

REMITTANCES-FINANCIAL DEVELOPMENT NEXUS: CAUSAL EVIDENCE FROM FOUR AFRICAN COUNTRIES

Thompson S. Bolarinwa^{1*} & Temidayo O. Akinbobola²

¹Department of Economics, Christland University, Abeokuta, Ogun State, Nigeria
²Department of Economics, Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria

*Corresponding author's email: bolarinwathompson@yahoo.com

Abstract

The bulk of existing studies investigating the relationship between remittances inflows and financial development focus on the effect of the former on latter neglecting the feedback impact. Unlike these studies, this work adopts a robust composite measure of financial development using the World Bank four mainstays to investigate the direction of the causal relationship between remittances and financial development between 1999 and 2017. Adopting four most developed financial sectors across the four regions of Africa, this study documents causal evidence from homogeneous and heterogeneous models. Our results established both causal directions in heterogeneous models among African most developed financial sectors. Thus, remittances inflows have spurred financial development and vice versa. However, the direction of the causal relationship only flows from financial development to remittances in the homogeneous setting. It is, therefore, recommended that these countries should develop their financial sectors to attract higher remittances. Also, policymakers are advised to explore remittances inflows, as a policy option, to develop their financial sectors.

Keywords: Africa; Financial Development; PVAR; Remittances

JEL Classifications: F2; F3; F4.

Introduction

The inflow of remittances into developing countries has continued to attract the attention of scholars, governments, international communities and policymakers in the last two decades (Beck, Demirguc-Kunt, & Levine 2007; Gupta, Pattillo, & Wagh, 2007). This is because remittances to developing countries, especially sub-Saharan African, have been experiencing a continuous surge in volumes in recent times (Gupta, Pattillo, & Wagh, 2009; Chowdhury, 2016). Totalling US\$ 442 billion in 2015 from US\$ 3.3 billion in 1975, remittances equal two-thirds of foreign direct investment inflows into developing economies, while it has grown more than four times the amount of official development assistance (US\$ 79 billion) and become a reliable source of external finance and foreign exchange earnings for several developing countries in recent times (World Bank, 2009; WDI, 2017). Although the volume of remittances to developing countries is overwhelming, the formal and recorded remittances only account for a negligible proportion of total remittances to developing economies (Puri & Ritzema, 1999; Lim & Basnet, 2017). In this regard, Freund and Spatafora (2005) noted that unrecorded and informal remittances account for about 45-65% of formal and recorded flows to sub-Saharan countries annually.

Compared to other international inflows like official foreign aids, international bilateral aid flows, foreign direct investment and export earnings; remittances to developing countries have been relatively stable (Gupta, Pattillo & Wagh, 2009; Yang, 2008; Aggarwal Demirgüç-Kunt & Pería, 2011). This is especially important to sub-Saharan African region which has been experiencing dwindling and fluctuating foreign aids in recent times. Moreover, unlike other inflows which have tendencies to erode receivers' competitiveness internationally, remittances do not have this adverse effect (Rajan & Subramanian, 2005). Besides from the volume and stability of remittances, the flow of remittances has also attracted the attention

of scholars and policymakers due to its effects on macroeconomic performance, especially, economic growth of recipient nations. In particular, attentions have been drawn to the impact of remittances on quality of institutions, economic growth, poverty reduction, consumption and financial development in the recipient countries (Adams & Page 2005; Gupta *et al.*, 2007; Gupta *et al.*, 2009; Imai *et al.*, 2014; Chowdhury, 2016; Williams, 2017; Bangake & Eggoh, 2020).

Above all, the roles of remittances in promoting financial sector development has received considerable attention in both theoretical and empirical literature (Gupta, Pattillo & Wagh, 2009; Aggarwal, Demirgüç-Kunt & Peria, 2011; Fromentin, 2015; Akkoyunlu, 2015; Fromentin, 2017; Bangake, Eggoh & Semedo, 2018; Misati, Kamau, & Nassir, 2019). One, Scholars have argued that remittances inflows tend to boost demand for financial services and consequently financial sector development. This notion is built on the premise that remittances encourage recipients to demand and gain access to financial products and services which they would not have otherwise (Orozco & Fedewa, 2007; Olowa & Olowa, 2013). Thus, remittances encourage the recipients to use formal banking services for transfer of funds and other financial services. Two, it is also assumed that remittances inflows enable the financial sector to reach the unbanked recipients or recipients with limited financial intermediation. Thus, it promotes financial inclusion activities in developing countries (Agarwal & Horowitz, 2002; Olowa & Olowa, 2013). Three, since remittances usually involve large amount, it is postulated that recipients often need financial products that will enable them to save such funds for future consumption as well as gain some amount of interest earnings from this savings (Aggarwal *et al.*, 2010). This implies that remittances inflows could be a strong determinant of financial development.

On the other hand, scholars also have argued that financial development could also influence and have a positive effect on remittances inflow (Demirgüç-Kunt *et al.*, 2010; Aggarwal *et al.*, 2011; Coulibaly, 2015; Bangake & Eggoh, 2020; Olayungbo & Quadri 2019). Following this view, it is documented that a well-functioning financial sector could encourage a high volume of remittances inflow from abroad since the level of financial sector development boosts international financial transactions. Secondly, it is argued that a high level of financial development reduces the costs of the financial transaction. This is because a well-developed financial sector reduces the costs of sending remittances from abroad (Coulibaly, 2015). Thus, remittances inflow could also be a function of the level of financial development. The two arguments imply reverse causation and bi-directional causality between financial sector development and remittances inflows. Thus, the use of causality method within a simultaneous framework that treats both remittances and financial development as separate endogenous variables is more adequate in addressing the relationship empirically. This is tenable since financial development could be determined by remittances inflows and remittances inflows could also be a function of the level of financial development. Moreover, the neutrality hypothesis argues that there is no relationship between remittances and financial development (Akkoyunlu, 2013; Karikari *et al.*, 2016). Despite these plausible arguments in the theoretical literature, the bulk of existing studies have neglected the feedback relationship (Demirgüç-Kunt, Córdova, Pería & Woodruff, 2011; Coulibaly, 2015; Olayungbo & Quadri, 2019). Also, few studies that have addressed the issue of reverse causation have reported contradictory evidence (Chowdhury, 2011; Motelle, 2011; Ahamada & Coulibaly, 2013; Akkoyunlu, 2015; Coulibaly, 2015; Fromentin, 2015; Karikari, Mensah & Harvey, 2016).

