

**EFFECTS OF FOREIGN REMITTANCES ON INFLATION
IN KENYA**

University of Nairobi



SCHOOL OF ECONOMICS

BY

RIUNGU PENINAH KAWIRA

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Partial Fulfillment of the Requirements for Award of Masters
of Arts in Economics Degree of the University of Nairobi**

Supervisor: Raphael M. Kabando

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DECLARATION

I hereby assert that this is my work. It has not been presented to any other university for the award of any degree. Secondary sources used in the study have been acknowledged for the ideas borrowed from other scholars and authors in its compilation.

Signature

Date

Riungu Peninah Kawira

X50/66064/2013

This research paper is submitted for my approval as supervisor

Signature.....

Date.....

Raphael M. Kabando

School of economics

University of Nairobi

DEDICATION

I dedicate this work to all those who struggled in one way or the other to uplift themselves, work tirelessly to achieve education and to largely improve their well-being and make the world a better place.

ACKNOWLEDGEMENTS

This work could not have been achieved without the help of my supervisor, other lecturers, colleagues and classmates among others. Special thanks goes to my supervisor Raphael Kabando, for his tireless efforts, invaluable time and academic guidance to me in the entire research process.

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Finally I say thank you to all who supported me in one way or the other. May the almighty God bless you in abundance.

With that said however, any errors and oversight in this paper are solely my responsibility.

ACRONYMS AND ABBREVIATIONS

ADF	Augmented Dickey-Fuller
AU	Africa Union
CBK	Central Bank of Kenya
CPI	Consumer Price Index
ECM	Error Correction Mechanism
FDI	Foreign Direct Investment
GDPG	Gross Domestic Product Growth
GMM	Generalized Method of Moments
IMF	International Monetary Fund
IOM	International Organization for Migration
KBRR	Kenya Banks' Reference Rate
KNBS	Kenya National Bureau of Statistics
KNBS	Kenya National Bureau of Statistics
NEER	Nominal Effective Exchange Rate
NSE	Nairobi Stock Exchange
ODA	Official Development Assistance
OLS	Ordinary Least Square
REER	Real Effective Exchange Rate
UN	United Nations
VAR	Vector Autoregressive

ABSTRACT

Understanding effect of remittances on macroeconomic variables like inflation is crucial since, they play vital role in economic development of recipient economies. The study therefore, seeks to examine the effects of foreign remittances on inflation rate in Kenya using quarterly data for the period 2004-2015. Stationary analysis shows that all the variables in the model are integrated of order (1), hence, the study applied Johansen maximum likelihood co-integration technique to check the presence of long run relationship between remittances and inflation. Results indicated the existence of at least three (3) co-integration vectors. Error Correction Model (ECM) was then used to check the extent and direction of relationship between variables. All factors analyzed show a positive effect on inflation rate, except real GDP. The results of the analysis also found out that a one percent increase in foreign remittance inflows increases inflation rate by 0.09 percent in the long -run.

Keywords: Remittances, inflation, Error Correction Mechanism

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CHAPTER ONE

1.0 BACKGROUND INFORMATION

1.1 Introduction

Remittances are the inflows of money sent from overseas by country migrants. Some individuals from developing countries migrate to developed countries to look for business, education and employment opportunities or as refugees. International Organization for Migration (IOM) defines remittances as financial flows linked to migration that is personal cash transfer by a migrant to his/ her relations or natives back home (IOM, 2006).

The number of immigrants globally has been rising steadily. Immigrants' number increased swiftly between the years 2000 to 2010. Between 1990 and 2000 the number of migrants averaged 2 million annually, compared to 4.6 million new migrants annually between 2000 and 2010 (IOM, 2013). There are desirable and undesirable effects of migration at 'home' and also at the 'host' country, with the desirable benefits being financial remittances among other benefits.

Remittances from immigrants have rapidly grown outperforming Official Development Assistance (ODA) to reach approximately US\$ 404 billion (World Bank, 2014). The amount does not include money transferred by way of informal channels because it is difficult to officially record it.

Remittance to Sub-Saharan Africa in 2014 expanded by 2.2 per cent to approximately USD 32.9 billion compared to slow increase of 0.9 per cent in 2013. Nigeria a major recipient of remittances accounted for about two-thirds of all remittance flow into the region. However it is estimated that remittance flow remained at the same level at approximately \$21 billion in 2014. The increase in remittances in Sub-Saharan Africa in 2014, greatly reflects robust growth of remittances in Kenya, South Africa and Uganda at 10.7, 7 and 6.7 percent respectively (World Bank, 2015).

Remittances from emigrant workers have increased considerably between 1990 and 2010 to become a primary source of foreign inflows in Africa. It has grown from 9.1 billion dollars in 1990 to more than three-fold to reach US \$40 billion in 2010 (Ratha et al., 2011). This rapid growth in remittance flows mirrors an increase in emigration from Africa as well as increasing incomes of emigrant workers driven by improved growth in the developed countries before 2007/2008 financial crisis. Even though the 2008 financial crisis impacted migrants and migration worldwide, remittances remained resilient and have continued to be an important source of income to households (Lubambu, 2013). Lubambu argues that remittances have proven to be a viable source of foreign exchange for developing economies, compared to other forms of inflows such as Foreign Direct Investment (FDI), public debt and ODA.

Unlike other sources of external finance, remittances tend to be more stable making them a reliable source of financing for developing countries, since it's sent directly to the recipient and not susceptible to bureaucratic challenges hence, more often effective than development aid (Biller, 2007). Remittances flows in North Africa are now larger than official development aid constituting roughly 3.3 and 0.6 percent of GDP, respectively.

However, in Sub-Saharan Africa, remittances are somewhat lower than development aid constituting 2.2 and 3.7 percent of GDP, respectively (Ratha et al., 2011). Foreign Direct Investments are larger than remittances as a per cent of GDP in African countries that are rich in minerals and oil such as South Africa, Angola and Botswana. However, remittances exceed foreign direct investment for countries that are not rich in natural resources.

The total remittance inflows could be up to 50 per cent higher mainly because the precise estimation of total remittance inflows is hampered with difficulties (World Bank, 2010). International Monetary Fund (IMF) and World Bank as well as individual countries differ on their understanding of the specific components of remittance flows; they often overestimate or underestimate remittances by including or excluding other forms of transfers to Non-Governmental Organizations (NGOs) and missions. Moreover, a bigger share of remittance inflows is sent through informal channels and therefore not captured in official tabulations. For example, a survey by the World Bank using informal sources reported a US\$ 1.9 billion inflow to Kenya in 2010, compared to CBK figure of US\$ 609 million during the same year (Central Bank of Kenya, 2012). Similarly, in Ghana, the Central Bank estimated remittances in 2010 to be US\$ 1.6 billion, a figure fourteen times higher than the US\$ 114 million estimated by the International Monetary Fund (Ratha et al., 2011).

1.1.1 Remittances and Economic Development of Recipient Countries

The growth of remittance inflows in developing countries has generated intense debate and controversy among academics and policy makers studying the impact of remittances on the economies of the recipient countries (Adams and Cuecuecha, 2010). The

controversy revolves around the issue of how the remittances are spent. Burnside and Dollar (2000) argue that effect of remittances development of economies of recipient countries hinges on whether they are invested or consumed.

Three propositions have thus been put forth to explain how remittance expenditure might impact economic development. The first view advanced by some studies is that remittances are consumed just like any other form of income. Adams et al. (2005) corroborated this view in a study on how families spend remittances at the margin in Ghana. The paper found that households are indifferent at the margin and the expenditure of remittances will have no effect on economic development.

The second proposition is that remittances cause behavioral changes on households' expenditure. Specifically, it is argued that households utilize remittances on consumption of goods instead of investment goods. According to Chami et al (2003), literature review on the subject indicates that households spend a significant amount of remittances on consumption of goods. The implication of the finding is that remittances have no effect on investment and consequently on economic growth.

The third premise builds on the notion of permanent income hypothesis. This proposition argues that homes spend their earnings at a level consistent with their average long-term income. Therefore, since remittances tend to be transient, homes are likely to use it more on physical and human capital than on consumption of goods and services at the margin. Investment therefore, contributes to capital formation, a necessary requirement for economic expansion and development. For, example, expenditures on education generates human capital an important factor of economic growth. Similarly, expenditures

on investments such as machinery, housing, infrastructure and equipment create physical capital which generates more income and new employment opportunities for communities.

The remittance effects to the economy can materialize via various macro and microeconomic channels (Balderas and Hiranya, 2005). For example, availability of foreign exchange reserves due to remittances helps in financing current account deficit; reduce external borrowing as well as assist economies to recover from the negative impacts of shocks arising from financial crises and oil prices (Iqbal and Abdus, 2005). Besides, remittances have direct bearing on economic growth whether they are oriented toward consumption or investment. Remittances to households may raise the demand for goods and services causing inflationary pressure to the economy while at the same time triggering price level of non-tradable goods. Remittances also help households to combat poverty and improve the income distribution as well as cushion them against uncertainties (Khan, 2009).

On the other hand, the adverse impact of remittances on the recipient economy may arise as a result of Dutch disease and reduced motivation to engage in income generating activities. The supply of foreign exchange arising from increased inflow of remittances can lead to appreciation of the domestic currency thus decreasing trade competitiveness causing sluggishness in the economy (Javaid, 2009). Remittance inflows may increase money supply in the country, stimulating an increase in demand for goods and services causing an upward pressure on prices which may lead to demand pull inflation in the economy (Iqbal and Abdus, 2005; Nishat and Nighat, 1991). This will consequently hamper countries' effort to keep inflation within reasonable targets. For instance, Central

Bank of Kenya targets inflation to be within 5 ± 2.5 per cent (CBK. 2010). This target band has been time and again missed with actual inflation more often above the target inflation.

1.1.2 Overview of Diaspora Remittances in Kenya

The number of emigrants in the world has almost tripled over the last 45 years, from about 75 million in 1960 to almost 215 million in 2010 translating to 3 per cent of the world's population (UN, 2009). In Africa, almost 30 million persons reside outside their home country.

Official estimates from the Ministry of Foreign Affairs, Kenya shows that almost 3 million Kenyans live in Diaspora constituting about 7 per cent of the country's total population. The number is continuously on the rise, partly due to slow economic growth, high unemployment and under employment. Drawing upon this, Diaspora possesses immense Kenyan human and capital resources, making a significant contribution to the country's economic growth. Such contribution includes counter cyclical remittances, and technology transfer.

Kenyans migration abroad can be analyzed in three different waves. First, in the pre-colonial era, a small number of Kenyans travelled abroad looking for better education and employment opportunities. The second wave was the great airlift of young Kenyans required to go abroad for further studies in order to build capacity of individuals to work for the government immediately after independence in 1963. The third wave occurred prominently in the 1980s and 1990s as Kenyans migrated in search of better economic opportunities due to falling living standards (Kenya Diaspora Policy, 2014).

In the recent past, transfer of cash by Kenyans living outside the country (here in referred to as Diaspora remittances) has taken center stage and has been recognized to be a catalyst for economic growth and a source of foreign exchange (Kenya Vision 2030). On average, remittances to Kenya constitute 60 per cent of remittances to East Africa and 10 per cent of all remittances to the Sub-Saharan Africa (Ratha et al, 2011). During the year 2010, Kenya was among the top 10 remittances recipient's countries with remittance inflow estimated at Kshs. 151.2 billion (USD 1.8 billion) translating to 5.4 per cent of GDP (World Bank fact book, 2010).

In Kenya, remittance inflows are only overtaken by exports of goods and services (tourism, horticulture and tea) as the main source of foreign exchange. In 2008, net FDI and ODA inflows amounted to USD 0.1 billion, and USD 1.4 billion respectively while, exports of goods and services amounted to USD 8.3 billion against remittances inflow of USD 1.7 billion (World Bank, 2011).

