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**MACROECONOMIC DETERMINANTS OF  
DIASPORA REMITTANCES. A CASE STUDY IN  
KENYA**

**BY**

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## DECLARATION

This research project is my original work and has not been presented for the award of a degree in any other university or institution of higher learning.

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## APPROVAL

This research project has been submitted for examination with my approval as the University Supervisor.

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**Dr. Fredrick Odhiambo Sule**

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The route to conduct this project has been met with detours and has taken a long time to complete it. It is my profound gratitude that goes to my supervisor, Dr. Sule for his outstanding support, guidance, and encouragement in ensuring I complete this project. His resilience and kind words only pushed me harder to complete the program and forever, I will remain thankful to him.

## **DEDICATION**

This work is dedicated to my son Gabriel whose presence in my life constantly reminded me of the need to complete my studies. It is also a dedication to my loving mum, who constantly encouraged me to accomplish this journey through her kind words, and to my sister Nice, I set this as an example to encourage her to achieve greater things in life. Special dedication to my partner, Njuguna, who by setting an example, inspired me to also take this journey.

## ABSTRACT

The World has become a global village with interaction moving from only physical interactions but also through online platforms. Traveling abroad for work has come a long way in that, it is easy to get a job in another country as compared with yester years. Opportunities now are easily accessible through one's internet-enabled mobile phone. While Kenyans opt to go abroad for greener pastures, they leave behind families back at home who rely on them or those that need to be supported and uplifted financially. Migrants also feel the need to invest back home to safeguard their future when they retire or come back to their home countries. Throughout the years, remittances have been on an upward trend in Kenya with the presence of mobile money platforms, making it easier for one to receive remittances. However, little is known of the drive of these inflows, especially from a macroeconomic perspective. This paper, therefore, studies the impact of the macroeconomic variables namely, GDP, inflation and the real effective exchange rate. The study used the bound testing approach to cointegration and error correction model which are developed in the Autoregressive Distributed Lag (ARDL) model, to evaluate the existence of long-run and short-run relationships between remittances and the selected macroeconomic variables. The ARDL model was the best fit since one of its advantages is that it allows variables to have a combination of  $I(0)$  and  $I(1)$ , and none of the variables were  $I(2)$ . The study used 52 observations that is from 1970-2021 analyses were done using EViews version 12. Using this approach, results show that there exists a long-run relationship between remittances and the GDP, inflation, and real effective exchange rate. The findings also suggest that GDP plays a significant role in remittances while inflation and the real effective exchange rate are less significant but play a role. Remittance growth falls when GDP growth rises while remittances increase when inflation and real effective exchange rates are on the rise. Therefore, policies to attract remittances for investment and saving products should be embraced especially in favorable economic conditions.

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## ABBREVIATIONS

ADF	Augmented Dickey Fuller
AIC	Akaike Info Criterion (AIC)
ARCH	Autoregressive Conditional Heteroskedasticity
ARDL	Autoregressive Distributed Lag
CBK	Central Bank of Kenya
CPI	Consumer Price Index
CUSUM	Cumulative Sum of Recursive Residuals
CUSUMSQ	Cumulative Sum of Recursive Residuals of Squares
ECM	Equilibrium/Error Correction Model
ECT	Error Correction Term
GDP	Gross Domestic Production
IMF	International Monetary Fund
IOM	International Organization for Migration
KNBS	Kenya National Bureau of Statistics
KNOMAD	Global Knowledge Partnership on Migration and Development
REER	Real Effective Exchange Rate
RER	Real Exchange Rate
RESET	Regression Equation Specification Error Test
SIC	Schwarz Information Criterion
UAE	United Arabs Emirates
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
USD	United States Dollar
VAR	Vector Autoregressive
VEC	Vector Error Correction
WHO	World Health Organization

## CHAPTER ONE: INTRODUCTION

### 1.1 Background

In 2020, \$540 billions of dollars were sent home by more than 281 million people living outside their birth countries, being a 3.6 per cent of entire population in the World (UN, 2021). Majority of these people went abroad in search of greener pastures or join their families. Remittances refers to cash remitted back by those who left their birth countries, to their families and friends back home. It also functions as a measure for governments to show the link between people's movement outside their birth country and development. Remittances can also be non-cash, such as adopting the latest ideas, culture, religious practices, knowledge, and social capital, from foreign countries and implemented in home countries.

The flows of remittances globally and their benefits cannot be over-emphasized, especially in the low- and middle-income nations. Migrants usually send these flows to help families back at home or for investment purposes. According to the (Worldbank, 2021), “India received the highest remittances received in the World at an estimated value of 83.15 billion US dollars, followed by China (\$59.51 billion) and Mexico (\$42.88 billion) in 2020, while Egypt was the top African country to receive remittances at \$29.60 billion followed by Nigeria at \$17.21 billion”. According to the Central bank of Kenya and the World bank report 2021, Kenya received 3.1 billion US dollars during the same period (CBK, 2022) and (Worldbank, 2021). Particularly, Egypt has the largest share of receiving remittances in the continent and the fifth largest country in the World since 2008. This is partly due to high number of Egyptians (about 9.5 million) who live abroad, with most of them living in neighboring countries such as Saudi Arabia (Worldbank, 2021).

Remittances are considered as unrequited transfers and sources of foreign financing as to the countries receiving them (Lueth & Marta, 2007). Remittance flows in Africa have risen and have a large share compared to other financial flows. A study done by (Barajas et al., 2009) shows remittance flows were more than private capital flows, official capital flows, and official transfers in developing countries. This results in remittances being viewed as top earners of the foreign exchange in Kenya, which has continued throughout the years. The increase in remittance in Kenya is partly due to the decreasing transaction costs of remittances, from 13.1 per cent in 2011 to 8.4 per cent in 2020 (Worldbank, 2022). Notably, (UNCTAD, 2008) adds that remittances, “despite their massive flows into the developing countries, they cannot be considered a substitute of other foreign currency sources investment flows from foreigners, official development assistance, debt relief, or other public sources of finance development.”

Remittances can be categorized in to two main broad categories, that is, microeconomic and macroeconomic analytical levels. At the micro-level, remittances are influenced by individual's motives ranging from altruistic motives: where a migrant supports his not-to-do-so-well family back home; self-interest motive: where a migrant invests or saves back home in real estate, business, and purchase government bonds and bills; the implicit family contract: where either as a payment of loan if at all the family paid for the migrant's education or air ticket to go abroad; act as a source of insurance in that in case of any downfall back home, that would result to loss of income, the migrant would be able to come through. Undoubtedly, remittance flows advance lifestyles of millions of people, since a fraction is diverted into investing in real estate, education, and new enterprises.

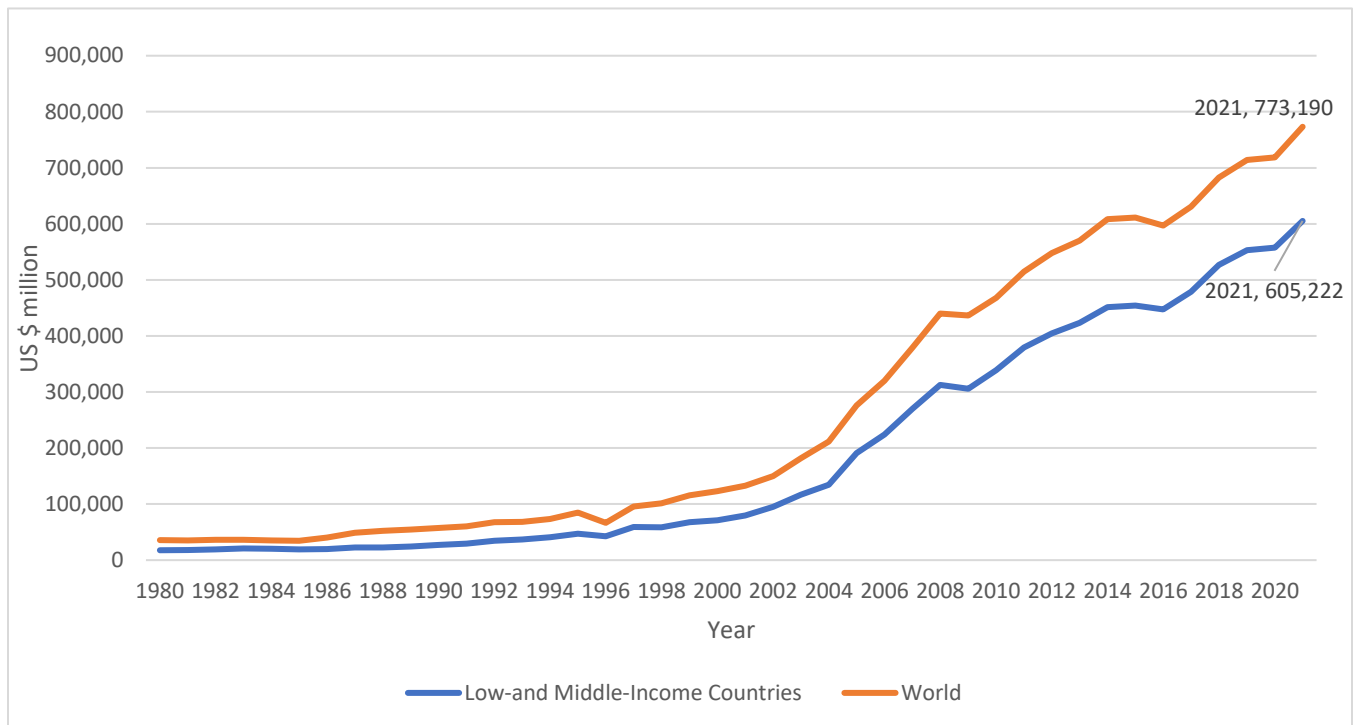
The study considered the annual GDP growth rates, inflation and Real Effective Exchange Rate (REER) as the macroeconomic determinants to examine the impact and magnitude they have on remittances.