Having established the possibility of the bi-directional causal relationship between financial development and remittances, the use of dynamic and simultaneous framework seems more appropriate. This is important because examining the effect of remittances inflows on financial development without considering the possibility of feedback relationship is likely to lead to the problem of simultaneity bias the main cause of dynamic endogeneity (Buck, Liu & Skovoroda, 2008; Chen, Lee & Chiu, 2014; Roodman, 2008; Wintoki, Linck & Netter, 2012; Wooldridge, 2002). Besides, investigating the impact of financial development on remittances inflow while neglecting the feedback effect is also likely to lead to overestimation problem.

Thus, yielding spurious estimates. Unlike existing studies that adopt ordinary causality method, this work adopts an innovative econometric method of dynamic panel causality method developed by Abrigo and Love (2015) and set up within two-step dynamic generalized method of moments (GMM) techniques of Arellano and Bond (1991) to investigate the causal relationship (Buck *et al.*, 2008; Chen *et al.*, 2014). This estimation technique has inbuilt capability to address the problem of dynamic endogeneity inherent in the relationship. Moreover, investigating the direction of the causal relationship between remittances and financial development is pertinent because remittances inflow has become a sustainable and steady source of revenue in most developing countries in recent times. Besides, financial development in most developing countries, Africa inclusive, are growing extraordinary in recent times.

Our paper contributes to the literature in the following ways. First, we adopt a more robust composite measure of financial development that accommodate the four mainstays of financial development—depth, efficiency, stability and access. This is in line with the World Bank classifications of financial development. Unlike existing studies using singular financial development indicator of the ratio of bank credit to GDP (King and Levine, 1993; Bettin & Zazzaro, 2011; Aggarwal *et al.*, 2011; Ojapinwa & Bashorun, 2014; Karikari, Mensah & Harvey, 2016; Fromentin, 2017); bank deposit to GDP (Chowdhury, 2011; Aggarwal *et al.*, 2011; Bettin & Zazzaro, 2011); broad money supply (M2) to GDP (Bettin & Zazzaro, 2011; Ojapinwa & Bashorun, 2014; Fromentin, 2017); loans (Bettin & Zazzaro, 2011) and financial inclusion indicators (Anzoategui, Demirguc-Kunt & Peria, 2013; Aga & Peria, 2014; IFAD, 2015), this present study adopts a more robust indicator of financial development derived from principal component analysis (PCA) method following the work of Shahzad, Adnan, Ali and Raza (2014). Unlike Shahzad *et al.*, (2014) that adopts eight financial depth indicators, the present study uses four indicators of financial development that cut across the four mainstays of financial development of the World Bank. Thus, we choose an indicator from each mainstay. This measure yields a more robust financial development indicator that accommodates all mainstays of the World Bank. Thus, the paper adopts Private Sector Credit to GDP and the Bank Branches per 100,000 adults (commercial banks) as measures of depth and access respectively. Also, Z-score and the Boone indicator for stability and efficiency correspondingly (see Table 1).

Secondly, we examine the direction of causality between remittances-financial development relationship from the four most developed financial sectors in Africa—Nigeria, South Africa, Kenya and Egypt. Nigeria and South Africa have the most developed financial sectors in West Africa and Southern Africa respectively while Kenya and Egypt have the best financial sectors in East and North Africa respectively. This is with the view to investigating whether past remittances inflows have contributed significantly to the present development level of financial sectors in these countries or vice versa following the theoretical submissions of Demirguc-Kunt *et al.*, (2010); Aggarwal *et al.*, (2011); Coulibaly (2015). Thirdly, the paper also contributes to the literature in terms of methodology. We adopt a panel causality method set up within panel Vector Autoregression (PVAR) developed by Love and Abedgo (2015). The method is built upon the methodology of the generalized method of moments (GMM) of Arellano and Bond (1991) and Bond & Blundell (1998). The method can address simultaneity and endogeneity problems embedded in the relationship. For heterogeneous models, the paper adopts the Toda-Yamamoto version of causality. The method uses data in the original state without differencing, unlike ordinary granger causality. It thus preserves the originality and natural characteristics of data to avoid spurious regression. The rest of the paper is structured as follows. The second section addresses both theoretical and empirical reviews while section three documents the trends of financial development and remittances in selected African countries. The fourth critically examine methodology adopted in the work while the fifth section deal with empirical results and interpretation. Lastly, section six provides a brief conclusion.

Table 1: World Bank Financial Sector Development Pillars and Indicators

Mainstays	Institutional Indicators
Depth	Private Sector Credit to GDP; M2 to GDP; Deposits to GDP; Gross value added of the financial sector to GDP; Financial Institutions' asset to GDP.
Access	Accounts per thousand adults (commercial banks); Branches per 100,000 adults (commercial banks); % of people with a bank account; % of firms with the line of credit (all firms); % of firms with the line of credit (small firms).
Efficiency	Net interest margin; Lending-deposits spread; Non-interest income to total Income; Overhead costs (% of total assets); Profitability (return on assets, return on equity); Boone indicator (or Herfindahl or H-statistics)
Stability	Z-score; Capital adequacy ratios; Asset quality ratios; Liquidity ratios

Source: World Bank Global Financial Development Database

Literature Review

Theoretical issues

The work is premised on the direct link view of the remittances-financial development literature. This view believes that there exists a direct connection in the remittance's inflows-financial development relationship (Gupta, Pattillo & Wagh, 2009; Demirgüç-Kunt *et al.*, 2011; Aggarwal, Demirgüç-Kunt & Peria, 2011; Brown, Carmignani & Fayad, 2011). Thus, remittances directly affect financial development without interacting with economic growth. On the other hand, the indirect link assumes remittances stimulate financial development. Thereafter, financial development is further presumed to have a further effect on economic growth (King & Levine, 1993; Levine, 1997, 2004; Rajan & Zingales, 1998; Beck, Levine & Norman, 2000a, b; Demirgüç-Kunt *et al.*, 2011). Thus, remittances inflows indirectly promote economic growth through financial development. This paper agrees with the direct link, thus, the exclusion of economic growth from the model.

