1}^{P} \delta_{2j} \Delta Irs_{it-j} + \sum_{j=1}^{P} \gamma_{2j} \Delta Iqx_{it-j} + \varepsilon_{it}, \quad (8)$$

$$\Delta Iqx_{it} = \alpha_3 + \sum_{j=1}^{P} \theta_{3j} \Delta Ppi_{it-j} + \sum_{j=1}^{P} \delta_{3j} \Delta Irs_{it-j} + \sum_{j=1}^{P} \gamma_{3j} \Delta Iqx_{it-j} + \varepsilon_{it}. \quad (9)$$

3.3. Augmented Toda-Yamamoto Causality Approach for Models

Toda and Yamamoto (1995) develop an augmented granger causality methodology to treat causal relation models in a VAR environment involving non-uniform level of stationarity among time series data set. Engle and Granger (1987) point out that inference from non-stationary and co-integrated variables' coefficients with the standard granger causality test results thereof may be invalid. The summarized specification of the Toda

and Yamamoto (1995) framework for Y_t and X_t series is provided below:

$$Y_t = a + \sum_{i=1}^{m+d} \phi_i Y_{t-i} + \sum_{j=1}^{n+d} \varpi_j X_{t-j} + \varepsilon_{Y_t} \tag{10}$$

$$X_t = a + \sum_{i=1}^{m+d} \varphi_i X_{t-1} + \sum_{j=1}^{n+d} \delta_j Y_{t-1} + \varepsilon_{X_t} \tag{11}$$

Where d represents maximum order of integration of the variable in the system, m and n are optimal lag of Y_t and X_t. The random error ε is assumed white noised.

4. RESULTS

4.1. Test for variables unit root

In testing for unit root as presented in table 3 below, the study applies exogenous variable assumption of individual effects, and individual and trend effects under the common unit root and the entity unit root process respectively. Using the Levin, Lin, and Chu (2002) criterion, the interest rate spread (Irs) is a level variable but under the Im, Pesaran, and Shin (1997) and ADF criteria it became stationery after first difference. The other two variables Ppi and Iqx have unit roots but became stationary at first difference under the three criteria.

TABLE 3.

Unit Root

	Common unit root process assumed			Country unit root process assumed					
Variable	LLC test	Prob.	LOS	IPS test	Prob.	ADF-FCs	Prob.	LOS	Exogenous variables assumption
IRS	−2.069	0.019*	I(0)	−3.808	0.000**	29.499	0.000**	I(1)	Ind.& Trend
PPI	−8.440	0.000**	I(1)	−5.070	0.000**	37.527	0.000**	I(1)	Ind.& Trend
IQX	−3.866	0.000**	I(1)	−4.447	0.000**	32.657	0.000**	I(1)	Ind.& Trend

Source: By the researchers using E-view 7. * and ** indicates 0.05 and 0.001 levels of significance respectively. LOS stands for level of stationarity; Ind. & Trend indicates Individual effects, individual linear trends

4.2. Summary statistics

The descriptive statistics presented in table 4 below provide background information on the variables applied for the regression. Interest rate spread (Irs) has the highest value of 16.196 percent in Kenya in 1996, while the

lowest appeared in Mauritius in 2010. The Ppi has its highest value of $7,298bn in 2008 in South Africa, while the lowest value occurred in South Africa with $1.7bn in 2003. Institution quality has its highest index value of 1.02 in 2014 in South Africa, while the lowest value of −1.723 occurred in Nigeria in 2002.

TABLE 4.

Descriptive statistics

	Mean	Median	Max.	Min.	S.D.	Skew.	Kurtosis	J.B.	Prob.	Obs.
Irs	7.4291	7.7500	16.196	0.5250	3.6743	0.1597	2.2324	2.5347	0.2815	88
Ppi	1167.73	512.80	7,298.9	1.700	1,577.82	1.9112	6.7388	104.83	0.0000	88
Iqx	−0.1721	0.0000	1.0200	−1.723	0.75940	−0.227	1.8366	5.7208	0.0572	88

Source: Computed by the authors with E-view 7; S.D. is Standard Deviation; J.B. is Jarque Bera.

4.3. Optimal Lag Structure

The model's optimal lag length for the study is two (2), since the entire six (6) criteria settled for it. It is presented in table 5 below:

TABLE 5.