## **1.2 Global overview of remittances**

According to (Hollifield et al., 2006) “remittances function as the largest source of external funding for developing countries, while the developed countries are considered to be the primary funders”. In 2020, largest share of remittances was from the United States of America at USD 68 billion, followed by UAE at USD 43 billion and thirdly Saudi Arabia at USD 35 billion (IOM, 2021). The increasing flows of remittances are due to a high number of people from their birth countries going to other countries seeking greener pasture; increased official records due to the use of digital transfers such as online banking, mobile payments, among others, a reduction of transactional cost due to high competition of various transfer mechanisms; depreciation of the dollars and other foreign currencies; and ease of entry restrictions to the developed countries (IOM, 2021).

Developing countries, more so those in Africa, receive tremendous remittance flows annually, and they are large compared to other financial flows (Barajas et al., 2009). Globally, the remittance inflows have been increasing over the years to stand at USD 773.1 billion while low- and middle-income countries inflows to stand at USD 605.2 billion, in 2021 as seen in Figure 1. With these high inflows, economists and policymakers become more interested in researching about their impact and more to understand what attracts them and how they can be channeled in a country's development.

**Figure 1: Migrant remittance inflows 1980-2021**



Source: KNOMAD/World Bank, 2022

Various studies have shown that these flows are stable or counter-cyclical. Ratha (2006) described remittances as stable flows compared to private capital flows in that, during shocks such as political instability, remittances flows increase and therefore being counter-cyclical. They flow from those outside their birth countries to the source country even when their economy may experience distress. In other words, economic shocks affecting the source country are critical drivers of remittances. In times of economic hardships, remittances are said to be the savior of the day as those abroad are motivated to remit more back home to cushion those at home from hardships faced. At the start of Covid-19, (Thomsen, 2021) mentions that “it was predicted that Africa would be more affected by the pandemic due to poverty, unsanitary living conditions and weak health systems”. To some extent, this may have played a role in motivating migrants to send more money back home.

### 1.3 Overview of Remittances in Kenya

In 2007-2009, when the US experienced the great recession after the housing bubble burst, a global financial crisis was realized impacting a slight decline in remittances flows in 2009 (Ratha & Sirkeci,

2010). The authors explain that compared with flows such as foreign direct investments, private debts and portfolio equity, and official development assistance flows, remittance flows remained resilient during the 2007-2009 financial meltdown. The recent economic shocks caused by Covid-19 pandemic was first announced in “China in December 2019 and later a global pandemic by the World Health Organization in March 2020” (WHO, 2020). To curb the pandemic, strict measures and restrictions were enforced such as controlling movement and total lockdown (apart from those supplying essential services), especially in developed countries which, reported mass fatalities and infections (Schellekens & Sourrouille, 2020). Though these restrictions helped curb the spread of the virus, they strained the economy where some businesses had to close inevitably, hence making many employees jobless. According (Jackson, et al., 2021), it is estimated that the pandemic reduced the global economic growth to -3.2% in 2020. For Kenya, the economic growth in the same period was -0.3%, down from the 5.0% growth registered in 2019 (KNBS, 2021). According to the (Worldbank, 2021) “remittance flows continued to show resilience during the pandemic in 2020 by registering an insignificant (1.6%) decline smaller than the one registered during the global financial crisis of 4.8%”. This shows remittances sometimes are resilience in economic shocks and sometimes not. In the following sections, we give an overview of the selected macroeconomic determinants relation to remittance flows in Kenya.

#### **1.4 Gross Domestic Product and Remittances in Kenya**

As per the (IMF, 2020) definition, Gross Domestic Product (GDP) is “a standard measurement used to show how much an economy produces every year by measuring the monetary value of final goods and services produced in a given period”. When the GDP growth rate declines, it means the economy is shrinking as there is a contraction in money supply. In other words, when the economy is dwindling, things get hard for businesses, households, and governments, causing low levels of production, a decline in sales, business closure, freezing of promotions and new employments, and dismissal of employees, among others. Such distress causes inflation and elevated levels of unemployment which, if not tackled on time, result in negative GDP growth. Overall, declining GDP growth rates distress most households, and those who rely on remittances ask for more.

Nonetheless, when the economy is doing well, as measured by favorable GDP growth rates, it may signify high employment rates and thriving businesses, noting a surplus of money in circulation. The households who receive remits at a time when the economy is booming may have a surplus for luxurious things, investments, and savings. In some cases, the receivers may not receive as much if they can make enough

on their own, making the migrant send less or no funds. Few studies highlight how an economy's GDP of the home country influence the inflows. One of the studies (Gupta, 2005) shows that "remittances are affected by the economic growth of the receiving country". If the GDP is low, remittances increase, acting as a counter-cyclical to safeguard those who rely on these remits.

### 1.5 Real Effective Exchange Rates and Remittances in Kenya

The Real Effective Exchange Rate (REER) as described by (Ohno, n.d.) considers "the price level difference between trading countries and includes inflation adjustments." In other words, it considers the adjusted inflation and trade-weighted exchange rate. The changes in REER connote the evolution of a country's aggregate external price competitiveness. In other words, the REER reflects how a currency is performing. The REER is constructed as follows:

$$REER_t = \frac{XR_n \times P_{dom}}{P_{row}}$$

Where  $REER_t$  is the "real effective exchange rate;  $XR_n$  is the nominal effective exchange rate, measured as the foreign price of local money;  $P_{dom}$  is the domestic price level, measured as consumer or wholesale prices;  $P_{row}$  is the price level for the rest of the World, using the country's leading trading partner as a proxy" (SlideShare.net). As stipulated by (Robert et al., 2004) "REER<sub>t</sub> rises, the country's cost competitive position has worsened since it is experiencing more inflation than its trading partners after allowance for changes in the nominal exchange rate" hence favoring imports while becoming hard to sell exports.

If remittance inflows cause REER to appreciate, this leads to international uncompetitiveness of domestic production, particularly that of nontraditional exports. An increase in REER leads to exports becoming uncompetitive and therefore, a loss in trade competitiveness while imports become preferable given the cheap prices and therefore, in the long term, this leads to a deficit trade balance. A study done by (Gakunda, 2017), in assessing the effect of remittances on trade balance, found that "remittances lead to an increase in the trade deficit". However, a study done by (Muktadir-Al-Mukit et al., 2013) in Bangladesh, while trying to determine the causality between remittances and imports, revealed that "remittances barely have impact on the influence in purchasing imported goods". While noting that Kenya continues to register an appreciation of REER, this paper unfolds its impact on remittances.

## 1.6 Inflation and Remittances in Kenya

Remittances may increase when the receiving country is experiencing negative economic shocks such as high inflation. Migrants, through the perspective of altruism, remit resources back home so that the family left back home can mitigate these shocks. Contextually, low inflation rates or also referred as deflation, leads to lower spending and can influence the migrant to remit less or none or may remit more for other purposes such as investments and savings coupled with the hopes that prices will rise in future. A study done by (Jr & Rivera, 2020), while investigating the relation between remittances and inflation in the Philippines, found that “inflation can influence migrants to remit more in the short run”. However, another study conducted in Georgia shows that there is no relation between remittances and inflation (Dilanchiev et al., 2020).

To understand how inflation pressure would influence the remitter to send more money, we first understand who receives the money and how they are likely to use the remits by looking at a survey done by the CBK on Diaspora remittances in December 2021. According to the (CBK, 2021), a large share of remits goes to support the receiver in purchasing food. The report also notes that remittances are mostly sent on monthly basis, with a large share going to purchase foods and household goods (16%), medical expenses (12%), education expenses (11%); and rent and household utilities (10%). Less than 3% remit for purposes of investment such as buying land, construction of houses and payment of mortgages.

Some studies, however, have revealed that there is no relation between inflation and remittances. One such study is by (Lueth & Marta, 2007) in determining the behavior of remittance inflows to macroeconomic shocks while using the vector error correction model in Sri Lanka reveals that remittances' response to a CPI shock is ambiguous. Inflation worsens poor households and only makes them poorer, and if these households receive any remittances, then the migrant may be bound to remit more. However, other studies support that inflation has a positive impact on remittances.

## 1.7 Problem statement

Remittances are dependable by those who receive them, as they are a source of income which is often spent on basics needs or invested playing a critical role in reducing poverty rates in an economy. Moreso, various studies have focused on effect of remittances sent to Kenya on variables such as unemployment, micro motives, GDP and exchange rate.



