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REMITTANCES AND ECONOMIC GROWTH IN SOUTH AFRICA: APPLYING ARDL BOUNDS TESTING ANALYSIS IN THE PRESENCE OF STRUCTURAL BREAKS.

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REMITTANCES AND ECONOMIC GROWTH IN SOUTH AFRICA: APPLYING ARDL BOUNDS TESTING ANALYSIS IN THE PRESENCE OF STRUCTURAL BREAKS.

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ABSTRACT

We take another look at the relationship between remittances and economic growth in South Africa, using recent data and a fairly lengthy time period of approximately 50 years for South Africa running from 1970 to 2019. We use the autoregressive distributed lag (ARDL) bounds testing approach to assess the cointegration among remittances, economic growth, including control variables in the presence of structural breaks. We find evidence to suggest that the structural change in economic growth occurred in 2008 during the global financial crisis, while the break point for remittances received emerged in 1997. After taking into consideration the presence of structural breaks, our study confirmed a cointegration relationship between remittances received and economic growth in South Africa. Specifically, the ARDL results present a negative and significant estimates of remittances on economic growth in the short and long-run, consistent with previous studies. All the specification tests confirm the statistical robustness of the ARDL bounds testing method.

KEYWORDS: ARDL, economic growth; remittances, WDI

JEL CLASSIFICATIONS: C32; F24

1. Introduction

South Africa's Gross Domestic Product (GDP) has experienced and continues to experience turbulence moments since global financial crisis of 2008. Before the global economic crisis, the growth rates were unstable and fluctuated between 5% and -2%, (World Bank, 2019). To help stabilize the economic situation, a number of policies were initiated to reduc the impact of global economic crisis on South Africa's economy. The National Development Plan (NDP) in 2011 introduced The National Planning Commission, which came out with a plan to spur South Africa's economic growth until 2030, with GDP expected to grow at 5% per annum and domestic investment-GDP pegged at 30%. South Africa's economy growth for the period 1970 to 2017 saw an average growth rate of 2.5% per annum. The rates were 3.3% and 3.6% for 1970s and 2000s, respectively. The late 1990s, however, recorded the worst GDP growth in the decade with an average rate of 1.4% (World Bank, 2019).Most of the interventions put in place are aimed at attracting Foreign Direct Investment (FDI) with little or no mention of remittances inflow, even though there has been a rise in remittances inflow into South Africa in recent times.

The role of remittances to the development of economies especially in the developing countries cannot be overlooked as it remains one of the major external sources of finance (Ratha,2012). Remittances from migrant workers have played critical roles in the lives on relatives left behind and the growth of economies. There has been an increase in the volume of workers' remittances inflows and has impacted positively on the lives of dependents as it cushions them from shocks (Paranavithana, 2014).

Remittances are money that flow unidirectionally from migrants to their relatives, community and country (Cohen 2011, Maimbo and Ratha 2005). It is estimated that there were 232 million international migrants as at 2013 up from 2000 figure of about 175 million. Remittances are now recognized as an important source of global finance. In 2013, remittances inflow into developing countries was approximately $404 billion, 3.5 percent increase from 2012 value. It is estimated that remittance flow in the coming years will experience an increase from an initial values of $436 billion in 2014 and $516 billion in 2016 (World Bank 2014). Aside foreign direct investment, remittances is the second largest source of external funding for most developing countries. Remittances flow is the three times the size of development assistance developing countries source from donor partners (Natacha 2012).

Remittances discussion in South Africa has not received much attention as most of the discussions are centered on remittances from South Africa into other developing countries. This is as a result of number of migrant workers living and working in South Africa due to the level of its development in relations to other developing countries in Africa AfrAsia Bank (2017). Discussions on remittances inflow into South Africa have been restricted to outflows making it difficult to assess the impact of remittances inflow on economic development. South Africa has seen an increase in the number of people seeking opportunities elsewhere, which is attributed to the global financial crisis in 2008 (Statistics South Africa, 2019). The deteriorating economic situation has compelled some people to seek opportunities, especially in New Zealand and Australia, among others.

Remittances inflow to South Africa has seen an increase due to an increase in the number of emigrants. Remittances into South Africa grew from US$258.6 million, equivalent to 0.2% of GDP, to a peak of US$1.2 billion, equating to 3% of GDP, 2011 (World bank, 2019). It however saw a decline to about US$755.4 million in 2016, before a mild recovery to US$873.2 million in 2017.

Remittances inflow is expected to propel economic growth, theoretically. There are varied means through which remittances influence economic growth; serves as source of funds for investment, provides immediate cash flow for household consumption and multiplier effect that is associated with remittances inflow (Catrinescu et al., 2009). Remittances inflow improve aggregate demand, which leads to the creation of employment (Organisation for Economic Co-operation and Development "OECD", 2019). Remittances inflow lead to an improvement in the recipient's country capital assets through investment in key sectors such as health and education, which contribute to improvement in quality of human resource (Barajas et al. 2009).

South Africa was once a major recipient of migrant workers but in recent times it has seen a surge in number of its people seeking opportunities outside South Africa. But studies that have looked at the impact of remittances on economic growth in South Africa context have generalized remittances (thus inflow and outflow), which does not truly reflect the exact impact of remittances inflow on economic growth. Now being a recipient of remittances, it is appropriate for a study of

this nature to guide policy makers to formulate appropriate policies to benefit the full impact of remittances on the country's economic activities.