Lag Structure table

Lag	LogL	LR	FPE	AIC	SC	HQ
0	−950.9512	NA	16036068	25.10398	25.19598	25.14075
1	−844.9591	200.8270	1249454.	22.55156	22.91957	22.69863
2	−792.132*	95.92190*	394182.3*	21.39823*	22.04224*	21.65561*
3	−788.0874	7.025885	451164.9	21.52862	22.44864	21.89630

Where 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. Source: Computed by the authors with E-view 7

4.4. Correlation Analysis

The study finds as represented in table 6 below that negative relationship exist between private participation in infrastructure (Ppi) and interest rate spread (Irs). The result suggests that the increased Ppi can influence the Irs downwards by about 32 percent. Similarly negative relationship exists between institutional regulatory quality (Iqx) and interest rate spread, indicates that Iqx can influence Irs downwards by about 33 percent. As an incidental variable, Iqx has negative correlation with ppi which may suggest that low record of institution's quality in many sub-Saharan economies as represented in this study by Nigeria and Kenya may adversely affect the growth of Ppi in the region.

TABLE 6.

Correlation table

	IRS	PPI	IQS
IRS	1.0000		
PPI	−0.3197	1.0000	
IQX	−0.3323	−0.1863	1.0000

Source: Computed by the authors with E-view 7

4.5. The short-run (Dynamic) Result

The dynamic multivariate equation results presented in table 7 produce mixed outcomes. The IRS and PPI produced the required short run negative coefficient which indicates the required speed of adjustment to equilibrium. It provides that there are short run flows from the respective explanatory variables in the models to the dependent variable; and that the model tends towards long-term stability. The IQX is however positively signed, indicates non-convergence of the explanatory variables to influence it, and may explode in the long-term.

TABLE 7.

Short-run (Dynamic) Causality Result

Dependent Variable	Optimal lag order of exp. variable	Coefficient: short run residual	Std. Error	Prob.	Outcome & implication
IRS	2	−0.5556	0.5050	0.2757	Joint influence of explanatory variables flow to the dependent variable. Converges to equilibrium
PPI	2	−0.0086	0.4160	0.9835	Joint influence of explanatory variables flow to the dependent variable. Converges to equilibrium
IQX	2	0.3626	0.3956	0.3632	No convergence to equilibrium

Source: Computed by the authors with E-view 7

4.6. Long-run causality result

The long-run result is presented in line with established model optimal lag length of two periods in Table 8A below. The result of the long-run

TY granger-causality for period one suggests that private participation in infrastructure (PPI) has negative influence on the interest rate spread (IRS), which suggests that a one percent increase in PPI funding could reduce the interest rate gap by 0.009 percent. The Wald tests are significant. Moreover, institutions' quality (Iqx) has positive long-term significant influence on IRS, which may indicate that the low performance of many African economies' institutions, weak policy prescriptions and poor monitoring may be exacerbating the cost of lending (Patrick Eke, Kehinde Adetiloye, Esther Adegbite and Lawrence Okoye, 2017). In period two, two significant results were obtained; the variables relations indicate that IRS negatively influences institution quality (Iqx); while the PPI positively influences institution regulations. On the later, it may suggest that since most of the PPI are foreign investment flows, its corporate governance capacity may influence moderately the performance of host economy's regulatory institutions. On the former, a one per cent increase in IRS could weaken institutional quality by 0.3 percent which suggests that the prevailing high interest rate spread is incidentally detrimental to the functioning of associated institutions.

TABLE 8A.

Long-Run Causality Result: Augmented Toda-Yamamoto Granger (Non-causality & co-integration) Approach

Null Hypothesis	Coefficient	Lag order(P)	Causality flow /Co-integration	M.Wald test (P lag order). F. Stat.	Value (prob,) X^2 Stat.
PPI does not cause IRS	-0.0001	1	$PPI \rightarrow IRS$	5.627(0.00)**	11.255(0.00)**
IRS does not cause PPI	-117.625				
IQX does not cause IRS	1.0769	1	$IQX \rightarrow IRS$	6.1794(0.003)*	12.3589(0.002)*
IRS does not cause IQX	0.0257				
PPI does not cause IQX	$-2.57E-05$	1	No Causality/	0.7593(0.472)	1.5187 (0.4680)
IQX does not cause PPI	-750.05		cointegration		
PPI does not cause IRS	0.0002	2	No causality/	1.6084(0.2090)	3.2169 (0.2002)
IRS does not cause PPI	111.85	2	cointegration		
IQX does not cause IRS	-0.7234	2		1.9785(0.147)	3.9597(0.1381)
IRS does not cause IQX	-0.0316	2	$IRS \rightarrow IQX$	40.804(0.000)**	81.608(0.000)**
PPI does not cause IQX	1.55E-05	2	$PPI \rightarrow IQX$	41.1450(0.000)**	82.290(0.000)**
IQX does not cause PPI	392.987	2		0.9877(0.3786)	1.9754 (0.3724)

