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UNDERSTANDING DIASPORA REMITTANCES LEVELS IN ZIMBABWE (2009-2020) INCLUDING FUTURE FORECASTS USING ARIMA TECHNIQUE (2020-2022)

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Abstract

Governments across the globe are progressively becoming aware of the increasing significance of international migration and remittances on the international development agenda. Remittances are perceived as one of the key benefits that migration bring to originating countries. Zimbabweans abroad do sent money and goods back to their country of origin, and these are known as diaspora remittances. Remittances do contribute to national development if harnessed into the national economy. The economic turnaround stories of Asian economic giants such as South Korea, China and India in the 1960s to date are also attributed to the contributions made by their expatriates in the diaspora. The funds were mainly channeled towards infrastructure and industrial development. For Zimbabwe, there is a decline in diaspora remittances over the years against an increase in migrants to other countries. Acknowledging the usefulness of diaspora remittances to economic development, the study seeks to analyse the trend from 2009 to 2020, including forecasts. The study recommends that the government of Zimbabwe should work on policies that would encourage the Zimbabweans in the diaspora to remit more to their country. Investments by migrants beyond remittances can change the development landscape of local communities, if appropriate options are given. In framing policies, there is greater need to consider the existence of first-generation and second-generation migrants. Worth to note also is that relying too much on remittances can also delay structural changes in the domestic economy.

Key words: *Diaspora, Economic Development, Migrants, Migration, Remittances, Zimbabwe*
JEL Codes: *E21, E27, F16, F22, F24, J61, O15, O24, P23.*

I. Introduction

Migration from one nation to another has always been the case in the past. Various reasons exist for people to choose to move to other nations. The common trend in international migration is that people from developing countries are migrating to advanced countries for jobs (Awojobi, Tetteh and Opoku, 2017). Zimbabwe has suffered very high levels of outward migration, estimated at between 0.4% and 0.2% of its population annually since the turn of the century (Welborn, Cilliers and Kwasi, 2019). The Zimbabwe Government recognizes that international migration has become an established feature of contemporary social and economic life, with both positive and negative manifestations and opportunities (Zimbabwe Diaspora Policy, 2016). Income inequalities, human rights abuses and insecurity continue to act as push factors for migration (ILO, 2010). Zimbabwe is one economy that has undergone economic crisis for a long period (Bonga, 2019). The economic crisis that Zimbabwe is facing has been and continues to be, a major factor that fuels the emigration of highly skilled nationals (Zanamwe and Devillard, 2009), and this still remains the case to date. Bonga and Dhoro (2015) indicated that due to crisis many workers resigned from work for greener pastures. Crush and Tevera (2010) narrated that Zimbabwe has now joined the list of 'crisis-driven' migrations – Angola, DRC, Rwanda, Somalia and Sierra Leone are on the list. According to UNDP

(2010), the political and economic instability that characterized Zimbabwe from 2000 onwards led to large numbers of Zimbabweans leaving the country. Welborn *et. al* (2019) confirmed that Zimbabweans have endured recurring economic and political crises and a dramatic deterioration of livelihoods that have intensified sharply since 2000.

There is permanent migration and temporary migration. There also exist the linkage between those who have migrated and relatives left behind. People who have migrated from Zimbabwe are mixed, with many being pushed by the economic crisis that hit the country for more than two decades. Strongly skilled and non-skilled Zimbabweans form the diaspora population. Shuval (2000) indicated that he concept of diasporas encompasses political refugees, alien residents, guest workers, immigrants, expellees and ethnic and racial minorities in countries other than their original. Zimbabweans migrants are mainly in South Africa, the United Kingdom, Canada, Australia and the United States. Germany, New Zealand and United Arab Emirates and other countries in the world also house migrants from Zimbabwe. SADC countries such as Botswana, Malawi, Mozambique, Namibia and Zambia also have a significant share of Zimbabweans who have migrated to those nations. South Africa, by far, is the single largest destination country for both voluntary and involuntary migration from Zimbabwe (IOM, 2018). The United Kingdom has been known to have attracted more educated and skilled migrants from Zimbabwe.

People in the diaspora do sent money home for many reasons, which may include sustaining families left behind, savings and investment for future. The need to construct secure livelihoods through gainful employment abroad constitutes an important driver of Zimbabwean emigration (IOM, 2018). Sen (1999) indicated that development goes beyond income indicators: True development involves broadening people's genuine freedoms by enhancing their human capabilities, that is, people's ability to live the kind of life they genuinely choose to pursue. Political challenges and economic hardship have had a significant impact on Zimbabwe's human capital base (WBG, 2019). According to IOM (2018), remittances refers to monies and goods earned or acquired by non-nationals that are transferred back to their country of origin. According to the International Monetary Fund (IMF), diaspora remittances are household incomes from foreign economies arising mainly from the temporary or permanent movement of people to those economies. Diaspora social remittances are taken as ideas, practices, mind-sets, world views, values and attitudes, norms of behavior and social capital that migrants mediate and either consciously or unconsciously transfer from host to home communities (Chivundu, Suphian and Kim, 2017). Remittances can contribute to national development if harnessed into the national economy (ZimStat, 2012). Remittances have many other benefits: they are widely distributed and flow into many areas of the country and to social groups that are neglected by other forms of development aid or foreign investment; and they can act countercyclically by increasing at times of need or crisis (King and Vullnetari, 2009). During periods of economic or political instability, or simply when opportunities at home are scarce, the funds remitted by migrants are a lifeline that can help keep food on the table, children at school, and roofs over heads (Truen et. al, 2016). Former Finance Minister, Patrick Chinamasa acknowledged importance of remittances in the 2014 Budget Statement by indicating that most countries in the world, including Zimbabwe's regional neighbours, were benefiting immensely from financial transfers by their nationals in the diaspora. Remittances that are either invested or saved have a multiplier effect on the economy and have a developmental impact (UNDP, 2010). Mugumisi and Ndhlovu (2013) in support indicated that remittances into Zimbabwe have positive micro economic and social impact on households and the community at large.

