

**CAPITAL FLOW VOLATILITY, FINANCIAL DEEPENING AND  
CAPITAL MARKET PERFORMANCE IN LOW-INCOME COUNTRIES**

**A thesis submitted in fulfilment of the requirements for the degree of**

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University of KwaZulu-Natal

Westville, Durban.

South Africa

**KUZIVA MAMVURA**

(215081310)

Supervisor: Professor M. Sibanda

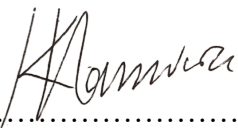
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**May 2018**

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## **DEDICATION**

**This thesis is dedicated to:**

My wife Isabel

My children Kuziva (jnr), Kudzai, Kupakwashe and Kundai

My Father and Mother

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## ABSTRACT

This study sheds light on the sources and impact of foreign capital flow volatility and its directional linkages with financial deepening and capital market performance in low-income Southern African Development Community (SADC) countries. It employs decomposed quarterly data on net foreign capital flows for a period spanning 16 years from 2000 to 2015. Decomposed net capital flows capture the dynamics of both inflows and outflows while taking domestic and foreign investors' contribution to the dynamics of capital flow volatility into account. The study is unique in that it uses contemporary panel data regression methods to investigate the behavior of capital flow volatility, financial deepening and capital market performance in low-income SADC countries.

Firstly, the panel autoregressive distributed lag (P-ARDL) model reveals that both portfolio flow and remittance flow volatility are significantly determined by domestic price level, money supply, real Gross Domestic Product (GDP) and interest rates. Global GDP significantly affects portfolio volatility but has no significant effect on remittance volatility. Only domestic and global interest rates are negatively related to remittance and portfolio volatility in these economies. Secondly, the panel vector error correction model (P-VECM) investigation reveals a bi-directional relationship between remittance flow volatility and financial deepening and also indicates a one-way causal relationship from portfolio flow volatility to financial deepening. Finally, the panel vector autoregression (P-VAR) model finds that global shocks are rapidly transmitted to the domestic economy and not vice versa. Shocks in portfolio volatility account for significant variations in money supply and lead to a decline in general price levels from the short run to the long run. Additionally, changes in remittance volatility impact directly and significantly on domestic interest rates and consumer price levels. Remittance volatility impacts positively on real GDP while portfolio volatility exert negative pressure in SADC countries. In order to achieve stable and constant capital flows, policy makers should adopt programs that lead to financial growth, price and interest rate stability. Given the paucity of macro-financial studies on the region, the study provides meaningful empirical evidence on the behavior and impact of portfolio and remittance flows in low-income SADC countries.

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## LIST OF ACRONYMS

ADF	Augmented Dickey Fuller
AIC	Akaike Information Criteria
AR	Auto-Regression
ARCH	Autoregressive Conditional Heteroskedacity
AREAR	Annual Report on Exchange Arrangement and Exchange Restrictions
ARIMA	Autoregressive Integrated Moving Average
ARMA	Autoregressive Moving Average
CBOE	Chicago Board Options Exchange
CML	Capital Market Liberalization
CMP	Capital Market Performance
CPI	Consumer Price Index
CSD	Cross Sectional Dependency
DOLS	Dynamic Ordinary Least Squares
ECM	Error Correction Model
EMDEs	Emerging Markets and Developing Economies
EWMA	Exponential Weighted Moving Average
FD	Financial Deepening
FDI	Foreign Direct Investment
FFR	Federal Funds Rate
FPE	Final Prediction Error

GARCH	Generalized Autoregressive Conditional Heteroskedacity
GDP	Gross Domestic Product
GFC	Global Financial Crisis
HQIC	Hannan Quinn Information Criteria
IFS	International Financial Statistics
IMF	International Monetary Fund
IN	Interest Rate
LLC	Levin Lin and Chu
LM	Lagrange Multiplier
LR	Likelihood Ratio
MS	Money Supply
MTO	Money Transfer Operator
NFPI	Net Foreign Portfolio Investment
NFR	Net Foreign Remittance
ODA	Official Development Assistance
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
P-ARDL	Panel Autoregressive Distributed Lag
P-VAR	Panel Vector Autoregression
P-VECM	Panel Vector Error Correction Model
RGDP	Real Gross Domestic Product

RW	Rolling Window
SADC	Southern African Development Community
SBIC	Schwarz Bayesian Information Criteria
SSA	Sub-Saharan Africa
SV	Stochastic Volatility
TGARCH	Threshold Generalized Autoregressive Heteroskedasticity
TSW	Tramo Seats for Windows
US	United States
VAR	Vector Auto-Regression
VIX	Volatility Index
WB	World Bank
WGDP	World Gross Domestic Product

# CHAPTER 1 : INTRODUCTION

## 1.1 INTRODUCTION

This chapter lays the foundation for empirical investigation of the predictors of net foreign capital flow volatility and the dynamic causal linkages with financial deepening and the performance of capital markets in low-income SADC economies. It also presents the background and context of the study, including the research objectives.

The rapid expansion and dramatic reversal of foreign financial flows to emerging economies, particularly portfolio flows, since the early 1990s has renewed the discourse on the functions and performance of foreign capital flows at the global level (Kaminsky, 2007). Foreign capital flow volatility, particularly the sudden withdrawal of such capital, has caused widespread financial crises (Hegerty, 2011b). According to Bluedorn, Duttagupta, Guajardo and Topalova (2013), the variability of foreign capital flows is an unavoidable fact confronting economic policy makers in both emerging and advanced economies, and needs to be managed. The major concern is that the strong fluctuations in capital flows described in the literature as episodes can impact adversely on economies. Furthermore, an International Monetary Fund (IMF) conference stressed that the major vulnerabilities and risks in the global economy lie in foreign capital flows (Shinohara, 2013, Walker, 2013). Large and unpredictable waves of capital lead to excess or insufficient liquidity, currency mismatches, and exchange rate appreciation and inflation pressures in recipient countries (Forbes and Warnock, 2012, Ahmed and Zlate, 2014). Furthermore, Friedrich and Gueri (2016) noted that strong fluctuations in capital flows cause economic distortions and policy challenges. The situation is exacerbated by significant changes in the composition and importance of capital flows (Becker and Noone, 2008, Pagliari and Hannan, 2017). Given this background, a detailed investigation of the variability of global financial flows and their impact in developing economies is required in order to provide meaningful information to economic policy makers. This need is more pronounced in low-income countries, which by their nature and categorization experience low standards of living, poverty, financial exclusion, and heavy reliance on donor and foreign capital flows for economic survival.

The focus on SADC low-income countries is motivated by the need to address the wide range of economic and financial challenges encountered in these economies. Low-income economies are confronted by high poverty levels as a result of low per capita income of less than USD1045.00 (World Bank, 2014), shallow and narrow financial markets (Allene and Giovannetti, 2011, Aye, 2013), high levels of public debt that rose from 34% of GDP in 2013 to 48% of GDP in 2016 and persistent current account deficits averaging 8% of GDP (IMF Regional Economic Outlook, 2017). While some SADC members are well-endowed with natural resources or are connected to regional trading routes and have the potential to become the financial hub of Southern Africa, others in this bloc such as Democratic Republic of Congo, Madagascar, Malawi and Zimbabwe are classified as fragile countries (IMF Regional Economic Outlook, 2017). Because of their fragile condition, they have low capital absorption capacity and low resilience to contain the pro-cyclical response of capital flows and economic shocks (Allen and Giovannetti, 2011). Although the region managed to escape the adverse effects of the global financial crisis (GFC) due to weak integration with global markets (Otchere, Senbet, and Simbanegavi, 2017), economic policy makers are concerned that another financial crisis might adversely affect it. These low-income countries have low financial depth and are highly vulnerable to capital fluctuations (Allen, Otchere, and Senbet, 2011). All these factors point to the need to establish how low-income countries in the SADC region respond to foreign capital flows and financial deepening.

More specifically, upward trends in fiscal and current account deficits as well as poverty and unemployment have presented significant challenges to low-income SADC economies. For instance, the deteriorating fiscal position surpassed 7% of GDP in Mozambique, Zimbabwe, Zambia and Swaziland, with only Lesotho recording a marginal surplus of 0.1% of GDP in 2017. Based on the African Development Bank (AfDB) 2018 report, such deterioration is expected to continue in 2018 and 2019. In terms of current account deficits, Lesotho and Mozambique recorded the highest external imbalances of 15.9% and 30.9%, respectively. In both absolute and relative terms, these levels of fiscal imbalances are too high when compared to other economies in sub-Saharan Africa.

In addition, the SADC low-income markets are characterized by small size, poor liquidity, a lack of financial infrastructure and high concentration (Bundoo, 2017). The SADC Statistics Yearbook (2013), reveals increased reliance on migrant remittances and portfolio flows to bridge the

savings-investment deficit and drive economic growth. However, the region experienced a sharp decline in capital flows due to low commodity prices and liquidity crises. For instance, Mozambique experienced a 20% decline while Zambia recorded a 70% fall (World Investment Report, 2017). Capital flows to Southern Africa are expected to increase by 10% in the future, driven by non-foreign direct investment (FDI) flows. This segment in the SADC bloc can be used as a pilot case to understand the behavior of undeveloped and marginalised financial markets or economies.

This study is further motivated by the lack of development or sophistication of capital markets in low-income SADC countries that require long term funding to bridge the savings-investment gap. According to Dahou, Omar and Pfister (2009), this situation needs to be addressed by policy makers and researchers as narrow and illiquid capital markets that lack varied financial instruments hamper access to long term finance. There is need to examine the impacts of financial development in attracting foreign investment flows and stabilising domestic markets. According to Nokaneng (2013) and Allen and Ndikumana (2000), the performance of the SADC economies is directly related to the performance of their capital markets. It is anticipated that further elimination of trade restrictions will broaden and deepen mobility of capital flows and financial integration. In contrast, Bara, Mugano and Le Roux (2016), state that financial development negatively affects the performance of SADC economies mainly as a result of undeveloped financial systems. There thus seems to be a lack of consensus on the role of financial development in economic performance in the SADC region.

Although the SADC capital markets are not fully integrated, the countries share a common objective as stipulated in the SADC Protocol on Finance and Investment which emphasises the need to develop capital markets and promote macro-economic stability (Bundoo, 2017). While Bundoo (2017) notes, that capital markets are an alternative source of long-term finance, African markets are perceived to be excessively risky, illiquid and undeveloped. However, Seleteng, Bittencourt, and Van Eyden (2013) observe that few macro-economic studies have focused on SADC members, particularly low-income countries.

Given the scarce literature on capital flow volatility, many questions remain unanswered. For instance, what are the effects of changes in volatility in low-income SADC countries and is there a stable and predictable relationship between volatility, financial deepening and the performance

of capital markets? The capital flow volatility, financial deepening and capital market performance nexus is important in order to determine how sudden and unpredictable changes in capital flow volatility impact adversely on low-income economies. To date no evidence has been produced that confirms the relationship between foreign capital flow volatility, financial deepening and the performance of capital markets, which is hypothesised in this study to be causal.

The behavior of the three concepts of capital flow volatility, financial deepening and capital market performance have not been previously studied together, but have been individually examined, mainly in relation to economic growth (Neumann, Penl, and Tanku, 2009, Broto, Díaz-Cassou, and Erce, 2011, Hegerty, 2011a, Wang, Marsh, Goyal, Raman, and Ahmed, 2011, Chakrobarty, 2014). To date no consensus has been reached on the nexus or lack thereof. Furthermore, the respective influence of these three concepts on a range of economic and financial variables has been tested with considerable variation in results. Analysing the three concepts together is more informative to economic policy makers as capital flows have been observed to enter the economy via the stock or debt markets and affect the level of money in circulation.

This study is distinct in that it employs decomposed net portfolio and net remittance flows that capture the contribution of both domestic and foreign investment players to capital flow volatility dynamics. Gross capital flows have been identified as good for short-term predictions while net capital flows are long-term in nature and reflect the overall position of the balance of payment position (Milesi-Ferretti and Tille, 2011, Obstfeld, 2012, Bluedorn et al., 2013a). Based on Engle and Rangel (2008) and Broto et al. (2011), this study utilises a superior measure of variability derived from absolute values of model residuals, unlike most previous studies that adopted the rolling widow standard deviation (Engle and Rangel, 2008, Broto et al., 2011). Furthermore, it employs contemporary panel data analysis techniques such as the panel Auto Regressive Distributed Lag (P-ARDL) to identify the sources of volatility. Finally, the researcher is not aware of any study that has quantitatively examined the impact of changes in remittance and portfolio flow volatility, particularly in low-income SADC countries.

## **1.2 BACKGROUND AND CONTEXT OF THE STUDY**

During the past two-and-a-half decades, foreign capital flows have fluctuated drastically across the globe, affecting both developed and developing countries, with volatility, particularly sudden

withdrawals, leading to worldwide crises (Hegerty, 2011a). Growth in capital flows and further integration of global financial markets have occurred simultaneously, with increased foreign capital flow volatility leading to serious policy challenges for the financial sector and overall economy (Forbes, 2012, Forbes and Warnock, 2012). This led to an increase in observed core movement across equity markets in most developing economies such as Asia (Forbes, 2012). Between 1990 and 2010 several authors and policy makers lamented sudden increases in the magnitude and volatility of foreign capital flows, particularly those of a short-term nature across the world (Prasad, 2014, Bluedorn et al., 2013b, Forbes and Warnock, 2012, Sula, 2010, Becker and Noone, 2008, Caballero and Krishnamurthy, 2006). These fears were confirmed at the onset of the GFC in 2008 when sudden stops and reversal in foreign capital flows were experienced, initially in advanced economies, but spreading to the developing world. While capital flows regained upward momentum and started to recover in 2009, they once again fell heavily in late 2011 due to the intensification of the European sovereign crisis (Bluedorn et al., 2013a).

However, the behavior of net capital inflows was somewhat different among advanced and emerging market economies. It was observed that volatility in net capital flows tracks that of gross flows in developing economies, while in developed economies, net flows are fairly stable due to the offsetting effect of outflows (Bluedorn et al., 2013b). Similarly, Nakagawa and Psalida (2007) show that net capital flow volatility is lower in advanced economies than in developing countries where net flows track gross capital flows. Because inflows and outflows in developed countries are unconditionally correlated, they tend to offset each other. Furthermore, Sarisoy-Guerin (2003) stresses that inflows and outflows of foreign capital are unconditionally correlated in advanced economies; hence they offset each other.

The mobility of capital flows has been observed to be significantly influenced by the level of globalization and integration of domestic markets into global capital markets. Increased globalization and integration into international capital markets leads to some compromises among exchange rates, monetary policies and free capital mobility (Obstfeld, Shambaugh, and Taylor, 2005). Obstfeld and Taylor (2004) bemoaned this trilemma as major phases of capital mobility were experienced in developing economies. It was also observed that capital market liberalization leads to high mobility in capital flows since the government loses the ability to use exchange rates and monetary policy to pursue its economic and financial targets. In low-income SADC countries,



excessive booms and busts in capital flows can easily lead to bubbles and financial crises (Kaminsky, 2005). The major concern of policy makers, investors and scholars is that global capital flows are excessively sensitive to external variables that are outside the control of domestic policy makers (Bluedorn et al., 2013). Large phases of capital flow mobility have widespread repercussions in even the biggest economies such as the US, and have become a serious issue for policy makers and investors, particularly in low-income countries with shallow and narrow markets. For instance, sudden fluctuations in foreign capital flows in the presence of a managed exchange rate system can trigger inflation (Kaminsky, 2005). Increased uncertainty regarding the magnitude of fluctuations in foreign capital flows raises the need to develop a comprehensive model that can accurately predicate and explain the volatility as well as ascertain its dynamic impact in these economies. Deeper understanding of capital flow dynamics will enhance decision making and promote the development of sound investor friendly policies.

In the wake of economic and financial crises, such as the turbulence in East Asia and recent global financial crises, extreme volatility has been observed to be the most challenging behavior of global financial flows (Obstfeld and Taylor, 2004, Carp, 2014). Although large inflows of foreign capital signal a boom in domestic markets, they may also be a good recipe for a financial crisis, especially in developing economies with less developed financial markets that have limited absorption capacity. According to Carp (2014) and Forbes and Warnock (2012), large sudden inflows pose risks and financial instability problems when they reverse drastically. For instance, during the Asian crisis, reversal of capital flows was more severe, strong and identical in magnitude to that observed during the debt crisis when total flows to Latin America fell by 31% in 1998 and 47% in 1999 (Carp, 2014). In Asia the sudden stops and reversals were more acute as capital flows fell from a net inflow of USD120 billion in 1996 to net outflow of USD50 billion. Furthermore, short term flows decreased significantly from a positive net inflow of USD52 billion to a negative net inflow of USD92 billion in 1998. On the other hand, short term net flows to Latin America fell from positive USD30 billion to negative USD31 billion in 2000. While the earlier crises were very significant, the GFC (the subprime crisis) of 2007/8 was the most severe since the Great Depression (Carp, 2014). Serven and Nguyen (2010) note that it was very different from the crises of the 1980s or 1990s due to its higher magnitude, strong impact and geographical distribution. The resultant global imbalances and instability could lead to substantial decline in foreign financial inflows followed by trade collapse and a decline in commodity prices. However, Carp (2014)

points out that global mismatches are also a result of economic policy failure and may cause volatility of foreign capital flows. Furthermore, volatility of global financial flows can be exacerbated by globalization and liberalization of domestic markets (Carp, 2014, Kaminsky, 2005), even though the efficiency and productivity of the financial and real sectors increase.

International capital flow variability is regarded as a very serious issue as it can significantly and adversely impact on the broad macro-economic and financial systems of both developing and developed countries (Pagliari and Hannan, 2017). Despite the limited empirical literature on this subject, the variability of international financial flows is one of the major threats to the efforts of policy makers and investors because it is not only difficult to estimate, but severely affects the macro-financial and real sectors of an economy (Broto et al., 2011, Neumann et al., 2009). Furthermore, there is no global consensus on the drivers of foreign capital flow volatility among the global, financial and macro-economic variables. Research on volatility of foreign capital flows is confronted by several complicated challenges. For instance, Lo Duca (2012b) observes that the drivers of capital flow volatility are time varying as their level of significance changes across time and across sections. Alfaro, Kalemli-Ozcan, and Volosovych (2004) pointed out that the sources of volatility of capital flows vary depending on the sample and period studied.