Subsequently, other research studies show that remittances are utilized for essential purpose such as education, food, shelter, and medical needs. The effects of the macroeconomic variables such as effects of GDP on remittances is of value to be looked into. For instance, if the GDP growth increases, and the remittances decrease, this would mean the migrant may not send in as much as he was remitting before when the GDP was on a decline. It would also allude to that there less inflows that go to investment. It is therefore significant, to know the real impact of GDP towards remittances so that policies geared towards an attractive investment and savings environment can be formed. Other studies focus more on the impact of remittances on REER where when remittances grow, they cause to REER to appreciate. In addition, several studies also look into the impact of remittances towards inflation where they are believed to inflate prices when the remit flows increase. However, there exists no research that looks into the impact of these macro variables towards remittances and especially in Kenya.

Furthermore, existing studies on macroeconomic determinants on remittances in different countries, show different results and few show the impact on long run and short run. Consequently, this paper closes in the gap on the impact of the macroeconomic variables on remittance. It also unveils the existence of long run and short run impact and its magnitude of the annual GDP growth rates, REER, and inflation on remittances for the period 1970 to 2021.

## **1.8 Research Questions**

This paper is driven by the following questions.

- ✓ Does a change in the macro-economic determinants, lead to remittances increasing, decreasing, or remain constant?
- ✓ What is the magnitude of the selected macro-economic determinants to impact remittances?
- ✓ Is there a long-run or short-run relation between the remittances and selected macroeconomic determinants?

## **1.9 Overall objective**

Remittances in some cases, thrive when there are economic shocks in the receiving countries and sometimes decline.

This paper intends to obtain the effect of the macroeconomic determinants on remittances, whether they are positive, negative, or constant. Specifically, the paper looks into the selected macroeconomic determinants expressly the annual GDP growth, real effective exchange rate and inflation.

Specifically, the study shall:

- Evaluate the impact of annual GDP growth, REER, and inflation on remittances in both the short-run and long-run.
- Offer policy recommendations based on research findings in safeguarding the remittance flows

### **1.10 Significance of the study**

This analysis is of value to numerous segments in Kenya's economy. First, for the government, it is of benefit to policy makers such as safeguarding and increasing the remittance flows depending on the impact of macroeconomic determinants. For instance, during inflationary pressures, the government would seek mitigations to reduce the cost of receiving the remits through official channels which, in long run, would increase foreign currency reserves.

The study also informs sectors such real estates and mortgage financial sectors where they can package the houses and land for sale at flexible terms when the country is under inflationary pressures. Mortgage financiers can offer tailor make- affordable rates to attract investors receiving the remits. This can boost the mortgage penetration rate in the country.

Thirdly, the study may be used to advocate to consumers (those receiving the remits) in that if inflationary pressures reduce the remit flows, they can plan in advance on how to meet their basic needs. Banking sectors and digital lending facilities may custom loans to clientele receiving the remits especially if the remits pass through their platforms.

Lastly, the study fills in the existing literature gap on how macroeconomic determinants affect remittances. Scholars would be interested in expounding the research further by adding more macroeconomic determinants and looking at both home and host variables for Kenya's case. There have been few existing studies that looks into the impact of macroeconomic determinants on remittances and therefore this investigation closes this gap.

## CHAPTER TWO: LITERATURE REVIEW

### 2.1 Introduction

This chapter features theoretical theories related to this study before looking into empirical evidence. Finally, at the end this chapter, an overview of literature and gaps in past studies are presented.

### 2.2 Theoretical Literature review

To understand the theoretical theories on remittances, we discuss the theories, (i) Neoclassical theory as discussed by (Smith); and (ii) Human capital theory; and (iii) Segmented labour market theory as suggested by (Byanjankar & Sakha, n.d.) explaining the macro determinants of remittances.

#### 2.2.1 Neoclassical Theory

The neoclassical theory as narrated by Adam Smith attributed that workers would migrate from an area of low paying wages or unemployment to that of high paying wages whether within or outside a country's borders (Smith). The theory explains macro-economic problems and microeconomic concepts like rational behavior in human beings. The neoclassical theory assumes that "the labour market and economies move towards equilibrium in the long run through trade and migration and that migrants move from countries where labour is abundant and low wages to where labour is scarce with high wages, denoting a linear relation between wage variances and migration" (EU, 2015). The report further narrates that individuals make independent decisions by considering higher earnings in the long run. With this theory, if migrants can get high paying jobs and better opportunities as opposed to what they would have back home, then they will be freely willing to remit money back home, more so if the family left back home are dependent on the migrant and if the situation back home is worse due to a depreciating economy where the GDP performance is low coupled with high unemployment rates. Further, (Pfau & Giang, 2010), notes that since remittances are decided at the household level, remittances are of importance in the neoclassical theory.

#### 2.2.2 Human capital theory

As defined by (Romer, 1996) "the human capital theory is the ability to acquire skills and knowledge of particular work which then makes the individual competitive". The human capital theory, which is also the basis of labour economics, "refers to the role of human capital in productivity and about incentives to invest in skills attained through school and on the job" (Acemoglu, 2008). According to this theory, it is established that "human capital is the dominant drive of migration as people can get access to opportunities beyond their current place of activity" (Byanjankar & Sakha). Therefore, increasing other workers' wages

with the assumption that the labour markets are perfect, results in people migrating to work where wages are high. This is coupled by a decline in GDP mainly due to unemployment, less business opportunities, and lack of trade competitiveness due to increase in REER back home.

According (Brown & Poirine, 2005), they found that “there are considerable gains to parents from raising and educating children in a low-income country as some are likely to migrate to high-income countries where they enjoy higher returns to their human capital”. In general, it’s assumed that the migrants will send substantial or at least a satiable amount in their home country. On a ripple effect of the theory and remittances, remittances are said to increase human capital as the receiver would have enough disposable income to advance education and enroll the children in private schools. This is supported by a study done by (Salas, 2014) on “the effect of international migration on children left behind in Peru where they found that families receiving remittances are more likely to send their children to private schools, hence advancing the country’s human capital growth and development”.

### **2.2.3 Segmented labour market theory**

The theory brings out the imperfection in the labour market from the demand side and compensation not explained by individual worker characteristics. The segments are by geography, education qualifications, race, and industry (Wikipedia, 2021). While studying the labour market segmentation in New Zealand, (Brosnan, et al., 1995) characterized labour segmentation as “non-competing groups such as economic, social, and political forces merged to differentiate wages of a comparable group of workers with a focus on race, sex, primary and secondary markets, and segmentation within the primary markets.” While “segmentation arose during the transition from competitive to monopoly capitalism, the theory also reveals how these divisions have different working conditions, promotional opportunities, wages and benefits and market institutions” (Reich et al., 1973). A new rising form of segmentation is flexibility working from home, a concept pushed by the Covid 19 may function as another additional division as more employees seek to continue with this arrangement post-Covid 19. According to (Agénor & Montiel, 2008) “restrictions on occupational mobility prevent workers in the low wages segment from moving to high wages segment even with similar qualifications and doing similar job descriptions”.

The labour market segmentation can also be brought about by “the existence of sectoral wage rigidities, which can lead to demand constrained employment” (Agénor & Montiel, 2008). The authors also add that “efficiency wage theory, which is the wage that minimizes labour costs per efficiency unit, explains why

modern sector firms pay more than the market-clearing wage in models with segmented labour markets as they predict the existence of non-competitive wage differentials even in the absence of unions and other institutions constraints.” The (IMF, 2020), while examining “the impact of remittances on labour market outcomes using cross country evidence, show that for the remittance-receiving countries, on the supply side, remittances reduce labour force participation and increase informality of the labour market while male and female labour supply show different sensitivities to remittances.” On the demand side, (Chami et al., 2018) elaborates that “remittances tend to reduce overall unemployment but benefit lower wages and productivity in non-tradable industries at the expense of high wages and productivity segments.” While this analogy is ideal for those who receive the remittances, it does not favour households that don’t receive remittances. The theory also brings about the Dutch disease effects in that remittances reduce unemployment rates and reduce the lower wage growth at the expense of high wages and productivity (Chami et al., 2018).

In conclusion, the neoclassical theory, assumes that individuals migrate to places where there is labour abundance and better wages for long term, leaving behind families whom they can support. The human capital theory assumes that migration decision is based on skills and monetary value one will accrue while they are abroad. More so, the theory assumes that the migrant will return home with new skills which can be implemented back home. Similarly, segmented labour market theory assumes that individuals move abroad for the sake of better wages than those back home.

### **2.3 Empirical Literature**

This section looks at earlier research to weigh the impact of macroeconomic determinants on remittances. The empirical literature may be grouped into two approaches of focus. One is the approach where studies look at the macroeconomic variables of both the sending and receiving countries, while the other approach only looks at the variables of the home country. For this study however, we only focus on home country variables.

Several studies show that macroeconomic determinant from home country have more influence in attracting remittances. According to (Singh et al., 2009) while investigating the impact of the macroeconomic determinants on remittances in Sub Saharan countries from 1990 to 2005, observed that remittances are counter-cyclical. This implies that remittances mitigate economic shocks brought by

variations in GDP per capita. In addition, “they noted that an overvalued exchange rate and high-interest rate in receiving country affect remittances negatively.”