Apart from formal channels, diaspora remittances may hit the country through informal channels. There is no documentation of such remittances that do not pass through formal channels. Estimates of such remittances will misguide policy, same as not accounting for them. This may be caused by irregular migration that exist. One becomes an irregular migrant when he/she enters a country without satisfying the immigration laws of that country (IOM, 2018). There is greater concern that in Zimbabwe, diaspora remittances continued to be transmitted through informal channels. Irregular immigration is not uncommon in Zimbabwe, as witnessed by detaining and prosecution statistics over the years for contravening immigration laws. Zhou, Pindiriri and Tambama (2013) indicated that the lack of proper travel documentation by many Zimbabwean emigrants meant that a significant flow of remittances came in through informal channels. Mugumisi and Ndlovu (2013) indicated that informal remittances in the long-run undermine inclusive governance and democratic state accountability.

1.1 Research Problem

Globally, the transfer of funds by migrants to their home countries or areas (cash remittances) has grown rapidly over the past two decades (Crush and Caesar, 2016). There exist aspects of remitting that have received scant attention in Zimbabwe. There is solid evidence that remittances can and have assisted many developing countries and least developed countries (LDCs) in maintaining balance of payment (BOP) stability, ensuring the availability of hard currency, improving countries' credit worthiness for external borrowing and increasing internal aggregated demand (UNCTAD, 2013). Many poor countries are highly dependent on remittances (Poirine and Dropsy, 2019), yet Zimbabwe seems unable to attract the remittances from its migrants abroad. A worrying trend is on the significant drop in official diaspora remittance figures which once hit a peak of US$935 million in 2015 from a rising trend since 2009. While the decline in the diaspora remittances figure can be attributed to informal channels such as cross-border transporters and hand deliveries through travelers especially on remittances from South Africa and Botswana, this may not be enough to explain the drop. According to the World Bank, African diaspora savings, at $53 billion every year, exceed annual remittances to the continent and are mostly invested abroad. According to IFAD (2017), migrant workers typically send home about 15 per cent of their earnings as remittances. As supported by Damiyano and Dorasamy (2019), remittances have increasingly become a critical component of national income that now warrants investigation.

1.2 Objectives of the Study

The study seeks to understand and analyse the trend of diaspora remittances flows to Zimbabwe by migrants abroad, including determination of the future trend by employing the ARIMA methodology.

1.3 Organisation of the Study

The paper is organized as follows. Section II presents the literature review, mainly the theories and models explaining migration and remittances. Section III presents methodology and data analysis for the study. The study conclusions are provided in Section IV.

II. Literature Review

There are continuing debates on the link between international labour migration, remittances and development (Awojobi et. al, 2017). There exist migration and remittances impact on human and economic development, while some studies explain the consequences of migration and remittances. The motives behind migration and remittances have led to series of theories to identify the actual grounds. Theories and models discussed in this paper are not exhaustive, but aid the study to attain its objectives.

- **Network Theory.** This theory explains why migration increases with time. The first migrants are related to their friends and families who they later invite to follow when they have settled, hence migrants increases with time. Massey (1988) defines migration networks as sets of interpersonal ties that link migrants, former migrants and non-migrants in origin and destination areas through the bonds of kinship, friendship and shared community origin. In support Garip and Asad (2015) narrated that migrant networks are webs of social ties that connect individuals in a sending region to others in a receiving context. It is through social networks that migrants learn about opportunities and conditions in potential destinations; at home, the structure of migrants' social networks shapes their ability and desire to leave (Blumenstock, Chi and Tan, 2019). Migrant networks become more established and migration becomes persistent migration with time. The theory explains the role of multiplier effects in future migration levels. Migration and subsequent remitting unfold within and is shaped by networks comprising familial and kinship ties, different kinds of social obligations, and value systems (Dzingirai, Mutopo and Landau, 2014). Truen *et, al* (2016) indicated that most migrants seemed to utilize networks of contacts, both family and friends, to make the move to foreign lands. Networks influence the magnitude and direction of migration flows from the sending region as well as migrants'adaptation outcomes in the destination (Garip and Asad, 2015). Networks lowers the costs of migration by providing information and capital among other needs. In their study Blumenstock, Chi and Tan (2019) found that the average migrant derives more utility from 'interconnected' networks that provide social support than from 'expansive' networks that efficiently transmit information.