Source: Prepared by the authors with E-view 7. * and ** indicate 0.01 and 0.001 levels of significance respectively; $\rightarrow$ denotes one-way causality/co-integration. Probability values are in parenthesis

4.7. Long-Run Causality: Joint Statistics

The Wald test result presented in Table 8B below reveals that only the Interest rate spread (Irs) and Institutions' quality (Iqx) are significant at

0.001 level. This result reveals that primarily the long-term development of the interest rate spread and institutional quality depends on respective models explanatory variables in the respective economies of Nigeria, South Africa, Kenya and Mauritius.

TABLE 8B.

Long-Run Causality Results: Joint Statistics Modified Wald Test

Variables studied @ lag order $P = 2$: IRS, PPI, Iqx	χ^2 Stat.	F. Stat.	Prob.(Stat.)	Prob.(F. Stat.)	Outcome: joint influence flow
Dependent variable: IRS	65.5023	10.91706	0.0000*	0.0000*	Yes
Dependent variable: PPI	10.7506	1.79177	0.0964	0.1167	No
Dependent variable: IQX	211.811	35.3019	0.0000*	0.0000*	Yes

Source: By the authors using E-view 7; * denotes 0.001 level of significance

4.8. Cointergration test

The study tests for the existence of any long-run relationship among the variables, a pre-condition necessary for the Toda-Yamamoto methodology. Using the Pedroni (2000) approach the result presented in Table 9 below suggests that either by the option of no trend, and the constant and trend option we reject the null hypothesis of no cointegration among the variables.

TABLE 9.

Pedroni Residual Co-integration Test

	Trend Assumption	AR. Coefficient	Statistics	Prob.	Weighted Stat.	Prob.
Panel Rho-Stat.	No Trend	Common	-	-	−2.0598	0.0197
Panel PP-Stat.	No Trend	Common	−2.1083	0.0175	−3.1145	0.0009
Group PP-Stat.	I & T	Individual	−2.7220	0.0032	−4.6439	0.0000

Source: prepared by the authors using E-view 7. I & T indicates Intercept & Trend

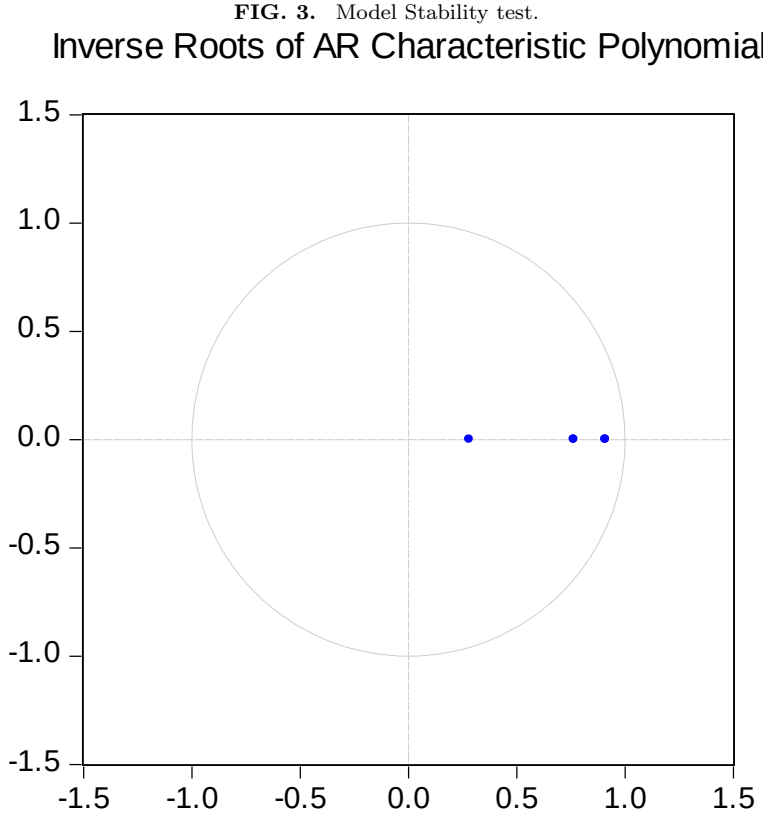
4.9. Model variables stability test

An examination of Figure 3 below reveals that the variables under study are centrally located within the unit circle, which suggests absence of unit root, hence the condition for stability of the model is meant.