While these studies postulate a one-way relationship in which remittances inflows affect financial development, recent studies have recognized a bi-directional causal relationship between remittances inflows and financial development (Demirgüç-Kunt *et al.*, 2011; Aggarwal, Demirgüç-Kunt & Peria, 2011). Furthermore, the submission of the direct link between remittances inflows and financial development assumes that the level of financial development could be influenced by remittances inflows. This is because remittances inflows boost demand for financial services and consequently financial sector development. This notion is built on the premise that remittances inflows encourage recipients to demand and gain access to financial products and services which they would not have otherwise (Orozco & Fedewa, 2007; Olowa & Olowa, 2013). This relationship is expressed functionally as:

$$\text{Financial Development} = f(\text{Remittances Inflows}) \quad (1)$$

Similarly, some scholars hold the view that a high level of financial development reduces the costs of the financial transaction including the costs of sending remittances (Agrawal *et al.*, 2011). Thus, it is also believed that a high level of financial development reduces the costs of sending remittances from abroad. Consequently, a well-functioning financial sector encourages a high volume of remittances inflows from abroad (Demirgüç-Kunt *et al.*, 2010; Aggarwal *et al.*, 2011). This is equally defined functionally as:

$$\text{Remittances Inflows} = f(\text{Financial Development}) \quad (2)$$

These two views are tested in this study within a simultaneous causality framework.

Empirical reviews

The relationship between remittances and financial development has received considerable attention in international finance literature. General observation shows that the bulk of studies in the literature has focused on the effect of remittances on financial development neglecting the feedback effect, yet this empirical evidence continues to yield contradictory results. While some empirical studies report a positive effect of remittances inflows on financial development (Aggarwal *et al.*, 2011; Cooray, 2012; Ojapinwa & Bashorun, 2014; Odionye & Emerole, 2015; Karikari, Mensah & Harvey, 2016; Fromentin, 2017; Misati, Kamau, & Nassir, 2019), some others document a negative relationship (Woodruff & Zenteno, 2001; Maimbo & Ratha, 2005). The contradictory evidence may not be unconnected with different methods, measures of variables and environments adopted in the empirical literature.

Recently, scholars have recognized and accounted for the feedback effect in the relationship (Calderon & Liu, 2003; Aggarwal *et al.*, 2010). However, only a few studies have investigated this empirically (Akkoyunlu, 2013; Coulibaly, 2015; Fromentin, 2015; Karikari *et al.*, 2016; Bangake & Eggoh, 2020; Olayungbo & Quadri 2019). Still, these studies have reported contradictory evidence. For instance, empirical studies have established that the direction of causality runs from financial development to remittances (Koay & Choog, 2013; Sibindi, 2013; Coulibaly, 2015). Coulibaly (2015) documents that the direction of causal relationship flows from financial development to remittances in the Gambia. This implies that financial development has attracted remittances inflows into the Gambia. Also, studies have reported the opposite causation from remittances to financial development (Chowdhury, 2011; Coulibaly, 2015). For instance, Coulibaly (2015) reported that the direction holds from remittances to financial development in Sudan, Niger, Sierra Leone and Senegal. Thus, past remittances inflows can adequately explain the present level of financial development in these countries. Similarly, few studies have also noted that neither direction of causation holds (Akkoyunlu, 2013; Karikari *et al.*, 2016). Akkoyunlu (2013) investigated the direction of a causal relationship in Turkey using Toda-Yamamoto causality, the result does not find any evidence of causality. Using short-run causality of VEC, Karikari, *et al.*, (2016) also reported that neither direction of causality holds for 50 African countries between 1990 and 2011. Unlike other studies on the subject, Masduzzaman (2014) and Fromentin (2015) reported a bi-directional relationship using a panel data of 32 countries from Latin America and Bangladesh data between 1981 and 2013 respectively.

Trends of Remittances Inflows and Financial Development in Selected African Countries

Fig. 1 shows the trends of remittances and financial development in the 10 biggest remittances-receiving countries in Africa according to World development indicators, (2018). Accidentally, the four most developed financial sectors in Africa fall among these countries. As shown in Figure 1, Egypt receives the highest remittances in 2017. Surprisingly, the country is the second-best developed financial sector among the ten countries. It is equally the best financial sector in the Middle East and North Africa (MENA). Following Egypt is Nigeria, the country stands as the highest remittances-receiving country which equally has the best financial sector in West Africa. The next countries are Senegal and Kenya. It should be noted that Kenya also has the best financial sector in East Africa. The last country in our analysis in South Africa. Although the best overall financial sector in Africa, the country takes the 7th position in remittances receipts. This is unconnected with the level of economic development which has discouraged migration in the economy relative to other African countries.

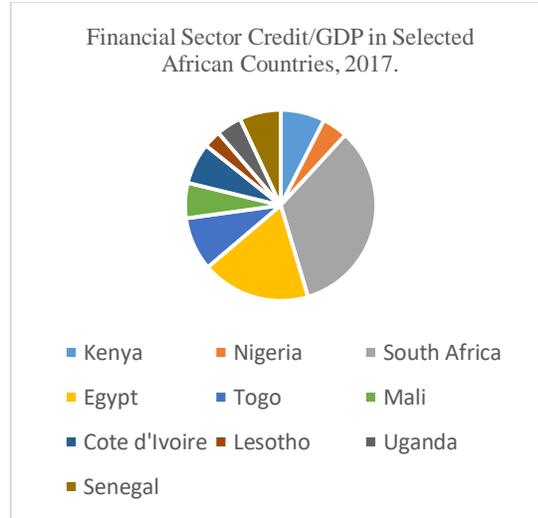
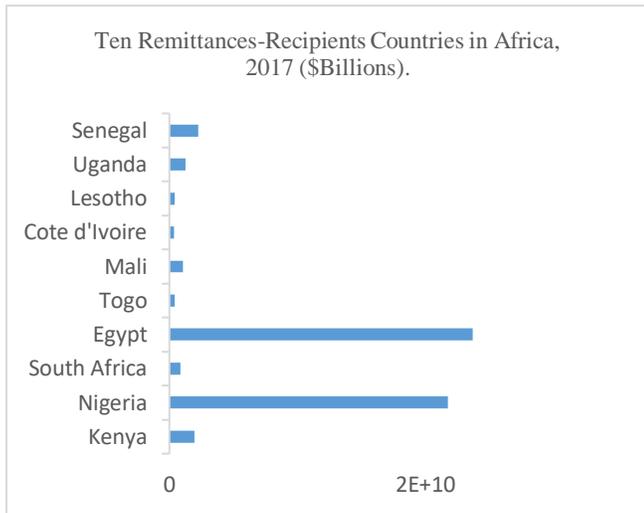


Figure 2: Financial Sector Credit/GDP, Source: Researchers

Figure 1: Ten Remittances-Recipients Countries, Source: Researchers

Similarly, Fig 2 displays the corresponding level of financial development among the 10 selected highest remittances-recipients' countries in Africa. Surprisingly, three best countries here (Egypt, Kenya and Nigeria) equally fall among the most developed financial sectors in Africa World development indicators, (2018). Thus, the theoretical propositions of the bi-directional relationship between remittances-financial development might be valid. Similarly, Fig 3 portrays the proportion of remittances in the GDP of recipient countries. As shown in Figure 3, Lesotho records the highest proportion of remittances in GDP. This is followed by Senegal and Egypt respectively. The low share of remittances in GDP of highest receiving countries might not be unconnected with the size of their economies. For instance, Nigeria has the biggest economy in Africa, hence, the little effect of remittances on her GDP. In comparison with other regions of the world, Fig 4 shows that South Asia receives the highest remittances in the world. This is followed by East Asia and the Pacific. However, Sub-Saharan African continent follows after MENA region. Lastly, Caribbean small states are the least remittances-receiving countries among the regions.