Although capital account liberalization and the integration of domestic markets into global markets have been identified as drivers of volatility, a number of factors have been observed to cause extreme variability in both developed and developing countries (Pagliari and Hannan, 2017). Firstly, emerging markets and developing economies (EMDEs) receive capital flows that are larger than their absorption capacity with regard to the depth and breadth of their financial markets (Pagliari and Hannan, 2017). Secondly, developing countries have smaller, less stable domestic economies and shallow, less diversified financial markets that are more vulnerable to shocks than advanced economies. Furthermore, due to the structural and institutional features of these countries, economic or financial shocks, whether positive or negative, domestic or global, are rapidly transmitted and amplified in developing economies. Finally, as a result of the recent GFC, concerns have been raised that foreign financial flows to developing economies are very sensitive to global or push factors beyond the control of domestic policy makers (Broto et al., 2011, Neumann et al., 2009).

In terms of the measurement of capital flow variability, previous studies used the rolling window standard deviation over some period of time (Neumann et al., 2009, Alfaro et al., 2004, Broner and Rigobon, 2004b). However, due to the increasing significance of capital flow volatility, approaches that assist in accurately predicting volatility are required to provide a deeper understanding of capital flow volatility dynamics, particularly in low-income countries. This study thus focuses on the volatility of some unique components of international capital flows, especially net foreign portfolio flows and net foreign remittance flows. It adopts a contemporary approach to estimate net capital flow volatility that uses the absolute values of residuals pioneered by Engle and Rangel (2008) and empirically proven by Broto et al. (2011).

Increased magnitude and volatility of foreign capital flows was observed in the run up to the 2008 GFC as sudden reversals were experienced across the globe because capital took safe haven in the US due to increased risk (Arora, Habermeier, Ostry, and Weeks-Brown, 2013, Ostry, Ghosh, Chamon, and Qureshi, 2012). Surges in inflows and disruptive outflows have increased significantly in both magnitude and volatility in recent times, contributing immensely to the global monetary system (Ostry et al., 2012). Rapid growth and a high degree of mobility in capital flows can pose serious policy challenges and dilemmas in developing countries since they also provide important benefits such as promoting financial sector competitiveness and efficiency, enhancing productivity and smoothing consumption (Arora et al., 2013). Due to rapid financial integration in recent years, both trade and capital flow linkages have increased drastically, leading to growth in financial flows among advanced, emerging and developing economies (Akçelik, Başçı, Ermişoğlu, and Oduncu, 2015). Overall, global capital flows have important, but varying effects and implications for economic and financial stability in individual countries and globally. According to Arora et al. (2013), capital flows carry risks which can be magnified by gaps in an economy's financial and institutional infrastructure. Gross flows have been found to be of greater significance in advanced economies while net capital flows are key to both advanced and emerging economies (Arora et al., 2013). These economies have to manage the macro-financial stability risks associated with fluctuations in capital flows. Policy instruments that can be used to address such risks include monetary, fiscal and exchange rate management policies as well as sound supervision and regulation of institutions.

Regarding the impact of financial liberalization, the past two decades have witnessed rapid growth in domestic financial markets as a greater percentage of capital has crossed international boundaries (Ahmed and Zlate, 2014, Becker and Noone, 2008). At the same time, there has been a significant increase in both inflows and outflows of capital in both magnitude and as a percentage of GDP, and large variations in response to changes in international markets (World Bank Global Economic Prospects, 2014). Developing countries benefit immensely from an increase in capital flows and financial integration when they occur gradually over time. However, this has not been the case, as capital flows and global financial integration have occurred simultaneously with an increase in capital flow volatility, posing significant challenges to the financial sector and macro-economy. As a result, there is ongoing debate in policy and academic circles regarding the costs and benefits of globalization (Alfaro et al., 2007).

Although free capital flows across national boundaries have been deemed beneficial to both advanced and developing economies due to their effect on the efficiency of resource allocation and economic growth, they have largely been huge and volatile, causing distortions in financial markets and abrupt economic policy changes (Ahmed and Zlate, 2014, Becker and Noone, 2008, Alfaro et al., 2007, Sethi, 2013). It is against this background that John Maynard Keynes voiced concern over the benefits of free capital flow mobility during the introduction of the Bretton Woods system (Alfaro et al., 2007). A review of the crisis in Mexico in the early 1990s, followed by the Asian debt crisis of 1997 and the recent GFC revived debate on the merits of globalization and financial integration due to their implications for capital flow mobility and the stability of financial markets. These crises, particularly the GFC, raised important questions regarding the stability effects of financial deepening or financial development given that the GFC originated in developed economies where the financial sector is very large and complex (Sahay, Cihak, N'diaye, Barajas, Pena, Bi, Gao, Kyobe, Nguyen, and Saborowski, 2015).

Due to the potential harmful effects of free capital mobility, globally, more effort is now being directed towards stabilization of capital flows and capital markets (Alfaro et al., 2007). However, attaining such an objective requires the backing of sound scientific studies that can assist in quantifying and explaining the variability of international financial flows as well as ascertaining the dynamic effects of changes in capital flow fluctuations on the real economy or macro-financial environment. This is particularly important in low-income countries that cannot afford to be

burdened with more economic uncertainty. According to Lane and McQuade (2014), sudden fluctuations in global capital flows are harmful as they affect macro-financial stability, and transmission of monetary and fiscal policies. Furthermore, capital market liberalization opens a country's economy up to foreign investment flows which may broaden and deepen domestic financial markets, but could expose the country to the fickleness of such flows (Bluedorn et al., 2013a).

As noted above, the GFC and the Asian debt crisis are notable examples of the adverse effects of the high degree of free capital mobility around the globe. Over time, the increase in capital flows and integration of global financial markets can provide significant benefits to host countries (Forbes and Warnock, 2012). However, policy challenges have emerged due to sudden surges in capital flows and increased global financial integration, which have occurred simultaneously with the increase in capital flow volatility in developing countries. Unstable capital flows are of great concern to policy makers as they can create serious problems and uncertainty in both domestic and global markets, particularly in low-income countries that are characterized by shallow and narrow markets. To this end, Forbes and Warnock (2012) *articulated fluctuations in financial flows by identifying four episodes that are linked to extreme capital flow variability, that is, 'surges', a sharp increase in capital inflows driven by foreigners; 'stops', a sharp decrease in capital inflows driven by foreigners; 'flight', a sudden increase in capital outflows driven by domestic players and 'retrenchment', a sudden decrease in capital outflows driven by domestic players.* Although sub-Saharan African (SSA) markets were spared the turbulence that affected other emerging and developed markets in the 2008/2009 GFC, the risk remains of foreign capital flow volatility that may overwhelm the relatively shallow SSA markets (Alleyne et al., 2014). Devereux and Saito (2006) note that, SSA countries experienced a massive build-up of external assets and liabilities denominated in different currencies, asset classes or maturity structures for both developed and to a lesser extent developing economies. In the US, the GFC led to a sudden and huge build up of foreign portfolio flows, pushing the treasury bill rate to an all time low and leaving economic policy makers or market players confused as to what really drives foreign capital (Egly, Johnk, and Liston, 2010).

Low-income countries require foreign private capital flows to finance the savings-investment gap (Karimo and Tobi, 2013) and ultimately boost economic growth and development. However,

studies have confirmed the destabilizing effects of capital flows that encompass widespread macro-financial implications such as exacerbating production and trade cycles, increasing fragility of financial markets, and fuelling the instability of the macro-economy (Forbes and Warnock, 2012, Mihaljek, 2008). Evidence that fluctuations in global capital flows are greater and more difficult to manage in developing than in developed economies (Broto et al., 2011, Broner and Rigobon, 2004b) further motivated this study. By focusing on net capital flow variability in low-income economies and its interaction with the financial and production sectors of the economy, the study complements and updates the limited literature on foreign capital flows.

Until very recently, some scholars were of the view that low-income and African economies receive very insignificant foreign capital flows (Bhinda and Martin, 2009). Although such flows are small relative to global figures, ranging between 5 and 20% of total developing country inflows (Singh et al., 2008), the amounts that they receive are large relative to the size of their economy and are as unstable as they are in major developing markets such as Argentina, Brazil, Russia and Turkey (Bhinda and Martin, 2009, Martin and Rose-Innes, 2004). Given this, emerging countries have been affected by capital flow induced financial crises and low-income countries cannot be insulated from the effects of capital flow volatility, especially given their shallow and narrow financial markets.

Bhinda and Martin (2009) note that in March 2009, G20 leaders pledged anti-shock financing of USD1.1 trillion with USD50 billion targeted at low-income countries to curb the effects of sudden capital flow fluctuations during the GFC. Depending on the magnitude of capital flow volatility, the risk of volatility negatively affecting low-income countries is high; policy makers thus need to know how to respond to such vulnerabilities (Bhinda and Martin, 2009, Martin and Rose-Innes, 2004). Besides being low-income countries, the countries selected for this study have made great strides towards deregulating domestic financial markets and reducing restrictions on capital markets in order to attract more foreign financial flows (IMF, 2008). Given the pace and magnitude of the mobility of international financial capital to the developing world, Ostry (2012) proposes the need to reintroduce capital controls to mitigate the risks emanating from financial vulnerability. During the GFC, large inflows of capital to Asian and Latin American economies exerted pressure on currency rates, inflating credit and product prices and thereby increasing fragility and eroding trade competitiveness (Cesa-Bianchi, Cespedes, and Rebucci, 2015).

In terms of financial development, there is substantial evidence that the degree of financial growth is a significant estimator of economic growth (Levine, 2005). However, an important sign of financial growth is the depth and breadth (financial deepening) of a country's financial markets. In relation to the deepening of financial markets in developing countries, foreign capital flows play a critical role in supporting a higher degree of investment and growth. The performance of the stock market is a critical predictor of an economy's overall performance as it also assists in the price discovery system and efficient allocation of long-term resources. However, it has been argued that it is more likely that rapid financial growth will lead to both economic growth and financial instability, highlighting the need to impose some speed limits especially in the absence of proper regulatory frameworks (Sahay et al., 2015, Cornelius, 2011). According to Winkler (2009), rapid financial deepening in South Eastern Europe led to macro-financial stability challenges as inflation pressure increased and international trade deficits were near double digits, causing sudden stops and reversal in capital flows and creating an Asia-like crisis (Winkler, 2009). There is evidence of rapid financial deepening in developing economies as the total financial assets held now exceed 200% of GDP and with the aid of financial integration, foreign capital flows have increased substantially (Cornelius, 2011). Furthermore, the surge in foreign remittances and portfolio flows may have direct or indirect implications for the financial and economic sectors of both the developed and developing world (Chowdhury, 2011). In light of this, there is need to examine if the relationships among the variables capital flow volatility, financial deepening and the performance of capital markets, is causal.

Portfolio flows are short-term in nature, highly unstable and more sensitive to changes in global conditions, while remittances are relatively stable and are counter-cyclical as they increase during economic downturns in developing countries (Chowdhury, 2011, Singh, Haacker, Lee, and Le Goff, 2011). Because capital flows have been observed to improve global allocation of resources, several economies have opened their capital markets and trade so as to further attract capital flows (Alfaro et al., 2007, Becker and Noone, 2008). Despite the significant benefits accruing from capital flows, Rigobon and Broner (2005) argue that capital flow volatility to developing economies is higher due to a number of factors. These include the high susceptibility of developing economies to build up mismatches, which create continuous shocks and higher global contagion. Capital flow volatility in developing countries is 80% higher than in developed economies. Furthermore, numerous scholars have pointed out that when capital flows are dominated by short-

term flows such as portfolio flows, they can interfere with the operation of domestic monetary and financial systems, causing instability and adversely affecting economic growth (Forbes and Warnock, 2012, Mercado Jr and Park, 2011, Di Giovanni, 2005, Chuhan, Claessens, and Mamingi, 1998). While the majority of studies on volatility of capital flows bemoan the dangers of such volatility, Prasad (2013) argued that it is not a bad thing; rather, the extent and direction of volatility is important as it tends to be pro-cyclical (a bad thing) rather than counter cyclical (a good thing).

There is considerable empirical literature on the cyclical behavior of foreign capital flows, particularly in emerging economies. The evidence suggests that net foreign financial flows are volatile and positively correlated with economic performance; that is, they decline during crisis periods. This behavior is more pronounced in the upper quartile of middle-income economies, resulting in the coining of the term “sudden stops” to refer to the significant decreases in net capital inflows that are often associated with financial and economic crises (Broner, Didier, Erce, and Schmukler, 2013). Recently, emerging economies have become the preferred location for foreign capital flows and domestic investors have also started investing abroad (Obstfeld, 2012). Given these findings, this study focuses on the volatility of net flows which are the financial counterpart to the current account balance (Bluedorn et al., 2013a) and can assist in investigating capital flows from a long-term view (Obstfeld, 2012). On the other hand, gross capital flows are mainly important in identifying episodes as they can be drivers of credit and asset prices, affecting domestic financial market stability (Obstfeld, 2012, Milesi-Ferretti and Tille, 2011). Although previous studies did not capture large differences in absolute values, gross capital flows have been observed to be more volatile and pro-cyclical than net flows (Bluedorn et al., 2013a, Broner et al., 2013, Forbes and Warnock, 2012), especially in developed economies. In addition, net capital flows have been observed to be more turbulent in emerging economies than in advanced economies where they are more stable as a result of the offsetting effects of capital outflows (Duttgupta, Bluedorn, Guajardo and Topalova, 2011).

Low-income countries suffer from a persistent savings-investment deficit as well as a lack of financial depth (Karimo and Tobi, 2013, Mailafia, 2005), resulting in the need for foreign capital flows to fund the resource gap and to provide foreign currency to stimulate economic growth (Obstfeld, 2009, Dell'ariccia, Mauro, Faria, Ostry, Di Giovanni, Schindler, Kose, and Terrones,



2008). However, large volatile flows can cause severe distortions in the operation and performance of financial markets and in the process negatively influence policy formulation, especially in developing countries (Ahmed and Zlate, 2014).

Foreign remittances are funds received from migrants working abroad and are an important channel for the movement of capital from developed to developing countries (Ratha, 2005b, Buch and Kuckulenz, 2004, Agarwal and Horowitz, 2002). They tend to be relatively stable at aggregate levels while flows to individual economies show a high degree of volatility (Jackman, 2013). Thus, remittance dependent economies may be vulnerable to sudden changes in these flows which can cause financial market and economic instability. Very little empirical research has been conducted on whether foreign remittances promote financial growth across recipient countries (Demirgüç-Kunt, Córdova, Pería, and Woodruff, 2011, Aggarwal, Demirgüç-Kunt, and Peria, 2011). Although foreign remittances are emerging as a significant and arguably the most stable source of external finance that has grown relative to other sources of external finance (Jackman, 2013, Kapur, 2003), it is crucial to determine the causes of volatility and its effects on developing financial markets. When appropriately used, foreign remittances can increase liquidity in financial markets and have significant, positive long-run impacts on economic growth (Mundaca, 2009). On the other hand, reliance on remittances can lead to the Dutch disease effect, where investment shifts from the manufacturing sector to the agricultural sector (Buch and Kuckulenz, 2004). Furthermore, Chami et al. (2003) argue that the moral hazard problem in foreign remittances is extreme and can impact negatively on economic performance. In contrast, portfolio flows of capital are often regarded as volatile and short-term in nature, but form an important source of foreign private capital in any economy (Karimo and Tobi, 2013).

The following discussion focuses on the history of foreign capital flows, their increase in magnitude and the causes of the sudden surges, stops and reversals based on findings from Sula and Willet (2009).

### **1.2.1 CAPITAL FLOWS: A HISTORICAL PERSPECTIVE**

Given the challenges that most developing and developed economies experience with regard to sudden surges, stops and reversals in capital flows, there is need to analyze the history of foreign capital flows. According to Sula and Willett (2009), the surge in international financial flows can be traced to the 1970s when a remarkable boom was experienced in emerging economies. The

sudden rise in international capital flows was driven by a number of factors, including the oil shock of 1973 to 1974, the introduction of the Eurodollar market and the significant increase in global bank lending during the period 1979 to 1981 (Sula and Willett, 2009). Latin America was the major recipient of these large inflows of international capital in the form of bank lending that reached USD44 billion in 1981 (representing 6% of the region's GDP). However, international lending came to a sudden halt in 1982 due to the significant increase in global real interest rates to levels not reached since the 1930s. The late 1980s saw the resurgence of international bank lending as flows to Latin America made a serious comeback as well as surges in capital flows to Asia. During these surges, the composition of capital flows was altered, with FDI and portfolio flows replacing bank lending. International bank lending to both Asia and Latin America fell from 70% of total private capital flows in the 1970s to about 20% in the 1990s. Foreign direct investment flows became the most significant source of foreign financial capital for both regions as portfolio flows increased substantially in the late 1990s, accounting for almost 40% of total foreign capital flows. In dollar value terms bond and equity flows to Asia surged to USD27 billion in 1993 and reached USD69 billion in Latin America in 1994. Similar to the 1980s, booms in the 1990s were followed by sudden reversals of capital as witnessed in the aftermath of the Mexican currency crisis of 1994. Capital flows to Asian countries were not affected as the crisis was confined to a small number of Latin American economies. However, a more severe crisis was experienced in 1997 during the Asian financial crisis which was amplified by the Russian default of 1998 and the Brazilian crisis of 1999. During the Asian crisis the sudden stop and reversal of capital flows were more substantial and sustained than in Latin America. Capital inflows fell from USD120 billion to an outflow of USD50 billion in 1998. In terms of short-term portfolio flows (debt and equity) to Asia, the fluctuations were huge and drastic, falling from USD52 billion in 1996 to an outflow of USD92 billion in 1998. Similarly, short-term flows declined from an estimated USD30 billion in 1996 to a negative flow of USD31 billion in 2000 (Sula and Willett, 2009).