While looking at the impact of inflation from home country for purposes of investments, several studies show that high inflation and interest rates may lead to a reduction of the remittance flows. Elbadawi and Rocha (1992) while examining inflation and exchange rate for home country in North Africa and Europe for the period 1977 to 1989 found that “the former shows a negative and significant effect on remittances implying that high inflation discourages investment.” This discourages migrants from sending remittances back home, particularly those meant for investments. Exchange rates, as signified by black premium rates, were noted to have an impact on remittances, implying the importance of balance exchange rates for remittances sent on official channels. The author supports the notion that remittances are significantly affected by economic policies in home countries. A similar ideology is shared by (El-Sakka & McNabb, 1999) while investigating the macroeconomic determinants of remittances, where they observed that “exchange rates and interest rate differentials are vital in attracting remittances, especially those that pass through official means”. While using a “panel data set of bilateral flows from 21 Western European to 7 European Union neighboring countries to examine the determinants of worker’s remittances”, (Siegfried & Schiopu, 2006) observed that GDP differential are significant and positively while the interest rate differentials are insignificant, representing a lack of reason to investment.

Wahba (1991) while examining flows from migrant workers for Egypt in the 1980s, also notes that “an increase in interest rates and a reduction in exchange rate increases official remittance flows while political instability has adverse effects on the flows.” Some of the studies that show exchange rate and interest rates from home country have no significance in attracting remittances was by (Gupta 2005) noted that “exchange rate depreciation and interest rate differentials and even political uncertainty have an insignificant effect on remittances.” Another study carried out by (Gupta, 2006) while analyzing the determinants of remittances in India, found that low economic growth in India led to migrants remitting more back home.

Through the existing literature, so much has been discussed on remittances being counter-cyclical or pro-cyclical. Counter-cyclical refers to when the economy in the receiving country are depressed or under recession leading to migrants remitting more to assist their families on these effects. For pro-cyclical, means that the remittances flows would decrease when the economic conditions faced with declines.

While looking at home country variables only, (Lueth & Marta, 2007), while trying to show that remittance receipts are less of a shock absorber, while using the Vector Error Correction (VEC) model on quarterly data from 1996 to 2004, found that “remittances reduced when the real GDP declined undermining their usefulness as a shock absorber and that remittance declines when the currency weakens.” The authors acknowledge that altruism is not the only motive behind remittances: altruism versus portfolio consideration.

Another study showing the procyclical effects of GDP and remittances was by (Rahman, 2006) when examining “the determinants of remittances in Saudi Arabia, with variables such as the real GDP income variables, wages per worker, returns and parity conditions, and composite indices about socio-economic factors and risk indicators in the country found that the per capita GDP has a positive relationship to levels of per worker remittances showing that remittances increase during booms and declining during recessions.” Additionally, (Lueth & Marta, 2007) investigated the “macroeconomic variables such as the real GDP, CPI, exchange rate and a relative rate of return for quarterly data for the period 1996-2004, to ascertain the behavior of remittance inflows when an economy experiences economic shock”. The results also show that “eventually, remittances decline as oil prices fall, and when the currency weakens.” Conversely, remittances increase as the GDP and inflation increase.”

Existing empirical evidence show the significance of macroeconomic variables in remittances and support the theory that remittances cushion against macroeconomic shocks hence being counter-cyclical. A study done in Egypt to show “the macroeconomic determinants of remittances in Egypt for the period 1980 to 2018 while applying the ARDL model disclosed that the exchange rate and the GDP per capita in Egypt are of significance and remittances play a key role as they are counter-cyclical and that the more migrant’s stay abroad, the less they are likely to continue remitting back home” (Qutb, 2019).

Different studies have showed that REER is insignificant to remittances while others the argue of its importance. The effects of real effective exchange rate on remittances highly depends on whether the remittances are sent through the official channels. The more remits sent through official channels, then they are likely to be negatively affected by REER. One of the study that shows the insignificance of REER was done by (Alleyne et al., 2008) who examined “a set of macroeconomic variables (Per capita GDP of the receiving country, real effective exchange rate, and interest rate differential) from 1986 to 2000, found that all the variables have a long run relationship and that both altruistic and investment played crucial role in making the decision towards remittances.” The findings also show existence of a negative and

insignificant correlation between REER and remittances.” The study was carried out in eight English speaking Caribbean countries (“Barbados, Dominica, Grenada, Jamaica, St.Kitts and Nevis, St.Lucia, St. Vincent and Grenadines, and Trinidad and Tobago”). Existing studies that show that the REER are significant in affecting remittance flows, include that of (Faini, 1993). He looked into “the impact of real exchange rate and interest rates on the worker's remittances for the period 1977-1989 for the countries Morocco, Portugal, Tunisia, Turkey and Yugoslavia” (Faini, 1993). The results show that “all the macro variables tested played a significant role in affecting the long-run desired flows of remittances” (Faini, 1993).

Changes of exchange rates affect the REER and if the former increases, then REER would increase too. The exchange rate increments would be assumed to discourage the remittance flows; however, some studies show that remittances will increase as the exchange rate increases. Lianos (1997) analysed “the factors that impact the flow of migrant remittances to Greece for the period 1961 to 1991” while looking into “migrant’s income, family income, interest, inflation, exchange rate, unemployment, and number of migrants.” The findings show that “income levels in the home country have no significance on remittances while the rate of inflation and interest rate differentials stand to be significant.” Exchange-rate adjustments lead to the migrants adjusting the remits so that the same value is sent home, implying increment in the exchange rate leads to more remittance flows. A similar study conducted by (Straubhaar, 1986) on “the macro determinants of remittances for Turkey from Germany from 1963 to 1982 found that the stability of Turkey was critical in attracting remittances, while the exchange rates were positive but not statistically significant.”

Empirical evidence shows that pressures of inflation in home country attracts more remittance inflows to cushion the receivers from high prices. A study done by (Lueth & Marta, 2007) to investigate the remittances association between workers' host and home country in eleven countries in Asia and Europe while using the gravity model, found that remittances were sent back home to ease inflationary pressures. They also noted that remittance flows declined when the economy was not conducive for investments and there was political instability. This supports the fact that high inflation in home countries would attract more remittances to be sent back home to cushion the receiver from the inflationary pressures.

While noting the significance of inflation in attracting remittances to cushion themselves from inflationary pressures, some studies have emphasized that remittances used in consumption may lead in escalating prices which may lead to two-edge sword problem that is, if inflation attracts remittances, then prices may



continue to increase eventually. A study done by (Maroney et al., 2004) applied unit root, cointegration, vector error correction and variance decomposition tests to examine nine macro variables that encompass the economy of Bangladesh economy from 1974 to 2000. Their results show that “monetary policy is more important than fiscal policy and recommends that remittances should be channeled to investments since direct consumption only leads to price escalation” (Maroney et al., 2004).

Other existing literature also show that inflation pressures may deter migrants from sending remittances. One such study was by (Barua, Majumder, & Akhtaruzzaman, 2007) who observed that “the determinants of workers' remittances in Bangladesh, while considering migration stock, host and home country economic condition, income differential, inflation differential, return on financial assets and exchange rate from 1993 to 2005.” He found that higher inflation in the home country discourages migrant workers from sending more remittances purposed for investments. Notably, higher inflation represents risk and uncertainty on investments and therefore migrants reduce the remittance flows meant for investment purposes.

## **2.4 Overview of literature**

The existing literature highlighted in this chapter show mixed results towards the impact of macroeconomic variables on remittances. While the assumption is that macro-economic variable such as a decline in GDP, denoting low economic productivity, would attract more remittances. However, some studies have shown that this may have no impact in a decline in GDP or no reduction of the flows of remittances when GDP is increasing. Similarly, inflation and real effective exchange rates also have diverse impact on remittances in that inflation and high REER may attract remittances or vice versa.

It is with this notion that we conduct the macroeconomics determinants for remittances for Kenya case since this kind of study barely exist. This study, therefore, will close in the existing gap on ensuring the findings show the true picture of the impact the macroeconomic determinants have on the remittances. These findings will go a long way in offering recommendations to policies that are consistent in improving the flows of remittances for enhancing the Kenya's economic growth.

## CHAPTER THREE: METHODOLOGY

### 3.1 Introduction

Chapter three explains the methodology herein used for the analysis of the study. In particular, elements on theoretical framework, empirical model, definition, econometric approach, diagnostic testing and the sources of data are highlighted.

### 3.2 Theoretical framework

Existing theories highlights diverse models for measuring the impact of macroeconomic variables on remittances. This paper applied the Autoregressive Distributed Lag (ARDL) Bounds test theory to bring out short and long run effects of the macroeconomics determinants on remittances. Duasa, (2007) used “ARDL model to investigate whether a long-run equilibrium relationship exists between trade balance and the determinants.” Autoregressive Distributed Lag (ARDL) as developed by (Pesaran et al., 2001) shows “the direction of causation between variables and that the advantage of using the ARDL approach is that it employs only a single reduced equation and it makes it not a must for pre-testing, which means that the test on the existing relationship between variables in levels is applicable irrespective of whether the underlying regressors are purely I (0), purely I (1) or a mixture of both.” As noted by (Duasa, 2007), this feature alone with the fact that the data entails cyclical components “makes the standard of the cointegration technique unsuitable.” In addition, (Tiwari & Shahbaz, 2014) notes that ARDL has better small sample properties compared to multivariate cointegration tests. Notably, ECM combines the short-run and long-run equilibrium, an integration that all related information in the variables is captured.