- **Cumulative causation theory.** The theory builds from the Network theory. The theory of the cumulative causation of migration posits that as migratory experience grows within a sending community, the likelihood that other community members will initiate a migratory trip increases (Fussell, 2010). Theory suggests migration to be a path-dependent process, where the current context of migration depends on previous migration patterns (Garip and Asad, 2015). A linkage do exist through time for first migrants and subsequent migrants. Migrant networks often enable migrants' social, economic and political adaptation in the receiving context. Garip and Asad (2015) explained that migrant networks influence both the initial decision to migrate from origin, as well as the adaptation outcomes in destination. The cumulative causation of migration is an important dynamic in perpetuating migration, although it does not contribute equally to all migration streams (Fussell, 2010).
- **Pure altruism theory.** The theory states that migrants send money to their families because they care about the well-being of their family. Money sent by migrants is used for education, food, health care, investment and the welfare of migrant families (Awojobi *et. al,* 2017). IFAD (2017) indicated that regular remittances lift most families above the poverty line and help them avoid falling back into "poverty traps." According to Fokkema, Cela and Ambrosetti (2013) people remit money because of emotional attachment to their parents' home country. Damiyano and Dorasamy (2019) narrated that migrants remit because they derive positive utility from the consumption of the family. The altruism hypothesis which argues that people migrate to increase their incomes and send cash home to their loved ones offers the best explanation for Zimbabwe's migrants (Zhou, Pindiriri and Tambama, 2013). Glytsos (2002) argued that permanent migrants are the only one who remit for altruistic purposes, while temporary migrants remit for investment and future consumption smoothing. Probability of remitting depends on strong family ties between migrants and remaining households. Remittances would decline with an increase in the recipient household's wealth and the length of time the migrant stays in the host country (Chinembiri, 2017).
- **Self-realization theory.** The theory builds from the notion of the quest to self-realization. This ideology was more widespread amongst the better-educated younger generation (King and Vullnetari, 2009) who migrated for jobs to other countries. The strategic migration decision is made because of wage differentials between countries. According to Damiyano and Dorasamy (2019), high skilled migrants usually have a larger amount to gain by migrating, they are typically the first to go and then unskilled workers follow.
- **Self-interest – exchange motive.** People in the diaspora remit funds to pay people who look after their investments or other material assets that are likely to be part of their preparation for returning (Fokkema et. al, 2013). There is an intention by the migrant to return to their recipient home country in the future. Anticipation of a bequest is another factor that explain the self-interest motive for sending remittances (Chinembiri, 2017). The migrant wants to demonstrate acceptable behavior as an investment for the future on return home (Damiyano and Dorasamy, 2019).
- **Tempered Altruism (Enlightened Self-interest) theory.** Also known as the theory of Informal Contracts of Insurance. An alternative to the pure altruistic and self-interest theories. Remittances arise from a mutual beneficial arrangement between a migrant and household. The sending of remittances is seen as a repayment of the principal invested by the family for the education of the migrant. The family can also function as a bank that finances migration for some members (Bouhga-Hagbe, 2004). Damiyano and Dorasamy (2019) indicated that households support migrants by, for example paying the costs of migration or supporting the migrant during periods of unemployment. Migration can be viewed as a household strategy for risk diversification, a subtle form of insurance (Chinembiri, 2017). Remittances are therefore linked to previous obligations as well as investment purposes. UNDP (2010) noted that a key characteristic of diasporas is the strong sense of connection to a homeland maintained through cultural practices and ways of life practised in host countries, as well as numerous forms of interaction between diasporas and their home countries.
- **Triple-win scenario model**. Migration is said to be 'good' for the source country, for the destination country and for migrants themselves. Harris (2002) indicated that all barriers to international migration should be brought down. From such an act, immigration both sustains development and prosperity in the developed world, and supports the development of the poor countries of origin via remittances and circular returns (King and Vullnetari, 2009). Free trade

economics treats labour, goods and capital as factors of production that should be allowed to move freely in order to maximize welfare gains on both a personal and global level, though there is ambiguity in regards to the welfare effects for the sending country as a whole (UNDP, 2010). When remittances are invested in productive assets other than real estate, they can have Keynesian multiplier effects on the economy (Bouhga-Hagbe, 2004). As indicated by Damiyano and Dorasamy (2019), remittances are now regarded as a vital building block in poverty reduction and economic development in migrant sending countries.

- **Diasporas as decision-makers ideology**. Individuals in the diaspora can have a huge impact on development in their 'home' country primarily through their influence as remitters (Page and Mercer, 2012). In this case remittances now means more than just sending money back home. Migrants are now part of the decision making back home. This explains the reason why many nations have come up with a diaspora policy document, where engagement is required between government and the diaspora. Chitiyo and Kibble (2014) confirmed that the Zimbabwean diaspora has an important part to play in the country's recovery. Considerable efforts need to be deployed to overcome migrants' mistrust over and above the difficulties of identifying attractive investment and business opportunities (UNCTAD, 2013).
- **Diasporas as option-setters ideology.** The key insight here is the recognition that the list of options for remitting from which diasporas choose does not emerge fully formed out of nowhere, but has a history. Diasporas do not need governments to re-educate them, rather diasporas can contribute to the process of generating the list of options for remitting from which individuals make their choices. Several countries have been active in leveraging remittances in devising mechanisms to promote investment, financial stability, businesses start-ups, and local infrastructure building (UNCTAD, 2013).
- **Intergenerational Migrants.** Levitt (2001) indicated that the relationships with family in the home country represent the core element of migratory projects of the first-generation migrants, and this cannot be automatically affirmed for the second-generation migrants, unless their parents and/or siblings returned home.
- **Bouhga-Hagbe model (Portfolio Diversification theory).** The model presents a worker residing abroad as an economic agent who each period, maximizes her expected lifetime utility by allocating revenue between transfers to the home country, consumption and asset accumulation, including real estate in the home country. The level of workers' remittances depends on their degrees of altruism and "attachment" to their home country, and should depend on interest rate differentials between the home country and the country of residence. This works only when the portfolio diversification motives are significant in the decision to remit. Consideration for interest rate differential on comparable deposit account offered in host and home countries, black market exchange premium, the return on real estate in the home country, inflation rates and other returns will thus influence the decision as whether to remit or not (Damiyano and Dorasamy, 2019). There should be a positive semi-elasticity between workers' stock of financial assets in the home country and the interest rate differential between the home country and the country of residence, holding the long-run level of remittances constant.
- **Migration Optimist View**. The migration optimists believe that migration has had a positive impact on the development process in sending societies, as it can generate counter-flows of capital in the form of remittances and investment as well as knowledge, which can be invested to stimulate development and modernization. Thus, remittances could alter the fortunes of Zimbabwe for the better, substituting official development assistance which is currently very low due to the negative perceptions the country is receiving from the traditional donor countries (Damiyano and Dorasamy, 2019).
- **Migration Pessimists view**. Migration is regarded as a negative phenomenon leading to further underdevelopment through the 'migrant syndrome' which drains labour and human capital resources. Migration pessimists argue that remittances are used for consumption and leads to a culture of dependency (Damiyano and Dorasamy, 2019).