Remittances from the Diaspora to Kenya are used for a number of purposes. At the macro level, it improves the capital account of the balance of payments which enables the country to maintain capacity to purchase imports as well as maintain adequate foreign exchange reserves to stabilize the domestic currency (Ocharo, 2014). Remittances also help support domestic investment and consumption in the country. At the household level, remittances play an important role in smoothing out consumption alongside financing development projects (Kiiru, 2010).

A survey of 2,423 Kenyan adults by Word Bank in 2010 yielded the following results: 14 per cent of Kenyan adults received remittances regularly, the recipients got money from

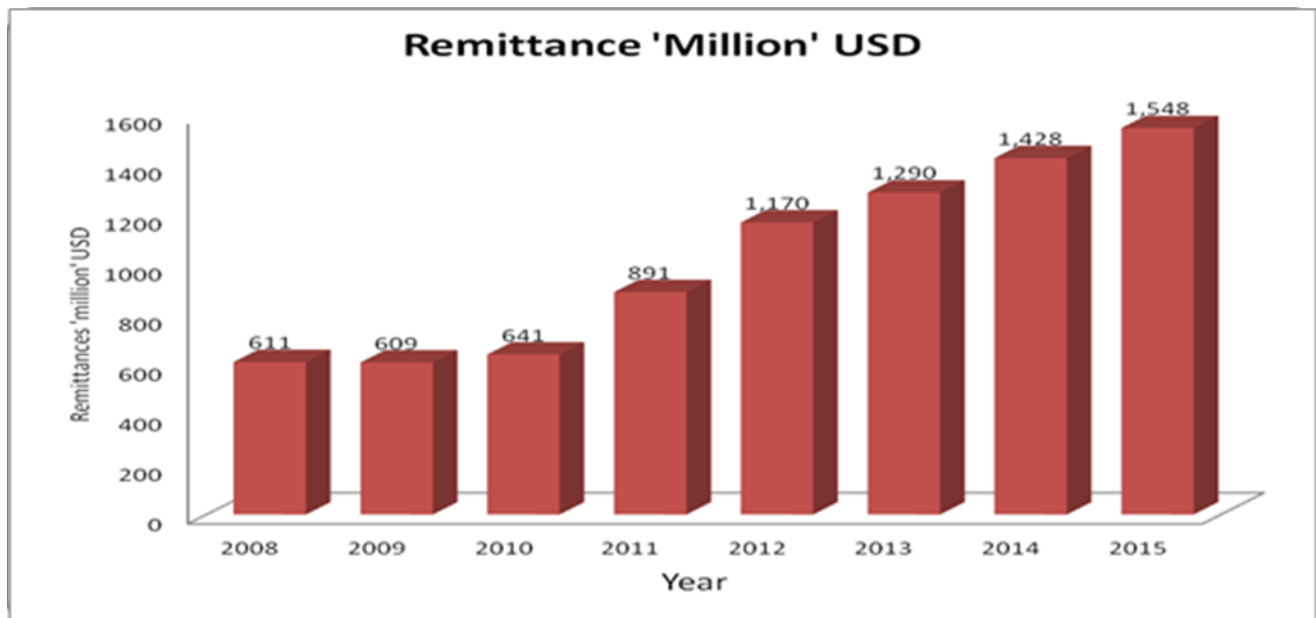
their family member on average seven times per year, the average received each time was USD 105, 17 per cent acknowledged that 2-5 people benefit from the foreign remittances they receive. The above-mentioned survey reveals that on average 20 per cent of respondent spent their money on daily expenses such as food, medicine, clothes and housing utilities; 33 per cent paid for university education of a family member; 35 per cent invested in small businesses; 8 per cent used the money to build a house or a piece of land to build a house while 4 per cent opened a savings account with the money. While these amounts may not be significant to an average middle-class American, they are of imperative importance in Kenya and other developing countries.

Remittances in Kenya have been on an upward trend in the last few years as shown in figure 1. For example, foreign remittances increased by 10.5 per cent in 2014 to USD 1.43 billion up from USD 1.29 billion in 2013. The increase in remittances inflows can be attributed to aggressive government efforts to draw Kenyans living in the Diaspora to invest in government securities. The Government is increasingly becoming aware of the contribution remittances inflows are playing in promoting economic development in the country. As such, the Government has deepened the financial sector by creating innovative investment instruments targeted at the Diaspora including: Infrastructure Bonds, Diaspora Investment Funds and Diaspora Investment Bonds. There has also been an attempt by the Government to improve the overall macroeconomic policy and business environment to attract Diaspora investment. For instance, Kenya was ranked position 108 in the World in January 2016 as compared to position 136 in December 2015 in the World Bank (2016) Doing Business Indicators.

The Kenya Constitution 2010 allows for dual citizenship making it possible for Kenyans to invest in the host countries as well as the home country (The Constitution of Kenya 2010). Finally, the Kenyan Government has aggressively conducted campaigns geared towards involving Kenyans living abroad into the country's development agenda.

The increased remittance flows to Kenya have attracted attention of various policy makers involved in formulation of policies towards good management of remittances so as to maximize their benefits. They include Government of Kenya, international agencies such as World Bank and NGOs. Nevertheless, there is little information about the possible use and effect of the increased inflow of remittances on macroeconomic variables in Kenya.

Figure 1: Trend of remittances to Kenya (2008-2015)



Source: Central Bank of Kenya, www.centralbank.go.ke

As reported by the CBK, remittances inflows remained resilient from all the regions in 2014. North America accounted for 47.3 per cent, Europe 28.7 per cent and 24 per cent

from the rest of the world. Remittances increased by 10 per cent from USD 1,283 in the year to November 2013 to USD 1,412 million in the year to November 2014. The 12-month average flow during the year to November 2014 sustained an upward trend and peaked at USD 117.6 million from USD 106.9 million in November 2013. The actual amount of remittance flows to Kenya may be significantly higher as unrecorded flows through informal channels are excluded from the official data.

The dominant position of North America in terms of remittances inflows is as a result of the large numbers of Kenyans living there with gainful economic activities. World Bank (2010) remittances to Kenya survey found out that 38 per cent of emigrants live in other African countries. The number of emigrants to Africa comprise 25 per cent with 9 per cent and 7 per cent of emigrants residing in Uganda and Tanzania respectively. The growth of multilateral trade and elimination of travel restrictions within East African Community largely accounts for this scenario.

The Kenya Diaspora Policy Paper was developed in 2014 to with an aim of empowering Kenyan Diaspora Communities to efficiently make greater contribution to the country's development as envisaged in the Kenya Vision 2030. This will be achieved through promoting conducive environment for investment and addressing challenges hindering effective contribution of Kenyans abroad to national development. To achieve this goal a number of strategies have been identified: curbing high cost of remittances, enhancing capacity to offer consular services, tapping into Diaspora skills and expertise to reverse brain drain, , and collection of data on Kenyans living abroad for proper planning and engagement.

1.1.3 Measurement and determinants of inflation in Kenya

1.1.3.1 Measurement of inflation in Kenya

There are many definitions of inflation. World Bank (2007) defines inflation rate as “an annual increase in the price of a basket of goods and services that are purchased by consumers in an economy” while the London Oxford economic dictionary (2009) defines inflation as “the consistent tendency for nominal prices to increase which leads to a decline in the purchasing power in a country’s currency”. Inflation rate therefore measures the changes over time of the consumer prices or the GDP deflator which takes into consideration prices of goods and services produced in the country. This percentage cost of living is calculated using the consumer price index in Kenya and GDP deflator, respectively.

Basu (2011) in his paper ‘understanding inflation and controlling it’ defines inflation as a sustained rise in prices across the board as opposed to relative changes in price of goods and services. In economics peculiarities exist that are specific to different regions and nations depending on their stages of development. Inflation can be ascribed to a general increase in money supply, rises in public expenditure, excess demand, changes in labour market, changes in costs and oil price increases.

There are mainly three ways of measuring inflation; use of the GDP deflator, wholesale price index (WPI) and the Consumer Price Index (CPI). According to (Mburu, 2002) inflation is easy to identify but challenging to quantify since the choice of measurement method is influenced by available information. Since 1961, Kenya uses CPI method to measure its inflation rate.

1.1.3.2 Determinants of Inflation

This research, seeks to determine whether remittances result in inflationary pressure in Kenya. This will be done by controlling for other independent variables that are likely to impact on inflation. Wide literature exists on the determinants of inflation (Brofen and Holzman 1963; Berk 1999; Laidler and Parkin 1975; Gali, et al 2001; Cotarelli 1998; Ball, et al 2013; Balderas and Nath, 2008; Khan and Islam, 2013). Other variables expected to influence inflation besides remittances, include, GDP growth, money supply, exchange rate, oil prices, openness and past inflation.

Output/GDP growth: GDP growth is an essential supply side variable that may influence inflation. Through the channel of aggregate supply, it is expected that a negative relationship exists between GDP growth and inflation. A rise in output is expected to raise aggregate supply in the market other things held constant and this will reduce the inflationary pressure (Roy and Rahman, 2014).

Money supply: The quantity theory of money implies that inflation and deflation in an economy occurs proportionately to either increase or decrease in money supply respectively. Money supply affects inflation through the aggregate demand and interest rate channels. However, as suggested by Qayyum and Kemal (2006) money supply has different impacts on the various categories of inflation.

Exchange rate: This can directly affect inflation through an appreciation of the domestic currency which generally lowers prices of imported consumer goods, capital goods and raw materials or indirectly through output gap and aggregate demand channels (Roy and Rahman, 2014).

Remittances: There are different points of view on how remittances can affect inflation. The theory underpinning the inflationary impacts of remittances indicates that remittances are partially spent on consumption and investment. If households receiving remittances spend it on consumption then, there will be a direct effect on aggregate demand due to increased expenditure on consumption of goods and services. Similarly, if remittances increase investment aggregate demand may also increase resulting to demand pull inflation (Khan and Islam, 2013).

Oil prices: Inflation pressure is affected by oil prices in most developing countries. Therefore, instability in supply and pricing of oil will lead to cost push inflation resulting to huge disparities between headline inflation and core inflation. Containing inflation by Central Bank is faced by problems due to cost structures of the economy. For instance, volatility in supply of key element of production process like oil, will mean that inflation remains volatile, making it difficult for Central Banks to meet their inflation targets. In some instances where huge discrepancy arises between headline and core inflation, the cause is more often apportioned to oil prices, without any empirical study to prove the extent of effect.

Openness: Open economies are susceptible to real exchange rate depreciation due to monetary expansion (Romer, 1993). Availability of cheaper goods from abroad will lower the domestic price levels, while costly good will result to a rise in domestic price levels (Wynne and Kersting, 2007).

Past inflation: Lagged inflation can influence current inflation through two transmission mechanisms. On one hand, if inflation in the past has been high, then the possibility is the

current inflation may be low due to a number of fiscal and monetary policies that have been put into place to counter the effects. On the other hand, a relatively high past inflation will lead to higher inflation equilibrium by making disinflation more costly for backward looking inflation (Cotarelli, 1998).