From the existing theories, the vector error correction model has been used while assuming that all variables are non-stationary. Lueth & Marta (2007) assumes that the variables are endogenous, nonstationary and cointegrated. They use the VEC model, which assumes all variables are nonstationary, which is not consistently the case. We note that the macroeconomic variables examined in this study may be stationary or nonstationary or have a combination of both and therefore why we choose the ARDL as it handles these combinations.

The hypothesized model specification is as follows:

$$REM_t = f(GDP_t, REER_t, Inf_t, ) \quad (1)$$

Where:

REM<sub>t</sub> = Total Remittances as percentage of GDP

GDP<sub>t</sub> = Annual GDP growth rates

REER<sub>t</sub> = Real Effective Exchange rate, CPI based

Inf<sub>t</sub> = Annual percentage inflation at consumer prices

The study only looked into the home country macroeconomic determinants without any analysis done on the variables from the sending countries. Therefore, ARDL is the best approach given this scenario and due to the existence of the variables having stationarity and non-stationary.

### 3.3 Empirical model

We investigate the effect of the macroeconomics determinants on remittances. The macroeconomics determinants examined were the GDP, inflation, and the REER. From literature review, numerous studies have included other determinants such as political instability, interest rates especially when the assumption is that the remittance flows are driven by investment motives. This study only examined the selected three variables as and, we do this without having any specific motive (altruistic or investment) of the remittances.

While incorporating the ARDL model, the following is a summary of Equation 1 after expressing them in a single equation:

$$REM_t = \alpha_i + \beta_1 GDP_t + \beta_2 \ln REER_t + \beta_4 INF_t + \varepsilon_t \quad (2)$$

Where all coefficients and variables are defined as;  $\alpha$  as a constant parameter and  $\varepsilon_t$  is the error term

Equation (2) is modeled as a conditional ARDL- error correction model to:

$$\Delta REM_t = \alpha_i + \sum_{j=1}^p \beta_j \Delta GDP_{t-j} + \sum_{j=1}^p \delta_j \Delta \ln REER_{t-j} + \sum_{j=1}^p \phi_j \Delta INF_{t-j} + \eta_1 GDP_{t-1} + \eta_2 GDP_{t-1} + \eta_3 \ln REER_{t-1} + \eta_4 INF_{t-1} + \varepsilon_t \quad (3)$$

Where:

REM<sub>t</sub> = Total Remittances as percentage of GDP

GDP<sub>t</sub> = Annual GDP growth rates

ln REER<sub>t</sub> = Log Real Effective Exchange rate, CPI based

$Infl_t$  = Annual % Inflation at consumer prices

Where  $\Delta$  is first difference operator,  $p$  is the optimal lag length,  $\beta, \delta, \emptyset$  are constant,  $j=1 \dots \dots k$  (where it represents the number of variables in a model),  $\alpha_i$  is a drift component and  $\epsilon_t$  are white noise error. The first step in the ARDL approach was to “trace the presence of cointegration by restricting all estimated coefficients of lagged level variables equal to zero” as laid out by (Pesaran, Shin, & Smith, 2001). That is, the “null hypothesis of no cointegration ( $H_0: \eta_1 = \eta_2 = \eta_3 = \eta_4 = 0$ ) are tested against the alternative ( $H_1: \eta_1 \neq 0, \eta_2 \neq 0, \eta_3 \neq 0, \eta_4 \neq 0$ ) by the mean of F test with an asymptotic non- standard distribution” (Pesaran, Shin, & Smith, 2001). Augmented Dickey Fuller test was used to check for the existence of unit roots.

### 3.4 Definitions of the Variables

Table 1 below presents the definitions, measurements and expected sign of the macroeconomic determinants of the remittances.

**Table 1: Definition and measurement of Variables**

Variable	Definition	Measurement	Expected Sign
Remittances as a percentage of GDP	Refers to the personal remittances flows as a percentage of the GDP in Kenya.	Refers to personal remittances received in Kshs divided by the total GDP in Kenya	Dependent variable
Annual GDP growth rate-	Annual GDP growth rate is the difference between GDP values from one period to the next as a proportion of the GDP from the earlier period, usually multiplied by 100.	GDP is a measure of the value - added through the production of goods and services in Kenya	Positive or Negative
Real Effective Exchange Rate (REER)	REER takes to account the price level difference between trading countries. Movements in real effective exchange rates indicate the evolution of a country's aggregate external price competitiveness.	Determined by taking the average of the bilateral exchange rate between Kenya and its trading partners and then weighting it to consider the trade allocation of each trading partner.	Positive or Negative
Inflation, consumer prices (annual percentage)	Inflation is measured by the consumer price index reflecting the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services annually. Consumer Price Index (CPI) is used to monitor price movements and how it affects policy decisions. In other words, Inflation rate is defined as a percentage change of the CPI.	It's measured by the consumer price index reflecting the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services annually.	Positive or Negative

### 3.5 Econometric Approach

The study purposes to obtain the impact of macroeconomics determinants on remittances. The ARDL method was chosen on various factors. First, as shown by (Pesaran et al., 2001) “the ARDL models yield consistent estimate of the long run coefficients that are asymptotically normal irrespective of whether the underlying regressors are I(1) or I(0) and therefore, does not require a specific identification of the order of data.” Secondly, “it supplies unbiased estimates of the long-run model and valid t- statistics even when some of the regressors are endogenous” (Pesaran et al., 2001). Thirdly, the OLS estimates the relationship. Fourthly, “given the size of the sample used in this study and the number of parameters to be estimated the bound approach makes it more appealing than the Johansen cointegration technique, which would have required the estimation of a system of 6 equations and thus a considerable loss in degree of freedom” (Pesaran et al., 2001).

The ARDL method “avoids large number of specifications in the standard cointegration test and different variables may have different optimal lags, which is impossible with the standard cointegration test” (Pesaran et al., 2001). Analysis of the data was done using the EViews version 12 software.

### 3.6 Diagnostic testing

It is important to ensure diagnostic testing in the time series model. The study undertook the relevant diagnostic test for the model for purposes of ensuring its efficiency and consistency. Here, as suggested by (Ali & Abdullahi, 2015) the model was tested from autocorrelation, its functional form, normality, and heteroscedasticity problems. If the null hypotheses is accepted in the above test, then the model will be efficient and consistent otherwise, otherwise, if rejected then the model is not be viable. For stability purpose, Cumulative sum chart (CUSUM) tests were used to measure that the model is within the critical bounds.

In a more detailed approach, all variables apart from REER were used in their original phase, while REER was transformed to natural logarithm in the EViews version 12 software. Conceptually, even though it's not a must to test for the unit root, the went ahead to test so as to know which variables have unit root or not and to ensure none are integrated to I(2). To do this, we used the Augmented Dickey Fuller (ADF) test using the 3 models i.e with intercept, with trend and intercept and none. After unit root testing, Vector Autoregressive (VAR) lag order was used to select the largest lag length of the model. The model with the lowest numbers in Akaike Info Criterion (AIC) and Schwarz Information Criterion (SIC) was chosen. Serial correlation, and the stability of the model, using the Cumulative sum (CUSUM) test were used to investigate the stability and that the model had no correlation in the long run and short run in the variables.

### **3.7 Data Sources**

The data on remittances as a percentage of GDP, GDP annual growth, real effective exchange rates and inflation were sourced from secondary sources from 1970-2021. All the data sources were from the International Monetary Fund (IMF) database, Kenya National Bureau of Statistics (KNBS), and Central Bank of Kenya (CBK).

## **CHAPTER FOUR: EMPIRICAL FINDINGS**

### **4.1 Introduction**

The ARDL bounds test was used due to its advantage of being able to measure short run and long run cointegration, estimating the equilibrating relationship and inference on the speed of convergence to equilibrium. In addition, the model allows variables to be at level  $I(0)$  or integrated to order one  $I(1)$  or

both but has no variable integrated to order two. The other advantage is that it performs better with small sample observations of about 30 to 80 as compared to (Johansen & Juselius, 1990) and (Phillips & Hansen, 1990). This chapter therefore, highlights the findings of the ARDL model.

#### **4.2 Unit root test**

The variables underwent unit root testing on to ensure that all variables are either on  $I(0)$  or  $I(1)$  and none of the variables were  $I(2)$ . Variables tested were REM, LREER, Infl and GDP. In Equation (2), only the rear effective exchange rates were logged since the other variables were in percentages. As described by (Wooldridge), “a variable that is in the form of a percentage is better off left in its original form since any regression coefficients involving the original variable will have a percentage point change interpretation.” Next, the outcomes of the unit root test are shown in Table 2. We confirm none of the used variables were integrated of order 2 since the results of p-value is zero for each of the series therefore rejecting the null hypotheses at all significance levels. The analysis shows that GDP and INFL have no unit root at level and are therefore stationary apart from REM (the dependent variable) and LREER which are non-stationary with intercept. With intercept and trend as exogenous variables, INFL, LREER and REM become non-stationary while with no exogenous variable, LREER and REM are nonstationary. At first differencing, all variables become stationary at all levels of the exogenous variables. Applying the unit root tests to the first differences of each series shows that we reject the hypothesis and no variable is identified as  $I(2)$ , which is key for the appropriate application of the bounds test.