2. Literature review

From the developmental perspective, remittance inflows has the potential to improve the local livelihoods and development in the recipient country. Remittance inflows serve as a key source of funding for investments. Households through remittances inflow are able to smoothing their consumption, which boost the demand for goods and services (Chimhowu et al., 2003). There are varied findings on the impact of remittances on economic growth. IMF (2005) study using time invariant instrument by applying cross-section data for 101 countries from 1970 to 2003, concluded that there is no statistically significant effect of remittances on economic growth. However, a study by Jongwinich (2007) indicated that remittance has a positive impact on economic growth and poverty alleviation in Asia and Pacific countries. A study by Barguellil et al. (2013) through the use of panel data grouped remittance recipient countries into two group; largest remittance recipient of GDP percentage and largest remittance recipient of amount for the period 1990-2006. The result shows that remittance has both direct and indirect effect on countries grouped under largest remittance recipient of GDP. The effect however, disappeared from countries under largest remittance recipient in amount.

Kyophilavong *et al.* (2013) concluded that impact of remittances on financial development and economic growth in the long run are country specific. They however, found that remittances and financial development are key in the development of developing economies and proposed for measures to reduce barriers that inhibit the flow of remittances. Bayar (2015), looked at the relationship among personal remittances, net foreign direct inflows and real GPD per capita using causality test for the period 1996-2013 and concluded that net foreign direct inflows and personal remittances unidirectionally cause economic growth in transition economies in Europe. Shahzad *et al.* (2014), used Fully Modified OLS and Dynamic Ordinary Least Square estimation analysis to examine the effect of capital, remittances, exports, and FDI on economic growth. The findings show that capital, remittances, export and FDI have positive effect on economic growth, whereas a negative impact of labor on growth is observed. The result further established a long run

equilibrium relationship between remittances and economic growth. Feedback causality between remittances and capital in the South Asian countries is also established.

The relationship between remittances and financial development on economic development using a panel of 66 developing countries for the period 1991-2005, showed that efficient financial system improves the impact of remittances on economic growth Bettin and Zazzaro (2009). Abida and Sghaier (2014), through Generalized Method of Moment (GMM) panel data analysis, established a positive relationship between remittances and economic growth. Ramirez and Sharma (2008), applied panel unit root and panel cointegration tests and Fully Modified OLS (FMOLS) and concluded that remittances have a positive influence on economic growth in selected upper and lower income Latin American and Caribbean countries. In addition, a study by Siddique, *et al.* (2010) on the causal link between remittances and economic growth shows mix findings. In Sri Lanka, a two-way directional causality is established, thus the both cause each other. In Bangladesh, the result shows that remittances influence economic growth. However, in India there is no causal relationship between remittances and economic growth.

It is argued that remittance has elements of multiplier effects as it increases savings, which in tend propels economic growth Stahl and Habib (1989). In Bangladesh, the multiplier effect of remittance for the period 1976-1998 was 1.24. Mahmud (2003) and Siddique (2004), attributed Bangladesh's economic growth to remittances inflow. According to Paul and Das (2011) there is a positive relationship between remittances and GDP in the long run, but such relationship does not exist in the short run. A study by Ali (1981) concluded that there is a positive relationship between remittances inflow and favourable balance of payment. However, Rahman et al. (2006) and Rahman (2009) concluded that there is no significant relationship between remittance and economic growth. In addition, a study by Ahmed (2010) found a negative between remittances and economic growth in Bangladesh.

Table 1 Summary of some studies on relationship between remittances and economic growth

Author	Region/Country of study	Methodology	Findings
Fayissa and Nsiah (2010)	36 African countries	Panel	Positive
Bettin and Zazzaro (2009)	66 developing countries	Panel	Positive
Ramirez and Sharma (2008)	upper and lower income Latin American and Caribbean countries	Panel	Positive

Yaseen (2012)	Nine countries	Panel	Positive
Goschin (2014)	Ten countries in Central and Eastern Europe (CEE)	Panel	Positive
Cooray (2012)	South Asia	Time series	Positive
Barguellil *et al*. (2013)	Two groups of countries	Panel	Positive
Imai *et al*. (2014)	Asia and Pacific countries	Panel	Positive
Paranavithana (2014)	Srilanka	TIme series	Positive
Nwaogu and Ryan (2015)	53 African, 34 Latin American and Caribbean countries	Panel	Positive
Matuzeviciute and Butkus (2016)	116 countries	Unbalanced panel	Positive
Meyer and Shera (2017)	Six high remittances receiving countries	Panel	Positive
Lipton (1980)		Negative	
Ahlburg (1991)	Tonga and Western Samoa	Survey	Negative
Brown and Ahlburg (1991)	Pacific region - Tonga and Samoa	Survey	Negative
Chami et al (2005)	113 countries	Panel	Negative
Feeny et al. (2014)	136 developing countries	Panel	Neutral
Jouini (2015)	Tunisia	Time series	Neutral
Lim and Simmons (2015)	Caribbean Community	Survey	Neutral

Source: Sheilla Nyasha Nicholas M. Odhiambo (2019)

Aside the differences in studies outcome ranging from positive effect, negative effect to inconclusive findings, approcahes adopted by researchers are also varied and require further exploration to assess the impact of remittances inflow on economic development. In addition, most of the earlier studies looked the effect of remittances on economic growth at aggregate levels, but the effect of remittances on economic growth should be looked at country specific level since there are country specific weaknessess and strenght that may hinder or complement remittances effect on economic growth. It is against this backdrop that this study seeks to examine the effect of remittances on South Africa's economic growth by using empirical approach that has not received much attention among researchers in the study of relationship between remittances and economic growth.