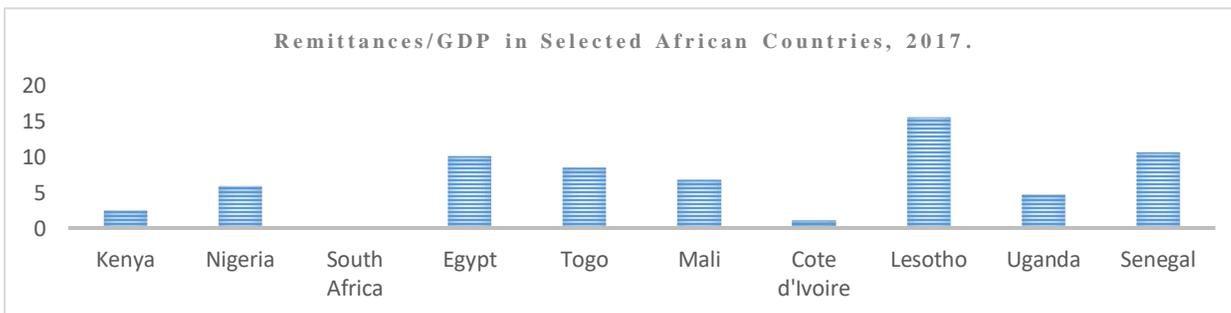


Figure 3: Remittances/GDP in Selected African Countries
Source: Researchers



Figure 4: Remittances in Different Regions of the World
Source: Researchers

Methodology

Empirical models

Toda-Yamamoto approach to causality (heterogeneous models)

To investigate the heterogeneous models, this study employs the Toda-Yamamoto (1995) causality method. This method addresses the problems associated with ordinary causality method in some ways. First, it disregards the problems associated with size distortions and properties resulting from the unit root and cointegration tests (Zapata & Rambaldi, 1997). Toda-Yamamoto (1995) causality technique is estimated within vector autoregressive (VAR) models in levels. Thus, the method artificially augments the right order of the VAR, k, by the maximum integrated order of integration, d_{max} . The next step is to estimate the $(k+d_{max})$ th VAR order while the estimates of the last lagged d_{max} vector are ignored (Wolde-Rufael, 2005; Rambaldi, 1997; Zapata & Rambaldi, 1997; Amiri & Ventelou, 2012). Hence, the method yields an asymptotic distribution (Wolde-Rufael, 2005). The causal relationship model between remittances inflows-financial development relationship is set up within VAR representations as follow:

$$\begin{aligned}
 REM_t = & \alpha_0 + \sum_{i=1}^m \alpha_{1i}REM_{t-i} + \sum_{j=m+1}^{dmax} \alpha_{2j}REM_{t-j} + \sum_{i=1}^m \beta_{1i}FINDEV_{t-i} + \sum_{j=m+1}^{dmax} \beta_{2j}FINDEV_{t-j} \\
 & + \mu_{1t}
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 FINDEV_t = & \varphi_0 + \sum_{i=1}^m \varphi_{1i}FINDEV_{t-i} + \sum_{j=m+1}^{dmax} \varphi_{2j}FINDEV_{t-j} + \sum_{i=1}^m \theta_{1i}REM_{t-i} + \sum_{j=m+1}^{dmax} \theta_{2j}REM_{t-j} \\
 & + \mu_{2t}
 \end{aligned} \tag{4}$$

From equation (3), we accept the alternative hypothesis that granger causality run from remittances inflow (REM) to financial development (FINDEV) if $\beta_{1i} \neq 0 \forall i$. Also, in equation (4), we conclude and accept the alternative hypothesis that financial development (FINDEV) granger causes remittances inflows (REM) if $\theta_{1i} \neq 0 \forall i$. This test is performed for individually country in the study. Thus, the method allows for the use of nonstationary series since these are augmented in the empirical modelling.

Techniques of analysis (dynamic panel VAR and causality (homogeneous model))

To investigate the homogeneous relationship between remittances inflows and financial development among the four most developed financial sectors in Africa, this study adopts simultaneous causality equations framework set up within panel vector autoregressive introduced by Abrigo and Love (2015) and estimated within the generalized method of moments (GMM) technique developed by Arellano and Bond (1991). While causality relationship is best investigated within the framework of vector autoregressive modelling, the problem of dynamic endogeneity inherent in the relationship is adequately addressed using generalized method of moments (GMM) technique (Buck *et al.*, 2008; Chang, Huang & Yang, 2011; Chen *et al.*, 2014). Thus, the causal relationship between remittances inflows and financial development seems more appropriate to be explored within the PVAR framework and GMM methodology with the following set of equations:

$$REM_{it} = \alpha_0 + \sum_{k=1}^p \alpha_{1j} REM_{it-k} + \sum_{k=1}^p \alpha_{2k} FINDEV_{it-k} + \eta_{1i} + u_{1it} \quad (5)$$

$$FINDEV_{it} = \beta_0 + \sum_{k=1}^p \beta_{1j} FINDEV_{it-k} + \sum_{k=1}^p \beta_{2k} REM_{it-k} + \eta_{2i} + u_{2it} \quad (6)$$

From equation (5), we accept the alternative hypothesis that granger causality run from remittances inflows (REM) to financial development (FINDEV) if $\alpha_2 \neq 0 \forall i$. Also, in equation (6), we conclude and accept the alternative hypothesis that financial development (FINDEV) granger causes remittances inflows (REM) if $\beta_2 \neq 0 \forall i$. Since differenced GMM estimator employs differenced instruments and the country differences is eliminated by the process of first differencing, this yields first differences equations (5) and (6) as follows:

$$REM_{it} = \sum_{k=1}^p \alpha_{1j} REM_{it-k} + \sum_{k=1}^p \alpha_{2k} FINDEV_{it-k} + \Delta u_{1it} \quad (7)$$

$$FINDEV_{it} = \sum_{k=1}^p \beta_{1j} FINDEV_{it-k} + \sum_{k=1}^p \beta_{2k} REM_{it-k} + \Delta u_{2it} \quad (8)$$

where Δ denotes the first difference operator. Also, the error terms of the transformed equations (3) and (4) satisfy the conditions of orthogonality. Hence, the dynamic panel GMM technique addresses potential endogeneity in the data.