**Table 2: The Augmented Dickey Fuller (ADF) unit root test results.**

The Augmented Dickey Fuller (ADF) unit root test results						
Null hypotheses: Unit root						
Variables	With intercept only	With intercept and trend	None	With intercept only	With intercept and trend	None
	Level			First differencing		
GDP	0.0000	0.0000	0.0025	0.0000	0.0000	0.0000
INFL	0.0028	0.0083	0.0428	0.0000	0.0000	0.0000
LREER	0.9469	0.8749	0.9093	0.0000	0.0000	0.0000
REM (Dependent)	0.1007	0.0056	0.2873	0.0000	0.0000	0.0000

### 4.3 Specifying ARDL Lag Structure

The E-views 12 statistical package software has inbuilt version of ARDL model. This allows the software to choose the optimal lag of the model. After several trials of different number of lags for the dependent variable and regressors, a maximal set of lags was set to 5, which led to the ARDL (5, 2, 5, 5) while ensuring that the Akaike Info Criterion (AIC) was the least. The best fit model had no trend specification. About 1,080 models were evaluated and model with the least AIC was chosen.

Table 3 shows the results of the ARDL (5, 2, 5, 5) model. The R-squared and the adjusted R-squared are significant at 0.9 and 0.8, respectively, hence the model is best fit to continue with bounds testing. AIC tends to select a lag length that is longer than its optimal as described by (Hurvich & L, 1989). Schwarz Information Criterion (SIC), on the other hand, tends to select simpler model specifications and therefore under fitting the model, hence better to use the AIC model as suggested by (Gile, 2013).

Our standard ARDL (5, 2, 5, 5) model looks as below:

$$\begin{aligned}
 &D(\text{REM}) \ C \ D(\text{REM}(-1)) \ D(\text{REM}(-2)) \ D(\text{REM}(-3)) \ D(\text{REM}(-4)) \ D(\text{REM}(-5)) \ D(\text{GDP}(-1)) \ D(\text{GDP}(-2)) \\
 &D(\text{INFL}(-1)) \ D(\text{INFL}(-2)) \ D(\text{INFL}(-3)) \ D(\text{INFL}(-4)) \ D(\text{INFL}(-5)) \ D(\text{LOGREER}(-1)) \ D(\text{LOGREER}(-2)) \\
 &D(\text{LOGREER}(-3)) \ D(\text{LOGREER}(-4)) \ D(\text{LOGREER}(-5)) \ \text{REM}(-1) \ \text{LOGREER}(-1) \ \text{GDP}(-1) \ \text{INFL}(-1)
 \end{aligned}$$

(4)



**Table 3: Results for the ARDL model**

Dependent Variable: REM  
 Method: ARDL  
 Date: 10/19/22 Time: 22:21  
 Sample (adjusted): 1975 2021  
 Included observations: 47 after adjustments  
 Maximum dependent lags: 5 (Automatic selection)  
 Model selection method: Akaike info criterion (AIC)  
 Dynamic regressors (5 lags, automatic): GDP INFL LREER  
 Fixed regressors: DUMMY  
 Number of models evaluated: 1080  
 Selected Model: ARDL(5, 2, 5, 5)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
REM(-1)	0.485416	0.137503	3.530215	0.0016
REM(-2)	0.078806	0.155322	0.507372	0.6162
REM(-3)	-0.128650	0.149886	-0.858321	0.3986
REM(-4)	-0.256265	0.138042	-1.856431	0.0748
REM(-5)	0.226327	0.134319	1.684995	0.1040
GDP	-0.051766	0.036954	-1.400814	0.1731
GDP(-1)	-0.028455	0.042306	-0.672613	0.5071
GDP(-2)	-0.055970	0.043552	-1.285132	0.2101
INFL	0.012880	0.013608	0.946531	0.3526
INFL(-1)	0.001484	0.014614	0.101515	0.9199
INFL(-2)	-0.028800	0.014505	-1.985598	0.0577
INFL(-3)	-0.001913	0.013675	-0.139906	0.8898
INFL(-4)	0.027416	0.014193	1.931571	0.0644
INFL(-5)	0.016847	0.012479	1.350025	0.1886
LREER	-1.813822	1.243090	-1.459123	0.1565
LREER(-1)	1.153939	1.585583	0.727769	0.4733
LREER(-2)	1.430169	1.505495	0.949966	0.3509
LREER(-3)	-0.290628	1.520445	-0.191147	0.8499
LREER(-4)	-3.832099	1.654275	-2.316482	0.0287
LREER(-5)	3.518169	1.244258	2.827523	0.0089
DUMMY	1.156294	0.322936	3.580569	0.0014
R-squared	0.901570	Mean dependent var		1.705163
Adjusted R-squared	0.825854	S.D. dependent var		1.104654
S.E. of regression	0.460981	Akaike info criterion		1.590646
Sum squared resid	5.525088	Schwarz criterion		2.417307
Log likelihood	-16.38017	Hannan-Quinn criter.		1.901724
Durbin-Watson stat	1.628770			

\*Note: p-values and any subsequent tests do not account for model selection.

Next, the ARDL (5, 2, 5, 5) is tested to ensure that the model has normality, has no heteroscedasticity, passes the CUSUM and Ramsey tests, and its serially uncorrelated as discussed below.

## 4.4 Results for residual diagnostics tests

### 4.4.1 Testing the model for serial correlation

The model was tested to ensure it does not suffer from autocorrelation using the Breusch-Godfrey Serial Correlation LM test. The  $H_0$  is residuals are serially uncorrelated, F – statistics 2.094 with a P-value of 0.1063 therefore, we accept the null hypotheses that is, residuals are serially uncorrelated as shown in

Table 4. The model was also tested using a correlogram of residuals tests at 5 lags to ensure that serial correlation doesn't exist. The results show that all approximated p-values, are greater than 5% meaning there exist no serial correlation.

**Table 4: Results for Breusch-Godfrey Serial correlation test and correlogram of residuals test**

Breusch-Godfrey Serial Correlation LM Test:  
Null hypothesis: No serial correlation at up to 5 lags

F-statistic	2.094985	Prob. F(5,21)	0.1063
Obs*R-squared	15.64171	Prob. Chi-Square(5)	0.0079

Date: 10/27/22 Time: 20:20  
Sample (adjusted): 1975 2021  
Q-statistic probabilities adjusted for 5 dynamic regressors

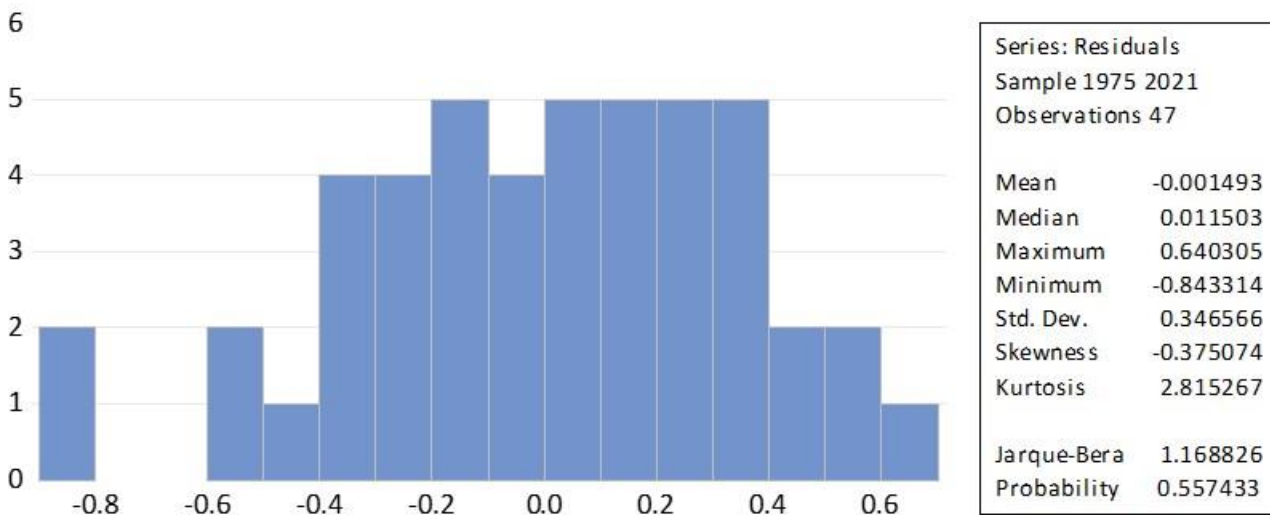
Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob*	
█	█	1	0.154	0.154	1.1855	0.276
█	█	2	0.137	0.116	2.1483	0.342
█	█	3	0.104	0.070	2.7167	0.437
█	█	4	0.256	0.227	6.2286	0.183
█	█	5	-0.082	-0.176	6.6015	0.252

\*Probabilities may not be valid for this equation specification.

#### 4.4.2 Testing for Normality using Jarque-Bera test

Normality test is conducted to assess the distribution of data using the Jarque-Bera. The results show that P-value for Jarque-bera is 0.557, greater than 5% therefore the model passes the normality test as shown in Table 5.

**Table 5: Results for Normality test**



#### 4.4.3 Testing for Heteroskedasticity Tests: Breusch- Pagan- Godfrey and Autoregressive Conditional Heteroskedasticity (ARCH)

The model was tested for heteroskedasticity using the Breusch-Pagan-Godfrey and ARCH test. The findings show that the p-value of the F statistic is 0.4027 and 0.2178, respectively, indicating that the null hypothesis is not rejected signifying that the residuals are homoscedastic as shown in Table 6.