Unit root tests with structural brakes: Zivot and Andrews Model

Since South Africa was exposed to various global economic shocks (such as East Asian crisis in 1997 and global financial crisis in 2008) and went through significant political events (such as the

period when it transitioned from apartheid regime to democracy in 1994), we can't rule out the possibility of structural break during the study period. Failure to account for structural breaks can lead to model misspecification, coefficient bias and spurious estimates (Pesaran, Shin, & Smith, 2000). To account for this, we use Zivot and Andrew's unit root test which has found great acceptance in the field of econometrics due to its ability to detect unit root and structure break in the data (Zivot and Andrews, 1992). Although we also performed the standard unit root tests such as Augmented Dickey Fuller (ADF) (Dickey and Fuller 1979) and Phillips and Perron (PP) test (Phillips and Perron, 1988), these tests do not allow for the possibility of a structural break. As suggested by Zevot and Andrews there are three standard model specifications to test for a unit root within a structural break environment. The first model (see equation one) allows for the possibility of a one-time change in the level of the series. The second one allows for the possibility of a one-time change in the slope of the trend function. The last one (see equation 3), attempts to bring together the one-time changes in the level and the slope of the trend function of the series. Thus, the following regression models are specified:

$$\Delta y_t = \vartheta + \vartheta y_{t-1} + \beta t + \vartheta DU_t + \sum_{i=1}^{n} \vartheta_i \Delta y_{t-i} + \mu_t \quad (1)$$

$$\Delta y_t = \Omega + \Omega y_{t-1} + \beta t + \Omega DT_t + \sum_{i=1}^{n} \Omega_i \Delta y_{t-i} + \mu_t \quad (2)$$

$$\Delta y_t = \theta + \theta y_{t-1} + \beta t + \theta DU_t + \theta DT_t + \sum_{i=1}^{n} \theta_i \Delta y_{t-i} + \mu_t \quad (3)$$

Where

DU_t= dummy variable capturing a shift in the intercept

DT_t = dummy variable denoting a shift in the trend occurring at time TB (possible break point)

TB = possible break date

Therefore

DU_t =1 if t $\geq$ TB (i.e. break point) and zero otherwise

DT_t =t-TB if t $\geq$ TB and zero otherwise

We opt to estimate equation 3 for the purpose of this article as it is the most comprehensive out of the three models accounting for the possibility of structural breaks.

3. Data and methodology

As noted earlier, our paper builds and extends on the work of Nyasha & Odhiambo (2019) by using more recent data and a fairly lengthy time period of approximately 50 years for South Africa running from 1970 to 2019. To empirically investigate the relationship between remittances and economic growth we regress economic growth on remittances, including some standard covariates that are regarded to be important in explaining economic growth. We draw data from two key sources: World Development Indicators of World Bank and Penn world tables. Following previous studies (Nyasha & Odhiambo 2019; Das et al, 2019 and Bird & Choi 2019), we include the following variables in the models: Rem = Personal remittances received (% of GDP), DS = gross domestic savings (% of GDP), DC = Domestic credit to private sector by banks (% of GDP), TFP = total factor productivity, BM = Broad money (% of GDP), POP =population, CF =Gross capital formation (% of GDP) and D08= dummy variable. We employ the autoregressive distributed lag (ARDL) advanced by Pesaran and Shin (1999) and subsequently fine-tuned by Pesaran, and Shin, and Smith (2001). We decide on the ARDL model as a preferred model because it has been widely used in this field (see for example, Das et al, 2019) and has quite a few benefits compared to conventional methods that have been used in analyzing cointegration. For example, unlike the Johansen's tests and Granger/Enger causality test, ARDL can be employed even if the variables are of mixed stationary— follow the I(0) and I(1) process. Following the aforementioned studies, the control variables were transformed by taking natural logs. Given that the duration of the variables used in this study (over 48 years) is quite long, we can't rule out the possibility of structural breaks in the series. We therefore try to take this possibility into account by conducting Zivot-Andrews (ZA) unit root test. After establishing that most series underwent some structural breaks, an attempt was made to introduce a dummy variable (D08) in the model based on Zivot-Andrews (ZA) unit root test to represent a breakpoint in the series. Thus, the estimated ARDL in the presence of structural breaks is specification shown as follows:

$$\Delta lnGR_t = \Phi_0 + \sum_{i=1}^{n} \mu_{1i}\, \Delta lnGR_{t-i} + \sum_{i=1}^{n} \mu_{2i} \Delta lnRem_{t-i} + \sum_{i=1}^{n} \mu_{3i} \Delta lnDS_{t-i}$$