The models and theories discussed above help in explaining the volumes of migration and levels of remittances observed over time. The models contains the possible reasons why people migrate from one nation to the other, and why people remit their earnings back home including the quantities involved.

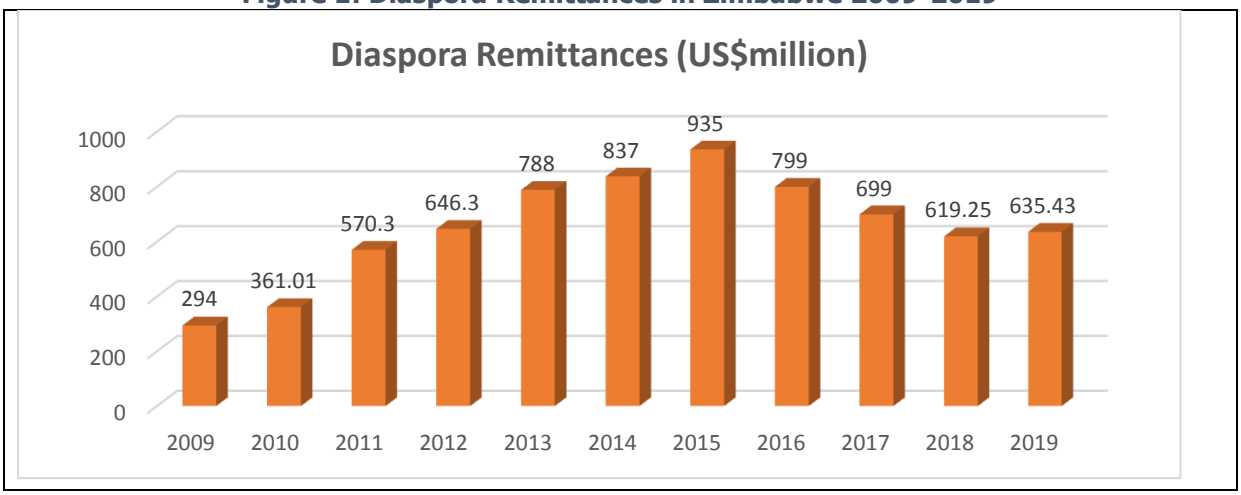
III. Methodology and Data Analysis

The study used data for years 2009 to 2019 for diaspora remittances for its analysis. Data was collected from various RBZ publications. Trend analysis has been employed to derive meaning from the diaspora remittances statistics. The study also used the autoregressive integrated moving average (ARIMA) methodology to enable forecasting for future period. The ARIMA model was popularized in the landmark work by Box and Jenkins (1970). The study used annual data from 2009 to 2019 giving 11 observations which is below the common 30 observations for an ARIMA model (some textbooks provide it as rules-of-thumb to set mimimum samples). The study argument is however, supported by Hyndman and Athanasopoulos (2018) who indicated that, there is no justification whatever for the magic number of 30 often given as a minimum for ARIMA modelling. With short series, the AIC suggest simple models to be used. Microsoft Excel, Eviews and Gretl statistical softwares have been used to present and analyse data.

3.1 Diaspora Remittances Trend (2009 – 2019)

The levels of diaspora remittances from 2009 to 2019 is presented in form of a graph below;

Figure 1: Diaspora Remittances in Zimbabwe 2009-2019



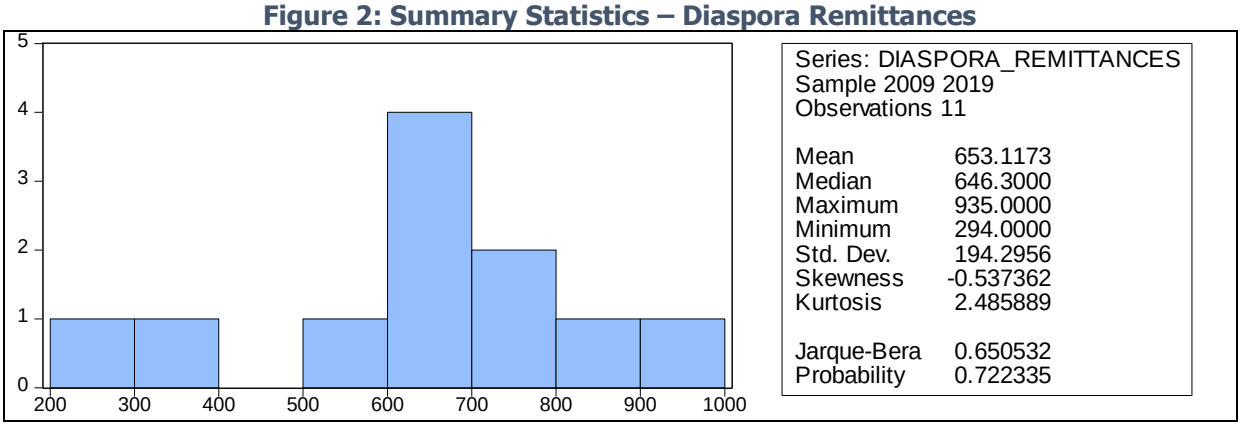
Source: Various RBZ publications (compilation)

From figure above, levels of diaspora remittances showed a rising trend from 2009 reaching a peak in 2015 (US$935 million), and declined for years 2016, 2017 and 2018 (US$619.25 million), and slightly rise again in 2019 to US$635.43 million. Due to the importance of diaspora remittances to the nation, the declining trend shown after 2015 is worth to be investigated, and adequate policy correction activated. The total number of Zimbabweans migrating outside the country is increasing, hence it is expected to have growing remittances back home.