From the discussion above, the determinants of inflation can therefore, be given by the following expression:

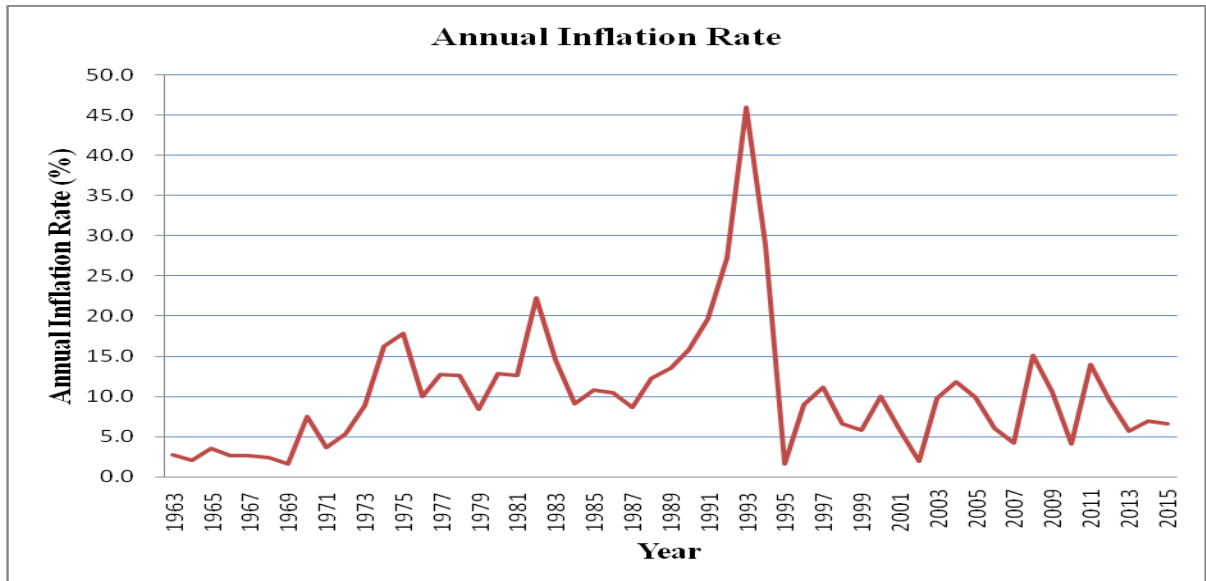
$$P = F \{GDPG, M2, NEER, RM, OPN, Op, P_{t-1}\}$$

Where P represents Inflation; GDPG - Gross Domestic Product Growth; M2 - Money Supply; NEER - Nominal Effective Exchange Rate; RM- Remittances, OPN – openness; Op - Oil Prices and Pt-1, past inflation.

1.1.4. Overview of inflation in Kenya

The core mandate of the Central Bank of Kenya is to formulate monetary policy to manage inflation to ensure low and stable inflation rates consistent with the country's economic growth targets (Central Bank Act, 2010). Since late 1990s, Kenya pursued an inflation target of below 5 percent (IMF 2015). Consequently, the Kenya Vision 2030 aims at maintaining a low rate of inflation of below 5 per cent. However, since July 2012 the CBK targets an inflation rate of 5 ± 2.5 per cent (IMF 2015).

Figure 2: Annual Inflation Rate (1963- 2015)



Source: Central Bank of Kenya, www.centralbank.go.ke

Figure 2 shows the annual inflation rates for the period 1963 to 2015. In 1960s, inflation averaged 3 per cent and therefore was not a policy problem. However, in the year 1974 and 1975 the inflation rate almost doubled to 16.3 per cent and 17.8 per cent respectively up from 8.9 per cent in the year 1973 (Economic survey, 1975). This rise was mainly attributed to poor rainfall, global world recession and the oil crisis due to increasing oil imports as the oil prices rose. Total world oil production, had been rising annually at a rate of 7 to 8 per cent before 1973, however it is estimated to have been about 2 per cent lower in 1974 than in 1973.

Commodity boom in 1976-77 of the major export crops, tea and coffee, eased some of the economic problems experienced in the early 1970s. The commodity boom led to a 54 per cent improvement in the terms of trade and to huge increases in foreign exchange availability in 1975-77 (Killick and Mwega, 1990). The Government intervened by raising import duties and sales taxes on certain luxury consumer goods and raising duties

on petroleum products so as to reduce consumption and hence inflation rate subsided to 10 per cent in 1976. The inflation rate was 12.7 per cent in 1977; this was ascribed to substantial increase of money supply by 46.8 per cent (Economic survey, 1978). Although this was a lower rate of inflation than that which prevailed in some of the developing economies, the inflationary pressures had a particular sharp impact on the property market.

The 1980s therefore started with macroeconomic disequilibrium hence the need for remedial policy options. As a result, in 1982, the inflation rate shot up to 22.3 per cent. This was attributed to the second oil price shocks after the first oil price shock of 1974. This coupled with a deterioration of world beverage prices to more ordinary levels led to 44 per cent worsening of terms of trade. The attempted coup against the Government in 1982 led to reduced investor confidence, a fall in investment and some capital flight (Killick and Mwegu, 1990).

During 1990s, the turn of events was slowdown in economic growth, money growth, rapid rise in inflation and exchange rate depreciation. Devaluation of Kenya shilling was seen as one of the causes of inflationary pressures, coupled with excessive money supply in 1992 and early 1993, decontrol of prices and poor weather conditions. A prolonged drought further made the Government to divert large amount of funds to famine relief imports to attain food security (Economic Survey, 1993). In 1993 Kenya recorded highest inflation rate of 46 per cent. The high inflation rate was attributed to an excessive money supply which grew by 35 per cent in 1992 compared to 24 per cent growth rate registered in 1991, low aggregate demand as a result of reduced purchasing power of the low-income wage earners resulting from intensified inflationary pressures, and depreciation of

the Kenya shilling with a low investor confidence due to rapid political reforms. (Economic Survey, 1994).

The year 2002 registered the lowest inflation rate of 2 per cent. This was attributed to firm fiscal and prudent monetary policies, low demand for imports and stable exchange rates. Other factors that contributed to low inflation include decline in prices of basic foodstuffs particularly maize grain, maize flour, rice and beans and stable world petroleum prices. The Government continued to pursue prudent monetary policies with the aim of containing the overall inflation rate within the 5.0 per cent \pm 2.5 target band (Economic Survey, 2003).

The inflation rate increased significantly to 15.1 per cent in 2008 and was attributed to post-election violence which disrupted economic activities in many parts of the country resulting to shortages in food supply, a rise in exchange rates, a rise in oil prices to US\$ 143 per barrel, the highest price ever by July 2008. The global financial crisis of 2007/2008 though started in United States also contributed to inflation in Kenya through deteriorating current account balances, depreciation of domestic currency and declining economic growth. The effects of global financial crisis were as a result of declining capital inflows, exports, remittances and rising overall food prices in the country (Economic Survey, 2008).

The year 2011 was characterized by high inflation rates with annual inflation increasing from 4.3 per cent in 2007 to 14 per cent in 2011 with the highest monthly inflation recorded at 19.7 per cent in November. This was ascribed to the weakening of the Kenya shilling thereby suppressing domestic demand and also leading to a sharp increase in

imports prices. Other factors included high food prices, non-alcoholic beverage prices, transport charges and high international oil prices due to political turmoil in the oil producing countries which led to disruption in oil supply. CBK intervened severally by raising the Central Bank Rate (CBR) to 18 per cent in December 2011 from 6.25 per cent in May to control the rising inflation and weakening Kenya Shilling (African Economic Outlook, 2012).

Between 2013 and 2015 inflation rate remained within the Central Bank target band of 5.0 per cent \pm 2.5. The inflation rate was 5.7 per cent in 2013, 6.9 per cent in 2014 and 6.6 per cent in 2015. This could be attributed to adoption of monetary policy measures by the Central Bank of Kenya thereby easing the inflationary pressure during the period.

1.2 Problem Statement

Inflation has always been one of the main macroeconomic goals of stabilization policies due to its negative consequences to the economy. It raises the cost of doing business hence, discouraging savings and investments. It also reduces the purchasing power of the low and fixed income groups therefore adversely affecting consumption.

The achievements of Kenya Vision 2030 aspirations are anchored on strong macroeconomic stability. An inflation rate of above 7.5 per cent is considered a hindrance to economic growth as it reduces consumers' purchasing power. CBK seeks to achieve a target inflation rate of 5 per cent, with a 2.5 per cent allowance margin on either side.

Over the last decade, remittance inflows to Kenya have been on an upward trend and have grown more than three-fold. On the other hand, the overall rate of inflation in Kenya

has been volatile with high inflation rates of 15.1 per cent and 14 percent recorded in 2008 and 2011 respectively. There is therefore, need to examine whether any relationship exist between these two variables.

There is a massive literature on the determinants of inflation (Catão and Terrones 2005). However, there have been few studies that have examined the effect of remittances on the inflation rate. In the past, no studies have been carried out to establish whether remittances cause inflation or not in Kenya. This study therefore, seeks to examine the relationship between remittances and inflation rate in Kenya.

1.3 Research Objectives

- i) To examine the effect of Diaspora remittances on inflation rate in Kenya;
- ii) To find out the effect of other macroeconomic variables on inflation rate in Kenya;
- iii) To draw lessons for the future and suggest policy recommendations based on the study findings.

1.4 Justification and Significance of the study

In Kenya, foreign remittance inflow has been increasing while the inflation rates have been volatile over the last decade. There is need therefore, to establish whether there is any relationship between inflation and foreign remittances. Theoretically foreign remittances may have inflationary effect via increasing domestic demand or money supply. On the other hand, through the increase in goods or services, foreign remittance may have deflationary impact only if remittances are invested in productive sectors of the economy.

The findings of the analysis of the effect of remittances on inflation will offer incentives to the Government, policy-makers and academicians to consider the role of remittances on the economy. The study findings will inform policy on how to address macroeconomic effects of Diaspora remittance inflows on inflation to ensure sustainability and to facilitate appropriate intervention measures.

1.5 Research questions

- i) What is the relationship between Diaspora remittances and inflation rates in Kenya?
- ii) How do other macroeconomic variables influence inflation in Kenya?

1.6 Organization of the study

The study is organized as follows: Chapter One presents introduction of the study, Chapter Two presents theoretical background and empirical analysis of remittances and inflation, Chapter Three gives the methodology while Chapter Four gives the analysis and the results of the study. Finally Chapter Five comes up with conclusions along with policy suggestions and recommendations.

CHAPTER TWO

2.0 Literature Review

2.1. Introduction

This chapter provides both theoretical and empirical literature review. Part one of the chapter discusses theoretical underpinnings while part two gives empirical analysis of remittances and inflation.

2.2 Theoretical Literature Review

There exist numerous theories that explain the reason why migrant decides to send funds and/or goods to their families. The theoretical literature on why migrants send remittances back home is summarized in four categories (Solimano, 2003). They are as follows (i) Altruistic Motive, (ii) Self-Interest Motive, (iii) Implicit Family Contract I: Loan Repayment; and (iv) Implicit Family Contract II: Co-insurance.

According to Chami *et al.* 2005, Altruism refers to the migrant's support to the relatives back home to finance basic needs. According to this model, transfer of remittances to the relatives back at home satisfies the migrant out of the concern for the family wellbeing. A migrant worker does not expect any form of reciprocation from his family in the country of origin. The migrant worker remits the money because his utility is derived from that of his family members (Chami et al., 2003). In other words, the migrant worker gets satisfaction from the improved welfare of the family left back home. Therefore, an incentive for the migrant worker to remit, increases when the family is facing difficult economic situations. Remittances are therefore a form of compensatory transfers which

compensate households faced by economic disruptions thus enabling them smoothen their consumption. As such remittances tend to be countercyclical; increasing during periods of economic downturns and decreasing during periods of robust economic growth. Therefore, according to this theory, remittances may have inflationary pressure since they are primarily spent on consumption activities by increasing the aggregate demand for services and goods.