$$+\sum_{i=1}^{n}\mu_{4i}\,\Delta lnDC_{t-i}+\sum_{i=1}^{n}\mu_{5i}\Delta lnTFP_{t-i}+\sum_{i=1}^{n}\mu_{6i}\Delta lnBM_{t-i}$$

$$+\sum_{i=1}^{n}\mu_{7i}\Delta lnPOP_{t-i}+\sum_{i=1}^{n}\mu_{8i}\Delta lnCF_{t-i}+\sum_{i=1}^{n}\mu_{9i}\Delta D08_{t-i}$$

$$+\vartheta_{1i}GR_{t-1}+\vartheta_{2}Rem_{t-1}+\vartheta_{3}DS_{t-1}+\vartheta_{4}DC_{t-1}$$

$$+\vartheta_{5}TFP_{t-1}+\vartheta_{6}lnBM_{t-1}+\vartheta_{7}POP_{t-1}+\vartheta\mu_{8}CF_{t-1}+\vartheta_{9}D08_{t-1}+\pi_{t} \quad (4)$$

Where:

Φ = constant, π_t = an error term. μ = short term dynamics of the model. ϑ denotes The long run coefficients, while Δ indicates that the variables are in first difference form. Given the fact that our dependent variable experienced a structural break in 2008, we introduce a dummy variable D08 in equation 1 to specifically account for the structural break. The dummy variable takes the value of 0 from 1970 to 2008 and 1 from then on. Derived from the ARDL model indicated in (1), the following error correction model can be specified as follows:

$$\Delta lnGR_t=\psi_0+\sum_{i=1}^{n}\mu_{1i}\,\Delta lnGR_{t-i}+\sum_{i=1}^{n}\mu_{2i}\Delta lnRem_{t-i}+\sum_{i=1}^{n}\mu_{3i}\Delta lnDS_{t-i}$$

$$+\sum_{i=1}^{n}\mu_{4i}\,\Delta lnDC_{t-i}+\sum_{i=1}^{n}\mu_{5i}\Delta lnTFP_{t-i}+\sum_{i=1}^{n}\mu_{6i}\Delta lnBM_{t-i}$$

$$+\sum_{i=1}^{n}\mu_{7i}\Delta lnPOP_{t-i}+\sum_{i=1}^{n}\mu_{8i}\Delta lnCF_{t-i}+\sum_{i=1}^{n}\mu_{9i}\Delta D08_{t-i}$$

$$+\Omega ECM_{t-1}+\pi_t \quad (5)$$

Where ECM_{t-1}= error-correction term lagged once and Ω = the coefficient of the ECM_{t-1}. The rest of the other variables are as defined above.

4. Results

4.1. Stationarity Results

The ARDL model is used to esitmate the relationship between economic growth and remittances, however before estimating this model we conduct some preliminary tests including stationarity.

The unit root test developed by Phillips and Perron (1988) known as the Philips and Perron unit root test is used to test for stationarity. This technique is chosen on the basis of being comprehensive compared to the widely used Augumented Dickey Fuller (ADF) developed by Dickey and Fulley (1981). Whereas the ADF test uses a parametric model to estimate the Autoregrressive Moving Average (ARMA) structure, the PP test is more robust to general forms of heteroskedasticity. The results presented in Table 2 show that economic growth and population are stationary at level while the rest of the variables are stationary after being differenced once, indicating that these variables are integrated of 1.

Table 2: Phillips-Perron (PP) unit root tests

		At Level								
		GR	LREM	LDS	LDC	LTFP	LBM	LPOP	D08	LCF
With Constant	t-Statistic	-4.635	-1.208	-1.147	-0.567	0.5662	-0.652	-8.695	-0.534	-1.468
	Prob.	0.0004	0.6639	0.6897	0.8681	0.9873	0.8490	0.0000	0.8753	0.5412
		***	----	----	----	----	----	***	----	----
		At First Difference								
With Constant	t-Statistic	-23.277	-5.006	-6.138	-6.627	-3.645	-5.218	-0.942	-6.928	-7.334
	Prob.	0.0001	0.0001	0.0000	0.0000	0.0084	0.0001	0.7657	0.0000	0.0000
		***	***	***	***	***	***	----	***	***

Notes:
a: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant
b: Lag Length based on AIC
c: Probability based on MacKinnon (1996) one-sided p-values.