4.10. Cross country heteroscedasticity test

Presented in table 10 below is the cross unit heteroschedasticity test. The result suggests that the study fails to reject the null hypothesis which indicates that the residuals of the cross sections are homoschedastic. This outcome perhaps may be due to the uniform nature of the four economies;

FIG. 3. Model Stability test.



Source: Extracted by the authors (2017) using E-view 7

while South Africa and Mauritius are somewhat of same structure and more developed, Nigeria and Kenya are alike in structure and less developed economies.

TABLE 10.

VAR residual heteroscedasticity test

Stat.	D.f	Probability
52.25272	54	0.5450

Source: The authors using E-view 7

5. DISCUSSION AND IMPLICATIONS OF FINDINGS

A major finding of the study is that private partnership in investment (PPI) has negative long-run impact on interest rate spread (Irs), a proxy for financial structure, which may suggest that the private-public partnership (PPP) model can assist the financial system off the current 'maladapted' financial structure in the long-term (Ojo, 2010). Increasing bank dominance in sub-Saharan African financial intermediation industry for infrastructure financing has implications as it sustains the uncompetitive high interest rate spread regime, indicative of perversed financial system. The group interest of the banking finance may have influenced the underdevelopment of these African economies' financial intermediation industry, such that their interest rate is most uncompetitive globally (World Development Indicators, 2016). This perhaps, unfortunately may have transmitted to weakened spate of real sector investments. The consequence of the oligopolistic behavior may thus have added to social and economic hardship in the region. Wijst (2013) opines that the financial market has the responsibility to facilitate, simplify, and increase the possibility of financing choices, particularly for the real sector.

The SPV mechanics can serve as the engine for bond market issuing to grow national and rural infrastructures. What the capital market requires is credibility of players, adherence to stated rules of contracts, and marginal return on capital. SPVs may serve to attract enormous appeal for development funding, particularly, given simultaneous liquidity market provision.

Moreover, the study finds that institutional quality (Iqx) has positive impact on interest rate spread (Irs) in the long-term. Institutions quality variable is an index combining the governance effectiveness, rule of law and regulatory quality, it then could act through governments' monetary policy instruments and incentives of governments and the society to engage and promote mutual and beneficial transactions, which may moderate interest rate spread downwards and ensue stable financial system. The qualities of institutions are mixed in the four countries; poorly managed (negative indices) in Nigeria and Kenya, relative to positives in South Africa and Malaysia in the study period 1995 to 2016. The assemblage may inform the positive flow of influence from Iqx to Irs, hence the high intermediation costs and financial system's predicament in the economies. The implication of this finding is that quality institutions matters for competitive interest rate regime, such that the subsisting negative institutions qualities in many African economies may not help to resend the increasing interest rate spread. Nallari and Griffith (2011) reveal that quality institutions not only reduce cost of transactions, but also facilitate markets for exchanges, and production of goods and services.

Lastly, the private participation in investments (Ppi) positively impacts institutions' regulatory quality (Iqx) from period two on, which suggests that the PPP scheme can serve to check corruption and institutional failures, by demanding effective governance, justice, and order in businesses, that may have been pervading African institutions. A PPP scheme should expectedly assemble excellers in specific disciplines from both institutions which may influence demand for maturity and perfections. It thus implies that improvement in the qualities of African institutions can be achieved through composition of human capital structures such as the PPP schemes. Such structures are likely to be less atavistic.

6. CONCLUSION AND RECOMMENDATIONS

This study attempts to establish how the public-private participation in infrastructure can influence the financial structure decision, such that African economies may be less bank-led financed, rather embrace more market-led financed option. The special purpose vehicles (SPVs) mechanism of the PPP may be the fulcrum to establishing the platform for bond market issuing for the bourgeoning infrastructure demand in African economies, perhaps, by maximizing the pull of funds from the people and non-bank financial institutions, like the pension funds, mutual funds, and insurance firm funds.

The study applied an augmented Toda-Yamamoto (TY) causality technique to establish that short-run dynamics and long-run equilibrium exist between the variables- private participation in infrastructure (Ppi), institutions' regulatory quality (Iqx), and interest rate spread (Irs) in four sub-Saharan African economies of Kenya, Malaysia, South Africa, and Nigeria.