On the other hand, self-interest motives refer to rent seeking motives for sending money back home where the immigrant is driven by the economic and monetary self-interest to remit back home (Rapoport and Docquier, 2005). A successful emigrant saves, and then decides to invest part of his savings in buying properties like land or commercial assets. Anticipation of a bequest is another reason that the studies have offered in the effort to try and explain this motive as migrants may use remittances as a strategy for investing in future bequest (Rapoport and Docquier, 2005 and Hoddinott, 1994). Lucas and Stark (1985) argues that if inheritance is conditioned on behavior of a greedy migrant's, then his or her motive to support the family back home could be as a result of wanting to maintain favour for the purpose of inheritance.

The 'exchange argument' reason for sending money to relatives is a possible reason in explaining the self-interest motivation for remitting. According to Rapoport and Docquier (2005) migrants send remittances to be used as means of purchasing various types of services for example taking care of the assets or family members. It is assumed that migrants trust family members or caretakers to acquire and/or maintain the assets or relatives on their behalf. In summarizing the self-interest theory, Rapoport and Docquier (2005) in their study found out that a positive relationship exist between remittance

sending migrants and their level of income, education and wealth of recipient household. However, in the long-run, the relationship between the money sent by migrants and the income of households' receiving remittances is ambiguous.

Implicit Family Contract I: Loan Repayment motive. This theory posits that families have a tendency of developing an implicit agreement between family members living in Diaspora, and his relatives at home. The implicit family contract with time may have an inter-temporal aspect, and may take a number of years or even decades. This type of remittances motive combines both the aspect of investment and compensation. In the investment element of the theory the household pay for the education of the immigrant by financing the expenses of migrating such as relocation and maintenance costs in the host country. The repayment aspect arises after the immigrant has settled in the host country and his income levels begin to rise. Out of the two aspects of the loan repayment theory i.e. repayment and investments, if the remitted funds are used in investment they may affect inflation negatively in the long run (Poirine, 1997).

Implicit Family Contract II: Co-insurance motive. This theory is an implied agreement involving the immigrant and his/her family back at home on the concept of diversifying risk. If economic risks between the host country of the migrant and his country of origin are not positively correlated then, it's convenient for the family to send the most educated members of its family abroad as way of cushioning the family against any uncertainty. Similarly the migrant is assured of a family that is doing well back at home to return to incase bad times arise in the host country. For this motive, migration acts as a co-insurance strategy while remittances take the role of insurance claim. Like any other contract, potential problems may arise during enforcement of the terms of contract by the

concerned parties. However, in principle, it is expected that the enforcement would be simpler given that these are implicit family contracts where family trust and altruism plays a key role. Lucas and Stark (1985) refer to this kind of engagements as “enlightened self-interest”. The motive views remittances as being equally beneficial to both the migrant and his or her household (Lucas and Stark, 1985).

Regardless of whether the motive of sending remittances is pure altruism, self-interest or a family contract, they are likely to have effect on the economy. This is because remittances lead to an improvement on living standards of the recipient households as a result of increase on personal income resulting to increase in consumption of goods and services hence boosting the economic activities (Cáceres and Saca, 2006). However, a rise on the consumption pattern without an increase in the real economic growth of the recipient country may cause the prices of the commodities to rise, triggering an upward pressure on the inflation rate.

Similarly, through money supply, remittances may have positive effect on inflation. An increase in remittance inflows leads to an increase in Central Bank reserves due to the increase in supply of foreign currency to the recipient country. Considering that money supply is a function of reserves and domestic credit, a rise in reserves will lead to an increase in money supply. Since money supply has positive impact on the prices, it will overly raise the inflation rate of the economy (Iqbal *et al.* 2013).

Inflationary effect of remittances can also be felt through the appreciation of domestic currency. The appreciation may occur due to increase in supply of foreign currency as a result of increase in remittance inflows which in turn increases reserves accumulation.

Appreciation of domestic currency means increase in purchasing power of the domestic consumer due to lower prices of goods and services. Therefore, appreciation is supposed to have deflationary effect on inflation. The impact on inflation can also be explained through depreciation and devaluation of domestic currency meaning a decrease of the domestic consumer purchasing power resulting to an increase in inflation (Iqbal *et al.* 2013).

Remittances can also affect inflation through an increase in foreign reserves accumulation in turn generating a balance of payment surplus. If the foreign reserves are not fully sterilized by the central banks, it will lead to an increase in monetary base and an appreciation of real exchange rate. This will therefore raise the price level (Roy and Rahman, 2014) and (Bugamelli and Paternò, 2009).

Finally, another way in which foreign remittances could affect domestic inflation is through an inflow of capital or savings. If savings are invested in productive sectors, then there is an increase in the output of the economy, resulting to an increase in goods and services, hence pushing the inflation rate downwards (Iqbal *et al.* 2013).

2.2 Empirical Literature Review

Existing empirical studies on the relationship between remittances and inflation have been conducted using either time series or panel data models. Nevertheless, most study results come to a rather similar conclusion that inflationary pressure caused by remittance inflows exists. Balderas and Nath (2005) using generalized impulse response function studied the impact of remittances on inflation and relative price variations in Mexico during 1980-2005. They did not find any proof of substantial impact on the two variables for the time period 1980-2005 even though after 1994 there appeared to have noteworthy positive effects.

Narayan *et al.* (2011) using General Method of Moments (GMM) methodology on 54 developing countries investigated the effect of remittances on inflation rate for the phase 1995-2005. The analysis indicated that remittances increase internal prices through expanding money supply which may lead to an appreciation of real effective exchange rate. The study also found out that remittances have significant impact on the rate of inflation in developing economies, causing inflationary pressure in both short and long term.

Ball *et al.* (2008) using panel vector autoregressive approach, conducted a study using quarterly and yearly data on 7 Latin American nations controlling for differences in exchange rate regimes. The study examined how different exchange rate regimes determine the impact of remittances on the inflation. Results confirmed that strength of relationship between remittances and inflation depended on choice of exchange rate regime of the economy. The investigation found out that growth in money supply due to remittance inflow together with a raise in demand for money could cause inflation under

fixed exchange rate regime. However, remittances inflows may have deflationary impact on the country under flexible exchange rate regime.

Kim and Yang (2008) using vector auto-regressive model comprising of various macroeconomic variables, investigated why increase in capital inflows cause prices of assets to rise in emerging East Asian economies. The study established that capital inflows contributed to the rise in prices of assets such as equities and land, even if it slightly explains part of asset value variations. At the same time, it causes a rise in both nominal and real exchange rates in emerging East Asian economies. As capital flows into the economies, stock prices were found to increase immediately while land prices increase was more delayed and could be explained by the spillover effect.

Zarate-Hoyos (2004) studied the consumption behaviour of remittance receiving households in Mexico by use of Ordinary Least Squares method. The results showed that the increment in household income due to remittance inflow either increased expenditure consumption on food, housing, furniture and medication or investment in fruitful activities such as schooling, manufacturing and agriculture raising demand for these items more than other items. The change in demand coupled by constrained supply for these goods could lead to uneven change in comparative prices and overall inflation.

Acosta et al (2009) applied dynamic stochastic general equilibrium model, to investigate why increase in remittances could lead to a rise in price levels of emerging market economies. A transmission mechanism considered stated that increase of personal disposable income arising from remittance inflows cause a decline in supply of labour. Decrease in supply of labour is linked to higher remunerations in terms of tradable goods

prices. This cause more contraction of the tradable sector due to high cost of production. The real exchange rate coupled with the ratio of tradable to non-tradable output thus induces high spending which can possibly lead to a rise in inflation.

Haderi *et al* (1999) using VAR model examined the role of remittances and private transfers by emigrants on inflation in Albania. They demonstrated how remittance shocks affect the inflation and exchange rate. They argued that inflation could be reduced through a direct effect on foreign reserves and exchange owing to large-scale emigration and huge remittance inflows.

Nath and Silva (2012) used VAR to study impact of remittance inflow on price distribution to recipient economies including distinct relative price development for 272 consumer items using monthly data in Mexico. The research finding indicated that in reaction to the remittance shock, if remittances increase, relative prices of several non-tradable commodities such as houses constantly increases while prices of some long-lasting commodities like equipment tend to decrease.

Cáceres and Saca (2006) study for the period 1995-2004 using a VAR model in El Salvador consisting of real and monetary variables found out that, remittances cause a decline in economic activity, money supply and foreign reserves, while in contrast they increase interest rate, imports and consumer prices hence, leads to inflationary effect on the economy.

Elbadawi and Rocha (1992) using panel data examined the remittances flow to 6 countries of Europe and North Africa that export labour. The study concluded that

remittances influences inflation indirectly as it discourages recipient households from engaging in productive activities.

Mandelma (2012) applied DSGE to examine impact of exchange rate and monetary policy under remittance variations in Philippines using data for the period 1995-2009. He concluded that there is a decrease in labour supply due to an increase in remittances in the recipient country. Therefore an increase in real wages coupled with increased consumption puts pressure on local goods prices hence, raising inflation.

Khan and Islam (2013) by applying VAR techniques examined how inflows of remittances affects inflation rate in Bangladesh using data from 1972-2010. They found out that a percentage increase in remittance causes 2.48 per cent rise in inflation in the long-run. Bugamelli and Paterno (2005) using a probit model looked at the relationship between remittances and inflation in regard to accumulation of international reserves and balance of payments for 110 emerging and developing countries. They argue that remittances can result to a B.O.P. surplus and accumulation of foreign reserves. Failure by central bank to fully sanitize the increase in these reserves will cause an increase in monetary base, resulting to more appreciation of the exchange rate causing an upward pressure on prices.

Ball et al (2013) applied panel vector auto regression techniques to analyze effect of remittances on a number of macroeconomic variables taking into account the exchange rate regimes for 21 emerging countries. The model predicted that under fixed exchange rate regime remittances will cause a temporal rise in inflation, local money supply, GDP and cause real exchange rate appreciation. While under flexible exchange rate regime,

remittances should result to a decrease in inflation, real exchange rate appreciation and increase in GDP with no change in money supply. The study therefore, concluded that exchange rate regime matters in determining the impacts of remittances, particularly in the short-run. Hence, researches that do not control for exchange rate regime may be biased.

Jansen et al (2012) used a stochastic limited participation model to study effects of remittance shock on major macroeconomic variables of a small open economy. They introduced a 1-standard deviation shock (approximately 14 per cent increase) to remittances and studied its effects on the aggregate macroeconomic variables. Findings showed that the remittances shocks that are entirely used for consumption will increase demand for goods and services putting an upward pressure on inflation at the time of shock.

Vacaflares et al (2012) used dynamic panel model in 9 Latin American countries using data for the period 1997-2010 to investigate the role remittances play in reserves accumulation and its influence on inflation rate. The finding shows that remittances contribute to the accumulation of international reserves in Latin America and suggests a positive impact on inflation.

Adhikari et al (2013) applied Ordinary Least Squares (OLS) method to study the effect of remittances on inflation in India. They found out that remittances from foreign countries do increase domestic price level but the effect is insignificant.

Majid (2012) using VAR model analyzed the impact of workers' remittances on macro indicators. The study established that, the expected amount of remittances in the Gulf

Cooperation Council Countries is deflationary hence no significant impact on economic growth.

Nguyen et al (2014) using VAR model studied effect of remittances on inflation in Vietnam using data from 1996 to 2012 and found that remittances cause inflation indirectly by increasing money supply. The result of the model indicates that remittances could have a significant impact on money supply with a one-quarter lag if State Bank of Vietnam fails to sterilize the impact on monetary base during the period. However, with a two-quarter lag money supply is found to accelerate inflation in Vietnam.

Abdallah et al (2015) using bounds testing approach examined the effect of international remittances on inflation in Ghana between 1979 and 2013. The empirical results found a significant effect of international remittances on inflation in the long-run while no significant impact was found between the two variables in the short-run.