Data and sources

Following the literature (Aggarwal *et al.*, 2006; Beck *et al.*, 2000; Gupta *et al.*, 2009; King & Levine, 1993), this paper proxy remittances inflows with the ratio of remittances inflows to GDP. We adopt four indicators of financial development selected from each of the four pillars of financial development following World Bank classification. This is used to build a robust indicator of financial development using the PCA method. Thus, private sector credit to GDP captures depth; while branches per 100,000 adults capture access. Similarly, net interest margin represents efficiency while liquidity ratios represent stability pillar of financial development. All data used in the study are sourced from the World Bank Global Financial Development Database available online. The study covers the periods between 1999 and 2017. Remittance is expressed in US\$.

Empirical Results and Interpretations

Descriptive statistics

Before examining the causal relationship between remittances inflows and financial development in selected African countries, it is pertinent to investigate the descriptive statistics and stationarity properties of the variables in the study. This displays the underlying features of the variables and examines the appropriateness of our methodology. Table 2 shows pieces of information regarding mean, median, maximum and minimum values and the kurtosis to determine the distributional properties of the variables. Table 2 shows that the mean and median of the variables are within the minimum and maximum values. This implies that the series exhibit a high level of consistency.

Table 2: Descriptive Statistics

	BANKBRAN	BOONE	DOMECRED	Z-SCORE	REMGDP	REM
Mean	5.108137	4.123577	79.78588	16.48550	2.967069	6.36E+09
Median	4.491222	-0.086859	57.31720	15.05805	2.384731	1.35E+09
Maximum	10.86248	42.78470	192.6601	42.78470	10.06079	2.37E+10
Minimum	1.800000	-2.540860	3.023980	11.09940	0.204474	50914426
Std. Dev.	2.207176	8.940986	62.03072	5.152746	2.411605	8.00E+09
Skewness	1.201348	2.379614	0.594563	3.170183	0.558357	0.976103
Kurtosis	3.803413	9.285147	1.894388	16.01551	2.493970	2.173547
Jarque-Bera	20.32498	196.8189	8.348595	663.7451	4.759866	14.23142
Probability	0.000039	0.000000	0.015386	0.000000	0.092557	0.000812
Observations	76	76	76	76	76	76

Source: Researchers

On average, remittances inflows occupy approximately 3% of the GDP of countries under investigation. With maximum values of 10%, this shows that remittances inflows occupy a significant proportion of GDP in African economies. Hence, it should have a significant influence on financial development and economic growth among these countries. This further clarifies why the issues of remittances inflows have attracted the attention of scholars and policymakers in recent times. Using raw values, an average country in the study attracts over \$6billions annually. A country like Egypt attracts over \$23billions annually. This is huge and has potentials to influence policymaking in these countries. The least country under investigation, South Africa, attracts over \$50million annually. Using four mainstays of financial development- access, depth, stability and efficiency-, Table 5.1 further shows that financial sector credit as a proportion of GDP has an average of 80% with the maximum value of over 192%. This implies that individuals and firms adequately access financial services among these countries. However, the indicator of financial access and bank branches per 100,000 adults are very weak among these countries despite a high level of financial depth. The indicator implies that a large proportion of the population has not accessed financial services among these countries.

For efficiency and stability mainstays, this paper adopts Boone indicator and Z-Score respectively. Boone indicator is a measure of the degree of competition while Z-Score measures the level of stability in the banking sectors. The higher the degree of competition in the banking industry, the more efficient it is. Also, a high Z-Score implies that the banking industry is immuned against financial crisis. As shown in Table 2, the Boone indicator shows that degree of competition is low among these countries. This is because the value is positive instead of the *a priori* expectation. This might not be unconnected with the waves of recapitalization policies which has forced these banks to merged and consolidated to highly capitalized status. However, these policies have reduced the number of banks operating in these countries thus reducing the degree of competition. An illustration is the Nigerian banking industry recapitalization policy of 2005

which reduces the number of banks from 86 to 25 (Bolarinwa, Obembe & Olaniyi, 2019). On the other hand, the policies have improved the capitalization and bank size among African countries, hence, the high level of stability as evidenced by Z-Score in Table 2.

The standard deviation, a measure of the degree of dispersion of variables from the mean, shows that all the variables are relatively stable. Bank branches/100,000 is the most stable variable in the model with a standard deviation of 2.2072. This is followed by ratio of remittances to GDP (2.411605); Z-Score (5.1528); Boone indicator (8.941) and the ratio of domestic credit to GDP (62.031). Furthermore, Table 2 also shows the variables of Bank branches/100,000, Boone indicator and Z-Score are leptokurtic relative to normal distribution since the kurtosis of these variables is greater than 3. On the other hand, the ratio of domestic credit to GDP and the ratio of remittances to GDP is relatively platykurtic since the value of kurtosis is less than 3. Lastly, most of the probability values are significant at 1% implying that the empirical results are valid. Having duly examined the descriptive statistics of the variables, Table 3 presents the correlation matrix of the variables in the model. This is expedient to ensure that the model does not suffer from multicollinearity. The results of the pairwise correlation, as shown in Table 3, depicts that all correlation coefficients are around 0.5 besides from Boone indicator and domestic credit (0.73834). The inherent multicollinearity in the model is corrected by the principal component analysis (PCA) analysis. Detailed information on the PCA variable of robust financial development is available in the appendix.