In comparison, debate continues to rage on the reasons for the 2008 reversal and subsequent rise in international financial flows (Fratzscher, 2012). Using a factor model and high frequency portfolio flows to 50 countries, Fratzcher (2012) reveals that changes in global liquidity and risk contributed significantly to fluctuations in foreign capital flows both during the crisis and in the recovery period. However, significant heterogeneity was observed across countries and was attributed to variations in the nature of domestic institutions, country risk and the soundness of the

macro-economy. It was concluded that global or external variables were the main drivers of foreign capital flows during the crisis, while domestic economic fundamentals were significant during the recovery period (Fratzscher, 2012).

### **1.2.2 CHANGING COMPOSITION OF CAPITAL FLOWS TO DEVELOPING COUNTRIES**

Since the year 2000, there have been dramatic increases in foreign capital flows from the private sector (Sayeh, 2011). Globally, private capital flows to the emerging and developing world increased from USD151 billion in 2002 to USD 1.7 trillion in 2007, while net capital flows rose from USD 49 billion to USD 674 billion during the same period (Chea, 2011). Portfolio debt and equity flows also increased drastically. Given these developments and contrary to conventional wisdom, bilateral and international financial institutions are no longer the main sources of external funding for investment in developing economies (Dorsey, Tadesse, Singh, and Brixiova, 2008, Chea, 2011). In the 1990s, the sensitivity of private capital flows to opportunities in developing economies began to rise as a result of both internal (pull) and external (push) factors. Furthermore, foreign remittances from migrant workers abroad have arguably become the largest source of finance for the developing world, more than treble the magnitude of official development assistance (ODA) (Ratha, Mohapatra, and Silwal, 2010, Chea, 2011). Remittances are unilateral transfers or gifts by migrant workers sent to family or friends back home (Chea, 2011). Foreign remittances increased from USD19 billion in 1980 to an estimated USD265 billion in 2007. In 2007, foreign remittances to SSA amounted to USD19 billion, constituting 2.5% of regional GDP and a similar amount to the ODA received by the region. On a global scale, foreign remittance flows to Sub-Saharan Africa are significantly smaller as they constitute only 5% of aggregate remittances to developing economies and in terms of contribution to GDP, SSA is overshadowed by the huge remittances received in the Middle East and South Asia (Dorsey, Brixiova, Singh, and Tadesse, 2008). Six of the 25 largest recipients of remittances in 2007 were African countries, i.e. Cape Verde, Comoros, Lesotho, Senegal, Sierra Leon and Togo (Chea, 2011, Ratha, Mohapatra, and Silwal, 2010,). However, SSA recorded the third largest percentage of GDP. As remittances can enter an economy via financial markets such as equity and debt markets, the following section sheds light on the significance of capital markets, particularly to SADC countries.

### **1.2.3 IMPORTANT DEFINITIONS**

It is crucial to provide definitions of capital flow vocabulary. This study adopts definitions provided by Gabriele, Baratav and Parikh (2000), which are in line with IMF balance of payment terminology in order to enhance understanding of the dynamics of foreign capital flows. *Capital inflows* refer to purchases of domestic assets by non-residents and sales are regarded as negative inflows. *Net capital inflows* are defined as purchases minus sales of domestic assets by non-residents. On the other hand, *capital outflows* pertain to purchases of foreign assets by residents and sales are treated as negative outflows. Accordingly, *net capital outflows*, is the difference between purchases and sales of foreign assets by residents. Overall, *net capital flows*, is the sum total of net capital inflows plus net capital outflows.

### **1.2.4 SIGNIFICANCE OF CAPITAL MARKETS**

Although low-income SADC financial markets are adjudged to be shallow and narrow, they have undergone some significant changes over the past couple of decades from the traditional bank-based system to a system dominated by capital markets (Aye, 2013). Given the limited level of development in these economies, there is a need for quality information to assist economic policy makers and other stakeholders involved in policy formulation and implementation to adopt measures that broadly address overall financial sector and economic sector performance.

In general, capital markets comprise of equity markets and long-term debt markets. However, this analysis focuses on equity markets due to the lack of data or the lack of organized exchange markets for debt securities in low-income SADC countries. There has been a considerable increase in the number of organized stock markets, particularly in the emerging markets of Southern Africa (Andrianaivo and Yartey, 2010). In Africa, new stock exchange markets were recently established in Ghana, Malawi, Uganda and Zambia. Before 1989, there were only five stock exchanges in SSA and three in North Africa. The establishment of stock exchanges in African countries is vital as it boosts domestic savings as well as increases the quantity and quality of investment, thereby accelerating economic growth (Andrianaivo and Yartey, 2010). Capital account liberalization and the establishment of stock markets are viewed as part of the trend of global liberalization. Furthermore, the establishment of stock markets provides avenues through which companies can raise cheaper equity capital. When these markets operate efficiently,

dissemination of investment information is more efficient, considerably reducing the costs of information (Andrianaivo and Yartey, 2010).

Moreover, the establishment and growth of stock exchange markets promote bank competition and create diversity among financial institutions. The lack of competition in low-income countries is indicated by the large difference between low deposit rates for investors and high interest rates for borrowers (Applegarth, Kansteiner, and Morrison, 2004). An increase in the number of financial market players, boosts liquidity, which is also linked to economic growth. Recent evidence has shown that economies with liquid markets experience higher investment rates and more productivity benefits (Applegarth, Kansteiner, and Morrison, 2004).

The development of capital markets also creates a legal and regulatory framework that leads to increased transparency, sound corporate governance and efficient information dissemination. However, critics of the stock market stress that market prices may not accurately reflect the underlying fundamentals, especially with the emergence of speculative bubbles driven by irrational behavior (Binswanger, 1999). In this regard, mere discounting of future cash flows such as dividends cannot determine market prices. This scenario can be magnified in low-income SADC countries with poor regulatory frameworks and higher macro-financial volatility.

### **1.2.5 CLASSIFICATION OF WORLD ECONOMIES**

The World Bank (WB) classifies and reviews world economies on the 1<sup>st</sup> of July each year based on estimated gross national income (GNI) per capita for the previous year. These GNI estimates are crucial as they are also used by the WB to determine lending eligibility.

As at July 1, 2014, low-income countries had a GNI per capita of USD1045.00 or less, middle-income economies had more than USD1045.00 but less than USD12746.00 and high-income countries had GNI per capita of USD12746.00 or more. Lower quartile middle-income and upper quartile middle-income economies are separated at GNI per capita of USD4125.00. Based on this classification, the following section lists and classifies the SADC countries into low-, middle- and high-income economies. This classification is very important to this study which focuses on volatility of capital flows in low-income SADC countries.

### **1.2.6 SADC COUNTRIES**

The SADC is a regional block that currently comprises 15 countries with great potential in terms of production and international trade and occupies the sub-Saharan African region. The countries are Zimbabwe, Zambia, Angola, Botswana, Democratic Republic of Congo (DRC), Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, and Tanzania. Their size differs significantly, and they are marked by diverse endowments, different linkages to trade routes (some are landlocked), and different land and population sizes as well as varying government policies and business environments. Capital markets are also important to the SADC region, as they provide avenues to raise long-term finance to fund long-term projects and social development programs. The bloc aims to establish harmonized securities markets throughout the region to attract domestic and foreign investment and to be able to compete at global level. To achieve this, in 1997, SADC established the Committee of SADC Stock Exchanges (CoSSE) to monitor and facilitate the operation of the region's stock exchanges. Table 1.1 below, presents development indicators for the SADC countries and classifies them based on GNI per capita.

**Table 1.1: SADC Development Indicators (2014)**

Country	Population in millions	GDP in billion USD	GDP growth	Inflation	Per capita income (USD)	Income level
Zimbabwe	15.2	13.6	3.20%	-0.20%	895.00	Low income
Zambia	15.7	27.07	6.00%	7.80%	1724.00	Lower middle
Tanzania	51.8	49.1	7%	6.10%	948.00	Low income
Swaziland	1.2	3.4	2.50%	5.70%	2833.00	Lower middle
South Africa	54	349.8	1.50%	6.40%	6478.00	Upper middle
Seychelles	0.09153	1.4	2.80%	1.40%	1529600	High income
Namibia	2.4	13.4	4.50%	5.40%	5583.00	Upper middle
Mozambique	27.2	16.3	7.40%	2.60%	599.00	Low income
Mauritius	1.2	12.6	3.60%	3.20%	10500.00	Upper middle
Malawi	16.7	4.2	5.70%	24.40%	251.00	Low income
Madagascar	23.5	10.5	3%	6.10%	447.00	Low income
Lesotho	2.1	2	2%	5.30%	952.00	Low income
DRC	74.8	32.9	9.00%	1.60%	440.00	Low income
Botswana	2.2	15.8	4.40%	4.40%	7182.00	Upper middle
Angola	24.2	131.4	3.90%	7.30%	5430.00	Upper middle

**Source: World Development Indicators, July 2014: <https://data.worldbank.org/products/wdi>**

Overall, these development indicators point to sound economic growth in the SADC bloc as all the countries recorded a significant growth rate. Furthermore, except for Malawi at 24 %, they all recorded single digit inflation. Despite these positive macro-economic fundamentals, the region is characterized by a significant number of low-income economies, as seven of the 15 SADC countries were classified as low income while two were lower middle-income economies as at July 1, 2014.

### **1.3 RATIONALE FOR RESEARCH ON LOW-INCOME SADC COUNTRIES**

This section explains why this research study focuses on low-income SADC financial markets, given the level of underdevelopment of its capital markets (Bist, 2018, Aye, 2013, Dorsey et al., 2008). Foreign capital flows to low-income economies are a poorly understood and poorly researched study area (Dorsey et al., 2008). Given this, the concept of capital volatility particularly in low-income SADC countries, is unique and requires attention to be able to fully address the vast challenges of high poverty levels, unemployment, savings-investment deficits and budget deficits that affect these economies. According to Dorsey et al. (2008), research on capital flows has concentrated on large emerging markets as low-income countries account for a small proportion of between 5 and 20% of total inflows to developing countries.

The region is of interest as it comprises developing countries that are characterized by low-income financial markets that are transforming and deepening fairly rapidly (Griffith-Jones, Karwowski, and Dafe, 2014, Bist, 2018). In addition, global investors who aim to earn above normal returns target such markets but have to contend with the level of risk. Policy makers and investors require quality information to support their investment decisions and choices. Furthermore, this study can provide a basis to compare the effect of capital flow variability in developed and developing economies, especially low-income SADC economies.

The SSA region in which the SADC countries lie is significantly influenced by investor perceptions of the region (Saurombe, 2017, Bhinda, Leape, Martin, and Griffith-Jones, 1999). Such perceptions range from negative bias to those that believe that SSA is the new and final frontier, making it the last region of opportunity.

The African region is hampered by negative perceptions that lead to under-investment (Aye, 2013, Bhinda et al., 1999). Although some of these perceptions are real, many signals are misrepresented. Thus, global market players become '*Afro euphoric*' when they are excited about Africa in good times and '*Afro pessimistic*' when they have negative feelings about the continent when things go wrong. However, Saurombe (2017) notes significant improvement in investor perceptions and the SADC region is now the second most attractive investment destination in Africa. The lack of quality investment information on low-income markets noted by most global investors is cause for concern and Africa is urged to market itself (Bhinda et al., 1999). The sub-Saharan African region is considered to be caught in a vicious circle of poor information, low expectations and low



investment. The findings from this study will offer the empirical evidence required to provide critical and valuable investment information on the behavior of key macro-financial variables in low-income SADC countries. Finally, global investment players need to contend and be comfortable with the levels of risk associated with investing in these markets that are deemed illiquid and underdeveloped and lack robust regulatory frameworks as well as innovative financial products such as synthetic derivatives (Aye, 2013).

#### **1.4 STATEMENT OF THE PROBLEM**

There is abundant empirical literature on the drivers of the magnitude or direction of gross or total foreign capital flows with respect to developed and major developing markets. However, empirical analysis of the behaviors of disaggregated net portfolio and net remittance flows appears to have been overlooked, especially their variability and financial linkages with the development and performance of capital markets with respect to low-income economies. Foreign portfolio and remittance flows are an invaluable and critical source of external funding for developing countries to fund the savings-investment gap (Karimo and Tobi, 2013). These flows can enter the mainstream economy via money and capital markets, particularly when they are motivated by investment objectives. In order to attract increased capital flows, several developing countries have liberalized trade and financial markets and opened capital accounts, leading to further integration with the global financial system and increased cross-border movement of capital (Menyah, Nazlioglu, and Wolde-Rufael, 2014, Ahmed, 2013, Bumann, Hermes, and Lensink, 2013). These economies stand to benefit immensely from the free mobility of international capital but expose themselves to global financial risks as portfolio and remittance flows may fluctuate considerably and unpredictably. Sudden growth in the magnitude and volatility of capital flows occurring simultaneously with rapid financial deepening can pose threats to the performance and stability of under-developed economies and financial markets. Policy makers and investors require quality information to guide them in achieving stable markets and formulating sound investment strategies that maximize returns at lower risk. However, the dilemma faced by market players is that there is no clear indication of when and to what extent international financial flows will fluctuate and affect the entire economy. There is a lack of consensus on which variables have the most significant effect on observed capital flow volatility. Another dilemma encountered in low-income SADC countries is that they are dominated by shallow and narrow financial markets with low absorptive capacity, but depend heavily on foreign investment flows, which can be highly volatile, to finance

the savings-investment gap. Inevitably, low-income economies are exposed to sudden surges in foreign investment flows, leading to further fragility and a higher possibility of a financial crisis. Although these markets are adjudged to be shallow and narrow, they are currently undergoing rapid transformation and financial deepening. As a result, market players are concerned that rapid financial growth combined with existing vulnerability to global shocks as well as regulatory lapses expose these markets to serious risks. Investors and the authorities thus require empirical evidence on the dynamic effects of changes in capital flow volatility on the macro-financial and productive sectors of the economy. Understanding the directional or causal relationships between capital flow volatility and financial deepening can assist in unmasking hidden challenges and informing policy directions.

### **1.5 AIM AND OBJECTIVES OF THE STUDY**

The overall aim of this study is to quantitatively identify and explain the factors underlying net capital flow volatility and investigate the dynamic effects of net capital flow volatility in low-income economies. In addition, the study analyzes the causal or directional relationships among capital flow volatility, financial deepening and stock market performance in the SADC region in order to enhance understanding of foreign capital flow dynamics and the operation of financial markets. The study seeks to achieve the following specific objectives:

- i) To ascertain the main predictors of net foreign capital flow volatility in low-income SADC countries.
- ii) To establish the short-run and long-run causal relationships among net capital flow volatility, financial deepening and capital market performance.
- iii) To evaluate the dynamic impact of changes in net foreign capital flow volatility in low-income SADC economies.

### **1.6 RESEARCH QUESTIONS**

The study seeks to answer the following research questions:

1. What are the drivers of net foreign portfolio investment (FPI) and net foreign remittance (FR) flow volatility in low-income SADC countries?
2. What are the short-run and long-run dynamics among volatility, financial deepening and capital market performance in low-income SADC countries?

3. What are the dynamic impacts of changes in net foreign capital flow volatility in low-income SADC countries?

## **1.7 SIGNIFICANCE OF THE STUDY**

This study makes numerous contributions to the body of knowledge. Firstly, to the best of the researcher's knowledge, this is the first quantitative and comprehensive investigation of net foreign capital flow volatility in low-income SADC countries that analyses the behavior of volatility, financial deepening and stock market performance together. It targets the volatility of decomposed capital flows, namely, net foreign portfolio and net foreign remittance flows. Despite the recent surges, stops and reversals in capital flows in major developing countries, there is a dearth of research on capital flow volatility in low-income countries. Hence, the study aims to complement and extend the scanty literature on the volatility of international financial flows, particularly in the context of low-income economies.

Previous researchers focused on the volatility of gross capital inflows (Neumann et al., 2009, Broto et al., 2011, Broner et al., 2013, Broner and Rigobon, 2004b), while this study investigates the volatility of net portfolio and net remittance flows with respect to low-income economies. Obstfeld (2012) noted that increasing numbers of domestic investors in developing countries are investing abroad even though international investors are attracted to these economies. Similarly, Bluedorn et al. (2013b) found that increased diversification of domestic investment abroad may be a source to hedge capital flow volatility. The authors add that gross outflows have a significant offsetting effect on gross inflows, mainly in developed markets. Hence, the emphasis on net capital flows in this study is considered justifiable and relevant as data is sourced from low-income economies. Net capital flow data is vital in that it reflects the overall position of the current account and is long term in nature. More importantly, net financial flows capture both domestic and international investors' contribution to financial and economic performance or stability so that specific can be formulated.

Furthermore, this study investigates the volatility of disaggregated net capital flows in order to determine whether portfolio and remittance flows can individually or jointly form a stable source of finance in low-income SADC economies. The change in composition of capital flows has seen portfolio and remittance flows making a growing contribution over the past two decades.

Regarding volatility approximation, the study uses a contemporary approach whereby volatility is measured from the absolute values of model residuals (Engle and Rangel, 2008). The robustness of this approach was empirically confirmed by Broto et al. (2011), who applied it to capital inflow data. Broto et al. (2011) concluded that the residuals approach produced superior results compared to the GARCH (1.1) and the rolling window standard deviation methods. Consequently, this study aims to provide accurate, valuable and up-to-date information to both domestic and international investors on the volatility dynamics of portfolio and remittance flows in the selected low-income markets. Furthermore, our measure of volatility is considered to be more robust and superior to previous estimates in that it is based on net capital flows which capture the contribution of both domestic and foreign investors and are long term in nature as they reflect the overall position of the current account in the balance of payment.

In achieving its three main objectives, the study employs unique and contemporary dynamic panel data methods, namely panel autoregressive distributed lag (P-ARDL), the trivariate panel vector error correction model (P-VECM) and panel vector auto regression (P-VAR) so as to provide quality information as well as enrich the literature on low-income economies. These are unique and recent econometric models that are ideal for the study. In the field of investment theory and practice, this study is expected to inform and advance ongoing debate on what drives capital flow volatility as well as its dynamic interactions with the macro-financial and productive sectors of the economy.