Following discussions above on the empirical literature, there is need to carry out research in Kenya to examine the effect of remittances on inflation rate given the steady growth of remittances. The study will be conducted under floating exchange rate regime. The research used quarterly data since inflation changes frequently, this can better characterize inflation rate in Kenya.

2.3 Overview of the Literature

Inflation is always and everywhere a monetary phenomenon given that it can only be caused by a more rapid increase in the quantity of money than the output quantity (Friedman, 1970). However, it's important to note that inflation causation cannot be

attributed to one factor and isolate it as the main cause of inflation. (Sowa & Kwakye, 1993).

Inflation has been attributed to monetary, structural and cost factors by the different theories documented. Empirical literature reviewed seems to borrow the same concepts in explaining the inflation causation.

An interaction of forces has been found to cause inflation, with a number of factors such as exchange rates, money supply, gross domestic product, openness and oil prices leading to a rise in the general price level. It is essential to note that the inflationary effect of remittances in Kenya has not been assessed. This research therefore seeks to fill this gap.

CHAPTER THREE

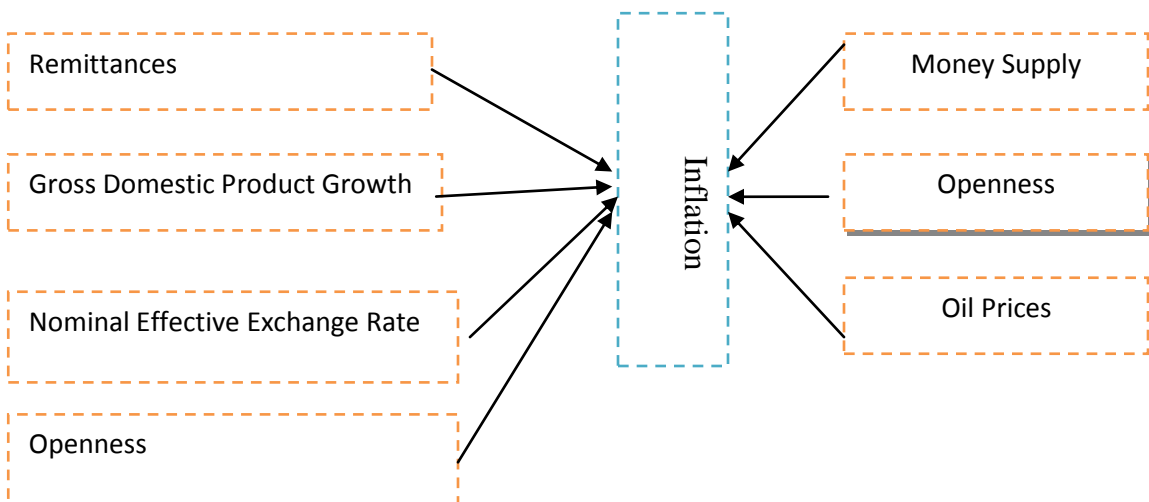
3.0 Methodology

3.1 Introduction

The chapter discusses conceptual framework, model specification, description of the variables used and gives a brief discussion of data types and sources as well as the pre-estimation tests.

3.2 Conceptual Framework

This section describes relationship that exists between inflation, nominal effective exchange rate, money supply, real Gross Domestic Product, remittances oil prices and openness. Inflation in Kenya has been attributed to expansion in monetary policy as a result of increase in money supply. Price shocks both internal and external also lead to rapid increase in prices in the economy. The factors have been shown in the diagram below.



Source; own representation from previous literature reviewed.

The study analyzed these factors by using both econometric analysis and descriptive evidence, where inflation as the dependent variable was regressed on the independent variables or explanatory variables. This research applied the Error Correction Mechanism (ECM) because of its ability to determine the existence of long-run relationship between the variables. The study used this model because of its simplicity, easy to estimate and its ability to conveniently capture the dynamics of multivariate systems.

3.3 Model specification

The study will adopt an Error Correction Mechanism used to study the effect of remittances on inflation in Pakistan (Iqbal, et al. 2013; Nisar and Tufail 2013). These researches have partially included money supply measured as broad money (M2) and other variables as key determinants of inflation.

Error Correction Mechanism will consist of six variables; inflation (P), nominal effective exchange rate (NEER), broad money supply (M2), remittances (RM), real Gross Domestic Product growth rate (GDPG), openness (OPN) and oil prices (OP), with oil prices treated as a exogenous variable.

Therefore, estimator VEC mechanism will be of the following form:

$$\{P, NEER, M2, RM, GDPG, OPN, Op\}$$

(3.1)

With oil price treated as an exogenous variable.

Where;

P = Inflation rate

NEER = Nominal Effective Exchange Rate

M2= Money Supply

GDPG= Real Gross Domestic Product Growth rate

RM= Remittances

OPN= Openness

Op= oil prices

3.4 Data Source

The analysis used quarterly time series data for the period 2004 to 2015. This is because quarterly data for remittances from the Central Bank of Kenya were only available from the year 2004. The data was obtained from the Kenya National Bureau of Statistics and the Central Bank of Kenya.

3.5 Preliminary Data Analysis

Before regression, variable trends were represented using graphs so as to have a visual impression on how variables have evolved over time. The various preliminary data analysis procedures were employed for testing for normality and stationarity at various conventional statistical levels of significance. Stationarity test was done using the ADF test.

3.6 Description of Variables and their expected signs.

- **Inflation Rate (P)**

This refers to an annual increase in the price of a basket of goods and services that are purchased by consumers in an economy leading to the decline of the purchasing power of a country's currency.

- **Money Supply (M2)**

Money supply is considered an important monetary variable that is a key determinant of inflation. Growth in money supply (M2) affects the price levels indirectly through the changes in interest rate and directly through the aggregate demand channel which further result to increase in prices causing inflation. This is expected to have a positive sign (Gottschalk et al. 2008).

- **Nominal Effective Exchange Rates (NEER)**

The exchange rate directly affects price of imports and exports of a country and increased money supply leads to nominal exchange rate depreciation. This expected to have a positive sign (Sowa and Kwakye, 1993).

- **Remittances (RM)**

Remittance is a vital demand side variable which is expected to have positive impact on inflation. They serve as direct increment to disposable income at the micro economic level. This may generate an increase in the domestic demand for goods and services and if it exceeds the domestic production it creates positive output gap and inflation (Kahn *et al* 2007).

- **Economic Growth (GDPG)**

GDP growth increases the availability of goods and services thereby easing pressure on domestic price levels. The growth is expected to have a negative impact on inflation rate (Mukhtar, 2010).

- **Oil Prices (OP)**

Oil is a major import in the country therefore any changes in the international market prices has multiplier effect as it affects more than one sector. This is expected to have a positive sign (Economic Survey, 1975).

- **Openness (OPN)**

Openness is a measure of economic policies that either restrict or support trade between nations. It is a ratio of trade to GDP (openness = Exports + Imports/GDP). Globalisation and trade liberalisation have resulted to an increase in openness for most trading countries. Open economies are likely to import inflation through manufactured and /or raw materials imports prices. Openness is expected to have positive impact on inflation (Zakaria, 2010)

3.7 Pre-Estimation Tests

- **Stationary test**

Time series data is subject to spurious regression since it is usually non-stationary. However, for data to be valid, the data sets must be stationary, that is the mean and the variance of the data set is time independent and they are constant over time. The Augmented Dickey Fuller (ADF) Test was used to test unit root of all the variables in the model and to determine the integration order. If a series is integrated of order zero that is $I(0)$ then it is stationary but if otherwise it is non-stationary (Gujarati, 1995).

- **Augmented Dickey Fuller Unit Root Test**

The assessment is derived from Dickey Fuller test and it is an appropriate method of checking whether a variable is integrated of orders one which was proposed by Dickey and Fuller (1979). However, due to the fact that the Dickey Fuller test may suffer autocorrelation if the residual process of OLS is applied, we make use of the augmented Dickey Fuller test. It involves an estimation of the following equation (Gujerati and Dawn, 2009):

$$\Delta X_t = \alpha + \beta_t + \gamma_i X_{t-1} + \sum_{i=1}^n \phi_i \Delta X_{t-1} + \varepsilon_t \dots \dots \dots (3.2)$$

Where X_t is the dependent variable, Δ is the first difference operator, t is time trend, ε_t is random error term and n is maximum lag length. To ensure that the error term is white noise, an optimal lag length is determined, while α , β , and γ are estimated parameters. If the null hypothesis test is not rejected i.e. $\gamma=0$ it follows that the variable under observation has unit root hence non-stationary.

- **Co integration**

Johansen maximum Likelihood cointegration test was done given the multivariate nature of the model to test existence of any long run relationship between the variables. To determine optimal lag length, different criteria were used, however the model lag length was chosen based on Akaike's Information Criterion (AIC). The purpose for determining the lag length is because insufficient lags yield incorrect test statistics (auto correlated errors), while too many lags reduce the test power.

CHAPTER FOUR

4.0 RESEARCH ANALYSIS AND FINDINGS

This chapter presents data analysis results. It presents time series properties, such as stationarity, correlation, causality and co-integration. The chapter further presents a diagnostic test that was aimed at testing the normality and linearity of the data used. The objective of this research was to investigate the impact of nominal effective exchange rate, real gross domestic product growth rate, money supply, remittances, openness, and oil prices on inflation.

4.1 Time Series Properties

4.1.1 Stationarity Test

Time series data encounter the danger of generating spurious results if the variables are non-stationary, resulting into estimates that are biased and inefficient. Therefore, to avoid admission of spurious results, the data was tested for seasonality and trends using the Augmented Dickey Fuller test, at levels and at differences.

Inflation, remittances, money supply, Gross Domestic Product, Nominal effective exchange rate and oil prices were found to be stationary at first difference. This means they are integrated of order one, $I(1)$ hence, the null hypothesis for the presence of a unit roots is rejected at 5 per cent for these variables.

Table 4. 1: Stationarity Analysis

Variable	Test Statistic	P-Value	Remark
lnP	-0.372	0.9146	Not-stationary
D.lnP	-3.112	0.0245	Stationary
lnRM	-0.448	0.9001	Not-stationary
D.lnRM	-2.522	0.0288	Stationary
lnM2	0.854	0.9601	Not-stationary
D.lnM2	-3.721	0.0043	Stationary
lnGDPG	-1.465	0.5543	Not-stationary
D.lnGDPG	-4.231	0.0001	Stationary
lnNEER	-0.471	0.8973	Not-stationary
D.lnNEER	-3.667	0.0021	Stationary
lnOP	-2.432	0.1181	Not-stationary
D.lnOP	-3.343	0.0111	Stationary
lnOPN	-2.423	0.187	Not-stationary
D.lnOPN	-4.652	0.001	Stationary

4.1.2 Lag Length Determination

To determine suitable lag length, different criteria were used; Akaike's information criterion (AIC), sequential modified LR test statistic, Schwarz information criterion (SC), final prediction error (FPE) and Hannan-Quinn (HQ) information criterion.

The determination of the lag length was necessitated by the fact that stationarity and cointegration tests are lag-sensitive. In this case, five lags were selected by use of Akaike's information criterion (AIC) given that data was quarterly, as shown in table A1 in the appendix.

4.1.3 Correlation Analysis

Pair-wise correlation analyses were done to eliminate the presence of serial correlation as shown in Table A2 in the appendix. Inflation was found to be having weak negative relationship with remittances, money supply, real GDP, oil prices and openness.

4.1.4 Co-integration Test

After finding out that all variables are integrated of order 1, the co-integration was done to deduce the long-run relationship amongst the variables. Co-integration revealed existence of long-run stable equilibrium relationship among the variables. Johansen Maximum Likelihood method was used given that the model is multivariate. In this case, the trace statistic was found to be smaller than the critical value at 5 percent significance level, with a maximum rank of 3. This implied that co-integration is present and that there exists at least three (3) co-integrated equations, in either bi-directional or uni-directional relationship as shown in Table A3. This means that the dependent and independent variables move closely to achieve long run equilibrium. This gave an indication that Granger causality exists in at least two directions.