Based on the findings discussed in the last section, the study recommends as follows: First, for the reduction of interest rate spread (Irs), the PPP mechanism be given broader outlook, such that infrastructure finance be sourced from the bond securities market using the SPV structure, effectively strengthened by appropriate legal provisions. The bond market competitiveness should be promoted at the local government and municipal council levels by the governments providing legislative directive and support for private investments in stock market infrastructures. Capital trade points should be encouraged in major cities in the economies. Furthermore, institutional quality (Iqx) has positive link to interest rate spread (Irs) provides that institutions of rule of law mechanism on the credit industry be reformed in favour of long-term bond finance; effective and efficient governance be strengthened on bank credit procedure. Deposit insurance institutions and Central Banks' regulatory checks could act promtly to limit risky credit behavior of bank and insider loans. Moreover, Central Banks should promote bank competitiveness from foreign investors, particularly

in specialized lending intermediation institutions in critical sectors, such as agriculture, transportations, roads, small scale industries, to crowd out long-term lending at uncompetitive high interest rate by conventional commercial bank. Update the qualities of government and quasi-government institutions, having direct impact on the investment industry. Establish prudential regulation by investment regulators and self regulatory agencies, as promoted by the World Bank.

Finally, in the second period, the PPP positive link to Iqx reveals that appropriate legal support given to the PPP scheme, particularly as a bait to divert infrastructure credit finance to the market-based finance option, and hence impact IRS downwards. Private sponsorship of capital market infrastructures should be encouraged in order to open the securities industry for capital issuing. Legal and technology infrastructure are vital organs that drives market competitiveness. Given the avalanche of critical infrastructure at local and national level, the private sector should be given tax incentives to invest in capital market infrastructure, while the on-going liberalization of the market is intensified. National competitiveness in all sectors related to the capital market should be pursued. Competitiveness of the banking industry may reduce the interest rate spread.

REFERENCES

Adegbite, Esther, 2016. Financial System's Dynamics and Economic Growth in Nigeria. A Lead Paper delivered at the 6th Annual Conference of the Department of Finance, University of Lagos, Nigeria, February.

Adelegan, Janet Olatudun and Bozena Razewicz-Bak, 2009. What Determines Bond Market Development in sub-Saharan Africa? IMF Working Paper. WP/09/213

Arellano, Manuel and Stephen Bond, 1991. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies* **58(2)**, 277-297.

Arrow, Kenneth and Robert Lind, 1970. Uncertainty and the Evaluation of Public Investment Decisions. *American Economic Review* **60**, 364-378.

Ayala, Diana, Milan Nedeljkovic, and Christian Saborowski, 2015. What Slice of the Pie? The Corporate Bond Market Boom in Emerging Economies. IMF Working Paper WP/15/148.

Baltagi, Badi Hani, 2008. *Econometric Analysis of Panel Data*. Fourth edition. John Wiley & Sons, Ltd, 273-316.

Bosworth, Barry, 2014. Interest Rates and Economic Growth: Are They Related? Center for Retirement Research, Boston College. CRR Working Paper 2014-8: 1-26

Djankov, Simeon, Caralee McLiesha, and Andrei Shleifer, 2007. Private Credit in 129 Countries. *Journal of Financial Economics* **84**, 299-329.

Eke, Patrick, Kehinde Adetiloye, Esther Adegbite, and Lawrence Okoye, 2017. A Cointegration Analysis of Interest rate spread and corporate bond market development in selected Africa Economies. *Journal of Applied Economic Sciences* **12, Fall 6(52)**, 1654-1667

Engle, Robert and Clive Granger, 1987. Co-integration and Error Correction: Representation, Estimation, and Testing. *Econometrica* **55**, 251- 276.

Estache, Antonio, Juan Ellis, and Lourdes Trujillo, 2007. Public-Private Partnerships in Transport. Policy Research Working Paper 4436, The World Bank Sustainable Development Vice-Presidency, December. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1072402, accessed Nov. 12, 2017.

Goldsmith, Raymond, 1955. Financial Structure and Economic Growth in Advanced Countries An Experiment in Comparative Financial Morphology. *National Bureau of Economic Research* **1304**, 111-168.

Goldsmith, Raymond, 1969. Financial Structure and Development. CT, Yale University Press, New Haven.

Im, kyung So, Mohammad Pesaran, and Yongcheoi Shin, 1997. Testing for Unit Roots in Heterogeneous Panels. *Journal of Econometrics* **115**, 53-74.