This is a comprehensive study on capital flows which investigates net capital flow variability that can pose serious threats to the stability and performance of developing financial markets. The large body of existing empirical literature concentrates on drivers of the size of capital flows. The concept of remittance volatility is also still fairly new in the study of capital flows (Jackman, 2013). Further motivation for the study lies in recent empirical findings that drivers of foreign capital flows have differential and time varying effects across different types of flows and across cross-sectional units (Lo Duca, 2012b).

Financial deepening is a recent phenomenon in low-income countries, and no specific studies have yet been carried out to test if the relationship between capital flow volatility and financial deepening is causal, particularly with respect to low-income SADC countries. The literature on

financial deepening has focused on its links with economic growth or savings (Odhiambo, 2008, Ang, 2010, Nwachuku, 2009, Levin, 2005, Shaw, 1973, Schumpeter, 1911) in emerging markets.

Finally, low-income markets are less sophisticated, shallow and narrow, with limited financial instruments (Aye, 2013), but have the potential to become future emerging markets. Although Broner and Rigobon (2004b) found that the variability of foreign capital flows is much higher in developing countries than in developed countries, the role of deepening financial markets has to be incorporated.

## **1.8 LIMITATIONS AND ASSUMPTIONS OF THE STUDY**

Firstly, the study is confined to low-income SADC countries which are confronted by an array of problems such as narrow and illiquid financial markets, huge fiscal and current account deficits, and high poverty levels and unemployment rates, yet have great potential to become the financial or trading hub of Southern Africa. However, it is assumed that its outcomes would be a fair representation of low-income economies across the globe. Secondly, the use of unbalanced panel data does not negatively influence the study's findings as the missing observations are believed to be of no material effect. Finally, while the study focuses on net portfolio and net remittance flows, gross capital flows are also vital in revealing volatility dynamics, especially episodes during times of sudden fluctuations.

## **1.9 OVERVIEW OF THE THESIS**

Chapter 2 analyses the theoretical and empirical literature that underlies the study. The literature on portfolio and remittance volatility as well as the concept of financial deepening is reviewed. Chapter 3 outlines the data, data sources and research methodology employed. Chapter 4 analyses the results by running the P-ARDL model to determine the sources of net capital flow volatility in low-income countries. It analyses the panel ARDL results and its suitability in determining the drivers of portfolio and remittance volatility in low-income countries. Chapter 5 presents the P-VECM analysis of the relationship among net capital flow volatility, financial deepening and capital market performance in line with the second objective. Chapter 6 analyses the dynamic effects of changes in net capital flow volatility in low-income SADC countries using P-VAR and Chapter 7 summarizes and concludes the study.

## **1.10 CONCLUSION**

This chapter presented the background to the study as well as the problem statement and the research objectives and questions. It noted that free large movement of capital flows can pose serious problems and policy challenges to both developed and developing economies. However, such challenges can be more pronounced in developing countries, especially low-income economies characterized by narrow and shallow financial markets. Given this background, the extensive review of the theoretical and empirical literature in Chapter 2 assists in highlighting the observed financial linkages and the challenges identified in previous studies.

## **CHAPTER 2 : LITERATURE REVIEW**

### **2.0 INTRODUCTION**

The previous chapter laid the foundation for this study of capital flow volatility and financial deepening in low-income SADC countries. It highlighted the background to the study and its major research objectives. This section reviews the theoretical and empirical literature on capital flows, particularly volatility of portfolio and remittance flows. Theoretical explanations of the process of financial deepening, mobility and the variability of international financial flows are reviewed. The available empirical literature on the sources of remittance and portfolio flow volatility is also discussed. Finally, the theoretical and empirical premises used to estimate capital flow volatility in low-income SADC countries are examined. The following section reviews the theoretical and empirical literature that explains the growth, cross border mobility and volatility of capital flows as well as certain financial linkages.

### **2.1 NEO-CLASSICAL MODEL OF FOREIGN CAPITAL FLOWS**

Earlier studies explained international financial flows (primarily portfolio investment) as pure arbitrage involving interest rate, while later contributions, based on the neoclassical model, regarded them as an outcome of international differences in marginal revenues (Frenkel, Frunk, and Stadtmann, 2000; Hossein, 2005). The standard neo-classical model indicates that foreign financial flows should move from advanced economies with high capital to labor ratios to developing economies with low capital to labor ratios. If capital were to flow freely, new investments would only occur in poor economies until the return on investment is equalized across all countries. Furthermore, as noted by Gourinchas and Jeanne (2013), foreign financial flows to developing countries are determined by their productivity, that is, countries with higher productivity should receive more net capital inflows. However, foreign capital also flows from poor to rich countries; this is known as the Lucas Paradox. Lucas (1990) argued that if the neo-classical model was true, the incremental product of capital in India was supposed to be 58 times higher than that of the US in 1988. All capital was supposed to flow from the US to India but in reality, this did not occur. Despite the increase in capital flow mobility over the past few decades, movement of foreign capital from rich to poor countries has been much lower than that predicted by standard neo-classical theory (Alfaro, Kalemli-Ozcan, and Volosovych, 2005, Alfaro, Kalemli-

Ozcan, and Volosovych, 2008). This can arguably be explained by differences in institutional quality between rich and poor countries as well as differences in fundamentals (technology and government policy) and international market imperfections (sovereign risk and information asymmetry). Despite developing economies' significant growth potential, capital flows out of these economies in search of better value in the developed world (Caballero and Krishnamurthy, 2006). The extreme version of the Lucas Paradox occurs when foreign capital does not move to developing countries with fast growing economies and high productivity of capital and creditworthiness. Although capital has higher returns in developing than in advanced countries, it does not flow there due to market failures. This violates the general economic theory which postulates that foreign capital chases high interest. The portfolio-based theory of balance of payment account discussed below focuses on the structure of national foreign currency positions and how they determine the flow of capital across the globe.

## **2.2 PORTFOLIO THEORY OF INTERNATIONAL CAPITAL**

The recent surge in external assets and liabilities among countries has renewed interest in the development of portfolio-based theories of foreign capital and current account. According to the portfolio theory of international capital, the nature and extent of foreign currency content in domestic investment portfolios is a key factor in promoting capital flow mobility among countries (Devereux and Saito, 2006). Given a two-country scenario, each country selects an optimal portfolio of bonds after factoring in both nominal and real risks. In this case, current account shortfalls are funded by net foreign capital flows which reflect the relative movement in gross assets and liabilities, but can be equilibrated by rises in offshore financing. The stability of global wealth distribution is promoted by movements in net capital flows that generate changes in risk premiums on a country's liabilities and assets. Accordingly, Obstfeld (2014) argues that sound strategies for balance of payment adjustment cannot be defined without paying attention to the structure of domestic portfolios.

## **2.3 THE PORTFOLIO BALANCE FRAMEWORK**

Garg and Dua (2014) examined the determinants of foreign portfolio investment in India and showed that portfolio flows are partially influenced by the portfolio balance model in which global financial flows are driven by the existence of the zero-arbitrage condition. The portfolio balance theory was pioneered by Fernandez-Arias (1996) and Fernandez-Arias and Montiel (1996) who



modeled portfolio flows using a zero-arbitrage condition. It suggests that investors diversify portfolio holdings between domestic and foreign financial assets comprising bonds, or equity depending on expected rates of return (Dominguez and Frankel, 1993). The theory also stipulates that the risk adjusted expected return in the receiving country is equal to the forgone returns from investing in the home country. In this model, foreign capital flows are influenced by economic factors in both the capital exporting country and the capital importing country as well as the creditworthiness of the receiving economy.

On the other hand, Magud, Reinhart and Rogoff (2011) developed a portfolio balance approach to capital controls and showed that short-term measures assist in determining the nature of capital flows, create monetary policy autonomy and manage volumes of inflows. This model is designed to explain the results of introducing capital flow measures tailored for both inflows and outflows. It assumes a two-period environment that can receive capital inflows in period  $t$  of magnitude  $CF_t$ . Foreign capital flows can either be short term,  $St$ , or long term,  $Lt$ . The random real rate of return on  $Lt$  is  $r$  and on  $St$  is  $r^*$ . The major assumption being  $r^* > r$ . Hence  $CF_t = St + Lt$ . Given that short term flows represent a portion,  $x$ , of total capital flows  $St = xCF_t$ , where  $x$  is a product of the optimizing behavior by international investors. As a result of the random nature of rates of return on each capital flow the optimization challenge can be dealt with by solving utility maximization with respect to the means and variance-covariance (Magud et al., 2011). Using the above equations, the parameters of the model can be determined by solving these equations to ascertain the portfolio composition of capital flows.

## **2.4 DISEQUILIBRIUM APPROACH TO FOREIGN CAPITAL FLOWS**

In contrast to the neo-classical theory and the theory of international capital, Moody and Taylor (2004) proposed the disequilibrium approach where the determinants of supply and demand for capital flows are crucial in dictating the direction of the flow of global capital in developing economies. The theoretical appeal of the disequilibrium approach is that capital flows might plausibly not be responsive to interest rate movements as a result of credit rationing; hence, the markets will fail to clear. It has been argued that interest rates might not always clear credit markets when lenders have inadequate information about borrowers' creditworthiness, or their risk aversion as a result of information asymmetries may mean that the market fails to clear at a given price. This leads to disequilibrium where the drivers of flows change over time depending on

whether the size of foreign financial flows is determined by demand or supply (Mody and Taylor, 2004).

## **2.5 CAPITAL FLOW LIBERALIZATION**

Having analyzed the important theories that support the free mobility of foreign capital flows, it is critical to explain the role and significance of capital market liberalization (CML). Free mobility of capital flows is made possible when markets are liberalized. The IMF (2012) defines capital flow liberalization (sometimes referred to as capital account or CML) as the removal of restrictions that aim to limit the flow of foreign financial flows. It also entails unlimited convertibility of domestic currency in international financial transactions. However, some prudential measures might be kept in place for purposes of achieving financial stability and national security. Other scholars define capital flow liberalization as deregulation of financial markets and opening up of the capital account (Kaminsky and Schmukler, 2008). Existing evidence points to the need for a well-planned and well-sequenced model of capital account opening along with complementary policy reforms in the real sectors (Mohan and Kapur, 2010).

Since the beginning of the mid 1980s, several sub-Saharan African nations such as Ghana, Botswana, Kenya, Mauritius, Malawi and Zimbabwe have reformed their financial systems and opened capital accounts as a way to set their economies free (Keck and Piermartini, 2005, Moriera, 1999). During the same period the IMF suggested that its charter be amended to include a mandate to promote liberalization of capital markets. There is extensive empirical literature on the drivers of foreign financial flows and the merits or demerits of capital account liberalization. Significant contributions in this area of study include Dell'Ariccia et al. (2008), Obstfeld (2009) and Kose et al. (2009) who show both the benefits and risks of CML. However, some scholars have argued that CML leads to increased risks and financial market volatility and does not promote economic growth and financial stability (Stiglitz and Ocampo, 2008). Furthermore, in an IMF paper, Prasad (2003) publicly acknowledged the risks associated with CML. It is apparent that short-term speculative flows increase in volatility and can become a source of financial crises in emerging markets. Even where a financial crisis is not a direct result of volatile capital flows, global capital mobility promotes the spreading of a financial crisis (Stiglitz and Ocampo, 2008). In addition, Stiglitz and Ocampo (2008) stress that CML has failed to boost economic growth and has instead promoted financial instability, with the poor bearing the greatest burden. The use of traditional

economic policy tools has been made difficult by unpredictable and volatile flows as they also lead to higher consumption volatility that can result in welfare losses. However, proponents of CML argue that even though liberalization might not provide the desired results, the costs of intervention measures are very significant. According to Prasad (2014), an ideal economy with a liberalized capital account is characterized by fairly stable financial flows. Macro-economic fundamentals drive the economy and net capital flows behave counter cyclically and cushion domestic cycles.

### **2.5.1 MERITS AND DEMERITS OF CAPITAL FLOW LIBERALIZATION**

Financial liberalization has created new channels for resource transfers from developed to developing countries, but it has also generated conditions wherein such transfers can easily be reversed with serious consequences in terms of instability (Gabriele et al., 2000). These flows have been observed to be confined to a small group of countries and many developing countries have faced an acute shortage of foreign funding, while the few that have some degree of access to global finance are confronted by the challenges of volatility and sustainability.

The liberalization of foreign capital flows has been cause for concern since the financial crises of the late 1990s and is distinct from the liberalization of trade flows (Akçelik et al., 2015). The empirical literature has debated the positive or negative effects of short-term capital flows, giving rise to two distinct views, with many others in between. The first school of thought supports the view that the liberalization of global financial flows promotes economic performance. In contrast, opponents of this view argue that there is no connection between capital account openness and the growth of the economy (Akçelik et al., 2015). For instance, Stiglitz and Ocampo (2008) and Stiglitz (2004) argue that, in most cases, the liberalization of foreign capital flows has led to increased economic instability. In between these two opposing views, are scholars who stress that capital account liberalization has both benefits and costs, but the benefits are maximized when countries achieve a certain level of institutional development. However, most countries have begun to introduce capital flow measures (CFMs) to manage the adverse impacts of volatile capital flows, particularly those of a short-term nature. Notably, liberalization of capital flows has often been followed by financial crises (Dell'Arricia et al., 2008, Pinto and Ulatov, 2010). The risks associated with capital account openness can be severe in economies that have yet to reach significant levels of financial institutional growth (Akçelik, Başçı, Ermişoğlu, and Oduncu 2015). Other scholars believe that inherent capital flow volatility, reflected most severely in sudden stops

(Calvo and Reinhart, 1999), hot money (Stiglitz, 2000) and capital flight leads to adverse effects particularly during economic downturns in economies with limited absorptive capacity (Kose, Prasad, and Terrones, 2003) and low investor protection (Lemmon and Lins, 2003).

Well before the GFC, several countries had adopted plans to liberalize cross border capital flows and had progressed fairly rapidly, especially in emerging Europe, China and India. While the speed of liberalization declined slightly with the start of the global crisis, the general trend across the globe is to increase free movement of capital flows. Capital flow management systems have been observed to cause more costs and problems to the overall economy such as increasing indiscipline in financial markets and public finances; reduced availability of external funding and misallocation of financial resources and have also deprived investors of diversification opportunities (Stiglitz and Ocampo, 2008). However, the move towards free cross border mobility of capital flows shows countries' appreciation of the positive role played by foreign capital flows. At the household or firm level, foreign financial flows promote the efficiency of resource distribution and the performance of local financial markets (Obstfeld, 2009). Foreign direct investment inflows improve technological advancement and information dissemination. Removal of global capital flow restrictions is more beneficial and less risky if an economy's financial sector has attained a certain threshold level of development (Kose, Prasad, Rogoff, and Wei, 2009, Dell'Arriccia et al., 2008,). Given this, liberalization of capital flows can promote financial and institutional growth, but it requires good planning, timing and sequencing to ensure that the merits of capital flow management exceed the costs (IMF, 2012; 2012a). However, previous studies' failure to find a positive relationship between growth and liberalization could be the result of incorrect hypothesis specification (Henry, 2007) and lack of recognition of the indirect benefits of financial openness for economic growth, such as macro-economic discipline and financial development (Kose et al., 2009). It could also be due to lags in the impacts of capital flow liberalization on growth. Some economies such as China and India have experienced continuous economic growth despite relatively closed capital accounts (Kose et al., 2009, Prasad, Rogoff, Wei, and Kose, 2005). In summary, it is important to note that the advantages of liberalization are highest when economies have attained a specific level of financial market growth (Dell'Arriccia et al., 2008, Kose et al., 2009, Prasad and Rajan, 2008, Alfaro et al., 2004). Nonetheless, liberalization can expose economies to significant risks, especially when a sufficient level of financial market growth is not attained. This was the case in the Mexican 1994-95 crisis; the Russian crisis of 1998 and the Asian

crisis of 1997-98 (Dell'Arricia et al., 2008, IMF, 2012a, Prasad and Rajan, 2008, Kose et al., 2009). There is need to carefully manage liberalization as exceeding the thresholds for financial and institutional development can lead to rapid capital flow fluctuations. Large and volatile financial flows are risky even to advanced markets with highly developed financial markets (IMF, 2012b). However, Mishkin (2009) points out that financial liberalization can indirectly promote financial deepening and that foreign banks encourage competition and institutional quality. In addition, institutional reforms promote improved financial reporting and disclosure. Dell'Arricia et al. (2008) support these views through case studies of Czech Republic, Estonia and Lithuania. The findings of previous studies on the impacts of capital flow liberalization are mixed, with a new strand of literature vigorously opposing full capital flow mobility. Magud, Reinhart, and Rogoff (2011) further argue that, given capital controls, an economy is able to maintain an independent monetary policy and is able to determine the composition of foreign capital flows.

In terms of the correlation between capital flow liberalization and economic performance, there is ongoing debate on the positive or negative effects of short-term financial flows. Proponents of free cross border mobility of capital flows support the idea that financial liberalization promotes economic growth (Asongu and De Moor, 2017, Prasad et al., 2005). However, opponents of such a policy argue that there is no correlation between capital account opening and gross domestic product (GDP) (Stiglitz, 2004). Scholars whose views fall in between these extremes have argued that liberalization of the capital account has both benefits and costs which are influenced by the level of institutional development (Pinto and Ulatov, 2010, Dell'Arricia et al., 2008). According to Kaplan and Rodrick (2001), capital flow controls can be beneficial as was the case with the Asian and Malaysian crises.

Globalization of financial markets and the volatility of international capital flows impact on the operations of domestic and world financial markets (Carp, 2014). In addition, free mobility of global capital flows has promoted interdependence between global markets, spurring growth in related economies. The positive effects of globalization can be achieved through introducing and maintaining sound macro-economic policies, robust financial regulation and sound supervision frameworks. In most cases, financial crisis has been preceded by huge foreign capital inflows, with destabilizing effects on domestic markets. For example, the 2007 subprime crisis was characterized by market failure and market distortions (Carp, 2014).