Table 3: Correlation Matrix

	REMGDP	BANKBRANCH	BOONE	DOMECRED	ZSCORE
REMGDP	1				
BANKBRANCH	-0.308600	1			
BOONE	-0.576017	0.349678	1		
DOMECRED	-0.483658	0.554075	0.738341	1	
Z-SCORE	0.076259	-0.140082	0.522863	0.078954	1

Source: Researchers

Moreover, to determine the appropriateness of the unit root test, the work examines the presence of cross-sectional dependence in the variables using Perasan (2004, 2015) which is more appropriate when there for small sample properties, the empirical results are presented in Table 4. The results show that null hypothesis is accepted for both remittances and financial development at 5% significant level. Thus, it could be concluded that cross-sectional dependence does not exist in the variables. This implies that the second generational unit root tests such which hold the assumption of underlining assumption of cross-sectional dependence are not necessarily applicable for the study.

Table 4: Results of the Cross-Sectional Dependence Test

Variables	CD Test Statistics	P Value
Financial Development	-2.959	0.087
Remittances	-2.898	0.104

Source: Researchers,

Unit root test

Testing for the unit root properties is essential for determining the appropriateness of methodology. Besides from time series analysis, it has been argued that the unit root test is equally important for panel analysis (Chen et al., 2014; Chang et al., 2011). This paper carries out both panel and time series unit root tests for variables in the study. For panel model, the study adopts three-panel unit root tests {LLC (Levin et al., 2002; IPS (Im et al., 2003 and the ADF- Fisher chi-square (Maddala & Wu, 1999)}. It should be noted that LLC assumes common unit root processes among cross-sectional units while IPS and ADF-Fisher tests

assume individual unit root processes across cross-sectional units. The results of the panel unit root tests with individual effects and linear trends are presented in Table 5. The results of the three tests show that remittances inflow is stationary at levels, [I(0)] without first differencing. On the other hand, the variables of Domestic Credit, Bank Branches/100,000, Boone Indicator, Z-Score and the PCA of Financial Development indicators attain stationarity at [I(1)]. Since the integration of the variables in the model does not exceed one, this shows that difference generalized method of moment (DGMM) is more appropriate than an ordinary panel method common in the literature.

Table 5: Stationarity Test for Homogeneous Models (Individual Effects & Linear Trends)

Variables/Tests	LLC		IPS		ADF-Fisher		Status
	Levels	First Difference	Levels	First Difference	Levels	First Difference	
Remittances	-3.189***	-	-3.227***	-	26.8826***	-	I(0)
Domestic Credit	0.08132	0.37204	-0.05098	-2.12911*	7.05908	13.9677*	I(1)
Bank Branch/10,000	-0.9411	-3.93850***	0.24450	-2.34115***	5.75887	19.0173***	I(1)
Boone Indicator	0.35486	-5.12381***	0.10092	-4.43832***	10.5164	35.1038***	I(1)
Z-Score	-1.62847	-6.37241***	-0.23676	-5.53410***	7.86595	39.0594***	I(1)
Financial Dev. PCA	0.4028	-4.6641***	0.34468	-3.9578***	6.73554	28.8534***	I(1)

Source: Researchers

For the homogeneous models (individual countries models), this study further conducts the time series unit root tests for the variables. Table 6 presents the results using Augmented Dickey-Fuller and Phillip-Perron tests. The results show that remittances inflow is stationary at levels without first differencing in Kenya only while the same variable attains stationarity after first differencing in Nigeria, South Africa and Egypt. Unlike remittances, financial development indicator attains stationarity in all countries at first difference. Empirical results from the stationarity properties of the variables under heterogeneous models show that the order of integration of remittances inflows differ among countries. However, this is not an issue since Toda-Yamamoto causality addresses this issue (Toda & Yamamoto, 1995; Menyah & Wolde-Rufael, 2010). This further lends credence to the appropriateness of the Toda-Yamamoto causality method adopted in the present study. This shows that Vector Error Correction (VEC) common in the literature might not be tenable.

Table 6: Stationarity Test for Heterogeneous Models

Countries/Tests	Augmented Dickey-Fuller		Phillip-Perron		Status
	Levels	1 st Difference	Levels	1 st Difference	
South Africa					
Remittances	-1.4758	-3.3373**	-1.5488	-3.4609***	I(1)
FINDEV PCA	-3.3809*	-5.2821***	-3.3811*	-13.7426***	I(1)
Nigeria					
Remittances	-1.8865	-3.8726**	-1.8865	-3.8632**	I(1)
FINDEV PCA	-1.2664	-4.4138**	-1.3798	-4.4092**	I(1)
Kenya					
Remittances	-9.8685***		-3.8784**		I(0)
FINDEV PCA	-1.5296	-6.4246***	-2.5728	-6.4246***	I(1)
Egypt					
Remittances	-0.5394	-3.2731**	0.0760	-2.8406***	I(1)
FINDEV PCA	-2.0344	-4.2275**	-1.5544	-6.6033***	I(1)

Source: Researchers

Before proceeding to the interpretation of results of a causal relationship, it seems more expedient to interpret the baseline PVAR results. Table 7 presents the PVAR baseline results of the PVAR system. Following the procedures of the GMM method, appropriate and valid instruments are adopted in the model.

This is an initial condition must be fulfilled in Love and Abridgo (2015) PVAR modelling. Hence, the instrumental variables used in the estimations are valid. Also, the appropriate lag length of one is chosen following lag length selection tests. Having selected one lag length as suggested by four out five lag length criteria. Thus, the estimates of the system are robust and reliable for policy formulations. As shown in Table 7, the coefficient of financial development (FINDEV) is positive and 1% statistically significant in Remittances equation. This implies that financial development has a positive effect on remittances inflows into the countries under investigation. It also means that the level of financial development among these countries has encouraged immigrants abroad to send funds into their home countries. Thus, the results validate the views of Demirgüç-Kunt *et al.*, (2010); Aggarwal *et al.*, (2011); Coulibaly (2015) which noted that the level of financial development determines remittances inflows into an economy.

The result is particularly interesting because a high level of financial development enables immigrants to send remittances to their home country at fewer costs and efficiently thus prompting remittances inflows into these countries. Besides, the statistical significance of one lag of remittances (0.9395) on the present value of remittances inflows confirms the appropriateness of our methodology, DGMM and PVAR. This confirms the dynamic nature of remittances inflows (Demirgüç-Kunt *et al.*, 2010; Aggarwal *et al.*, 2011; Coulibaly, 2015). Thus, ordinary panel cointegration prevalent in the literature might not be appropriate. Also, the empirical results from Table 7 reveals that financial development granger causes remittances inflows into these countries, most importantly in the short run. This implies that the level of financial development has spurred remittances inflows into these countries. It is also evident that the level of financial development improves remittances inflows among these countries. The policy implication arising from the study is the fact that financial development is a strong policy variable for attracting and determining remittances inflows among in countries.