**Table 6: Results for Breusch-Pagan-Godfrey and Autoregressive conditional heteroskedasticity**

Heteroskedasticity Test: Breusch-Pagan-Godfrey

Null hypothesis: Homoskedasticity

F-statistic	1.104086	Prob. F(21,25)	0.4027
Obs*R-squared	22.61522	Prob. Chi-Square(21)	0.3648
Scaled explained SS	6.304108	Prob. Chi-Square(21)	0.9992

Heteroskedasticity Test: ARCH

F-statistic	1.488644	Prob. F(5,36)	0.2178
Obs*R-squared	7.195950	Prob. Chi-Square(5)	0.2065

## 4.5 Results for Stability Diagnostics tests

### 4.5.1 Ramsey RESET test

The model is tested for specification errors or omitted variables to prove the stability of the model applying the Ramsey RESET (Regression Equation Specification Error Test) test. The results show that the F-statistic and t- statistic *p*-value of 0.0592 which is more than 5 percent indicating that the model is free from specification errors as seen in Table 7.

**Table 7: Results for Ramsey RESET test**

Ramsey RESET Test

Equation: UNTITLED

Omitted Variables: Squares of fitted values

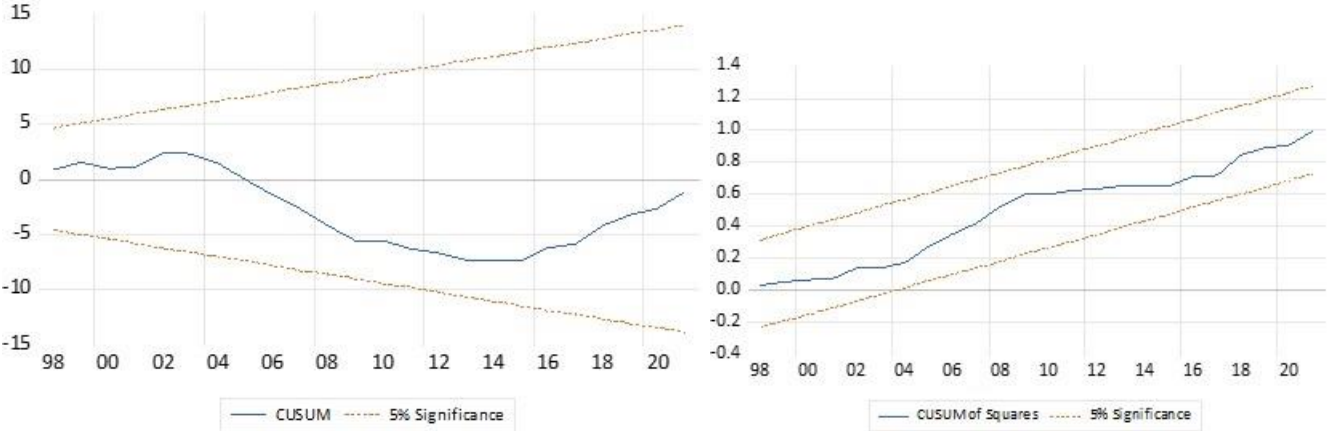
Specification: REM REM(-1) REM(-2) REM(-3) REM(-4) REM(-5) GDP GDP(-1) GDP(-2) INFL INFL(-1) INFL(-2) INFL(-3) INFL(-4) INFL(-5) LREER LREER(-1) LREER(-2) LREER(-3) LREER(-4) LREER(-5) DUMMY

	Value	df	Probability
t-statistic	1.976855	25	0.0592
F-statistic	3.907956	(1, 25)	0.0592
Likelihood ratio	6.826328	1	0.0090

### 4.5.2 CUSUM test and CUSUM squares test

The cumulative sum of recursive residuals (CUSUM) and the CUSUM of square (CUSUMSQ) tests were carried out to examine the stability of the long run coefficients and the short run dynamics of the model as suggested by (Pesaran & Shin, 1997). The CUSUM test is based on the first set of the number of observations which are plotted against the breakpoints and updated recursively while CUSUMSQ is based on the squared recursive residuals with the null hypotheses being that all coefficients are stable. The results

show that the plot of CUSUM and CUSUMSQ are within the critical bounds of 5 % significant level signifying stability in the model hence the null hypotheses are accepted as shown in Figure 2. The results further show that there is no issue of recursive residuals in terms of mean as shown by the CUSUM test and variance is acceptable as shown by the CUSUMSQ. The advantage of “these tests compared to the Chow test which requires specificity of the break points, is that they can be used without the requirement of a priori knowledge of the exact date of the structural breaks” (Lee).



**Figure 2: Plots of the CUSUM AND CUSUMSQ**

**4.6 Short run, long run form and bounds test**

The long-run relationship also known as the steady-state equilibrium while short-run relationship is assessed by the extent of the variation from the stability. Therefore, we are deriving the long-run relationship between the dependent variable and the regressors. The results for the short run show that the GDP is not significant though an increase by 1% would negatively affect the remittances by 5% as shown in Table 8. Inflation also was not significant though a 1% increase would increase remittances by 1.3% while REER would negatively affect remittances though insignificant.

**Table 8. Results for Conditional error correction regression (Short run)**



ARDL Long Run Form and Bounds Test  
 Dependent Variable: D(REM)  
 Selected Model: ARDL(5, 2, 5, 5)  
 Case 1: No Constant and No Trend  
 Date: 10/27/22 Time: 18:59  
 Sample: 1970 2021  
 Included observations: 47

Conditional Error Correction Regression (Short run coefficients)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
REM(-1)*	-0.594367	0.169145	-3.513957	0.0016
GDP(-1)	-0.136192	0.059018	-2.307628	0.0292
INFL(-1)	0.027913	0.018041	1.547168	0.1339
LREER(-1)	0.165728	0.116501	1.422550	0.1668
D(REM(-1))	0.079783	0.148846	0.536006	0.5965
D(REM(-2))	0.158588	0.118886	1.333951	0.1938
D(REM(-3))	0.029938	0.130699	0.229060	0.8206
D(REM(-4))	-0.226327	0.134319	-1.684995	0.1040
D(GDP)	-0.051766	0.036954	-1.400814	0.1731
D(GDP(-1))	0.055970	0.043552	1.285132	0.2101
D(INFL)	0.012880	0.013608	0.946531	0.3526
D(INFL(-1))	-0.013550	0.016486	-0.821885	0.4186
D(INFL(-2))	-0.042350	0.013717	-3.087302	0.0048
D(INFL(-3))	-0.044263	0.012854	-3.443443	0.0020
D(INFL(-4))	-0.016847	0.012479	-1.350025	0.1886
D(LREER)	-1.813822	1.243090	-1.459123	0.1565
D(LREER(-1))	-0.825611	1.412927	-0.584327	0.5640
D(LREER(-2))	0.604558	1.383315	0.437036	0.6657
D(LREER(-3))	0.313930	1.445073	0.217242	0.8297
D(LREER(-4))	-3.518169	1.244258	-2.827523	0.0089
DUMMY	1.156294	0.322936	3.580569	0.0014

\* p-value incompatible with t-Bounds distribution.

The long run results show that GDP coefficient (-0.229) is negative and significant (p-value 0.0095) as seen in Table 9. This means that GDP in this model is significant and that when it increases by 1% remittances decrease by 22.9 percent in the long run. Inflation and REER were insignificant but an increase of 1% would lead to remittances increasing by 4.69% and 0.2788%, respectively, in the long run.

The error correction model is as follows:

$$EC = REM - (-0.2291 * GDP + 0.0470 * INFL + 0.2788 * LREER) \quad (5)$$

**Table 9: Results for Long run form**

Levels Equation (Longrun)				
Case 1: No Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	-0.229138	0.081776	-2.802005	0.0095
INFL	0.046963	0.035638	1.317789	0.1991
LREER	0.278832	0.153639	1.814851	0.0811

The Error Correction Model (ECM) and F-statistic findings are shown in Table 10. The adjusted R squared for the short dynamic model is 0.82 implying that the ECM fits the data well. In addition, the coefficient of the Error Correction Term (ECT), and denoted as *cointEq(-1)*, also referred to as the “speed of adjustment” coefficient is negative. The speed of adjustments as defined by (Nsouli, Rached, & Funke, 2002) refers to “the total time required to move from one set of macroeconomic variables to another and to introduce economic reforms and make them operational.” This measures how “strongly the dependent variable reacts to a deviation from the equilibrium and how fast it’s corrected” (Nsouli, Rached, & Funke, 2002). The results for the speed of adjustment program, -0.594367 with a p-value of 0.0001 which is significant. This implies that about 59.4% of any movements into disequilibrium are corrected for within one period. In other words, previous year’s error will be corrected in the current year at the speed of 59.4 %. Therefore, the adjustments of the entire system towards the equilibrium at the speed of adjustment of 59.4%

The results of the F-bounds test (4.89) exceed all levels of the lower and upper bound critical values and therefore, we reject the hypotheses that there is no level relationship. The thumb rule is that when the F-statistic exceeds the upper bound, then there exists cointegration. That is, there exists a long-run correlation between the remittances and the macroeconomic variables. Since the model had no constant and trend, we therefore, also consider the t-statistics in absolute values  $|-4.670659|$  is 4.670659 which is greater than the critical upper bound and therefore we reject the t-bounds test null hypotheses, in that there is no levels relationship and conclude that there exists long-run relationship which conforms with the F-statistic.