3.2 Summary Statistics

The summary statistics for diaspora remittances are presented below;

Figure 2: Summary Statistics – Diaspora Remittances



Source: Eviews Statistical Software

For the period under study average diaspora remittances per year is US$653.12 million, implying that Zimbabwean outside the country send such an amount back home for various reasons through formal channels. the maximum diaspora remittances during the period was US$935 million in 2015 and the lowest being US$294 million in 2009. Variability for the period as measured by the sstandard deviation is 194.30, of which the statistic requires comparison with other periods or nations to have adequate meaning. A Jarque-Bera statistic 0.6505 with p-value of 0.722 indicates that the data follows a normal distribution. Jarque–Bera test is a goodness-of-fit test of whether sample data have the skewness and kurtosis matching a normal distribution. The JB test is also supported by the Shapiro-Wilk test statistic 0.944332 with p-value of 0.573.

3.3 Stability

Diaspora remittances stability is desirable, at least from the government's perspective, in that it makes it easier to plan ahead for the future. A simple measure of the stability is the coefficient of variation, which is defined as the standard deviation of diaspora remittances divided by the mean. The study divided the period into 3 so as to check variability for those periods including the whole study period. Economic events have been used to come up with the cut-off dates.

Table 1: Mean, Standard Deviation and Coefficient of Variation for Diaspora Remittances

Period	Mean	Standard Deviation	Coefficient of Variation
2009-2019 (whole period)	653.12	194.296	29.75%
2009-2013	531.92	203.684	38.29%
2014-2017	817.50	97.589	11.94%
2018-2019	627.34	11.441	1.82%
2020-2022 (forecast)	679.95	27.625	4.06%

Source: Microsoft Excel Computations

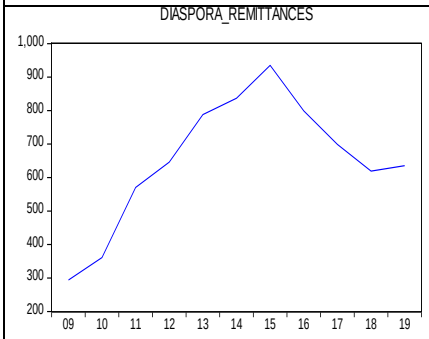
A lower coefficient variation implies greater stability. Coefficient of variation for the study period is 29.75%, this statistic however is more useful for country comparisons. The period 2009-2013 shows a CV of 38.29%, showing a greater growth of remittances during the period. 2014-2017 period recorded a lesser CV of 11.94% indicating a reduced growth of diaspora remittances in the country. 2018-2019 period again recorded CV of 1.82% indicating that there was no large differences for the years involved. For the forecast period 2020-2022, a CV of 4.06% has been calculated, this implies that for the future there is no greater increase in diaspora remittances expected in the country. The stability of remittances should also be seen in a broader context of the overall economic environment, which affects economic agents' levels of confidence in the country's policies (Bouhga-Hagbe, 2004). For any significant increase to be realized, there should be change in policy through increased diaspora engagement to address hindering challenges.

3.4 Stationarity Test

Working with time series requires data to be stationary. The effect of time on a variable should be taken out for effective investigations to be made. A time series is a sequence where a metric is recorded over regular time intervals (Prabhakaran, 2018). Hyndman and Athanasopoulos (2018) indicated that anything that is observed sequentially over time is a time series.

Figure 3: Stationarity Test Results – Data in Levels

Trend



Unit Root

Null Hypothesis: DIASPORA_REMITTANCES has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.732373	0.1056
Test critical values:	1% level	-4.420595	
	5% level	-3.259808	
	10% level	-2.771129	

Correlogram

Date: 10/15/20 Time: 14:39
Sample: 2009 2019
Included observations: 11

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.668	0.668	6.3840	0.012
		2	0.242	-0.369	7.3141	0.026
		3	-0.101	-0.158	7.4963	0.058
		4	-0.348	-0.219	9.9756	0.041
		5	-0.447	-0.110	14.729	0.012
		6	-0.397	-0.069	19.232	0.004
		7	-0.167	0.152	20.224	0.005
		8	-0.014	-0.203	20.232	0.009
		9	0.046	-0.082	20.383	0.016
		10	0.017	-0.179	20.424	0.025

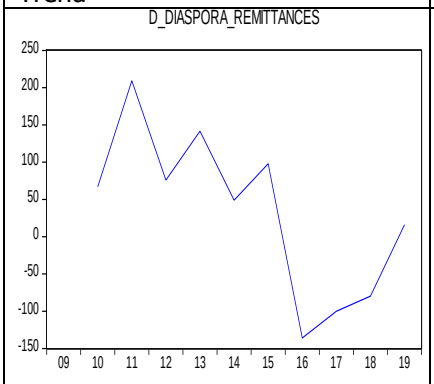
Source: Eviews Statistical Software

From the displayed results, the variable shows that it is not stationary in levels, it has unitary roots. The ADF statistic -2.732 has a p-value of 0.1056 which is above 0.05 (rule of thumb), hence showing that the variable is not stationary.