Panel Vector Autoregression (PVAR) Baseline Result

Table 7: Panel GMM Estimates of the PVAR System

Variables	REM	FINDEV
REM(-1)	0.9395***(0.2565)	-0.0354(0.0405)
FINDEV(-1)	3.8586***(0.6525)	0.8765***(0.1038)

Notes: *** denotes 1% significant level while () records the standard deviation of the coefficients.

Source: Researchers

On the contrary, the coefficient of remittances does not have a significant effect on the financial development equation. This means that remittances inflows do not contribute to significantly to all mainstays of financial development (depth, access, efficiency and stability) among these countries. Though it might have contributed to depth mainstay in the short run. The empirical results imply that huge remittances inflows into these countries have not contributed to a higher level of stability, degree of competition, credit to the real sector and banking services access among these countries altogether. Also, from Table 8, it is clear that past remittances inflows do not determine the present level of financial development. The result is tenable when some facts are considered in the descriptive statistics. For instance, despite a high level of remittances inflows, bank branches/100,000 is still very low. The highest recorded in the study is approximately 11. Also, high remittances inflow has not increased the degree of competition among these banks. Instead of the negative *a priori* expectation for a high degree of competition, the study reports a positive value for Boone indicator. This also indicates a low degree of competition. Besides, the correlation coefficient between domestic credit and remittances inflows has a value -0.48. This also implies a negative relationship. Thus, the view that remittances inflows increase financial sector credit, popular in the literature might be not extended to other financial development pillars of access, stability and efficiency.

Also, it is quite important to note that remittances are often transitory incomes which the receivers do not leave in the bank account but rather for immediate consumption and other purposes.

Panel Causality Results for Homogeneous Models

Table 9: Summary of Results from Panel Causality Model

Direction of Causality	Chi-Square	Inference of Causality
Remittances → Financial Development	0.766 (0.381)	No
Financial Development → Remittances	34.794*** (0.0000)	Yes
Financial Development ↔ Remittances	-	No

Notes: *** denotes 1% significant level while the probability values are indicated in the ().

Source: Researchers

For a clearer understanding of the nature of remittances-financial development relationship, this paper further examines the issue within a homogeneous setting. Thus, the causal relationship is further examined for each of the countries under review. Table 10 reports the results. The result of the homogeneous model is further validated in South Africa and Egypt. It should be noted that South Africa and Egypt have the two most developed financial sectors in Africa as shown in Fig 2. Thus, financial development in these countries has promoted remittances inflows. On the other hand, the opposite causal direction is reported for Nigeria and Kenya. This means that past remittances inflows have adequately contributed to financial development in Nigeria and Kenya. It also implies that remittances inflows into these countries have translated into financial development indicators of stability, access, efficiency and depth. Thus, policymakers in these countries are advised to formulate financial development policies using the surge of remittances inflows.

Causality results for heterogeneous models

Table 10: Summary of Results from VAR Causality Models

Direction of Causality	Chi-Square	Inference of Causality
South Africa		
Remittances → Financial Development	1.646251 (0.6489)	No
Financial Development → Remittances	30.1033*** (0.0000)	Yes
Financial Development ↔ Remittances	-	No
Nigeria		
Remittances → Financial Development	6.30492** (0.0427)	Yes
Financial Development → Remittances	0.21664 (0.8973)	No
Financial Development ↔ Remittances	-	No
Kenya		
Remittances → Financial Development	8.34617** (0.0154)	Yes
Financial Development → Remittances	3.40919 (0.1818)	No
Financial Development ↔ Remittances	-	No

Egypt		
Remittances → Financial Development	0.84518 (0.6553)	No
Financial Development → Remittances	7.0729** (0.0291)	Yes
Financial Development ↔ Remittances	-	No

Notes: *** and ** denotes 1% and 5% significant levels respectively while the probability values are indicated in the ().

Source: Researchers

Conclusion and Policy Recommendations

Following recent surge in remittances inflows into African countries and the continuous improvement in the financial sectors in African economies, several studies have examined the relationship between remittances and financial development in developing countries. However, large proportions of these studies have largely concentrated on the effect of remittances on financial development, neglecting the feedback relationship. Also, few studies that incorporated the bi-directional relationship have not addressed the endogeneity problem inherent in the relationship. This paper contributes to the literature by using panel causality based on PVAR and the Toda-Yamamoto causality tests to investigate the relationship among the four most developed financial sectors in Africa. The homogeneous model reports that causation runs from financial development to remittances inflows while the heterogeneous models document mixed results. The empirical results emanating from the study are important for policy formulations. First, empirical evidence shows that past financial development explains the present level of remittances in South Africa and Egypt. Thus, developments in finance has significantly contributed to remittances in these countries. The governments in these countries are therefore advised to make policies that specifically enhance financial development in these economies. These include financial inclusion services and reduction of cost of financial services. For instance, financial inclusion policies such as increase in the number of account ownership, borrowing and savings further increase encourage remittances inflows into these economies.

Moreover, reduction in the prices of financial services definitely encourage large proportion of the populace to embrace financial services thus encouraging remittances inflows into these economies. Moreover, the empirical results establish the view that the direction of causality flows from remittances to financial development for Nigeria and Kenya. This implies that past remittances in Kenya and Nigeria has significantly contributed to the present level of financial development in these countries. The policymakers in the countries are therefore advised to reduce the cost of sending remittances into these economies. These will encourage further remittances inflows into these economies thus developing the financial sectors in these countries. The effect is the positive spillovers on inequality, poverty, and economic growth in these countries. Moreover, policies aiming at full digitalization of remittances inflows and process are encouraged in these economies. These will help in encouraging more inflows in these countries. Thus, ultimately leading to development in the financial sectors in these economies with its spillover effects.

Notes:

The baseline VAR results are available for the countries are available from the authors on demand.

The results of the lag selection criteria are available on demand.

The stability test of the PVAR and VAR models and its graphs are equally available on-demand from the authors. These are not included in the study to conserve space.