## **2.5.2 RATIONALE FOR CAPITAL CONTROLS AND THE FOUR FEARS**

As a result of the adverse impacts of free capital mobility, policy makers are inclined to introduce some capital flow controls so as to deal with unpredictable fluctuations in international financial flows (Magud, Reinhart, and Rogoff, 2011). Tax laws, supervisory restraint and regulation of financial transactions have been used time and time again to address undesirable volatile external forces (Magud, Reinhart, and Rogoff, 2018). While such measures can be used to deal with violent episodes of capital flows, Magud et al. (2011) identify some fears caused by variability in large capital flows.

### **2.5.2.1 FEAR OF APPRECIATION**

The first is fear of currency appreciation as indicated by Calvo and Reinhart (2002). Large capital inflows exert upward pressure on the value of domestic currency, making local products uncompetitive in the international market, particularly relative to competitors that are deemed an unattractive investment destination. Calvo and Reinhart (2002) describe this appreciation in domestic currency value as the ‘fear of floating’. Similarly, Levy-Yeyati and Sturzenegger (2007) refer to it as the ‘fear of appreciation’. It has been observed that an increase in foreign investment inflows in an economy, leads to a rise in foreign currency reserve accumulation that supports a stronger exchange rate (Magud et al., 2018).

### **2.5.2.2 FEAR OF HOT MONEY**

Sudden global financial flows, especially in least developed countries, can lead to initial dislocation that is reflected in challenges associated with the sudden withdrawal of foreign capital flows. Hot money fluctuates significantly over the short-term period. Temporary global financial flows have been observed to be the most volatile; hence, James Tobin’s suggestion to put controls or speed limits on the wheels of international finance. Higher taxes can also be introduced to discourage the rapidity of inflows.

### **2.5.2.3 FEAR OF LARGE INFLOWS**

In this instance, policy makers in emerging economies do not universally distrust the providers of international capital flows. Furthermore, not all capital flows are regarded as hot money; rather, the volume of the capital flow matters. As highlighted by Calvo, Leiderman, and Reinhart (1994), a huge and indiscriminate flow of capital may cause disruptions in the financial system. Large foreign capital flows may lead to asset bubbles and may promote unnecessary risk taking by cash

rich domestic players (Magud et al., 2011). Economic policy makers may again obtain recourse from taxation.

#### **2.5.2.4 FEAR OF LOSS OF MONETARY AUTONOMY**

Given that the expectations of international investors and domestic policymakers are not always in line, it is not feasible to have a fixed exchange rate, monetary policy autonomy and open capital markets all at the same time (Magud et al., 2018, Frankel, 2003). If monetary flexibility is to be achieved, something has to be sacrificed. However, in light of the above-mentioned fear of floating, capital mobility is sacrificed in most instances rather than surrendering monetary policy autonomy (Magud et al., 2011). Some forms of capital controls are intended to manage exchange rate pressures that arise from large inflows and also assist in regaining monetary flexibility. Additionally, economic policy makers sometimes introduce capital controls to deal with capital flight, though they may lack effect when the fear of devaluation or default is significant enough.

#### **2.5.3 CAPITAL FLOW VOLATILITY RANKING**

In general, if time series data for a certain type of financial flow displays high volatility, that financial flow is regarded as ‘hot’ and there is a high probability of a sudden reversal in the event of a crisis (Sula and Willett, 2009). Several statistical approaches can be used to estimate volatility, beginning with traditional standard deviation computations and progressing to complex methodologies such as Kalman filtering, VAR, GARCH models and SV models. In order to compare and contrast the different types of capital flows, Claessens, Dooley, and Warner (1995) investigated the difference between the variability of short-term and long-term global capital flows using the simple standard deviation and coefficient of variation approaches. Based on the volatility estimates, the results reveal no significant differences. To validate their outcomes, Claessens et al. (1995) undertook further tests to investigate the persistence of various types of flows by considering their autocorrelations, half-life responses and the predictability of capital flows using the autoregressive model. Minimal evidence was found to support the existence of any significant differences among different types of international capital flows. Interestingly, it was observed that the variability of total flows is less than variability of its individual elements, implying that capital flows are highly exchangeable. Furthermore, it was revealed that there is a significantly negative relationship between long-term and short-term financial flows. In general, the main conclusion of this study is that there are no substantial differences between the time series properties of short-

and long-term capital movements. Whether long- or short-term, all capital flows are equally volatile and unpredictable (Claessens et al., 1995). In contrast, Chuhan et al. (1998) show different volatility results for the period 1985 to 1994. However, initial persistence tests produced results identical to Claessens et al.'s (1995) observations and show few significant differences across flow types. Furthermore, Chuhan et al. (1998) point out that identical univariate patterns among series can mask significant differences in the event that one capital flow type influences another and this can be detected when the data is analyzed together. Chuhan et al. (1998) employ Granger causality tests to show that short-term capital flows follow other flows but FDI does not. The results further reveal that short-term inflows are more responsive to fluctuations in short-term inflows in other countries than FDI flows. The composition of international capital flows thus matters. Univariate similarities were observed in the sample, but it was demonstrated that they mask real differences.

On the other hand, the IMF (1999) employs the coefficient of variation of net foreign capital flows to analyze variability and finds that while direct investment flows are the least volatile, long-term capital flows have also been observed to be as unstable as short-term capital flows. Gabriele et al. (2000) utilize the coefficient and the standard deviation approaches to examine the variability and stability of global capital flow types during the period 1975-1998. They find that overall instability increases with direct investment flows and that sudden withdrawal of FDI from East Asian countries during the Asian crisis contributed to the crisis. Utilizing Granger causality tests, Gabriele et al. (2000) show that both inflows and outflows of varying types of foreign capital flow in one direction during crisis periods and in opposite directions in stable periods. The major conclusion by Gabriele et al. is that short term flows are highly unstable, and that all international financial flows contribute to the stability or instability of the economic and financial environment.

Sula and Willett (2009) highlight that the weakness of previous research is the limited period over which volatility studies have been conducted. In addition, these studies concentrate on time periods characterized by huge flows and incorporate minimal statistics on recent financial crises in developing countries. However, when variability is estimated for a bigger period without a distinction between crisis and non-crisis periods, different elements of capital flows are assumed to behave in a similar way in both periods (Sula and Willett, 2009).

An important finding in the study of international financial flows is that the standard deviation method can be problematic and biased if capital flows are not stationary (Sula and Willett, 2009).



The coefficient of variation (ratio of standard deviation to the mean), indicates an estimate of variability that is comparable across countries. However, such a volatility measure is of minimal policy significance as it does not incorporate size. For instance, consider two different types of foreign financial flows. The one has a sample average of three and a standard deviation of six while the other has a sample average of four and a standard deviation of eight. The coefficient of variation in both cases is two and the two flows are equally unstable. If more information is not provided on the size of these countries, it will be difficult to conclude which volatility will be more important.

## **2.6 CAPITAL FLOW PROBLEMS: THEORIES**

Fernández-Arias and Hausmann (2000) identify theories that best explain the problems relating to foreign capital flows to developing countries.

The first theory acknowledges that excess foreign capital flows to developing countries lead to the main financial problem that results in moral hazard whereby private returns exceed social benefits. Excess capital flows also result in excess credit creation, distorting resource allocation. Discouraging capital inflows is the ideal remedy. This is known as “Theories of Too Much” that presume that moral hazard leads to imprudent lending.

The second view is referred to as “Theories of Too Little,” and suggests that the main problem emanates from manipulations that cause dishonoring of financial contracts, leading to very little capital flows relative to set targets. In turn, failure to enforce financial contracts can increase susceptibility to financial or economic crises. This proposition can assist in explaining a persistently worrying economic theory of international trade. The classical theory predicts that financial resources should move from advanced economies with surplus capital to capital deficit developing countries in order to equilibrate capital to labor ratios. However, after several years of free mobility of global capital, capital to labor ratio disparities remain significant with no signs of approaching equilibrium. In addition, the magnitude of foreign capital flows, for example, 5% of GDP in the recipient economies, is very low compared to what would be required to attain equilibrium over a given period.

The final set of theories highlights the turbulence of financial markets in developing countries and the undependability of international capital flows in driving sustainable economic development.

Accordingly, the recent financial and economic crises could be best explained by the “Theories of Too Volatile”. In terms of this proposition, economies are exposed to investor panic, increasing the risk of huge withdrawal of capital, leading to unnecessary sudden stops and financial crises. Similarly, manipulations in international financial markets may give rise to financial contagion and disruption of the flow of international capital to financially and economically sound countries.

The sets of theories outlined above focus on different circumstances and challenges in global markets but are supportive of each other in explaining crises. For instance, Theories of Too Volatile may be correct whether or not the international financial flows are too much or too little. Similarly, Theories of Too Much and Theories of Too Little can occur together as they do not have identical benchmarks.

According to Fernández-Arias and Hausmann (2000), rapid growth in global capital flows seems to be insufficient in relation to predictions by economic theories and the way open economies are designed. Given robust growth in global capital flows to developing markets, they are less than what one would expect. In this case, crisis situations are reviewed based on problems relating to national and international commitment (Fernández-Arias and Hausmann, 2000).

## **2.7 PRIVATE CAPITAL FLOWS, BALANCE OF PAYMENT AND FINANCIAL EXPOSURE**

It is important to briefly consider and analyze the behavior of capital flows into or out of developing countries by both foreign and domestic investors on the national account. Basically, international capital flows are recorded when ownership of a financial asset changes from one country to another. For example, when foreigners buy a financial asset in a country, it is recorded as a capital inflow and a corresponding increase in foreign liability is recorded on the financial account. Conversely, when domestic investors purchase a financial asset abroad this is regarded as an outflow. More attention is paid to private capital flows as they are more sensitive to changes in global financial market conditions than FDI and official flows (Albuquerque, 2003). Through the financial account, capital flows are strongly linked to developments in the balance of payment account especially as the financial account matches the sum of the current account balance, changes in reserves and errors and omissions (Global Economic Prospects, 2014). Huge inflows of capital can lead to an improvement in the financial account balance while causing deterioration of the current account balance of the recipient economy. Large inflows can put upward pressure

on real effective exchange rates and can result in loose domestic financing conditions. However, large flows can be offset through investments abroad by local investors, rising foreign currency reserves or by prudential policies (Global Economic Prospects, 2014). Regardless of the direct impact of large inflows of financial capital on current account positions, capital flows have significant influence on the spread of external shocks through the expansion of large currency positions that can magnify the effects of changes in world market conditions. The risks of sudden fluctuations in capital flows are more prominent in countries operating large current account shortfalls, but they can also threaten surplus countries with large external liabilities. Analyzing the behaviors of foreign financial capital to developing economies appears to be particularly relevant given the expected tightening of global financing conditions.

## **2.8 GLOBALIZATION OF FINANCIAL MARKETS**

One of the major developments in global markets over the past three decades has been the dramatic increase in international capital flows. According to some IMF data, there was a 300% expansion in total gross capital flows between 1991 and 2003. Portfolio equity flows surged by 600% during the same period in industrialized economies, way above growth in the real economy (Evans and Hnatkovska, 2014). This sudden growth in international capital flows shows that there is greater global financial integration. It is also evidenced by the increase in bonds and equities held by the US as financial wealth and by foreign ownership of US financial assets that has increased substantially. As a result of increased cross border mobility of financial flows, volatility in both inflows and outflows increased even in the US economy from 2007 (Evans and Hnatkovska, 2014).

## **2.9 FINANCIAL DEEPENING: THEORY AND EVIDENCE**

The concept of financial deepening was developed by Edward (1973) as a mechanism to explain changes in financial systems that enable the provision of diverse financial services targeting different sections of society. It implies that the financial system has attained particular depth; hence, the maturity of credit and deposit would be the same. Financial deepening also implies the development of specialized and organized domestic financial functions, institutions and markets as they gain in relation to foreign markets. Nzotta and Okereke (2009) stress that financial deepening requires that financial markets effectively mobilize savings. According to Chakrobarty (2014) and Nnanna and Dogo (1999), deepening of financial markets simply refers to an increase in the proportion of money supply (MS) to GDP. A number of approaches and formulae have been

proposed to measure financial deepening such as the ratio of money supply (M2) to GDP (Rahman and Mustafa, 2015, Sackey and Nkrumah, 2012, Giuliano and Ruiz-Arranz, 2009, Gupta, Pattillo, and Wagh, 2009), ratio of market capitalization to GDP and market liquidity to GDP (Rahman and Mustafa, 2015) or proportion of private sector credit to GDP (Di Giovanni, 2005). Following the Keynesian school of thought, financial deepening is driven by government expenditure, whereby the government injects money into the economy through expenditure on government projects, thereby shifting aggregate demand and income which in turn raises demand for money. The causal linkage between financial deepening and economic performance remains unresolved. One of the reasons is that indicators of financial deepening differ among economies and countries or among financial markets as different countries are bound to have different levels of financial deepening (Sackey and Nkrumah, 2012). Financial deepening is a major component of financial development and the depth and breadth of an economy's financial markets can be a key indicator of financial development (The World Economic Forum's Financial Development Index, 2010). Based on supply of equity and outstanding debt, developing markets have made substantial strides towards matching the level of financial growth in advanced economies. The growth of financial markets plays a critical role in understanding processes such as economic growth, stabilization of financial markets and financial integration. Deep financial markets, either in terms of size or liquidity or both, provide firms with easy access to the necessary funding to pursue investment projects which they might otherwise have to forego (Di Giovanni, 2005). Hypothetically, financial development creates a conducive environment for growth, either through the supply-leading (financial development drives growth) or demand-following (growth generates demand for financial products) channel (Mohan, 2006).

Theory and a number of empirical investigations are supportive of the finding that the development of financial markets promotes economic growth (Rajan and Zingales, 2003, Levine, 2005); however, the issue of causality has yet to be resolved because it is difficult and complex to determine. Proponents of finance promoting growth argue that developed financial systems reduce external financing constraints and as such can promote economic growth (Levine, 2005). This is confirmed by Dermirguc-Kunt and Levine (2008). Similarly, Cornelius (2011) suggests that financial systems assist in capital accumulation and innovation, and for countries to fully benefit from international capital flows, including FDI, some minimum level of stock market development is required. If the stock market is not developed to a certain level, the presence of capital flows

exerts no effect or even negatively affects development. Goswami and Sharma (2011) and Chami et al. (2010) indicate that deep markets allow savers to invest in a broad range of financial assets and enable borrowers to access a broader range of financing and risk management instruments. The deepening of emerging financial markets also allows for smooth adjustment to shocks, but rapid deepening may lead to credit booms and high vulnerability to crisis (Ali Shah and Bhutta, 2014). In addition, early stages of financial market development can cause high market volatility because capital flows can be relatively large compared to the absorption capacity of the economy (Cornelius, 2011, Cornelius, 2007). Ang's (2011) examination of the Malaysian economy shows that financial deepening removes credit constraints and enhances efficiency in transforming savings to investments as well as countries' economic profitability. However, Hellmann et al. (2000) note, that the hazards of financial deepening are the outcome of increased competition which reduces profit margins and increases bank fragility. Evidence suggests that financial deepening is progressing rapidly in developing economies as the sum of bonds and equities held in these economies is estimated at over 200% of GDP (Cornelius, 2011). In light of the supply-leading hypothesis, policy makers need to prioritize financial sector policies tailored to promote financial development which will subsequently enhance economic growth.

In addition to the above arguments in favor of the supply-leading hypothesis, in the economic literature, financial deepening has generally been regarded as a crucial factor in promoting economic growth (King and Levine, 1993, Chakraborty, 2008). As noted earlier, a well-performing financial market supports the growth of the economy by efficiently and effectively mobilizing financial savings and directing them to the most productive investment opportunities (Adjasi and Biekpe, 2006). Furthermore, Naceur and Ghazouani (2007) point out that developed financial systems reduce the costs of collecting information and transacting. Crucially, financial development and intermediation alleviate poverty as very robust financial systems have been associated with declining poverty levels (Beck, Degryse, and Kneer, 2014a). In general, financial markets in low-income countries are regarded as underdeveloped, as they have shallow and narrow markets that are concentrated in major cities (Andrianaivo and Yartey, 2010).

Contrary to the above hypothesis, the demanding-following hypothesis confirmed by some earlier studies argues that the performance of the economy drives financial development (Odhiambo,

2008, Waqabaca, 2004, Agbetsiafa, 2003). Although Fowowe (2010) found a bidirectional relationship between financial growth and economic performance, the issue of directional linkages between financial development and growth was not fully addressed. Based on Ohwofasa and Aiyedogbon (2013), the demand-following view is a mere lagged response to economic growth, i.e., growth generates demand for financial services. Rationally, decision makers should focus on promoting economic growth so as to indirectly induce demand for financial products which will then enhance financial development. In this case, economic growth is a causal factor while financial growth is only a by-product.

The financial sectors of African low-income countries are still at an early stage of development such that lessons from other crises could be very useful in informing their development strategies. Financial markets in low-income countries are generally regarded as narrow and shallow, but are experiencing growth and integration at a fairly rapid pace. These markets are exposed to a number of vulnerabilities such as exposure to global shocks and limited regulatory capacity (Griffith-Jones, Karwowski, and Dafe, 2014). Gradual deepening of financial markets is positive, unlike rapid deepening which leads to fragility or instability of markets. In addition, macro-prudential regulation is required to deal with boom and bust cycles (Griffith-Jones et al., 2014). The need to create a robust financial sector in the developing world poses serious policy challenges and calls for substantial research in the field of international finance. It is difficult to track the regulatory systems of developed financial markets as they have been problematic of late, a sign of poor regulation (Griffith-Jones et al., 2014).