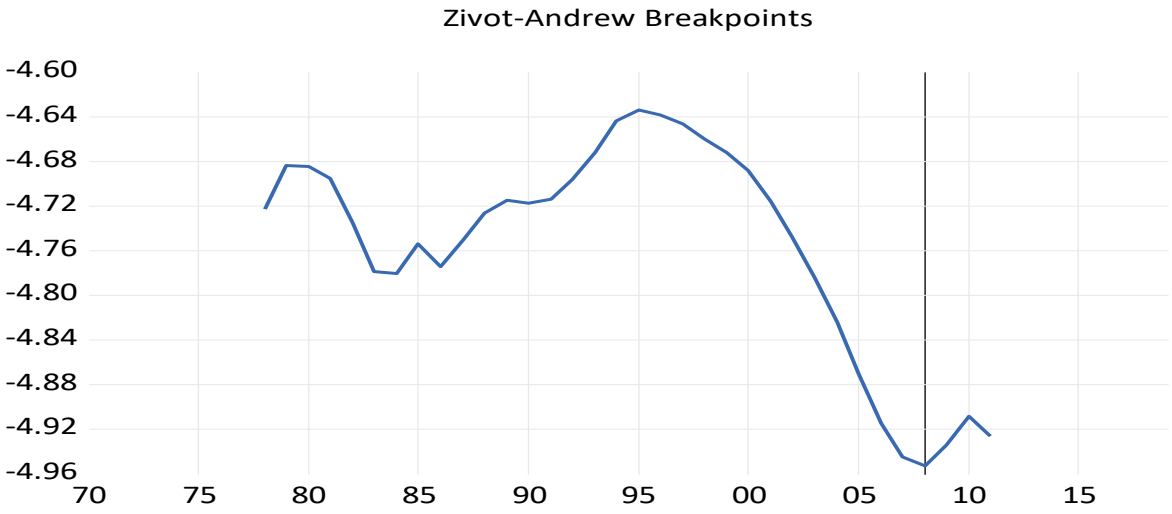
Several tests have been developed to test unit root and structural breaks at the same time. In this study we employ the Zivot-Andrews test which tests for unit root with break in the trend and the its alternative hypothesis stating that the process is stationary. For economic growth, the results are presented in Table 3 and the findings show that the null hypothesis of a unit root with a structural break cannot be rejected. The break point for economic growth[‡] in South Africa is shown to be around the 2008 global financial crisis. Figure 1 which is extracted from the Zivot-Andrews test highlights the exact point of the structural break in economic growth.

[‡] The results for the rest of the variables are presented in the appendix

Table 3: Zivot – Andrews unit root tests (Economic Growth)

	t-Statistic	Prob. *
Zivot-Andrews test statistic	-4.953428	0.141074
1% critical value:	-4.80	
5% critical value:	-4.42	
10% critical value:	-4.11	

Figure 1: Graphical representation for Economic growth rate breakpoint



4.2. ARDL bounds test

To empirically analyze the long run relationship between economic growth and remittances to South Africa we begin by employing the ARDL bounds test. While other co-integration tests require variables to be integrated of the same order, the ARDL bounds test does not. Moreover, the ARDL bounds test is relatively efficient even with small sample sizes. Evidence presented in Table 4 shows that the null hypothesis of no co-integration should be rejected since the critical value is larger than both critical bounds.

Table 4: F-Bounds Test (break point: 2008), lag (3, 2, 3, 2, 3, 1, 3, 3, 3)

			Critical bounds		
Test Statistic	Value	Signif.	I(0)	I(1)	Decision
F-statistic	5.964045	10%	1.95	3.06	Co-integration
		5%	2.22	3.39	
		2.5%	2.48	3.7	
		1%	2.79	4.1	

4.3. Long Run Estimates

Before estimating our model, the optimal lag order has to be deterrmined and in this instance we use the Akaike Information Criterion (AIC). According to the AIC values, the appropriate lag for the model is as follows: ARDL (3,3,3,2,3,13,3,3). Having determined the optimal lag order, the model is estimated and the results are presented in Table 4.

Table 5: Long Run Estimates

Case 3: Unrestricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LREM	-3.523378	0.722567	-4.876197	0.0006
LDS	-7.600441	3.860770	-1.968634	0.0773
LDC	2.804709	1.581808	1.773103	0.1066
LTFP	-6.730479	3.034662	-2.217868	0.0509
LBM	-0.081750	0.037176	-2.198973	0.0525
LPOP	-12.83159	2.385809	-5.378299	0.0003
DUMY08	-2.541601	0.826330	-3.075770	0.0117
LCF	14.66978	2.577612	5.691230	0.0002

The estimated coefficient for remittances is found to be statistically significant at the 1% level of significance. The coefficient is negative indicating that remittances have a negative impact on economic growth. More specifically, a 1 percent increase in remittances leads to a 3.5 percent decrease in economic growth in the long run. These results similar to those of Nyasha and Odhiambo (2019) who found that for South Africa, contrary to their expectations, remittances are detrimental to economic growth. The effect of remittances depends on the level of financial development of countries, with remittances having a positive impact on economic growth in countries that have less advanced financial sectors and a negative impact in those countries with a high level of development (Sobiech, 2015). Hence, the negative impact of remittances on economic growth in South Africa can be attributed to South Africa's well-advanced financial

system. Moreover, another plausible explanation that can be attributed to the negative effect of remittances on economic growth is the usage of remittances for household consumption rather than for productive purposes.

Similar to remittances, the coefficients for domestic savings and broad money supply are found to be statistically significant with negative effects on economic growth. The effect of domestic savings is in contrast to those of Amusa (2014) whose empirical analysis shows that corporate savings have a positive impact while household and government savings have statistically insignificant effect on economic growth. Considering the effect of domestic credit to the private sector, we find that it is statistically insignificant indicating that it does not influence economic growth in the long run and this is in contrast to Olowofeso et al. (2015)'s findings. The dummy variable for the 2008 crisis is also found to be statistically significant and as expected its presence causes economic growth to decline in the long run. The rest of the variables are found to be statistically significant with negative coefficients except for capital formation whose impact on economic growth is positive. These findings are supported by Ncanywa and Makhenyane (2016) whose study shows that gross capital formation has a positive impact on economic growth in both the short run and long run.