3.5 First Differencing

Figure 4: Stationarity Test – First Differencing

Trend



Unit Root

Null Hypothesis: D_DIASPORA_REMITTANCES has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.631413	0.4288
Test critical values:	1% level	-4.420595	
	5% level	-3.259808	
	10% level	-2.771129	

Correlogram

Date: 10/15/20 Time: 14:59
Sample: 2009 2019
Included observations: 10

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.451	0.451	2.7102	0.100
		2	0.350	0.185	4.5509	0.103
		3	-0.143	-0.462	4.9026	0.179
		4	-0.116	0.054	5.1717	0.270
		5	-0.418	-0.280	9.3678	0.095
		6	-0.326	-0.167	12.565	0.050
		7	-0.229	0.251	14.664	0.041
		8	-0.063	-0.172	14.901	0.061
		9	-0.005	-0.099	14.905	0.094

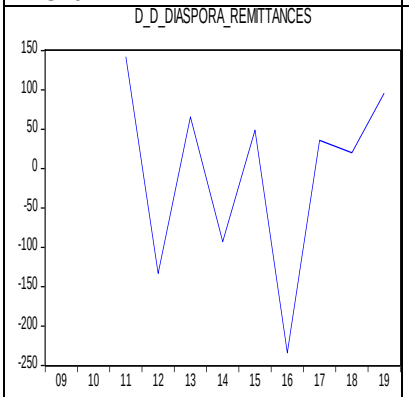
Source: Eviews Statistical Software

Again, the differenced series is not stationary, ADF test reported a statistic -1.631 with a p-value of 0.4288. The correlogram also shows insignificant spikes for the differenced variable.

3.6 Second Differencing

Figure 5: Stationarity Test – Second Differencing

Trend



Unit Root

Null Hypothesis: D_D_DIASPORA_REMITTANCES has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.018728	0.0060
Test critical values:	1% level	-4.582648	
	5% level	-3.320969	
	10% level	-2.801384	

Correlogram

Date: 10/15/20 Time: 15:05
Sample: 2009 2019
Included observations: 9

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.482	-0.482	2.8775	0.090
		2	0.388	0.202	5.0049	0.082
		3	-0.519	-0.369	9.4416	0.024
		4	0.366	0.007	12.101	0.017
		5	-0.388	-0.156	15.832	0.007
		6	0.085	-0.451	16.072	0.013
		7	-0.077	0.031	16.365	0.022
		8	0.127	-0.122	17.951	0.022

Source: Eviews Statistical Software

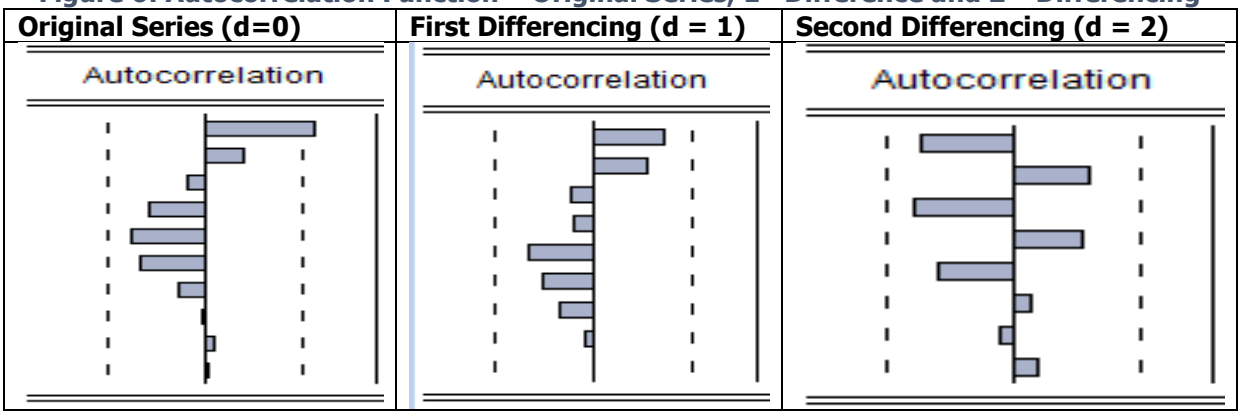
The second differenced series reported an ADF statistic -5.018 with a p-value of 0.0060 that is less than 0.05, thereby indicating stationarity. The objective of working with stationary data has been achieved through differencing. Given that the data is now stationary, the study will proceed in determining the forecasting model, ARIMA. ARIMA model is specified as ARIMA (p, d, q), where p, d, and q should be determined.

3.7 Determination of p, d and q in ARIMA (p, d, q)

The determination of the three parameters defines the ARIMA model.

- **d** – *d* shows how many times a series is differenced to attain stationarity. The study data has attained stationarity after being differenced twice, implying that *d* = 2. To ensure efficiency and reliability of forecasting results, the concept of over-differencing and under-differencing are invited. The right order of differencing is the minimum differencing required to get a near-stationary series which roams around a defined mean and the ACF plot reaches to zero fairly quick (Prabhakaran, 2018).

Figure 6: Autocorrelation Function – Original Series, 1st Difference and 2nd Differencing