**Table 10: Results for error correction form and bounds test**

ARDL Error Correction Regression  
 Dependent Variable: D(REM)  
 Selected Model: ARDL(5, 2, 5, 5)  
 Case 1: No Constant and No Trend  
 Date: 10/27/22 Time: 19:22  
 Sample: 1970 2021  
 Included observations: 47

ECM Regression				
Case 1: No Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(REM(-1))	0.079783	0.114972	0.693930	0.4939
D(REM(-2))	0.158588	0.100052	1.585053	0.1250
D(REM(-3))	0.029938	0.115604	0.258970	0.7977
D(REM(-4))	-0.226327	0.113538	-1.993407	0.0568
D(GDP)	-0.051766	0.029393	-1.761158	0.0900
D(GDP(-1))	0.055970	0.035574	1.573369	0.1277
D(INFL)	0.012880	0.011731	1.097954	0.2823
D(INFL(-1))	-0.013550	0.012902	-1.050192	0.3033
D(INFL(-2))	-0.042350	0.011794	-3.590703	0.0013
D(INFL(-3))	-0.044263	0.011244	-3.936429	0.0006
D(INFL(-4))	-0.016847	0.011361	-1.482957	0.1501
D(LREER)	-1.813822	1.135221	-1.597769	0.1222
D(LREER(-1))	-0.825611	1.286578	-0.641711	0.5267
D(LREER(-2))	0.604558	1.260379	0.479664	0.6355
D(LREER(-3))	0.313930	1.283255	0.244636	0.8087
D(LREER(-4))	-3.518169	1.167080	-3.014507	0.0057
DUMMY	1.156294	0.244487	4.729469	0.0001
CointEq(-1)*	-0.594367	0.127255	-4.670659	0.0001
R-squared	0.829199	Mean dependent var		0.059101
Adjusted R-squared	0.729074	S.D. dependent var		0.838581
S.E. of regression	0.436486	Akaike info criterion		1.462986
Sum squared resid	5.525088	Schwarz criterion		2.171553
Log likelihood	-16.38017	Hannan-Quinn criter.		1.729625
Durbin-Watson stat	1.628770			

\* p-value incompatible with t-Bounds distribution.

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	4.889582	10%	2.01	3.1
k	3	5%	2.45	3.63
		2.5%	2.87	4.16
		1%	3.42	4.84

t-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-4.670659	10%	-1.62	-3
		5%	-1.95	-3.33
		2.5%	-2.24	-3.64
		1%	-2.58	-3.97

## CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Introduction

This chapter highlights the summary of the findings, conclusions, policy recommendations and areas of further research that can be considered.

### 5.2 Summary of key findings

The study's objective was to ascertain the impact of the selected macroeconomic variables whether positive, negative or constant on remittances in Kenya. The selected macroeconomic variables were the annual GDP growth, REER and inflation. The study also evaluated whether there exists long run or short run correlation between remittances and the selected macroeconomic variables. The study used data from 1970-2021 and analysis were done using the EViews version 12. The results of the study can guide policies which can lead to remittances amplifying the country's growth in the long run. The results can also be used to model economic policies for other countries of the similar economic ecosystem like Kenya.

The paper used the ARDL bounds testing model which is capable of testing the short run, long run and ECT. The ARDL model is single equation, which is one of the pros of using the model as it accepts variables to have either I(0) or I(1) both. None of the variables tested in this paper were of I(2). After running several trials with different lags, the ARDL model (5,2,5,5) was the best fit lag structure, as it had the least AIC. The EViews version 12 came in hand as it had the capability to choose this model automatically with the maximum lag structure of the dependent variables and the regressors set to 5. Moreover, this model passed the tests on having no serial correlation, being homoscedastic, has normality, passes the stability diagnostic tests that is the CUSUMs and Ramsey tests.

The findings unveil that there is a pronounced correlation between GDP and remittances than REER and inflation. The findings show that not only is GDP significant towards attracting remittances, but also when it increases, remittances decrease. Consequently, when there is favorable economic growth, migrants remit less. This conforms with (Chamon, Semblat, & Morant, 2005) where they found that GDP is significant and when it grows, remittances decrease. The authors explain that Samoans abroad remit more back home to insure families back home from the economic shocks. This implies that for Kenyan case, remittances are mostly sent for altruism purpose and a smaller amount goes to investments.

On the impact of inflation on remittances, the findings show that inflation impacts remittances positively. In other words, when inflation rises, remittances also increase. This theory conforms to what is expected



of remittances especially where most migrants remit for altruism purpose to take care of basic needs such as food, medical, education etc. In economic theory, when inflation surges, government seek ways in reducing the consumer expenditure by elevating interest rates, increasing taxes and cutting down government expenditure. However, over a duration of time, remittances may lessen. Nevertheless, the findings in this paper show that a surge in inflation would raise remittances though inflation was found to be insignificant. This finding, however, may allude that government efforts to ease inflation may affect remittances eventually and therefore, there is need to diverse remittances from being consumption oriented to investment oriented.

The impact of REER on remittances shows that when REER increases, remittances also increase. The relation between the remittance and REER is positive and insignificant, similar to that of inflation. The positive sign of the REER is in tandem with the economic theory where REER is CPI based and therefore where there is increase in inflation then remittances would also increase. This is contrary to Elbadawi and Rocha (1992) where they found that inflation and REER were significant and had negative impact on remittances. However, these results were consistent with the theoretical presumptions of (Lueth & Marta, 2007) and (Jr & Rivera, 2020), where they found that inflationary pressures lead to increase of remittances. The analysis also reveals that a one-percentage point in the REER indicates a 0.2788% increase of remittances. This is contrary to (Lin, 2011) where they found that an appreciation of REER led to decline in remittances for Tonga.

The three macroeconomic variables selected in this paper show existence of a long run relationship between the regressors and remittances. The findings also reveal that speed of adjustment towards from short run to long run equilibrium is 59.4 percent. In addition, the error correction term was negative where the negative sign signifies the degree of correction.

### **5.3 Conclusions**

The findings show that when the GDP increases, remittances decrease which may mean that migrants only send in the money for consumption basis, and when its needed. These findings also depict that inflation and REER affect remittances positively.

Evidently, there only exists a long run relation among the chosen macroeconomic variables and the remittances. For Kenya to have remittances amplify the economic growth, it is therefore prudent to ensure that the investment environment is safe and reachable to Kenyans abroad so that significant share of remittances can be diversified into investment and savings avenues in Kenya.

#### **5.4 Policy recommendations**

In 2021, Kenya received 3.1 billion US dollars from the official transfer channels (Worldbank, 2021). The country envisages to have its economic growth on an upward trend as laid in the Vision 2030. In order to achieve this, there is need to ensure the investment ecosystem is reachable, affordable and trust worth for Kenyans abroad to invest. Sectors such as real estates should have flexible terms when the country is under inflationary pressures. The government could establish affordable mortgage policies to offer affordable rates to attract investors receiving the remits. This can boost the mortgage penetration rate in the country.

Most available studies have concentrated on looking into the impact of remittances on macro-economic variables. One such study here in Kenya was by (Kawira, 2017) where she looked into the effects of remittances on inflation. Her findings show that “a one percent increase in remittances would lead to 0.09 percent increase in inflation in the long run.” However, in this paper, where we look into the impact of macroeconomic variables on remittances shows that 1% surge in inflation indicates a 4.69% rise in remittances. This clearly shows the gravity macroeconomic variables have on remittances and therefore need to be at the forefront of policymaking. It is therefore necessary to ensure that inflation is mitigated in a way that, a significant share of remittances can be channeled to investments.

Remittance flows pass through both the official and unofficial channels to Kenya. The passage through the unofficial flows makes it harder to know their impact in the country. Policy makers should facilitate affordable and readily available payment mechanism that can be used by Kenyans abroad.

The government should foster investment mechanisms while using different currencies for Kenyans remitting back home. This would attract more Kenyans abroad to invest in treasury bills and treasury bonds and have the flexibility of receiving their interest in any currencies as preferred.

### 5.5 Further areas of study

This paper only looked into three macro-economic variables such as GDP, REER and inflation while using the available data for the considered periods. Other macro-economic variables such as unemployment, political stability and the domestic interest rate could be considered in order to unveil their impact on remittances.

Past research has focused on the effect of remittances to REER especially on having a Dutch disease problem. This paper closed in the gap in finding out the impact of REER on remittances. However, given that Kenya still receives remittances both in official and unofficial channels this may have different results should the remits passed through the unofficial channels be significant. Therefore, further studies should unveil the level of remits passed through unofficial channels and their impact on REER. Moreover, there is need to research on why unofficial channels are still preferred in this era when there has been technological acceleration in digital-remittance platforms which are easily accessible.

Further research should also investigate the use of remittances more so on the type of investments they go to and challenges of investing back home. This should encompass the volume of remittances going to investments directly rather than those sent through families since such information may be scanty. More investigation on the return of these investments, may inform policy makers to form attractive packages, should the existing rate of return be low than expected.

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