In order to analyze the short-term dynamics between economic growth and the independent variables albeit with more emphasis on the effect of remittances we follow Chandio and Jiang (2019) by estimating an error correction model based ARDL. The results presented in Table 6, most importantly show that the error correction parameter is statistically significant with a negative coefficient. This implies that that there is stable a long run relationship between economic growth and the chosen independent variables. Interestingly, we notice a change in the sign for the remittances coefficient when the variable is lagged once. While a 1 percent increase in current period remittances will induce a 6 percent decrease in economic growth, a 1 percent increase in previous period remittances will induce a rise in economic growth worth around 5 percent. The dummy variable for the global financial crisis is found to be statistically significant with a negative effect on economic growth. However, when the first lag of the dummy variable is taken considered, it becomes statistically insignificant. This is in line with our prior expectations as moving one period back for dummy variable takes us to a period when there was no financial crisis.

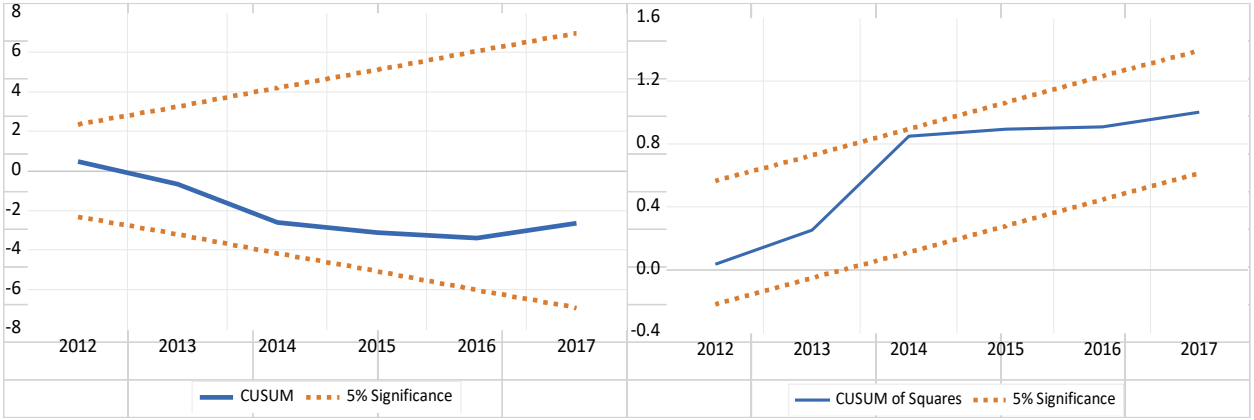
Table 6: ARDL Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	143.7938	14.64767	9.816839	0.0000
D(GR(-1))	1.922396	0.270473	7.107538	0.0000
D(GR(-2))	0.449628	0.097340	4.619146	0.0010
D(LREM)	-6.809982	0.838908	-8.117671	0.0000
D(LREM(-1))	5.020876	0.857036	5.858419	0.0002
D(LDS)	3.183012	2.684123	1.185866	0.2631
D(LDS(-1))	18.98827	3.072324	6.180426	0.0001
D(LDS(-2))	19.72389	3.208976	6.146475	0.0001
D(LDC)	10.93844	2.755280	3.969992	0.0026
D(LDC(-1))	-8.176026	2.482925	-3.292901	0.0081
D(LTFP)	-2.505265	6.094613	-0.411062	0.6897
D(LTFP(-1))	74.45427	10.84545	6.865025	0.0000
D(LTFP(-2))	64.78805	10.41410	6.221187	0.0001
D(LBM)	-0.501568	0.080736	-6.212479	0.0001
D(LPOP)	-6185.783	783.8701	-7.891338	0.0000
D(LPOP(-1))	12519.00	1624.970	7.704147	0.0000
D(LPOP(-2))	-10888.69	1289.218	-8.445966	0.0000
D(DUMY08)	-5.197435	0.937231	-5.545521	0.0002
D(DUMY08(-1))	-1.302077	0.864835	-1.505578	0.1631
D(DUMY08(-2))	-1.512230	0.883340	-1.711945	0.1177
D(LCF)	17.34926	1.732685	10.01293	0.0000
D(LCF(-1))	-22.27783	3.426596	-6.501446	0.0001
D(LCF(-2))	-5.652331	1.312824	-4.305475	0.0015
ECM(-1)*	-4.459035	0.453642	-9.829422	0.0000

R-squared	0.977011	Mean dependent var	-0.042656
Adjusted R-squared	0.947636	S.D. dependent var	2.605772
S.E. of regression	0.596285	Akaike info criterion	2.099364
Sum squared resid	6.400008	Schwarz criterion	3.092318
Log likelihood	-20.08664	Hannan-Quinn criter.	2.463321
F-statistic	33.25985	Durbin-Watson stat	2.218922
Prob(F-statistic)	0.000000		

While the preliminary tests indicated that the employed model is fit for the current analysis, we also conduct two stability tests in the form of the Cusum and Cusum of squares tests to check the reliability of our chosen model. Figure 2 presents results from the two tests and its it clear that the plots of stability both lie within the critical bounds at the 5 percent level of significance, hence confirming that the model parameters are efficient.