References

- Acosta, P.A., Baerg, N.G., & Mandelman, F.S. (2009). Financial development, remittances, and real exchange rate appreciation. *Economic Review*, 1, 1–12.
- Adams, R. & Page, J. (2005). Do international migration and remittances reduce poverty in developing countries. *World Development* 33, 1645–1669.
- Aggarwal R., Demirguc-Kunt A., & Peria, M.S.M. (2011). Do remittances promote financial development. *Journal of Development Economics* 96(1), 255–264.
- Akkoyunlu, S. (2013). *Remittances and financial development: Is there a direct link? Evidence from Turkey Data*. Global Development, New Frontiers, 10–13 April 2013, University College London.
- Bangake, C., & Eggoh, J. (2020). Financial development thresholds and the remittances-growth nexus, *Journal of Quantitative Economics*, 18(2), 425-445.
- Beck T., Levine R., & Loayza N. (2000). Finance and the sources of growth. *Journal of Financial Economics*, 58, 261–300.
- Bettin, G., & Zazzaro, A. (2012). Remittances and financial development: Substitutes or complements in economic growth? *Bulletin of Economic Research*, 64(4), 0307-3378 DOI: 10.1111/j.1467-8586.2011.00398.x
- Blundell, R., & Bond S. (1998) Initial conditions and moments restrictions in dynamic panel data models. *Journal of Econometrics*, 87, 115–143.
- Chowdhury, M. B. (2011). Remittances flow and financial development in Bangladesh, *Economic Modelling*, 28, 2600–2608, doi:10.1016/j.econmod.2011.07.013
- Chowdhury, M. B. (2016). Financial development, remittances and economic growth: Evidence using dynamic panel estimation. *Journal of Applied Economic Research* 10(1), 35–54.
- Cooray, A (2012). Migrant remittances, financial market development and the government ownership of banks: Evidence from a group of non-OECD economies. *Journal of International Finance Market and Institutions* 22(4), 936–957.
- Coulibaly, D. (2015). Remittances and financial development in sub-Saharan African countries: A system approach. *Economic Modelling* 45(1), 249–258.
- Demirgüç-Kunta, A., Córdova, E.L., Pería, M.S.M., & Woodruff, C. (2011). Remittances and banking sector breadth and depth: Evidence from Mexico. *Journal of Development Economics*. 95, 229–241.
- Fromentin., V. (2015). Migrant’s remittances and financial development in Latin America and the Caribbean countries: A dynamic approach, Cahier de Recherche No 2015-02.
- Fromentin., V. (2017). The long-run and short-run impacts of remittances on financial development in developing countries, *The Quarterly Review of Economics and Finance*, 66(1), 192-201. <http://dx.doi.org/10.1016/j.qref.2017.02.006>
- Gupta, S., Pattillo, C.A., & Wagh, S. (2009). Effect of remittances on poverty and financial development in sub-Saharan Africa. *World Development*. 37, 104–115.
- Im, K.S, Pesaran, M.H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometric*, 115, 53–74.
- Karikari, N.K., Mensah S., & Harvey, S.K. (2016). Do remittances promote financial development in Africa? *Springer Plus*, 5, 1-21. <https://doi.org/10.1186/s40064-016-2658-7>
- Levin, A., Lin, C.F., & Chu, C. (2002). Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics*, 108, 1–24.
- Levine R. (1997). Financial development and economic growth: Views and agenda. *Journal of Economic Literature*, 35, 688–726.
- Levine, R. (2004). Finance and growth: Theory and evidence. *NBER Working Paper 10766*. Cambridge, MA
- Levine, R., Loayza N., & Beck, T. (2000). Financial intermediation and growth: Causality and causes. *Journal of Monetary Economics* 46(1), 31–77.
- Masuduzzaman, M. (2014). Workers’ remittance inflow, financial development and economic growth: A study on Bangladesh, *International Journal of Economics and Finance*, 6(8), 247-267.

- Misati, R.N, Kamau, A., & Nassir, H. (2019). Do migrant remittances matter for financial development in Kenya? *Financial Innovation*, 5(31), 1-25 <https://doi.org/10.1186/s40854-019-0142-4>
- Motelle S.I (2011). The role of remittances in financial development in Lesotho: Evidence from alternative measures of financial development. *Journal of Development Agricultural Economics* 3(6), 241–251.
- Odionye, J.C., & Emerole, O. B. (2015). The impact of international remittances on the Nigerian economy, *British Journal of Economics, Management & Trade* 7(1), 1-9.
- Ojapinwa, T.V., & Bashorun, O.T. (2014). Do workers' remittances promote financial development in sub-Sahara Africa countries? *International Journal of Financial Research*, 5(2), 151-159.
- Olayungbo, D.O., & Quadri, A. (2019). Remittances, financial development and economic growth in sub-Saharan African Countries: Evidence from a PMG-ARDL Approach. *Financial Innovation*, 5(9), 1-25. <https://doi.org/10.1186/s40854-019-0122-8>.
- Olowa, O., & Olowa, O. (2013). Migrant remittances and financial sector development in Nigeria. Conference on Financial Globalization and Sustainable Finance: Implications for Policy and Practice. Stellenbosch, South Africa, May 29-31, 2013.
- Orozco, M., & Fedewa, R. (2005). Leveraging efforts on remittances and financial intermediation. Report Commissioned by the Inter-American Development Bank.
- Shahzad, S.J.H., Adnan, N., Ali, S., & Raza, N. (2014). Impact of remittances on financial development in South Asia, *Review of Economics and Business Studies*, 7(2), 11-29.
- Sibindi, A.B. (2014): Remittances, financial development and economic growth: Empirical evidence from Lesotho. *Journal of Governance and Regulation*, 3(4), 116–124.
- Toda, H.Y., & Yamamoto, T., (1995). Statistical inference in vector autoregressions with possibly integrated processes. *Journal of Econometrics*. 66, 225–250.
- World Bank (2019). *Global financial development indicators*. Washington, DC: The World Bank.

Appendix 1

PRINCIPAL COMPONENT ANALYSIS

Eigenvalues: (Sum = 4, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	2.187278	0.939104	0.5468	2.187278	0.5468
2	1.248174	0.814501	0.3120	3.435452	0.8589
3	0.433673	0.302798	0.1084	3.869125	0.9673
4	0.130875	---	0.0327	4.000000	1.0000

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3	PC 4
BANKBRAN	0.432488	-0.541247	0.720463	-0.030649
BOONE	0.617353	0.253834	-0.210286	-0.714299
DOMECRED	0.603103	-0.206814	-0.492195	0.592654
ZSCORE	0.260954	0.774498	0.440973	0.370942

Ordinary correlations:

	BANKBRAN	BOONE	DOMECRED	ZSCORE
BANKBRAN	1.000000			
BOONE	0.349678	1.000000		
DOMECRED	0.554075	0.738341	1.000000	
ZSCORE	-0.140082	0.522863	0.078954	1.000000