The traditional relationship between a deeper as well as larger financial sector and long-term growth that was first postulated by Bagehot and Schumpeter (1912), and was extended to the empirical literature by Levine (2005), has been put to the test. Prior to Levine (2005), Easterly and Kraay (2000) suggested that financial depth (calculated as the ratio of private credit to GDP) reduces volatility of output up to a certain level, but beyond that, increases output volatility. More recently, Cecchetti and Kharroubi (2012) show that at low levels, a larger financial system promotes growth, but a point is reached when more finance and credit lower economic growth. It was further observed that faster financial deepening is harmful to real aggregate growth, implying that financial booms are bad for economic growth. Hence, macro-prudential or counter-cyclical regulation is important. The need to be cautious with respect to the growth of financial markets

was also highlighted in De La Torre, Ize, and Schmukler (2011), where "Too much finance" was regarded as consistent with positive but decreasing returns of financial depth, which at some point, become smaller than the cost of instability. The "Too much Finance" result is not only due to financial crises and volatility, but also misallocation of resources. For instance, rapidly expanding credit to households is desirable as it improves social welfare, but it can cause financial instability if not properly regulated.

Even though the finance-growth nexus has been thoroughly examined in the empirical literature, the relationship is not as significant in more recent data when compared with earlier and original studies that utilized data for the period 1960 to 1989. There are a number of reasons for this. For instance, repeated financial crises have had a weakening impact on the nexus between financial deepening and growth (Klein and Olivei, 2008). Rapid financial growth and excessive lending may lead to both a general price increase and weaker financial institutions, leading to a financial or economic crisis that hampers economic growth. High speed financial deepening may also be an outcome of broad-based financial liberalization which started in the late 1980s and early 1990s in countries that lacked proper legal or regulatory frameworks to successfully utilize financial growth. Countries with open capital accounts have been observed to enjoy more financial deepening and in turn economic growth than economies with restrictions on capital accounts.

However, there is limited evidence to indicate that financial liberalization reduces the impact of finance on economic growth. Similarly, evidence is scarce to support the argument that the growth of equity markets in recent years has replaced debt finance and has reduced the role of financial deepening in economic growth (Rousseau and Wachtel, 2011). Countries with open capital accounts were found to have a substantial rise in financial depth, leading to improved economic performance. However, the observed failure by open capital accounts to drive financial deepening among developing countries has serious policy implications and raises crucial dilemmas regarding the desirability of liberalizing the capital account (Klein and Olivei, 2008).

Having introduced the fundamental concept of financial deepening and related concepts in this section, we now turn to the theories that explain the existence of different financial structures in different economies.

## **2.10 THEORIES OF FINANCIAL DEEPENING**

Financial structure theories have greatly assisted in explaining the interaction between financial deepening and growth of the economy. Financial development theories include bank-based, market-based, financial service-based and law and finance-based theories (Levine, 2002).

### **2.10.1 BANK-BASED THEORY**

This theory focuses on explaining the positive role of commercial banks in financial and economic development as a result of mobilizing financial resources and reducing risks (Levine, 2002). Several development economists acknowledge that investment is crucial for growth and argue that most of the financing for corporates comes from banks as opposed to the disposal of shares and this also applies to the advanced economies. This traditional view focuses on banks rather than stock markets which are regarded as risky. Thus, corporate finance and development economics assigns insignificant benefits to the role of stock markets, but instead consider banks and stock markets as competing elements of the financial system (Beck and Levine, 2004). Modigliani and Miller (1958) regard banks and equity markets as competing sources of finance. Towards the end of 19<sup>th</sup> century, economists in Germany indicated that bank-based financial systems assisted the country to overtake the market-based United Kingdom as industrial leader (Goldsmith, 1969). Again, in the 20<sup>th</sup> century, bank-based financial systems saw Japan threatening to overtake the market-based US.

### **2.10.2 MARKET-BASED THEORY**

Proponents of this theory believe that a well-developed and functioning financial market is crucial to economic development. The theory explains the advantages of well-performing financial markets through promoting growth and profit motives, corporate governance, diversification and risk management (Levine, 2005). As indicated above, this system seems to be in competition with the bank-based approach.

### **2.10.3 FINANCIAL SERVICES THEORY**

This theory emphasizes the importance of developing financial systems that are both bank-focused and market-focused and emphasizes the significance of financial services offered by banks that



can drive industrial production and economic development (Kose et al., 2009). The financial services hypothesis asserts that there is no trade-off between banks and markets. Levine (2002), points out that financial products and players are established to provide key financial services. According to this viewpoint, the issue is not about banks or markets, but relates to efficient and effective financial services provision such as funding projects, risk management, and savings mobilization to promote economic development.

#### **2.10.4 LAW AND FINANCE THEORY**

The legal-based view of financial structure supported by Porta et al. (1998) and Demirgüç-Kunt and Levine (1999) rejects the bank-focused and market-focused arguments. This theory argues that financial products are a set of contracts that are enforceable at law. Accordingly, a properly functioning legal framework is required for the smooth operation of both markets and banks. A well performing legal system promotes the functioning of both markets and intermediaries. Provision of quality financial services needs the support of a robust legal system so as to ensure efficient allocation of resources that promotes growth.

The following section briefly discusses the benefits and costs of financial deepening set out in the empirical literature.

#### **2.10.5 FINANCIAL DEEPENING: PROS AND CONS**

Financial deepening is associated with several benefits and costs to both developing and developed countries. For instance, Ang (2008) and Calderón and Schmidt-Hebbel (2008) point out that deepening of financial markets assists in eliminating credit constraints and offers easy access to credit, thereby facilitating funding of investment projects. In addition, deeper financial markets have been observed to reduce macro-economic volatility as well as investment volatility (Kose, Prasad, and Terrones, 2006, Denizler, Iyigun, and Owen, 2002). Countries with more developed financial systems also experience fewer fluctuations in real output, investment growth and consumption. As financial deepening provides some significant benefits to the economy in general, it is also vital to consider the implications of the speed and manner in which a financial system develops. The deepening of financial markets also provides the requisite legal framework that allows easy access to credit. More importantly, financial deepening decreases the costs of

transacting and enhances the rate of innovation (Aghion and Howitt, 2009). It promotes efficient transformation of savings into investments and helps to absorb economic shocks, thereby minimizing the possibility of a crisis (Bumann, Hermes, and Lensink, 2013, Mileva, 2008). However, deepening of financial markets has failed to correct the problem of information asymmetry that reduces market efficiency even without government intervention (Shah and Bhutta, 2014, Stiglitz, 2000). Furthermore, heightened competition in financial markets may considerably decrease profit margins and increase the likelihood of bank fragility, especially when deepening occurs at high speed. Financial deepening has the potential to trigger a financial crisis if excess risk is assumed in light of increased competition (Hellmann, Murdock, and Stiglitz, 2000, Stiglitz, 2000). This means that excess deepening creates considerable challenges to the economy.

Having discussed the advantages and disadvantages of the deepening of financial markets, the following section relates financial deepening to the process of capital market liberalization to further enhance understanding of the factors that drive financial market development. These processes are very important in that they also influence capital flows to the developing world.

## **2.11 CAPITAL MARKET LIBERALIZATION AND FINANCIAL DEEPENING**

Many developing countries, often at the behest of multilateral financial institutions such as the IMF, liberalize their capital accounts and relax restrictions in their domestic markets, opening the door to international investment and capital flows (Stiglitz and Ocampo, 2008).

Klein and Olivei (2008) analyze the impact of capital market liberalization on financial depth and output growth across countries. The findings were largely influenced by the advanced economies incorporated in the study sample. According to Klein and Olivei (2008), capital account liberalization should promote the deepening of financial markets in developing markets, the failure of which has serious policy implications and defeats the motive to open capital markets. A crucial observation in the empirical studies is that capital market liberalization does not provide the same benefits to all countries. It is further noted that the benefits of open capital markets can only be fully attained in the presence of sufficient financial institutions and macro-economic policies.

Kaminsky (2005) point out that relaxation of financial markets does not cause permanent volatility in financial markets. If liberalization persists, capital markets in developing countries tend to be stable as financial reforms triggered by the opening of these markets lead to reforms in institutions,

causing financial markets to operate better. According to Kaminsky (2005), in the short term, globalization leads to the bankruptcy of financial markets and consequent decline in economic growth. In addition, while foreign financial flows may not lead to excess volatility in domestic financial markets, they spark inflation under a managed or fixed currency rate system. This is likely in the case of transitory inflows which can distort relative prices and reduce competitiveness due to real exchange rate appreciation. During surges in financial flows, governments should adopt a flexible exchange rate to avoid a surge in inflation (Kaminsky, 2005). Kaminsky and Schmukler (2008) conclude that liberalization of financial markets has led to the deepening and long-term growth of several economies.

However, the role of financial liberalization is still the subject of serious debate among scholars and policy makers. As stated above, one school of thought argues that liberalization promotes financial market development and leads to higher long-run economic growth. For instance, Klein and Olivei (2008) and Kaminsky and Schmukler (2008) show that a significant correlation exists among capital account liberalization, financial deepening and output growth. Similarly, Henry (2007) points out that financial liberalization facilitates efficient international allocation of resources (allocative efficiency). However, liberalization is also considered to induce excessive risk taking, which is a source of financial volatility and financial crises. Moreover, Rodrik's (1998) empirical analysis shows no correlation between capital market openness and the volume of investment or its growth rate. Rodrik (1998) asserts that the merits of capital account opening are not clear whilst costs are evident from frequent emerging markets crises. Thus, the theoretical forecasts of the neo-classical model do not resemble the reality of capital account dynamics (Henry, 2007). In contrast, Eichengreen (2001) states that the effects of capital market liberalization on economic performance is unambiguous. Furthermore, Prasad, Rogoff, Wei and Kose (2005) stress that there is no significant or substantial evidence to support the case that liberalization leads to higher growth of the economy. Arguably, the impact of capital account liberalization needs to be examined at firm rather than country level to obtain more clarity on the ways in which it affects the real economy (Henry, 2007).

In order to expand on the significance of deepening financial markets to the macro-economy, the following section highlights some of the stability and growth issues connected to the process of financial deepening, especially in developing countries. These include the effects of financial

deepening, economic stability, economic growth, international monetary stability and foreign capital flows.

## **2.12 FINANCIAL DEEPENING, ECONOMIC STABILITY AND GROWTH**

If well-managed, financial deepening in low-income countries can assist in promoting market resilience and capacity to deal with economic shocks, thereby improving macro-financial policy effectiveness and sustainable economic growth (IMF, 2017). The IMF's Financial Surveillance Strategy Paper (2014) states, that, the linkages between financial deepening and macro-economic stability are of high priority. It is argued that the shallow financial systems that characterize low-income SADC economies limit fiscal, monetary and exchange rate policy options. These could thus hamper macro-economic policy transmission and opportunities for diversification of risk. There is need to manage volatility of any kind and support economic growth in low-income countries. This is particularly important since such countries are very vulnerable to global shocks like sudden fluctuations in global product prices and swings in international capital flows (IMF, 2014). Limited policy options to mitigate ensuing volatility in low-income countries could result in substantial growth and welfare costs.

The benefits of financial deepening include varied and accessible financial services support, sustainable growth, and reduced poverty and income inequalities (Berg, Ostry, and Zettelmeyer, 2012, Bittencourt, 2012, Sackey and Nkrumah, 2012). Financial development promotes savings, which culminate in bigger investments and optimal distribution of resources, in turn leading to higher income growth. The financial systems of low-income countries have grown significantly and become more inclusive over the past 20 years, but still remain relatively shallow and undiversified. Although they have lower levels of financial depth than middle- and high-income economies, they are deepening at a faster pace than most emerging and developed markets.

### **2.12.1 FINANCIAL DEEPENING AND ECONOMIC GROWTH: RECENT EVIDENCE**

The finance-growth relationship has been widely investigated empirically (Apergis, Filippidis, and Economidou, 2007, Kar, Nazlıoğlu, and Ağır, 2011, Rousseau and Wachtel, 2011, Levine, 2005, Cecchetti and Kharroubi, 2012). Recent studies employing more up-to-date data have revealed that the relationship is no longer as strong as it was found to be by pioneering studies from 1960 to

1989. According to Rousseau and Wachtel (2011), excessive and rapid financial deepening leads to fast growth in credit which may trigger inflation and weaken financial systems and in turn lead to growth-inhibiting financial crisis. Furthermore, there is not enough evidence to suggest that the growth of stock markets in recent years has replaced debt financing, meaning that financial deepening plays a minimal role in enhancing growth (Rousseau and Wachtel, 2011). In contrast, Hasan et al. (2009) argue that the growth of financial institutions, establishment of regulatory frameworks and respect for property ownership rights lead to robust economic performance. Apergis et al. (2007) investigate the financial linkage between economic and financial development utilizing dynamic heterogeneous panel data on 15 OECD and non-OECD states and observe the existence of one long-run equilibrium relationship among financial deepening, economic growth and a set of constant variables. The study further establishes a two-way causality relationship between financial deepening and economic growth. Similarly, Klein and Olivei (2008) find that capital account liberalization has a significant impact on financial institution growth and economic performance across countries. It was found that economies with greater financial depth also experienced higher economic growth over the 20-year period. The deepening of financial markets is believed to promote growth of the economy in two ways, firstly, by mobilizing investments and secondly, through increasing the rate of return on financial resources which in turn raises productivity (Jun and Yu, 2005). Jun and Yu (2005) use provincial panel data to investigate whether financial deepening can account for growth in productivity. Their study reveals a significant and positive link between the deepening of financial markets and productivity growth. Odhiambo (2008) utilizes a tri-variate causality model and establishes a clear uni-directional causal flow from economic performance to financial development. It is further revealed that output growth Granger causes savings and savings promote financial development in Kenya. In this case, the findings contradict conventional wisdom that financial deepening unambiguously drives economic growth (Odhiambo, 2008). In agreement with Odhiambo's findings, Ang and McKibbin (2007) utilize time series data for Malaysia to conduct co-integration and causality tests to examine the correlation between finance and economic growth. Although a positive association is observed between financial depth and economic growth, the study reveals that the performance of the economy drives financial market development, particularly in the long term.

In terms of the relationship between deepening financial markets and the rise of the economy in the long-term, Bagehot and Schumpeter (1912) suggested the existence of a positive relationship which was confirmed by Levine (2005). However, this has been challenged by several recent studies using more up-to-date data such as Arcand, Berkes, and Panizza (2015), Law and Singh (2014), and Rousseau and Wachtel (2011). Easterly, Islam, and Stiglitz (2001) argue that financial growth measured by the proportion of private credit to real GDP can reduce production variability only up to a certain level, beyond which it increases productivity volatility. Several other studies have shown the existence of an inverse connection between financial deepening and economic growth beyond a certain level of financial growth, estimated at 80-100% of private credit to GDP (Cecchetti and Kharroubi, 2012, Griffith-Jones et al., 2014). Faster growth in finance has also been shown to be harmful to aggregate long-term real growth. Furthermore, the IMF (2012a) provides empirical evidence that large financial sectors may have negative impacts on productivity growth. De la Torre et al. (2012) argue that too much finance is consistent with positive but decreasing returns of financial deepening, which at some level will be less than the cost of financial instability. African financial systems seem to exhibit features which increase their exposure to global shocks in the economic and financial system due to limited financial market regulation and political pressure to deepen financial markets so as to develop the real economy (Griffith-Jones et al., 2014).

A comprehensive study on the linkages between financial growth and economic performance utilizing panel regressions of data from low- and middle-income economies also confirms a positive relationship in developing countries (Hassan, Sanchez, and Yu, 2011). However, short-term multivariate analysis shows mixed results, i.e., the existence of a two-way causal relationship for most regions and one-way directional linkage from growth to finance for the two poorest regions. It is further argued that economic growth is significantly explained by some factors from the productive sector such as trade and government expenditure. Hence, Hassan et al. argue that a well-developed financial market is a crucial but adequate condition to promote output growth in developing countries. However, there is disagreement pertaining to the direction of causality between financial depth and economic development. Kar et al. (2011) reached the same conclusion in their wide-ranging research on Middle East and North African (MENA) economies employing Granger causality tests. Gries, Kraft, and Meierrieks (2009) examined the relationship among financial depth, trade liberalization and economic development among 16 sub-Saharan African

economies utilizing the Hsiao-Granger approach. They found limited evidence to support conventional wisdom of finance-led growth and that growth strategies that prioritize financial or trade sector growth cannot be held as the SSA countries investigated failed to benefit from financial deepening. In an earlier study, Shan (2005) utilized the Vector Autoregression (VAR) model rather than the popular Granger causality tests to examine the connection between financial development and economic growth using data from OECD economies and China. The study found very little evidence to support the hypothesis of finance-led growth.

### **2.12.2 CHALLENGES OF FINANCIAL DEEPENING IN DEVELOPING COUNTRIES**

Several factors influence the environment in which financial deepening may prosper or fail, including policy issues, the structural characteristics of economies, socio-political factors and technological development. These factors can determine the extent of financial deepening in developing countries. Moreover, the interplay of demand and supply factors might constrain financial deepening in developing countries. For instance, poor mobilization of deposits, financial illiteracy, high transaction costs and too many formalities and documentation might impede the pace of financial deepening. On the supply side, economic instability, limited competition and regulatory restrictions might also act as barriers to deepening and diversification of financial systems. These challenges not only affect financial stability but also reduce the benefits that should arise from financial growth. Rapid expansion of financial systems also leads to instability, particularly given the weak and limited regulation frameworks in low-income economies. Different economies may require different approaches to promote financial deepening.