4.1.5 Diagnostic Tests

Several diagnostic tests were performed to avoid admission of erroneous results. The error term was found to have a mean of 0 and variance 1, indicating normality. This can be confirmed by the normality plot presented as Figure 2 in the appendix. The data was found to be homoscedastic [$\text{Chi-square (27) = 34.94, } p > 0.05$] as shown in Table A4, implying that null hypothesis of constant variance could not be rejected at 5 percent significance level.

The data was also tested for linearity using a graph matrix as given by Figure A1 in the appendix. The graph matrix illustrates that the independent variables were not in linear relationship before transformation, but are after the data is transformed. Ramsey's Model specification test shows that the model fits well [$F(3, 38) = 0.78, p > 0.05$] and the null

hypothesis that the model has no omitted variable and could not be rejected at 5% level of significance.

4.2 Long-run Regression Results

These are the long-run results with the log of inflation rate as the dependent variable, and log of remittances, log of money supply, log of real GDP, log of real exchange rate, log of openness and the log of oil prices as the explanatory variables. The model is significant at 5 percent significance level [$F(6, 41) = 6.08, p < 0.05$], and independent variables explain 58.7 percent of the total variations in inflation rate ($R^2 = 0.5870$). The model has a better fit since its Root Mean Squared Error is 0.42219; the closer the Root Mean Squared Error to zero, the better the model. The model has a trend at 16.1, meaning that in the absence of all the explanatory variables, inflation rate increases at a constant factor of 0.16 percent.

Table 4. 2: Regression Results

Variable	Coefficient	P-Value
lnRM	0.0009	0.000
lnM2	0.0014	0.000
lnGDPG	-0.0167	0.000
lnNEER	0.0114	0.000
lnOP	0.0058	0.000
lnOPN	-0.1655	0.000
Constant	16.1288	-

All the factors analyzed show a positive effect to inflation rate, except for GDP and Openness. Further, there is a significant influence by all the variables under the study, at a level of 5 percent on inflation rate.

A percentage increase in remittances increases inflation by 0.09 percent. The remittances coefficient is significant at 5 percent level ($p < 0.05$), meaning that remittances is an

important factor in determining inflation. The Coefficient for money supply is significant at 5 percent significance level, and a percentage change in money supply causes a 0.14 percentage change in inflation rate, making it an important factor in determining inflation.

The coefficient for Real GDP is significant at 5% level of significance, meaning that GDP is an important factor in determining inflation. A percentage change in real GDP leads to 1.67 percent reduction in inflation rate. Real exchange rate causes a 1.14 percent increase in inflation rate, and its coefficient is significant meaning that real exchange rate is an important factor in determining inflation.

The Coefficient for oil prices is significant at 5 percent level of significance, and a percentage increase causes a 0.58 percent rise in inflation. The Coefficient for openness is significant at 5 percent level of significance, and a percentage increase causes a 16.5 percent rise in inflation. Oil prices and openness are important factors in determining inflation.

The equation for the regression analysis for long run relationship can therefore be represented as:

$$\text{LNP} = 16.13 + 0.0009\text{LNRM} + 0.0014\text{M2} - 0.0167\text{LNGDPG} + 0.0114\text{LNNEER} + 0.0058\text{LNOP} - 0.1655\text{OPN}$$

4.3 Granger Causality Results

Table 4. 3: Granger Causality Results

	D_lnP	D_lnRM	D_lnM2	D_lnGDPG	D_lnNEER	D_lnOP	D_lnOPN
L_ce1	0.415	75.85	-9.344	121.4***	10.29	0.0474	0.870
	(0.134)	(0.298)	(0.460)	(0.000)	(0.789)	(0.997)	(0.085)

	D_ lnP	D_ lnRM	D_ lnM2	D_ lnGDPG	D_ lnNEER	D_ lnOP	D_ lnOPN
LD.lnP	-0.324 (0.327)	-177.8* (0.041)	10.42 (0.490)	-95.60* (0.012)	-9.669 (0.833)	-1.025 (0.952)	-1.077 (0.074)
L2D.lnP	-0.606 (0.060)	-139.1 (0.100)	6.729 (0.647)	-37.61 (0.309)	-66.28 (0.137)	-18.88 (0.250)	-1.143 (0.051)
L3D.lnP	0.0947 (0.724)	-53.21 (0.449)	2.699 (0.825)	-16.29 (0.596)	-11.30 (0.761)	-1.846 (0.893)	-1.086* (0.026)
L4D.lnP	-0.653** (0.004)	7.604 (0.898)	-5.507 (0.594)	-19.98 (0.442)	-33.13 (0.291)	-16.46 (0.155)	-1.019* (0.014)
LD.lnRM	0.00150 (0.156)	-0.851** (0.002)	-0.0157 (0.746)	-0.280* (0.021)	-0.0264 (0.857)	-0.00705 (0.896)	0.000357 (0.853)
L2D.lnRM	0.000958 (0.496)	-0.163 (0.659)	0.0417 (0.515)	-0.162 (0.317)	-0.0750 (0.700)	-0.0269 (0.708)	-0.00401 (0.118)
L3D.lnRM	-0.000724 (0.583)	0.215 (0.534)	0.0477 (0.427)	-0.0488 (0.747)	-0.0115 (0.950)	0.0209 (0.756)	-0.00529* (0.027)
L4D.lnRM	-0.000774 (0.473)	-0.0228 (0.936)	-0.0221 (0.652)	-0.0478 (0.699)	-0.0569 (0.703)	0.0244 (0.658)	-0.00321 (0.102)
LD.lnM2	0.00225 (0.654)	-1.971 (0.135)	0.167 (0.465)	-0.956 (0.097)	0.241 (0.728)	0.385 (0.133)	0.0125 (0.172)
L2D.lnM2	-0.00417 (0.497)	-1.369 (0.396)	0.268 (0.338)	-0.153 (0.828)	0.268 (0.752)	-0.240 (0.443)	-0.00321 (0.774)
L3D.lnM2	0.00895 (0.180)	-0.178 (0.919)	-0.0329 (0.914)	-0.347 (0.651)	-1.792 (0.053)	-0.467 (0.171)	-0.0170 (0.161)
L4D.lnM2	-0.00232 (0.747)	2.115 (0.262)	-0.129 (0.693)	-1.660* (0.044)	-0.0637 (0.949)	0.331 (0.366)	0.00221 (0.866)
LD.lnGDPG	0.00503 (0.138)	1.269 (0.154)	-0.146 (0.344)	0.667 (0.087)	0.293 (0.533)	0.0142 (0.935)	0.0145* (0.019)
L2D.lnGDPG	0.00319 (0.267)	0.693 (0.359)	-0.0592 (0.652)	0.312 (0.345)	0.396 (0.321)	0.104 (0.479)	0.0149** (0.004)
L3D.lnGDPG	0.00328 (0.096)	-0.409 (0.429)	-0.0327 (0.716)	0.116 (0.609)	0.113 (0.679)	-0.0172 (0.864)	0.0104** (0.004)
L4D.lnGDPG	0.00297* (0.038)	-0.234 (0.534)	-0.0472 (0.470)	0.193 (0.242)	-0.0222 (0.911)	-0.0521 (0.476)	0.00368 (0.159)
LD.lnNEER	-0.00470 (0.167)	-0.931 (0.297)	0.0909 (0.558)	-1.468*** (0.000)	0.101 (0.830)	0.141 (0.416)	-0.00917 (0.139)
L2D.lnNEER	-0.00808* (0.034)	-1.929 (0.054)	0.255 (0.143)	-0.530 (0.226)	-0.546 (0.301)	-0.251 (0.197)	-0.0110 (0.115)
L3D.lnNEER	-0.00210 (0.500)	0.156 (0.849)	0.0355 (0.802)	-1.104** (0.002)	-0.255 (0.554)	0.0458 (0.773)	-0.00570 (0.314)
L4D.lnNEER	-0.000475 (0.901)	-1.519 (0.129)	-0.0283 (0.871)	-0.352 (0.421)	-0.305 (0.563)	-0.161 (0.409)	-0.0148* (0.033)
LD.lnOP	0.00539 (0.349)	4.209** (0.005)	-0.181 (0.490)	1.588* (0.016)	0.00660 (0.993)	0.388 (0.186)	-0.000736 (0.944)
L2D.lnOP	-0.00261 (0.767)	1.132 (0.625)	-0.142 (0.723)	0.0276 (0.978)	1.677 (0.170)	0.169 (0.708)	0.0251 (0.118)
L3D.lnOP	0.0136 (0.147)	-0.267 (0.914)	-0.0147 (0.973)	1.773 (0.100)	-0.455 (0.727)	-0.174 (0.717)	0.0128 (0.453)
L4D.lnOP	-0.00986 (0.202)	3.110 (0.125)	-0.00756 (0.983)	-1.043 (0.240)	1.264 (0.237)	0.455 (0.249)	0.00359 (0.799)
LD.lnOPN	-0.0447 (0.768)	5.981 (0.881)	-3.602 (0.602)	23.90 (0.170)	-18.31 (0.383)	-11.77 (0.128)	-0.225 (0.416)
L2D.lnOPN	0.0282 (0.854)	119.3** (0.003)	-3.963 (0.572)	7.577 (0.668)	22.75 (0.285)	10.23 (0.192)	0.184 (0.512)

	D_lnP	D_lnRM	D_lnM2	D_lnGDPG	D_lnNEER	D_lnOP	D_lnOPN
L3D.lnOPN	-0.267 (0.081)	19.33 (0.631)	10.74 (0.124)	4.810 (0.784)	22.69 (0.285)	0.623 (0.936)	-0.514 (0.066)
L4D.lnOPN	0.118 (0.402)	50.54 (0.170)	-3.195 (0.617)	11.78 (0.465)	8.425 (0.665)	2.205 (0.758)	-0.0453 (0.859)
_cons	-0.709* (0.015)	6.512 (0.932)	37.04** (0.005)	-3.686 (0.913)	29.18 (0.471)	-3.341 (0.823)	-0.424 (0.426)

P-values in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The short-term results show that real GDP is granger caused by money supply, remittances, and nominal exchange rate, but the contrary is not true. On the other hand remittances are granger caused by inflation, real GDP and nominal exchange rate. The short term model coefficients are stable and have no outliers as seen in figure 3 in the appendix. In the short term, remittances only granger causes real GDP and openness and not inflation, money supply, oil prices or nominal exchange rate.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The key objective of the study was to investigate the effects of Diaspora remittances on inflation rate in Kenya. A quarterly time series data from 2004-2014 was analyzed using Vector Autoregressive model. Consumer Price Index was used as a measure for inflation rate.

Study findings indicate that the independent variables explain 58.7 per cent of the total variations in inflation rate. The model has a trend at 16.12, meaning that in the absence of all the explanatory variables, inflation rate increases at a constant factor of 0.16 per cent. All the factors analyzed show a positive effect to inflation rate, except real GDP. Further, there is a significant influence by all the variables under the study with an exception of money supply, at a 5 per cent level of significance on inflation rate.

With the log of inflation rate as the dependent variable, and log of remittances, log of money supply, log of real GDP, log of real exchange rate log of oil prices and the log of openness as the explanatory variables the empirical results found out that relationship between remittances and inflation is significant in the long run.

Short-term results show that real GDP is granger caused by money supply, remittances, inflation rate, openness and nominal exchange rate, but the contrary is not true. On the other hand, nominal exchange rate and money supply granger causes oil prices.