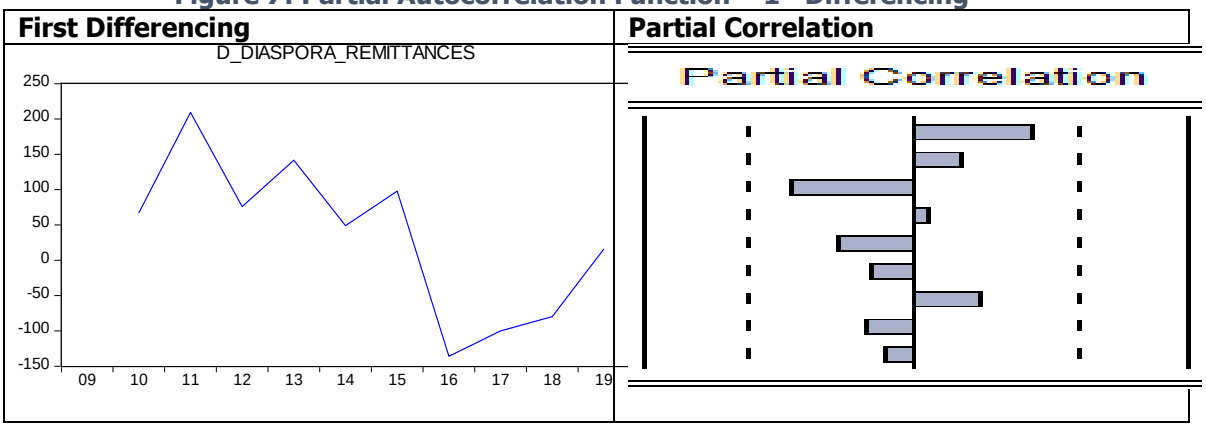


Source: Eviews Statistical Software

Looking at the autocorrelation plot for the 2nd differencing the lag starts negative and goes into the far positive zone quickly, which indicate that the series might have been over-differenced. The study tentatively fix the order of differencing as 1 even though the series is not perfectly stationary - weak stationarity scenario. This is supported by the ADF statistic for the original series [ADF = -2.732373 (0.1056)] which was almost significant at 10%.

- **p** – *p* refers to the AR terms that the model requires. The required number of AR terms is obtained by inspecting the Partial Autocorrelation (PACF) plot.

Figure 7: Partial Autocorrelation Function – 1st Differencing

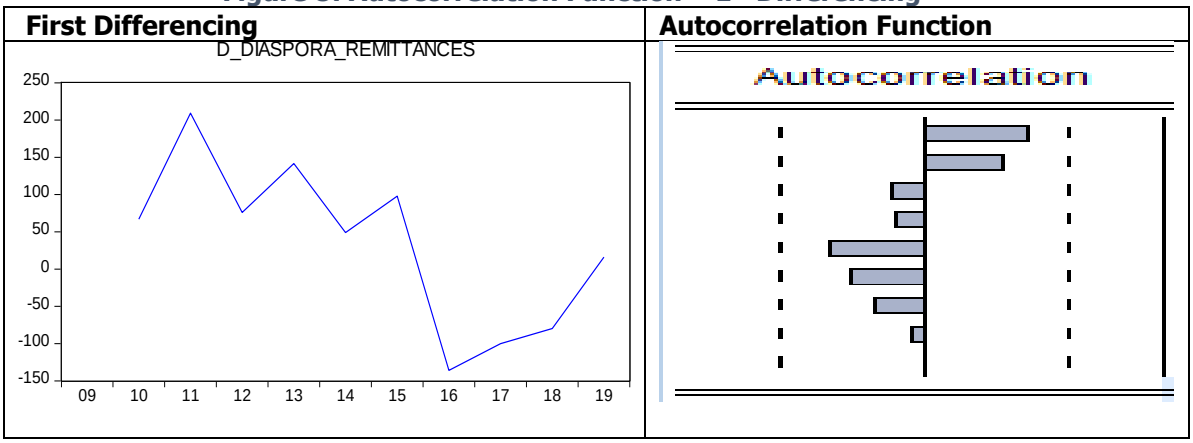


Source: Eviews Statistical Software

As observed the PACF lag 1 is almost close to the significance line. Lag 2 goes too far from the significance line, while lag 3 changes to negative sign. The study therefore fixes p as 1.

- **q** – *q* refers to the MA terms the model requires.

Figure 8: Autocorrelation Function – 1st Differencing

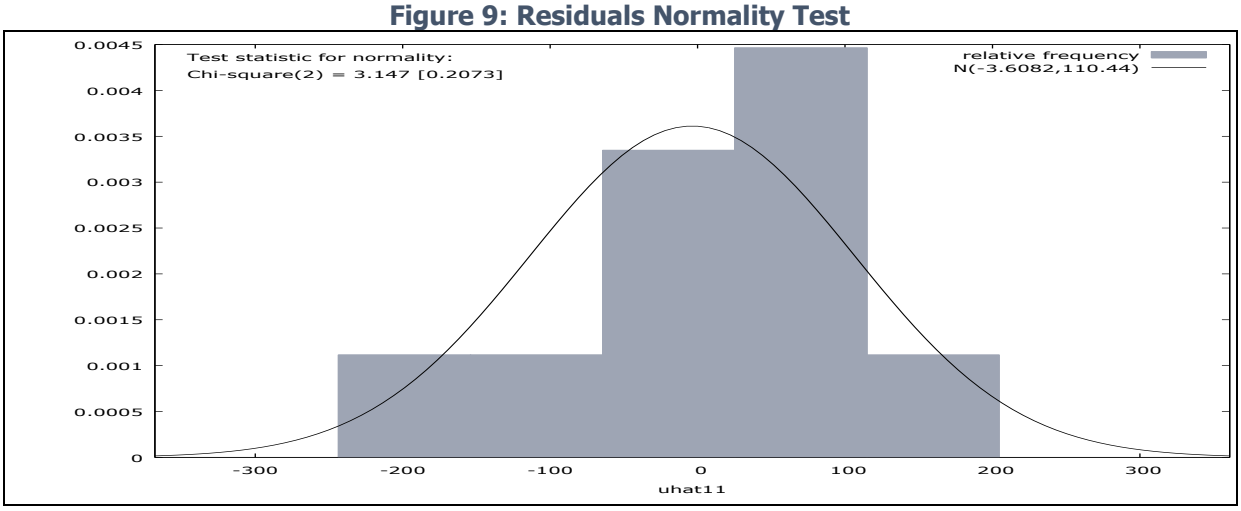


Source: Eviews Statistical Software

As observed the ACF lag 1 is almost close to the significance line. Lag 2 goes far from the significance line, while lag 3 changes to negative sign. The study therefore fixes q as 1.