### **2.12.3 FINANCIAL DEEPENING AND INTERNATIONAL MONETARY STABILITY**

The need for reform of the international monetary system has been high on the agenda of IMF and G-20 communiqués (Wang, Marsh, Goyal, Raman, and Ahmed, 2011). These high-level deliberations usually focus on the need to strengthen the international monetary system and also emphasize the need to promote and increase financial deepening in emerging markets. In this regard, financial deepening is expected to provide critical stability benefits through limiting fluctuations in asset prices, providing better sources of funding and reducing the need for reserve accumulation. There is some divergence between the financial depth of developed versus developing countries with the latter showing some catch-up. However, the speed of the catch-up

may have serious implications for international imbalances. During the initial stages of financial deepening, risks, costs and the possibility of crises are high as policy makers attempt to build reserves, restrict capital mobility and limit exchange rate flexibility. As financial deepening progresses and is supported by exchange rate flexibility, capital account openness and minimal reserve buffers, the risk of a crisis is bound to diminish. In later stages, alongside flexible exchange rates, open capital accounts and smaller reserve buffers, the likelihood of a crisis declines. The IMF and the G-20 have emphasized the need for a comprehensive and balanced strategy in dealing with volatile foreign capital flows. Given this approach, the center of attraction has been promoting the deepening of financial markets in less developed countries. Financial deepening creates an environment where players can easily access financial markets for savings and investment; financial players are able to handle larger volumes of capital and turnover without triggering a corresponding movement in asset prices and the market provides a large set of assets for hedging and diversification purposes (Goswami and Sharma, 2011, Chami, Sharma, and Fullenkamp, 2009a). The deepening of financial markets is widely believed to provide substantial stability benefits to the economy (Wang et al., 2011). Furthermore, it can reduce dependence on the US treasury as well as balance sheet mismatches as alternative long-term finance can be raised in local currency even during times of global stress, limiting adverse spillovers (Wang et al., 2011, Caballero, Farhi, and Gourinchas, 2008). Indeed, it has been argued that developing countries can create their own safe or reserve assets. In contrast, rapid financial deepening can lead to credit booms and subsequent busts. Wang et al. (2011) note that, the incidence of a crisis is much greater in the initial stages of deepening when policy makers are building foreign reserves, limiting mobility of capital and managing flexibility of exchange rates. It has been found that a deep financial sector promotes orderly and balanced expansion of the balance sheet as well as smooth adjustment to global shocks. The widely used measure of financial deepening is M2/GDP, but it can be more comprehensive to include all financial claims and counterclaims of an economy, both locally and abroad (Wang et al., 2011).

#### **2.12.4 FOREIGN CAPITAL FLOWS AND FINANCIAL DEEPENING**

International financial flows are needed for the growth and development of underdeveloped markets. The SADC region is dominated by low-income financial markets that require external funding to promote financial development and in turn spur economic growth. Recently, many African countries have recorded unprecedented levels of global financial flows partly due to a



surge in commodity prices (Dahou et al., 2009). African exports between 2000 and 2006 are estimated to have grown from USD159 billion to USD290 billion. Over the same period, portfolio equity and debt registered a fivefold increase to exceed USD60 billion while foreign remittance flows reached a peak of USD22 billion in 2006.

Although the issue of whether or not financial market development drives economic growth has generated considerable academic and policy debate (Dahou, Omar, and Pfister, 2009), based on our understanding, no study has investigated the directional or causal relations among financial deepening, foreign capital flow variability and the performance of stock markets, particularly in low-income countries. Excluding South Africa, the level of financial development in the SADC region is still very low (Andrianaivo and Yartey, 2010). Markets are characterized by limited access to debt and bond markets, and there is a small banking sector, low levels of deposits and loans, high levels of non-performing loans and general capital inadequacy among most financial institutions (Hearn and Piesse, 2008, Andrianaivo and Yartey, 2010). Because of the rapid growth in stock markets in African economies, recent years have been characterized by the adoption of international accounting and auditing standards (Ntim, 2012).

At the beginning of the 1990s, many countries in Southern Africa began the process of trade and financial liberalization, bank regulation, establishing central bank credibility and creating monetary policy. The dominance of government-owned financial institutions was reduced and new and innovative financial products were introduced. At global level, cross border mobility of capital flows increased and in the SADC region, considerable interest has been expressed in monetary integration; a single currency could be in place by 2018. Despite these significant developments, the financial system is still regarded as small in both absolute and relative terms. For example, Andrianaivo and Yartey (2010) show that in the developed financial markets bank credit to the private sector almost reached 100% while that in sub-Saharan African markets hardly exceeded 15%. Aregbeshola (2016) shows that financial development is a more significant driver of growth in developing economies than it is in industrialized countries, but points to the need for rapid economic growth as a prerequisite for financial market deepening. This raises the question of the widely debated causality relationship between financial deepening and growth. Arguably, financial deepening is at its lowest in Southern Africa. Given the above developments and changes in the financial landscape,

careful study of the directional financial linkages among foreign capital flow mobility, financial deepening and the performance of financial markets will add to or extend the existing theoretical and empirical literature, particularly on low-income countries. Although low-income SADC countries are receiving rapidly growing portfolio and remittance flows, they have not as yet experienced a significant shift in the size and sophistication of their financial markets to reap the benefits of large-scale economies (Beck et al., 2014b).

Regardless of the problems related to size, lack of depth and liquidity, some African capital markets do well in terms of return on investment. For instance, the Ghana Stock Exchange was regarded as the best performer in the world at the end of 2004, providing investors with an annual gain of 144% in US dollars compared to the 30% gain offered by Morgan Stanley Capital International Global Index (Databank Group, 2004).

The overall conclusion that an economy with advanced financial markets is exposed to highly unstable foreign financial flows and more risks (Broner and Ventura, 2016) is not confirmed by Sole Pagliari and Ahmed (2017). However, it is consistent with the findings of Lagoarde-Segot (2009) and Umutlu, Akdeniz, and Altay-Salih (2010), who found that a considerable relationship is displayed between the variability of capital flows and that this correlation is more powerful in more advanced markets. Hence, it can be deduced that an economy with advanced financial markets is more subjected to shocks emanating from the global financial market.

The North Atlantic financial crisis created considerable policy challenges and raised the need for more research on financial systems development and the mobility of international financial flows (Griffith-Jones et al., 2014). This is further motivation for the need to identify a desirable financial sector structure and size (Griffith-Jones et al., 2014). The crisis posed challenges to conventional wisdom that advanced economies' financial systems and their regulation should be replicated by developing economies, given that these financial systems have been so problematic and badly regulated. Financial markets in African low-income countries are generally at an early stage of development and are shallow and narrow although they are experiencing moderately rapid deepening. Decision makers are, however, concerned that rapid growth combined with existing vulnerabilities to global shocks and regulatory lapses might pose major risks to financial market stability. Given this, it is difficult to apply the lessons learnt from crises in advanced financial markets to low-income African financial markets. According to Griffith-Jones et al. (2014), low-

income financial markets are developing quite rapidly and are also exposing themselves to the risks of financial instability.

In general, foreign banks are expected to play a critical role in the financial deepening and stability of African markets; however, existing evidence is somewhat ambiguous, calling for further research (Beck et al., 2014a). For instance, foreign banks should bring critical experience from developed financial economies and should assist in attaining economies of scale in developing countries. However, they are less inclined to lend and their loans are more volatile than loans from domestic banks. In addition, foreign banks rely on 'hard' information about borrowers (Detragiache, Tressel, and Gupta, 2008). Fuchs et al. (2012a) argue that most foreign banks exist as subsidiaries that fund themselves and do not rely on parent banks, thus limiting their impact on national savings. In terms of financial deepening and stability, low-income African markets have the advantage of being latecomers to financial development and can learn from the positive and negative lessons of other economies' experiences. Moreover, governments of low-income countries have more space and flexibility to shape the financial systems of smaller markets.

#### **2.12.5 DETERMINANTS OF FINANCIAL DEEPENING**

Several factors have been revealed in the empirical literature as forces that contribute to varying extents to financial deepening in both advanced and less developed countries (Andrianaivo and Yartey, 2010). The main factors include the existence of a robust macro-economic environment, the quality of financial institutions, an established banking sector and investor or shareholder protection laws as prerequisites for the efficient operation and performance of financial markets (Andrianaivo and Yartey, 2010). Other variables including the level of financial and trade openness also promote financial development (Baltagi, Demetriades, and Law, 2007, Rajan and Zingales, 2003). In addition, Aggarwal et al. (2011) use recent data show that there is a desirable, significant and robust linkage between workers' remittances and financial growth in developing economies.

A steady and stable macro-economy is regarded as necessary for the establishment and growth of capital markets and the broader economic system. This is supported by the fact that a volatile environment usually creates information asymmetry problems which can expose the financial system to vulnerability. High and unpredictable rates of inflation are likely to hamper growth of financial markets and consequently growth of production output as investors are not attracted to

uncertain environments. Some time ago, Garcia and Liu (1999) argued that high per capita income, domestic savings and investments are key determinants of equity market development. Furthermore, the development of a robust banking sector is regarded as complementary to the development of the stock market in Africa as opposed to a substitute (Andrianaivo and Yartey, 2010). In a much earlier empirical investigation, Demirguc-Kunt and Levine (1996) showed that stock market performance indicators are significantly correlated with banking sector development.

In order to increase understanding of the linkages among capital flow volatility, financial deepening and capital market performance, the following section reviews some of the recent empirical evidence on the drivers of capital market performance.

### **2.13 DETERMINANTS OF CAPITAL MARKET PERFORMANCE**

The capital market has been observed to be a crucial source of funding for profitable investment projects and subsequently a driver of economic development. However, as indicated in earlier sections, capital markets in transition economies are very shallow and illiquid and lack transparency (Olgić Draženović, and Kusanović, 2016). These researchers classified the determinants of capital market performance into the legal and institutional framework, political stability, macro-economic stability and breadth of investor base. It was argued that legal and regulatory certainty is key to the increased performance of capital markets. It was further observed that countries with a broader investor base, that is, pension funds, insurance companies and investments funds, have better performing stock markets (Demirguc-Kunt and Levine, 2008) than countries without developed financial intermediaries. Several macro-economic variables were found to be significantly related to the performance of capital markets. For instance, Islam, Mostofa, and Tithi (2017) revealed that consumer price index (CPI) and GDP were the most significant factors in driving capital market performance in Bangladesh. In addition, Hajilee, and Al Nasser (2014) studied the drivers of capital market performance in selected emerging markets and observed that exchange rate volatility was the most significant factor compared to other macro-economic variables. Furthermore, in Nepal, inflation and broad money supply had positive effects on capital market performance while interest rates were inversely related with the performance of capital markets (Shrestha and Subedi, 2014). This finding suggests that equity investment is regarded as a hedge against general price increases.

The following section identifies some of the observed financial connections between remittance flows and the deepening or growth of financial markets.

## **2.14 REMITTANCES AND FINANCIAL DEEPENING**

According to Alberola and Salvado (2006), an important factor that impacts on foreign remittances to developing countries is the absence of commercial banks as key players in the remittances market. However, given increased access to banking services, remittance flows could be a significant driver of financial deepening in recipient economies. Money Transfer Operators (MTOs) have long dominated the remittance transfer market in developing economies, enabling them to charge high transfer fees; banks' entry to this market is set to challenge their position (Alberola and Salvado, 2006). While migrant workers have lacked confidence in domestic banks, their entry to this market could increase competition, resulting in reduced fees and in turn boosting the level of remittances. However, it could also result in increased remittance flow volatility (Alberola and Salvado, 2006). According to Beck et al. (2009), financial deepening of both markets and institutions is concentrated in high-income economies, yet low- and lower to middle-income countries continue to attract an increasing volume of remittance flows. Hunte (2004) shows that foreign remittances have a significant desirable impact on financial deepening and thus recommends that policymakers should consider implementing incentives to enhance remittance flows. Hunte (2004) demonstrates that a 1% increase in household income leads to a 0.8% decline in foreign remittances, thus confirming the remittance decay hypothesis that remittances decrease as income increases.

Furthermore, migrant workers have been observed to be sensitive to negative shocks to household income as they increase remittances. Ratha (2005a) investigated the effect of financial remittances on development in 44 African economies from 1975 to 2004. The results indicate that foreign remittances drive financial deepening on the continent holding economic fundamentals and institutional variables constant that are normally used to explain financial deepening in low-income countries. While SSA gets only a small fraction of total flows to the developing world, their estimated effect on financial growth compares well with other studies that employ larger samples in developing economies (Ratha, 2005a).

Remittance flows to developing economies are attracting much interest among policy makers due to their increasing magnitude and their effects on host economies. For example, in 2006 total remittances to the developing world amounted to US\$221 billion, twice more than the amount of ODA received (Gupta et al., 2009). Remittance figures are under reported and evidence shows that those that pass through the unofficial market could add at least 50% to official international figures (Gupta et al., 2009). Indeed, remittances have outgrown other forms of private capital flows and ODA, growing on average by 16% per annum since the year 2000 (World Bank, 2006). However, it is important to note that a portion of this increase could be linked to improvements in recording. Fundamental growth in remittances has been experienced in the Caribbean, Latin America, and the East Asian and Pacific regions where growth rates have consistently been above developing countries' average. The biggest recipients of capital flows in 2006 were Mexico, China and India, accounting for more than 30% of the total received in developing economies.

Beck and Peria (2014) analyzed the link between remittances and the degree of financial development, and found a significantly negative correlation between the two variables. Workers' remittances are an alternative source of capital and a contributory factor in reducing the financial challenges encountered by the majority of people in developing economies. On the other hand, the level of growth of a country's financial system is positively correlated to remittance flows. Access to banking services and the level of transaction fees in developing markets play a significant function in predicting the movement of remittances (Freund and Spatafora, 2008, Beck et al., 2009).

According to Giuliano and Ruiz-Arranz (2009), foreign remittance flows and remittance volatility have not been fully analyzed at macro-economic level. The interaction between foreign remittances and financial sector performance is crucial because of its implications for economic performance. The growth of the local financial sector is expected to promote the flow of remittances. Well-developed financial markets should lower the cost of doing business, including transaction costs and fees, and can direct remittances to projects with good returns and therefore promote growth. Foreign remittances are a good replacement for poorly organized markets for credit and provide a cheaper source of funding with no collateral security required. Giuliano and Ruiz-Arranz (2009) show that remittance flows can boost the growth of the economy in countries with poorly developed banking institutions as they provide a cheaper source of finance.

On the other hand, foreign remittances to developed financial markets seem to have little impact on economic growth (Giuliano and Ruiz-Arranz, 2009). A properly functioning banking system promotes the effects of remittances. Giuliano and Ruiz-Arranz's (2009) study reveals that the marginal impact of remittances on growth decreases as financial deepening rises. As noted above, remittances have been observed to contribute significantly to economic development particularly in countries with shallow and narrow financial markets while in developed financial markets, they have limited impact on growth. In contrast to Jackman (2013) and Craigwell et al. (2010), Giuliano and Ruiz-Arranz's (2009) analysis of the cyclical properties of remittances shows that remittances are mainly profit-driven and are hence pro-cyclical.

#### **2.14.1 FOREIGN REMITTANCES AND THE COMPOSITION OF CAPITAL FLOWS**

Foreign remittances are now considered a key avenue of raising external funding for developing economies, providing a much needed source of foreign currency as well as stability (Beck and Martinez Peria, 2009, Bettin et al., 2015). Their limited volatility and counter-cyclical behavior with respect to macro-economic conditions in the recipient country help manage developing countries' vulnerability to external shocks. Foreign remittances to developing economies have increased gradually over time in comparison to other capital flows supported by an increase in skilled or unskilled labor migration (Bettin, Presbitero, and Spatafora, 2015). During the period 1990 to 2011, foreign remittances showed an upward but steadier path than other types of international capital flows. However, this does not mean that the volatility of remittance flows is not significant. Foreign remittances continue to surge ahead and were projected to reach USD435 billion in 2014, three times more than the level of ODA and were predicted to surpass USD500 billion by 2017 (Bettin et al., 2015).

#### **2.15 CYCLICALITY OF REMITTANCE FLOWS**

Foreign remittances have been observed to behave counter-cyclically to business cycles, acting as a shock absorber for sudden fluctuations in production. Conversely, private capital flows such as portfolio flows have been observed to behave pro-cyclically to production cycles. However, there is no agreement among scholars regarding the cyclicity of foreign remittances. For example, Chami et al. (2005) argue that workers' remittances are only counter-cyclical with respect to output in the recipient economy because of the altruism contributory factor (Agarwal and Horowitz, 2002)

and also due to households migrating as a result of the need to diversify and hedge against shocks associated with changes in income (Yang and Choi, 2007). Other scholars stress that workers' remittances can behave pro-cyclically when the migrant's motives are influenced by factors such as human capital investment (Adams and Cuecuecha, 2010, Cooray and Mallick, 2013, Giuliano and Ruiz-Arranz, 2009). Ruiz and Vargas-Silva (2014) observe that the cyclical nature of remittances with regard to recipient economies might be country or corridor specific and is unlikely to be constant over time. The level of cyclical nature may thus depend on country level characteristics. Some scholars argue that there is no substantive evidence to support a significant relationship between remittances and business cycles or specific shocks in the receiving economy (Naudé and Bezuidenhout, 2012, Akkoyunlu and Kholodilin, 2008). Moreover, micro-economic evidence suggests that foreign remittances decline over time as migrants' attachment to their relatives back home gradually weakens, i.e., the remittance decay hypothesis (Bettin et al., 2015). Finally, Frankel (2011), Singh et al. (2010) and Chami et al.'s (2005) macro-economic studies show that workers' remittances are negatively correlated with the size of income in the receiving country, thereby mitigating the unfavourable effects of food price shocks. This will further assist in reducing consumption and output growth volatility in vulnerable recipient economies (Combes, Ebeke, Etoundi, and Yogo, 2014, Chami et al., 2012). A study in Italy found that remittances are pro-cyclical with respect to the macro-economic situation in the source economy. However, if the source and the recipient economies are exposed to negative shocks of the same size, for example, armed conflict, remittances will behave anti-cyclically to the effects arising from the output contraction in the recipient economy (Beck and Peria, 2014).