5.2 Conclusions

The study examines the relationship amongst inflation rate, nominal effective exchange rate, money supply, remittances, oil prices, openness and real GDP. From the study, it can be concluded that remittances is an important factor in determining inflation rate in Kenya in the long run.

Remittances are sent to family members directly without any intermediaries and they can use them depending on their priorities. For instance, they may use money sent to them in financing basic consumption, health, education, and housing or invest in business. However, if much of the remittances received by households are used for immediate consumption needs, it may lead to an increase on the domestic demand for goods and services and if consumption exceeds domestic production then it will create a positive output gap and cause inflation. It can therefore be concluded that it is the manner in which the foreign remittances are spent that causes inflation in the economy i.e. consumption patterns of the recipients of foreign remittances are responsible for inflationary role of remittances. Inflationary pressures in Kenya can therefore be attributed to the changes in production, aggregate demand and the money supply.

5.3 Recommendations

Remittances in Kenya have been on an upward trend in the last few years and are an important source of external capital that can help boost economic growth in Kenya. However, empirical results from the study show that increase in remittances causes an increase in inflation rate in Kenya. In view of this, the Government through the Central Bank of Kenya is recommended to develop policies that will counter the effects of remittances on inflation rate.

In addition the Government can counter effect of remittances on inflation by providing attractive investment opportunities and encouraging the recipient of remittances to use them for investment purposes since from the literature review remittances have been found to cause inflation if they are spent on consumption rather than investment.

5.4 Limitations of the study

Regardless of the high level of interest in remittances, evidence indicates that data on remittances is less reliable than any other data in the balance of payments accounts. Globally, there have been inconsistencies in information on remittances with regard to its coverage and data compilation. This is evidenced by the consistent discrepancy between the amount of remittance received and amount of remittance paid (IMF, 2009).

The limitation of the study is largely on the reliability of data since the study has used official data estimates from the Central Bank of Kenya which only captures remittances sent through official channels i.e. the financial institutions operating in the country. However, quite a significant percentage of remittance inflows transmitted through private means are unrecorded i.e. informal channel, thereby underestimating the actual amount of remittance inflows officially recorded. Moreover, there are foreign remittances in form of kind transfers and are difficult to measure accurately.

5.5 Suggestions for further Study

This paper investigated the effects of remittance inflows on inflation rate in Kenya. The number of variables in the model is not exhaustive hence, future studies could include other macroeconomic variables like interest rates, Government deficits, and trade openness among others. In addition, further research should control for different

exchange rates regimes i.e. floating exchange rate, managed exchange rate and flexible exchange in investigating the effects of remittances on inflation since changes in regimes of exchange rate have significant different effects on macroeconomic variables.

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APPENDIX:

Appendix A1: Lag length Selection

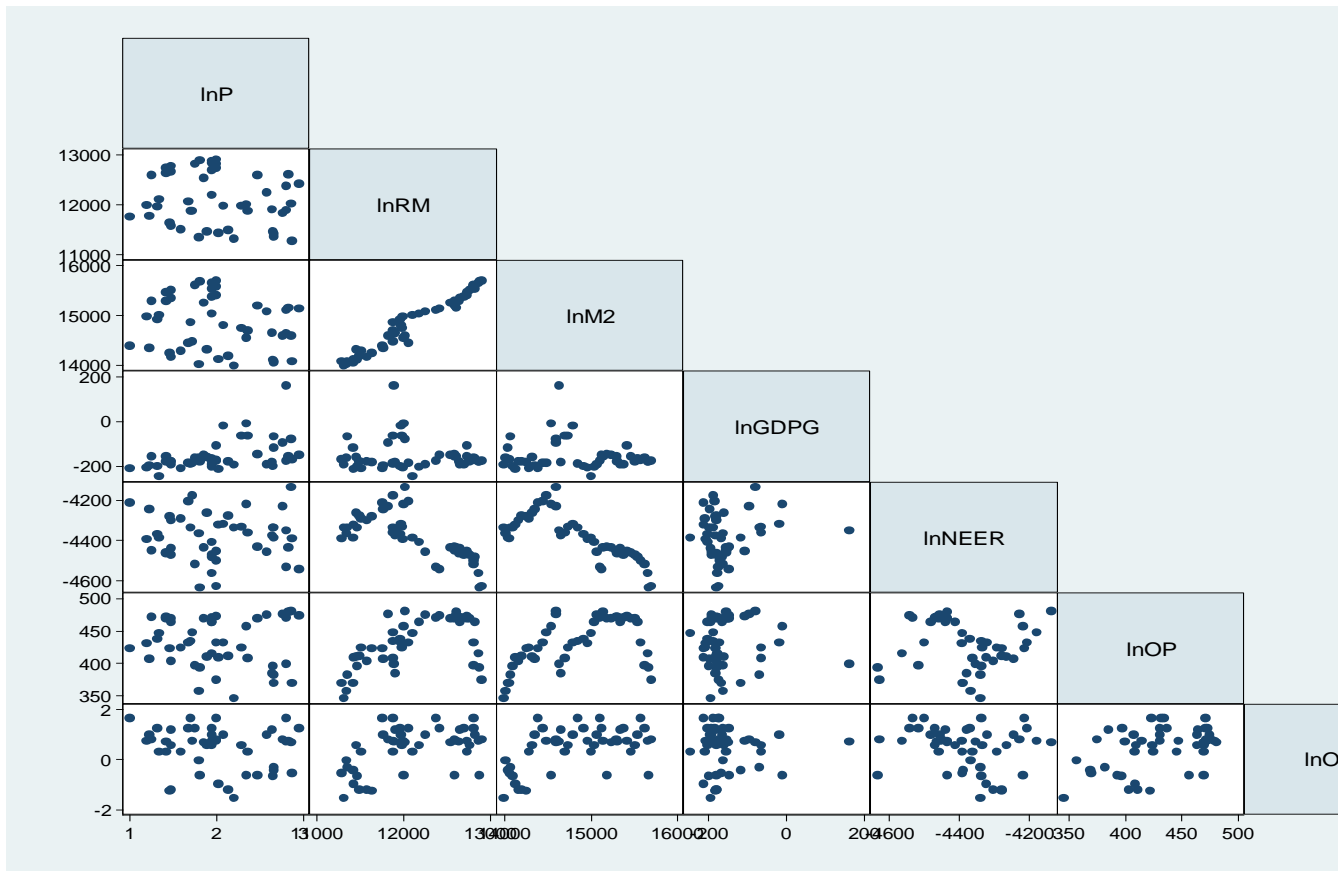
```
. varsoc lnP lnRM lnM2 lnGDPG lnNEER lnOP, maxlag(5)
```

Selection-order criteria
Sample: 6 - 44

Number of obs = 39

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	7.52833				3.7e-08	-.078376	.01345	.177556
1	221.985	428.91	36	0.000	4.0e-12	-9.23001	-8.58723	-7.43849*
2	269.646	95.322	36	0.000	2.5e-12	-9.82803	-8.63428	-6.5009
3	305.485	71.677	36	0.000	3.8e-12	-9.81973	-8.07503	-4.95701
4	365.675	120.38	36	0.000	2.6e-12	-11.0603	-8.76462	-4.66197
5	454.859	178.37*	36	0.000	1.3e-12*	-13.7876*	-10.941*	-5.85371

Figure 3: Linearity Test



Appendix A2: Correlation Analysis

```
. corr lnP lnRM lnM2 lnGDPG lnNEER lnOP lnOPN
(obs=48)
```

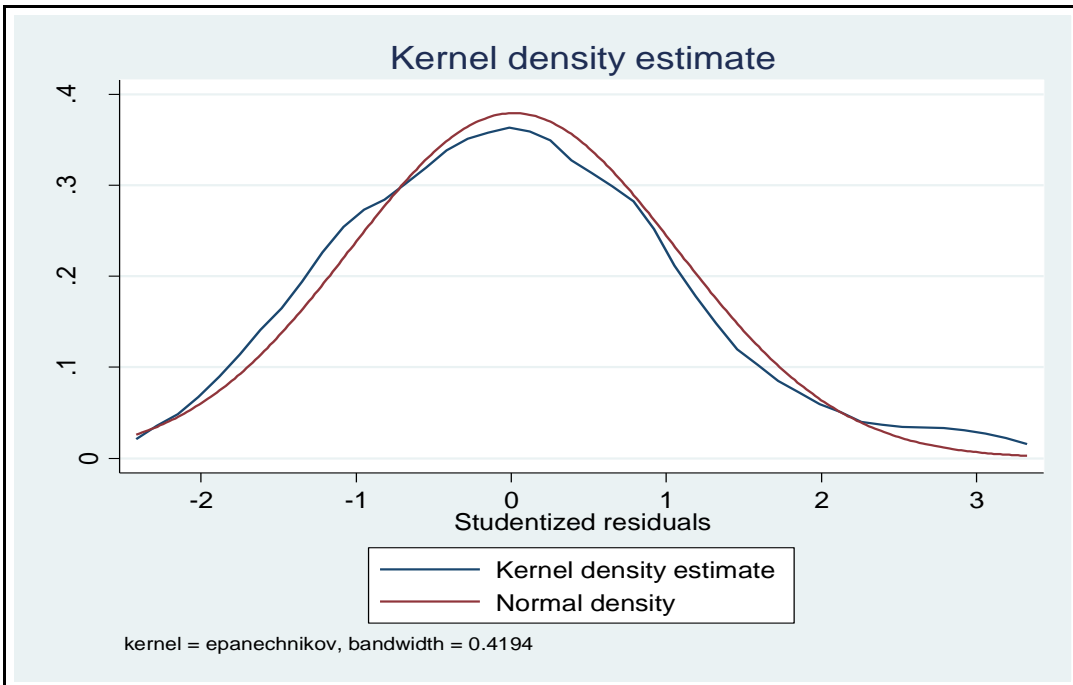
	lnP	lnRM	lnM2	lnGDPG	lnNEER	lnOP	lnOPN
lnP	1.0000						
lnRM	-0.1566	1.0000					
lnM2	-0.1801	0.9760	1.0000				
lnGDPG	0.4796	-0.0700	-0.0852	1.0000			
lnNEER	-0.0355	-0.7104	-0.7574	0.1688	1.0000		
lnOP	-0.0580	0.5622	0.5248	-0.0253	-0.0666	1.0000	
lnOPN	-0.1227	0.4818	0.5213	-0.0201	-0.1907	0.4390	1.0000

Appendix A3: Co-integration Test

```
. vecrank lnP lnRM lnM2 lnGDPG lnNEER lnOP, lags(4)
Johansen tests for cointegration
Trend: constant
Sample: 5 - 48
Number of obs = 44
Lags = 4
```

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	114	-1017.8717	.	161.9622	94.15
1	125	-991.66381	0.69616	109.5464	68.52
2	134	-968.48711	0.65128	63.1930	47.21
3	141	-951.2061	0.54411	28.6309*	29.68
4	146	-940.89096	0.37429	8.0007	15.41
5	149	-937.99474	0.12335	2.2082	3.76
6	150	-936.89063	0.04895		