Having determined parameters p, d and q, the study will have ARIMA (p, d, q) specified as ARIMA (1, 1, 1). To test the appropriateness of the model for forecasting, normality test for the residuals is done using Chi-square. Investigation of marginal normality can be accomplished visually by looking at a histogram of the residuals (Shumway and Stoffer, 2011). The normality test is shown below;

Figure 9: Residuals Normality Test



Source: Gretl Statistical Software

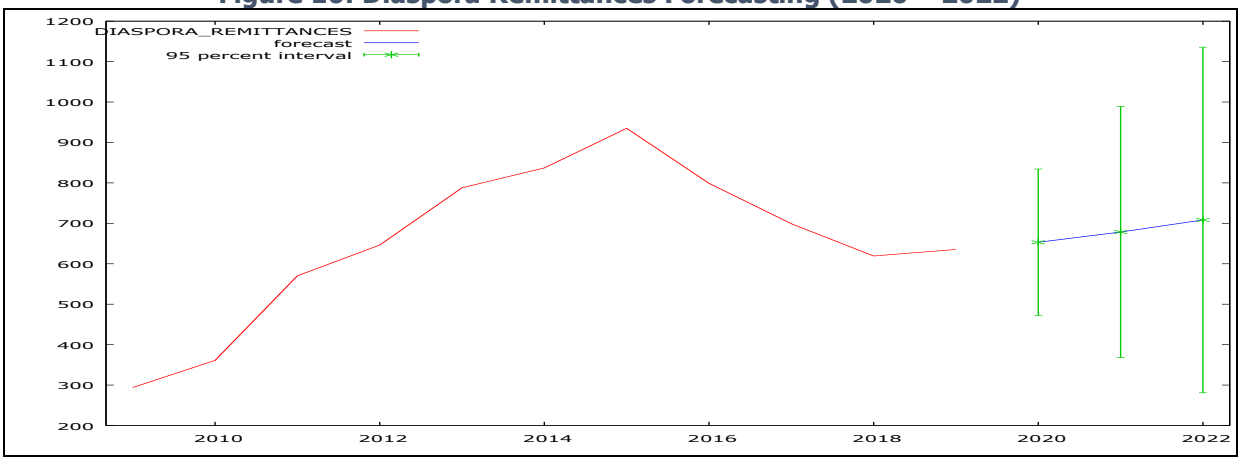
The Chi-square statistic is 3.147 with probability of 0.2073, implying the acceptance of the null hypothesis that residuals are normally distributed. If the model fits well, the standardized residuals should behave as an iid sequence with mean zero and variance one (Shumway and Stoffer, 2011). The ARIMA (1,1,1) model, therefore is appropriate for forecasting.

3.8 Forecasting

Forecasting a time series is often of tremendous commercial value (Prabhakaran, 2018). The appropriate forecasting methods depend largely on what data are available (Hyndman and Athanasopoulos, 2018). In forecasting, the goal is to predict future values of a time series (Shumway and Stoffer, 2011). The study used only the previous values of the time series to predict its future values commonly known as Univariate Time Series Forecasting. ARIMA is a forecasting algorithm based on the idea that the information in the past values of the time series can alone be used to predict the future values (Prabhakaran, 2018).

Basing on the analysis from the previous sections, the study used the ARIMA (1, 1, 1) as the best model suitable for forecasting diaspora remittances. The forecast graph is shown below;

Figure 10: Diaspora Remittances Forecasting (2020 – 2022)



Source: Gretl Statistical Software

As observed from the above graph, diaspora remittances are expected to increase for the future period, years 2020, 2021 and 2022. The expected increase for the next three years will not surpass the previous years 2012-2017.

IV. Conclusion

The wave of Zimbabwean migrants to other countries continues unabated. Major reasons given by most labour migrants are that in their home countries, there are no job opportunities, inadequate social infrastructure and lives are not secure due to the problem of insecurity (Awojobi *et. al*, 2017). Migrants once settled in the foreign land start sending money back home or they buy goods abroad and send home for selling. The study managed to explore the trend of diaspora remittances for Zimbabwe during the period 2009 to 2019. The trend showed a rising pattern from 2009 (US$294 million) to reach peak in 2015 (US$935) before starting to decline until 2018 (US$619.25 million) and a slight increase in 2019 (US$635.43). Such a trend calls for investigations to be made, given the increase in number of migrants outside Zimbabwe and the existence of the Diaspora policy. Diaspora remittances are very important for national development. Asian economic giants such as South Korea, China and India in the 1960s has made remarkable economic turn-around using diaspora remittances for infrastructure and industrial development. Information from previous government engagements shows that the diaspora community is very keen on investing in various sectors of the economy (transport and infrastructure development, renewable energy, agriculture processing, health care, financial sector, manufacturing, tourism and real estate sector).

The study also used the coefficient of variation statistics to check on the stability of diaspora remittances for various episodes. From the obtained statistics, there is no greater change of diaspora remittances expected in the country. A better pace of growth was only registered for periods 2009-2013 and 2014-2017.

Through employing the ARIMA time series analysis model, the study managed to forecast diaspora remittances for years 2020-2022. Forecasting aids decision making by giving pointers on the expected trend. An ARIMA (1,1,1) was found the appropriate model. A slightly rising trend of diaspora remittances was observed, however, the pace of growth is not desirable to effect development and remains below the 2015 peak of US$935 million.

To reap macroeconomic benefits from increased diaspora remittances, the study recommends building diaspora confidence in local financial systems and craft policies that incentivise cluster investments which tend to be large-scale.

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