Figure 2: Cusum Stability Test



4.4. Robustness Check

To enable satisfaction with the baseline results which suggested that an increase in remittances will lead to a decline in economic growth, we estimate the same model but use the fully modified least squares technique to assess the consistency of the results. The fully modified least squares is selected on the basis that it caters for serial correlation and endogeneity in the presence of cointegration. Table 7 presents the findings from estimating the fully modified least squares and the results are similar to those obtained by using the ARDL. Remittances are found to be statistically significant with a negative effect on economic growth albeit with a larger coefficient. All the other factors used as drivers of economic growth that were found to be statistically significant maintain their significance and original signs including the dummy variable. The only difference is in relation to domestic credit which was statistically insignificant when we estimated the ARDL model but is found to be statistically significant when we use the fully modified least squares technique.

Table 7: Results obtained from fully modified least squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LREM	-8.446336	0.042141	-200.4306	0.0000
LDS	-15.17925	0.216771	-70.02441	0.0000
LDC	-11.11959	0.156433	-71.08231	0.0000
LTFP	46.37329	0.332718	139.3773	0.0000
LBM	0.115671	0.004316	26.80128	0.0000
LPOP	-224.1818	0.936066	-239.4936	0.0000
DUMY08	-19.09899	0.086539	-220.6993	0.0000
LCF	-6.097317	0.150065	-40.63130	0.0000

C	807.5485	3.800420	212.4893	0.0000
@TREND	5.309219	0.020546	258.4065	0.0000

R-squared	-3.347005	Mean dependent var	2.633699
Adjusted R-squared	-4.464806	S.D. dependent var	2.074584
S.E. of regression	4.849738	Sum squared resid	823.1987
Long-run variance	0.006025		

Moreover, we take a look at the impulse response function to analyze how economic growth reacts to shocks in the dependent variables. Figure 2 depicts the results of the impulse response functions.

Figure 3: Impulse Response Functions.

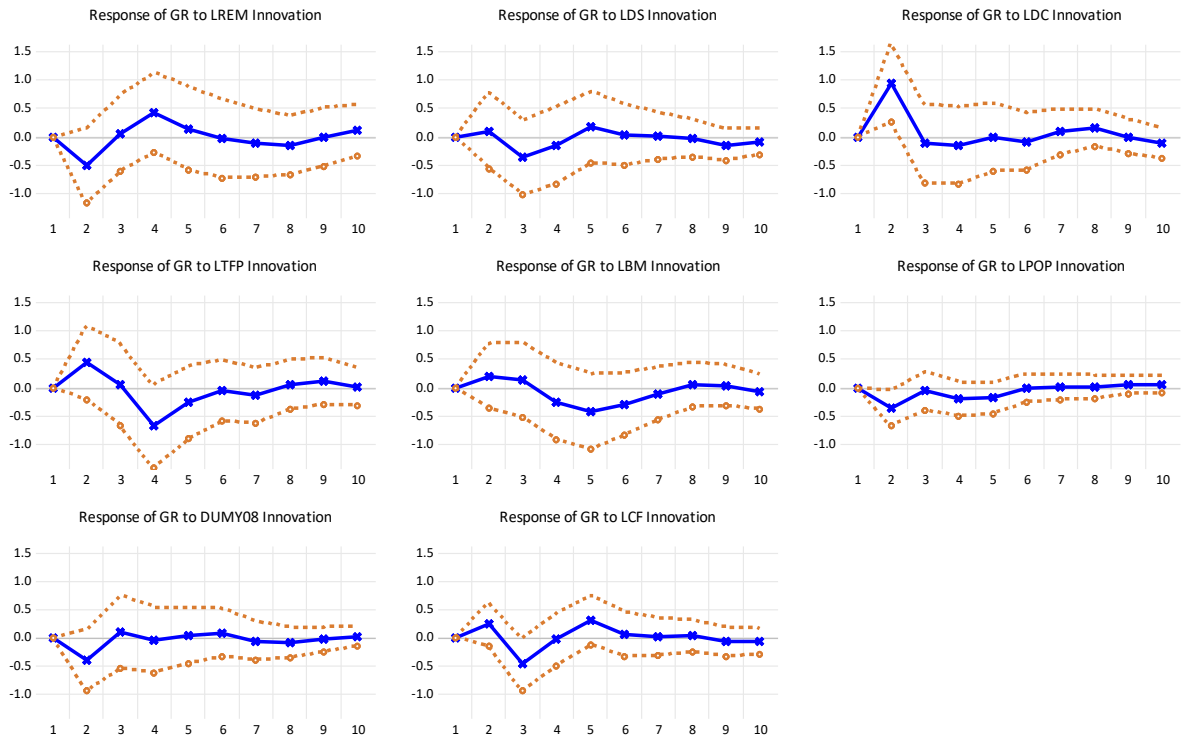


Figure 3 shows that a one standard deviation shock to remittances initially has a negative effect, changing to be positive around the second period and dying out around the fifth period. This finding is in line with the base line results which highlight a change in sign for remittances when lags are included. Interestingly, the effect of shock in the dummy variable dies out between the second and third period which is much quicker than most of the other dependent variables This

could also be compared to main results that show that the effect of the dummy variable becomes insignificant the moment lags are included