Figure 4: Normality Test



Appendix A4: Homoscedasticity Test

```
. imtest, white
```

```
White's test for Ho: homoskedasticity  
against Ha: unrestricted heteroskedasticity
```

```
chi2(27)      =      34.94  
Prob > chi2   =      0.1403
```

```
Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	34.94	27	0.1403
Skewness	11.90	6	0.0642
Kurtosis	0.35	1	0.5558
Total	47.19	34	0.0657

Appendix A5: Model Fit and Specification

. linktest

Source	SS	df	MS	Number of obs =	48
Model	6.72509484	2	3.36254742	F(2, 45) =	21.36
Residual	7.08442347	45	.157431633	Prob > F =	0.0000
Total	13.8095183	47	.293819539	R-squared =	0.5870
				Adj R-squared =	0.5642
				Root MSE =	.39678

lnP	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
_hat	2.482659	1.254262	1.98	0.054	-.043554	5.008873
_hatsq	-.3361673	.2821851	-1.19	0.240	-.9045173	.2321826
_cons	-1.576768	1.361311	-1.16	0.253	-4.318589	1.165054

. ovtest

Ramsey RESET test using powers of the fitted values of lnP
 Ho: model has no omitted variables
 F(3, 38) = 0.78
 Prob > F = 0.5147

Appendix A6: Long Terms Regression Results

Cointegrating equations

Equation	Parms	chi2	P>chi2
_ce1	6	7.61e+07	0.0000

Identification: beta is exactly identified

Johansen normalization restriction imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
_ce1						
lnP	1	.	.	.	.	.
lnRM	.0009082	1.54e-06	590.10	0.000	.0009051	.0009112
lnM2	.0014958	1.77e-06	842.81	0.000	.0014923	.0014993
lnGDPG	-.0167089	3.73e-06	-4484.59	0.000	-.0167162	-.0167016
lnNEER	.0114952	2.48e-06	4631.94	0.000	.0114904	.0115001
lnOP	.0058889	4.88e-06	-1207.16	0.000	-.0058985	-.0058794
lnOPN	-.1655111	.000358	-462.36	0.000	-.1662127	-.1648095
_cons	16.12883	.	.	.	.	.

Figure 5: Coefficient Stability Test

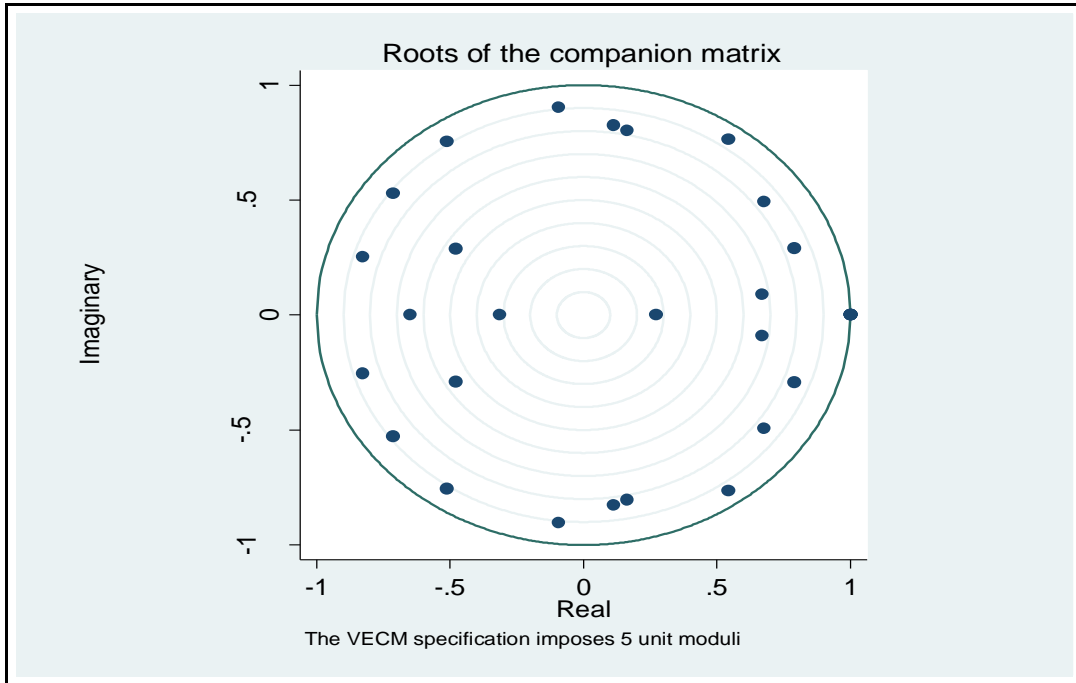
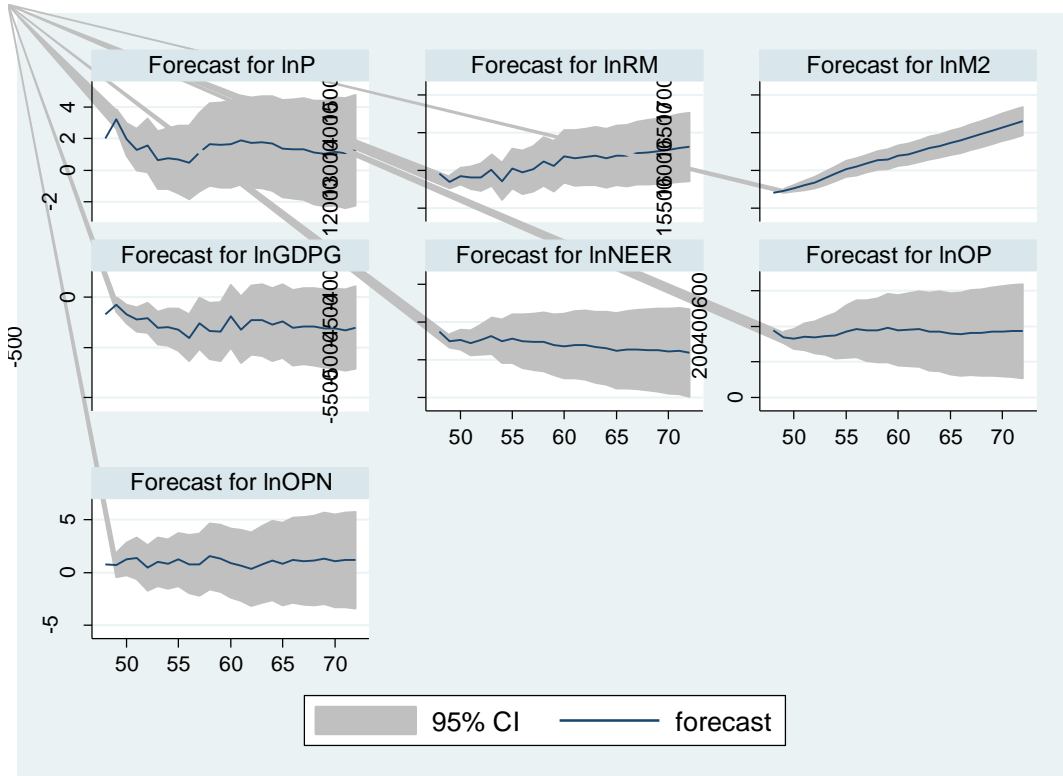


Figure 6: Forecast



Appendix A7: Data

year	quarter	lnP	lnRM	lnM2	lnGDPG	lnNEER	lnOP	lnOPN
2004	Q1	2.208274	11323.87	13981.49	-193.152	-4339.12	345.6317	-1.55889
	Q2	1.791759	11347.47	14005.17	-160.944	-4366.91	357.2346	-0.04115
	Q3	2.667228	11418.34	14035.9	-116.315	-4388.38	369.1376	-0.4131
	Q4	2.867899	11287.6	14061.75	-166.771	-4390.99	369.6352	-0.52609
2005	Q1	2.660259	11360.23	14072.04	-69.3147	-4337.94	382.2098	-0.29665
	Q2	2.653242	11471.42	14089.56	-198.787	-4335.98	396.2716	-0.64157
	Q3	2.014903	11435.05	14117.05	-212.823	-4322.54	408.9332	-0.97794
	Q4	1.481605	11588.74	14158.49	-179.176	-4302.04	403.6009	-1.2123
2006	Q1	2.128232	11494.18	14190.43	-179.176	-4277.92	411.578	-1.19523
	Q2	1.458615	11639.23	14248.92	-182.455	-4278.75	422.391	-1.2577
	Q3	1.589235	11517.84	14286.28	-210.413	-4292.24	424.42	0.294068
	Q4	1.88707	11466.83	14318.17	-158.924	-4262.82	410.0989	0.567296
2007	Q1	1.223776	11767.76	14342.5	-196.01	-4242.62	407.0735	0.989681
	Q2	0.993252	11760.23	14388.52	-211.626	-4211.24	422.8293	1.664426
	Q3	1.667707	12059.47	14442.98	-184.055	-4204.84	431.348	1.260984
	Q4	1.722767	11876.41	14482.09	-185.63	-4177.61	447.8473	0.726431
2008	Q1	2.351375	12005.49	14543.9	-9.53102	-4217.59	456.9543	-0.6241
	Q2	2.85647	12019.14	14590.02	-78.8457	-4137.4	481.2184	0.685035
	Q3	2.766319	11823.92	14594.37	-95.5511	-4228.15	476.7289	0.782235
	Q4	2.809403	11885.95	14635.9	160.9438	-4351.83	399.4524	0.692993
2009	Q1	2.646175	11906.65	14653.78	-182.455	-4376.76	385.2273	1.186463
	Q2	2.360854	11875.09	14691.38	-64.1854	-4362.33	408.0922	0.294068
	Q3	2.282382	11980.84	14736.12	-64.1854	-4333.89	424.2765	0.567296
	Q4	2.079442	11967.8	14789.82	-18.2322	-4319.22	431.348	0.989681
2010	Q1	1.704748	11876.52	14850.12	-187.18	-4337.03	433.9901	1.664426
	Q2	1.308333	11960.12	14914.52	-201.49	-4368.56	437.1345	1.260984
	Q3	1.193922	11990.41	14968.13	-207.944	-4393.46	431.0799	0.726431
	Q4	1.335001	12103.49	15001.63	-246.81	-4389.25	445.783	0.294068
2011	Q1	1.94591	12188.29	15036.01	-202.815	-4409.52	464.3429	0.567296
	Q2	2.580217	12255.26	15066.37	-190.211	-4455.74	474.927	0.989681
	Q3	2.80336	12376.72	15105.79	-175.786	-4532.71	471.2229	1.664426
	Q4	2.95491	12418.59	15132.38	-148.161	-4541.8	473.6198	1.260984
2012	Q1	2.827314	12611.28	15141.3	-154.756	-4432.36	479.2065	0.726431
	Q2	2.4681	12598.48	15187.37	-145.862	-4432.24	469.7749	-0.6241
	Q3	1.856298	12542.81	15240.65	-150.408	-4434.03	469.6837	0.685035
	Q4	1.252763	12594.01	15289.88	-154.756	-4449.33	471.8499	0.782235
2013	Q1	1.410987	12640.24	15298.23	-179.176	-4462.69	472.2953	0.692993
	Q2	1.481605	12660.18	15346.83	-194.591	-4437.94	464.5352	1.186463

year	quarter	lnP	lnRM	lnM2	lnGDPG	lnNEER	lnOP	lnOPN
	Q3	1.94591	12698.74	15372.97	-191.692	-4468.78	470.953	1.260984
	Q4	2.00148	12735.39	15414.39	-106.471	-4453.18	472.5616	0.726431
2014	Q1	1.410987	12739.56	15462.64	-154.756	-4458.06	469.4097	0.294068
	Q2	1.481605	12763.2	15510.45	-179.176	-4468.66	469.6837	0.567296
	Q3	1.94591	12830.21	15543.7	-164.866	-4479.95	464.3429	0.989681
	Q4	2.00148	12807.79	15581.94	-170.475	-4498.36	431.7488	1.664426
2015	Q1	1.757858	12805.29	15618.26	-160.944	-4516.34	397.0292	1.260984
	Q2	1.94591	12872.71	15660.04	-177.495	-4562.68	414.7885	1.260984
	Q3	1.808289	12880.26	15677.77	-179.176	-4634.44	393.3784	0.726431
	Q4	2.00148	12903.88	15704.04	-174.047	-4628.69	375.4199	0.294068