Jhingan, M. L., 2007. The Economics of Development and Planning, 39th Edition. Vrinda Publications Ltd, India: 66-347.

Kateja, Alpana, 2012. Building Infrastructure: Private participation in Emerging Economies. *Procedia - Social and Behavioral Sciences* **37**, 368-378.

Levin, Andrew, Chien-Fu Lin, and Chia-Strang James Chu, 2002. Unit root in panel data: asymptotic and finite sample Properties. *Journal of Econometrics* **108**, 1-24.

Moszoro, Marian, 2010. A Theory of Efficient Public-Private Capital Structures. Haas School of Business, 545 Student Services #1900, 2220 Piedmont Avenue, University of California at Berkeley, Berkeley, CA 94720-1900, accessed Nov. 28, 2017.

Mu, Yibin, Peter Phelps, and Janet Stotsky, 2013. Bond Markets in Africa. IMF African Department, International Monetary Fund Working Paper 13/12: 1-52.

Nallari, Raj and Brenda Griffith, 2011. Understanding Growth and Poverty. Theory, Policy and Empirics. Directions on Development, Poverty. The World Bank: 201-220.

Ojo, Joshua T., 2010. The Nigerian Maladapted Financial System: Reforming Tasks and Development Dilemma in Nigeria. Chartered Institute of Banker Press, Nigeria: 1-49, 299-342.

Oyinlola, Abimbola, 2012. Estimating Dynamic Panel Data with Difference GMM Estimator, presented at the CEAR Panel Econometrics Workshop, University of Ibadan, Ibadan, Nigeria, September: 24-28.

Patrick, Hugh, 1966. Financial Development and Economic Growth in underdeveloped countries. *Economic Development and Cultural Change* **14**, 174-189.

Pedroni, Peter, 2000. Fully Modified OLS for Heterogeneous Cointegrated Panels. *Advances in Econometrics* **15**, 93-130.

Rajan, Raghuram and Luigi Zingales, 2003. The Great Reversals: The Politics of Financial Development in the 20th Century. *Journal of Financial Economics* **69(1)**, 5-50.

Romer, Paul, 1990. Endogenous Technological Change. *Journal of Political Economy* **98 (5)**, 71-102.

Ross Stephen, Randolph Westerfield, and Jeffrey Jaffe, 2009. Corporate Finance. Ninth Edition, Mcgraw-Hill International Edition, New York NY, 10020: 300-317.

Schultz, David, 2004. Encyclopedia of Public Administration and Public Policy, Fact on File Inc., New York, NY10001: 351-353.

Smit, Albertus, 2010. The competitive advantage of nations: is Porter's Diamond Framework a new theory that explains the international competitiveness of countries? *Southern African Business Review* **14(1)**, 105-130.

Toda, Hiro and Taku Yamamoto, 1995. Statistical inference in vector autoregressions with possibly integrated processes. *Journal of Econometrics* **66**, 225-250.

Viscusi Kip, John Vernon, and Joseph Harrington Jr., 2000. Economics of Regulation and Antitrust. 3rd edition, The MIT Press. Cambridge.

Vernimmen Pierre, Pascal Quiry, Maurizio Dallocchio, Yann Le Fur, and Anthonio Salvi, 2011. Corporate Finance, Theory and Practice, Third Edition, John Wiley and Sons, Ltd, 313-366.

World Bank, 2017. Private Participation in Infrastructure Data base, The World Bank.

World Development Indicators (WDI) 2016. Retrieved from data.worldbank.org on 20/12/2017.

World Development Indicators, 2017. ppi.worldbank.org/data. Retrieved from data.worldbank.org on 20/12/2017.

World Federation of Exchanges (WFE), 2016. Retrieved from https://www.world-exchanges.org/home/index.php/files/54/Market-Highlights/418/WFE-FY-2016-Market-Highlights.pdf, accessed 12th Nov. 2017.

Worldwide Governance Indicators (WGI), 2017. World Governance Indicators Update, 2017. Retrieved from www.govindicators.org, accessed Nov. 12, 2017.

Wijst, Nico Van Der, 2013. Finance: A Quantitative Introduction. New York. Cambridge University Press: 39-48.

Wright, Mike, 1987. Government Divestments and the Regulation of Natural Monopolies in the UK: The Case of British Gas. *Energy Policy* **15**, 3.

Zaharioaie, Marina, 2012. Appropriate financial instruments for public-private partnership in European Union. *Procedia Economics and Finance* **3**, 800-805.