5.Conclusion

The study examined the effect of remittances inflow on South Africa's economy from 1970 to 2019. The study used ARDL approach to examine the short run effect and long run effect of remittance inflows on economy growth. The study established a negative relationship between remittances inflow and economic growth in South Africa. In the same vein, the study further established a negative relationship broad money supply and domestic savings and economic growth. The result showed that error correction of about -4.459035 to bring the relationship between remittance inflows and economic growth into an equilibrium. The study brings to light the need for South Africa to put in place measures in the area such as improving its financial systems and removing barriers that inhibits realization of the positive impact of remittances inflow on its economy. To further explore the relationship between remittances inflow and economic growth, it is recommended for future studies to approach the topic from the net remittance inflows perspective.

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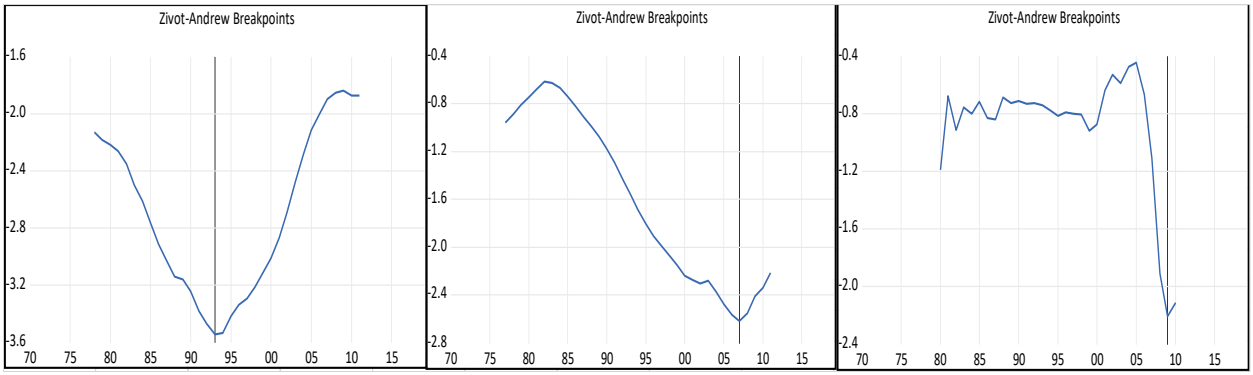
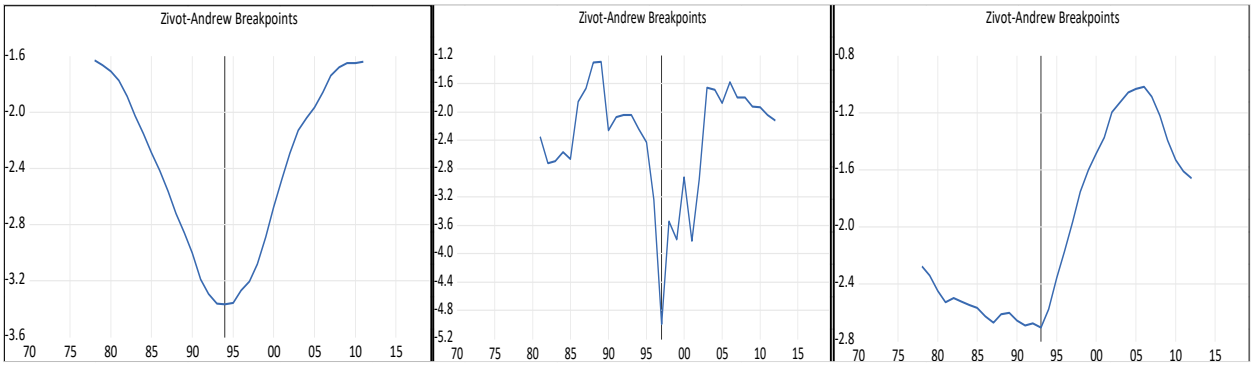
Appendix 1

LFC-1993 LDC-2007 LTFPP-2009



LDS-1994 LREM-1997 LBM-1993



Source: own derived from WDI and Penn World Table version 9.0

Table A1: Summary stats

	GR	REM	CF	POP	DS	DC	BM	TFP
Mean	2.431	0.154	21.988	40.090	23.183	102.147	60.242	0.752
Standard Deviation	2.212	0.088	5.066	10.292	5.401	34.302	9.796	0.095
Kurtosis	-0.676	-1.767	-0.530	-1.280	-0.546	-1.655	-0.941	0.005
Skewness	-0.228	0.273	0.811	-0.092	0.879	-0.029	0.627	-0.721
Minimum	-2.137	0.051	15.162	22.839	17.380	53.967	45.500	0.533
Maximum	6.621	0.291	34.115	56.717	36.190	160.125	80.800	0.900