## **2.16 FOREIGN REMITTANCES TO SUB-SAHARAN AFRICA**

There is much evidence that foreign remittances to the developing world are seriously underreported (Gupta et al., 2007). As noted above, remittances received via unofficial means could increase the recorded global figures by more than 50%. In Africa, the sub-Saharan region still receives the least amount of remittances compared to other regions, although they are on a rising path. For instance, these financial flows rose by more than 55% to reach close to \$7 billion during the period 2000 to 2005 compared to overall growth of 81% for all developing countries (Gupta et al., 2007). Given this analysis, most studies on the effects of these financial flows have centered on Latin America and South Asia where large volumes of remittances are received. This



study analyses the importance of remittances to the SADC bloc (part of the SSA region) and assesses their variability in low-income countries so as to inform and advise policy makers. On the whole, only about 4% of total remittances to the developing world goes to Africa, which is by far the smallest share, while India is the largest recipient, accounting for 33% of total remittance flows. In contrast, about 25% of recorded aggregate global remittances are received in Latin America and the Caribbean. Since the 1980s, foreign remittances to economies in Latin America and the Caribbean, and East Asia and the Pacific rose more rapidly compared to the median for less developed economies. The biggest three in terms of remittance receipts in 2005 were China, India and Mexico as they jointly accounted for an amount in excess of 33% of the total to all developing economies. During the same period, Nigeria was the only African country to make it onto the top 25 list while South Asia was well represented by Bangladesh, India, and Pakistan. As a ratio of economic output, the magnitude of remittances to SSA was recorded at 2.5% while other less developed economies recorded 5% of total economic output. However, Lesotho, Cape Verde, Guinea-Bissau, and Senegal receive significant flows of remittances, and for some of these economies, workers' remittances are a considerable source of external funding and currency.

Informal foreign remittances to SSA comprise 45-65% of remittances through formal channels. Intraregional migration which is very popular amongst SSA countries is another important source of remittances. For instance, South Africa and Botswana offer opportunities to foreign workers from bordering countries while in West Africa labor migration is incentivized by considerable cultural links. Because remittances are highly stable in relation to other types of international financial flows, they offer cheaper and easy access to foreign funding. However, just like any type of global capital flows, huge flows of workers' remittances pose some risks to the economy such as exchange rate over-valuation that could adversely affect exports in the recipient country. Foreign remittances arising from trained and technical migrant workers are associated with the loss of a skilled labor force, which is a serious issue in the SSA region. Adverse effects may also include an increase in consumption spending that can lead to an increase in inflation.

The biggest challenge in SSA is that most remittances are channeled through the informal market, and unofficial remittances comprise 45-65% of total flows compared to only 20% in Latin America (Freund and Spatafora, 2008). This is best explained by the high transaction costs of remitting money through formal channels in SSA. The SSA region in which the SADC bloc lies comprises

34 countries but makes a minimal contribution to the total remittances of developing countries. For instance, in 2006, SSA received a total of USD9 billion in workers' remittances, representing 4% (1.6% of GDP) of total remittances to developing countries. In contrast, India received 33% of total remittances to developing countries. Furthermore, the SSA region receives more aid than official remittances. Countries that receive the highest remittances include Lesotho, Swaziland, Mauritius, Uganda, Nigeria, Cape Verde, Senegal and Togo (IMF BOP Year Book, 2006, World Economic Outlook, 2006). In SSA, Nigeria tops the list in terms of total remittances received, while Lesotho leads the group regarding remittances as a ratio of GDP or export earnings.

In the SADC region, foreign remittances are a source of foreign currency and a stable and cheaper source of external funding. Gupta et al. (2009) point out that remittance flows are less volatile as a source of foreign currency than ODA or FDI. Furthermore, workers' remittances in SSA are expected to behave counter-cyclically to business cycles, i.e., they should increase during times of economic distress in the home country. These flows promote financial and economic stability by lowering the chances of capital flow reversals and also reduce investor panic by providing foreign currency to the financial system. However, Bugamelli and Paternò (2011) argue that these benefits can only be fully realized by economies with remittances in excess of 3% of GDP. The ratio for SSA falls short of this benchmark and the possibility of capital flow reversal driven by investor panic is low. A notable case where international remittances cause Dutch disease is when the local currency appreciates against other major currencies, thus reducing export competitiveness and ultimately reducing economic growth as recipients become demotivated to work (Gupta et al., 2009). This was observed in Cape Verde (Bourdet and Falck, 2006). However, Rajan and Subramanian (2005) argue that foreign remittances can be self-adjusting as an overvalued currency restricts remittances, meaning that the effects of Dutch disease cannot be sustained.

## **2.17 FOREIGN REMITTANCES AND GROWTH IN SADC COUNTRIES**

The controversial question of whether foreign remittances foster economic growth remains unresolved among economists (Wadood and Hossain, 2015, Siddique et al., 2012). Empirical research as well as theoretical studies have failed to settle this issue. Although foreign remittances cause a rise in the host country's income and significantly alleviate poverty (Gupta et al., 2007), their impact on productivity and long run economic performance is not certain as there are several channels through which they can influence growth. A rise in remittance inflows can raise

investment which in turn can spur long-term economic growth. In addition, remittances can reduce the liquidity constraints encountered by people in less developed economies (Woodruff and Zenteno, 2007). The positive impact of remittance flows is larger for countries with relatively less developed financial markets (Singh et al., 2011).

Regardless of the increasing significance of foreign remittances in aggregate foreign capital flows, the impacts of remittance volatility and its relationship to financial deepening have not been adequately examined. It has also been observed that foreign remittances drive productivity growth in economies with less advanced financial markets by providing a cheaper source of finance (no collateral required) and supply liquidity to domestic markets (Giuliano and Ruiz-Arranz, 2009).

Furthermore, while foreign remittances have become a significant component of gross international financial flows to developing economies, the linkages between remittances and output growth have yet to be fully examined, especially with respect to low-income countries. Arguably, they are used to cater for basic needs such as food and shelter and are hence considered to have limited effect on long-term growth (Giuliano and Ruiz-Arranz, 2009). Giuliano and Ruiz-Arranz (2009) also consider the crucial interactions between remittances and the financial sector that should feed into economic growth. For instance, when markets deepen, this lowers the cost of transacting, thus attracting more remittances to high return projects and in turn promoting growth. Similarly, and according to Freund and Spatafora (2008), remittance transfer costs have been observed to be lower in developed financial systems and when exchange rates are less volatile. Furthermore, when used appropriately, remittances can be a good replacement for inefficient credit markets in financing domestic enterprises, thus avoiding the need for collateral security and the prohibitive borrowing costs in developing markets (Giuliano and Ruiz-Arranz, 2009). A similar but micro-study of 30 communities in Mexico revealed that income from workers' remittances from the US is a critical source of initial capital for 21% of new businesses (Massey and Parrado, 1998). Thus, remittances can provide a better option of external funding and provide liquidity to the markets, spurring growth in developing economies. However, the situation is different when it comes to developed economies which attract the bulk of global remittances. Based on empirical analysis, advanced financial systems are able to attract more remittances as it is cheaper to transact but remittances appear to be failing to amplify their impacts on economic growth (Giuliano and Ruiz-Arranz, 2009). In their study, Giuliano and Ruiz-Arranz (2009) use a large cross section of

developing countries to examine the interactions between remittances and financial development on economic growth. The findings confirm that workers' remittances play a crucial role in driving growth in less developed financial markets after controlling for endogeneity. Furthermore, the study shows that remittances are mostly pro-cyclical, indicating that these flows respond to investment opportunities.

In contrast, Barajas et al. (2009b) indicate that foreign remittances have no impact on long-term economic growth, but acknowledge their poverty-alleviating and consumption-smoothing effects. Barajas, Chami, Fullenkamp, Gapen, and Montiel (2009b) reiterate that as billions of US dollars are moved worldwide through official channels (US300 billion was moved worldwide in 2007), it is highly possible that huge sums of remittances are also finding their way through informal channels. These volumes of remittance flows imply that they are economically important to most economies. They have become large relative to most private financial flows with an average remittance to GDP ratio of 3.6% (Chami et al., 2008). However, the flow of remittances to developing economies has not been uniform, with some receiving significantly more than others. Given these volumes and disparities, remittances are attracting the attention of economists and policy makers who are keen to investigate their role in economic growth (Barajas et al., 2009b, Chami et al., 2009b). Foreign remittances are mostly spent on consumption necessities such as shelter, health, food and clothing and their impact on long-term economic growth is not well understood. Due to their role in consumption, volatility in remittance flows is anticipated to have short-run impacts on output. A number of scholars have investigated remittance multipliers for economies, with mixed results. United Nations' (2003) studies or policy makers that treat remittances as similar to other private capital flows often report positive effects on long-term growth (Barajas et al., 2009b). The possibility of remittances promoting economic performance and hastening economic development is based on the fact that they are regarded as uncontrolled, private financial flows that not only finance consumption, but investment. Rajan and Subramanian (2005) found very limited evidence to show that remittance flows have contributed to the growth of developing countries; indeed, they may have retarded growth. Similarly, Barajas et al. (2009b) argue that when remittance flows are accurately estimated, and the estimation technique is properly designed, no substantial positive impact of remittances on long-term output growth can be found; rather, a significant undesirable association is observed between remittances and economic

performance. Furthermore, some economies experienced remittance flows in excess of 10% of GDP for several years, but there is no empirical evidence to show that this spurred economic growth. These arguments suggest that foreign remittances are merely sent to lift people out of poverty or for insurance motives, rather than to finance entrepreneurship. There is thus a need for recipients to understand the role of remittances and possibly obtain advice from institutions that can assist them to make the best use of them (Barajas et al., 2009a). Most of the existing empirical literature is based on micro-economic studies that utilize primary and survey data. The macro-financial implications of workers' remittances and their variability have not been fully examined and there is no consensus on the macro-economic determinants of remittances and what shapes their variability (Buch and Kuckulenz, 2004).

## **2.18 INTERNATIONAL CAPITAL FLOW VOLATILITY**

The variability of international financial flows is very important to both developed and developing countries as it has the potential to destabilize financial markets. There is an extensive body of literature on the drivers of the volume or direction of capital flows. However, these studies do not focus on the causes and impacts of foreign capital flow volatility, particularly in low-income economies.

In terms of the factors affecting the magnitude and direction of foreign financial flows, the empirical literature classifies the main drivers of capital flows into two broad categories, namely, pull factors (domestic macro-economic variables) and push factors (external variables) (Koepke, 2015). Global risk appetite and the US' monetary policy arguably constitute the global factors. For instance, Calvo and Reinhart (1996) point out that global inflows to Latin America in the 1990s were driven by global variables or external factors, leading to increased vulnerability of economies in that region. Fratzscher (2012) utilized a factor model and found that external factors were the key determinants of international flow of financial capital during the GFC whilst domestic variables were significant in explaining global capital flow dynamics in 2009 and 2010, particularly in emerging and developing markets. On the other hand, Forbes and Warnock (2012) analyzed capital flow episodes, including sudden increases and decreases in aggregate inflows as well as sharp increases and decreases in financial outflows. The analyses also confirmed the critical role of global risk in causing extreme capital flow instability. Similarly, Miranda-Agrippino and Rey (2015) show that a single global factor is crucial in explaining a large part of the variance of returns on risky assets around the globe, namely, the changing degree of risk aversion by market

players and total volatility, denoted by VIX, the Chicago Board Options Exchange Volatility Index. Miranda-Agrippino and Rey (2015) show that the Federal Reserve monetary policy significantly influences this global variable. Passari and Rey (2015) find that gross international capital flows, commodity and leverage are embedded within a global financial cycle and that VIX is a good estimator of such a cycle. This signifies the existence of prominent spillovers from Federal monetary policy on global financial flows to less developed markets.

Similarly, Ahmed and Zlate (2014) point to the desirable effects on capital flows as a result of the positive effect of unusual US monetary policy. They further highlight that the global risk appetite, and growth and interest rate differentials between developing and developed countries are significant determinants of foreign capital flow to less advanced economies. Ghosh (2014b) establishes that VIX and US interest rates are key factors in determining increases in international finance to emerging economies. However, domestic factors such as the value of domestic currency, capital account openness and external financing requirements have also been observed to be crucial drivers of global financial flows.

Fratzscher (2012) categorizes the determinants of capital flow volatility into push and pull factors. Push or global variables include shocks in global liquidity, risks and world GDP (WGDP), especially among advanced economies that have a considerable impact on the operation of emerging capital markets. Throughout the recovery period from 2009 to 2010 after the GFC, the domestic macro-economic environment, and stability of local financial institutions, policies and regulations were the main drivers of capital flow mobility (Carp, 2014). Similarly, Ito and Krueger (2009) point out that domestic variables such as income per person, cost of labor force and capital market liberalization are the main drivers of foreign capital flow variability.

Although there is a rich theoretical and empirical literature on the drivers and consequences of international flows and crises, the evidence-based literature on the sources and drivers of volatility is still very limited and can be classified into two schools of thought (Pagliari and Hannan, 2017). One group of scholars focuses on comparing the variability of global financial flows to developing and developed countries. For example, Broner and Rigobon (2004b) demonstrate that capital flow volatility is much higher in developing than in advanced economies as a result of higher susceptibility to mismatches in the economy which generate continuous shocks and greater international contagion. Alfaro (2007) emphasizes the significance of domestic variables such as

institutional quality and the robustness of domestic economic policies in explaining differences in volatility. Goldstein and Razin (2006) and Albuquerque (2003) argue that the difference in volatility between developing and developed economies can be attributed to the type of investment flow as shown in the gap between FDI variability and foreign portfolio investment variability which is smaller in advanced economies, yet the volatility of portfolio flows is higher in developing countries.

The second strand of empirical contributions uses panel regressions to investigate the impacts of integration of financial markets on the variability of cross border financial flows. For instance, Neumann et al. (2009) demonstrate that integration of financial markets drives the variability of FDI flows to developing economies whilst reducing that of portfolio debt in advanced countries. Lagoarde-Segot (2009) and Umutlu et al. (2010) focus on prices rather than quantities and show that capital market liberalization decreases the variability of equity gains in developing countries. Broto et al. (2011) analyzed the factors influencing the instability of different types of financial flows to less developed countries using annual data for the period spanning 1980 to 2006. The results show that global variables are more significant than domestic variables in causing serious fluctuations in international capital. Further analysis also demonstrates that some country specific variables decrease the instability of certain flows without increasing that of others.

Based on economic theory, global capital flows should be volatile, and volatility is not a bad thing (Prasad, 2014). Furthermore, volatility of capital flows is required to offset domestic business cycle conditions. Ideally, if an economy is sharing risk with the rest of the world, capital should be received when its performance has fallen and when the economy is doing well it should not receive capital flows. The biggest challenge with international financial flows is that they are extremely volatile and are volatile in the wrong direction, i.e., capital flows are pro-cyclical instead of being counter-cyclical (Prasad, 2014). In addition, the surge in global capital has been accompanied by financial instability over the past three decades and this has raised concern about the impacts of capital flows on domestic economies (Reinhart and Rogoff, 2009). An important and ongoing debate in academic and policy circles is what really drives capital flows and their variability as well as the consequences of financial flow instability. The main objective is to minimize the instability of domestic and international capital markets as well as reduce negative effects on the real economy. However, it is crucial to identify the main drivers of variability in

foreign financial flows as well as the dynamic relations among capital flows, growth and macro-economic stability (Alfaro et al., 2004). While Gabriele et al. (2000) attempt to differentiate between the volatility and instability of capital flows, most of the literature uses these terms interchangeably. In terms of the measurement of instability or volatility, most studies use deviations around a mean or trend (Osei et al., 2002). According to Gabriele et al. (2000), instability is measured as the coefficient of variation of the data in levels while the standard deviation depicts the volatility of capital flows.

### **2.18.1 VOLATILITY: NET CAPITAL FLOWS VERSUS GROSS CAPITAL FLOWS**

Based on Sole Pagliari and Ahmed (2017), net foreign capital flows to emerging and developing countries appear to be highly unstable compared to those of developed countries, as gross outflows dilute the effects of gross inflows in advanced economies and not in emerging or developing countries. It is further observed that gross inflows in developing and emerging economies are on average three times more volatile than direct investment flows. In addition, portfolio debt is more volatile than portfolio equity. In terms of policy, both the magnitude of capital flow volatility and the rate of change in volatility are crucial (Pagliari and Hannan, 2017). In general, FDI displays a stable variability pattern over time while portfolio flows, especially debt and other short-term flows, show a higher level of volatility and reversibility. The same study reveals that global factors such as the Federal Reserve's monetary policy attitude, the growth of the US economy and changes in the global volatility index affect capital flow volatility in developing economies more than domestic and structural factors. However, the IMF (2016) argues that the recent slowdown in capital flows can be predominantly explained by economic slowdown in emerging markets. The determinants of the magnitude of capital flows can be quite distinct from the drivers of capital flow volatility (Pagliari and Hannan, 2017). Further observation shows that the overall dynamics of foreign financial flows are guided by changes in the individual elements of gross capital flows such as portfolio and remittance flows.

According to Sole Pagliari and Ahmed (2017), FDI contributes significantly to total flows to developing countries, but in terms of variability, short-term flows such as portfolio and bank flows contribute more. They add that different results can be obtained from estimating the variability of disaggregated global financial flows compared to the instability of total flows. When foreign capital flows are divided into their individual components, foreign portfolio investment flows are



found to be both the most unstable and sensitive to the external drivers associated with global conditions (Global Economic Prospects, 2014). Based on estimates of the individual components, it is shown that in steady state, portfolio flows are highly responsive to fluctuations in short term interest rates, the quantitative easing (QE) indicator and the yield curve. In contrast, equilibrium FDI tends to be relatively inelastic to the impacts of changes in external variables, but in line with the literature is very sensitive to domestic variables such as country credit ratings (Dailami, Kurlat, and Lim, 2012, Alfaro et al., 2008).

Forbes and Warnock (2012) examined the phases of extreme capital flow fluctuations and identified various episodes, namely, sharp increases or decreases in aggregate inflows and sudden increases or decreases in aggregate outflows. Unlike previous studies, they utilized gross capital flows and obtained significantly different outcomes from some models in the literature that made use of net capital flows. The study found that, global factors such as the international risk index are significantly connected to rapid and extreme capital flow fluctuations. It also reveals that, the spreading of crisis via trade, geography or the banking system is strongly linked to sudden stops and retrenchment episodes. In this case, country specific fundamentals were observed to be of little significance in triggering foreign financial flow episodes. Capital inflow surges are usually followed by a financial crisis, and such a crisis is considered to emerge almost simultaneously with sudden stops in gross financial inflows (Global Economic Prospects, 2014). Forbes and Warnock (2012), argue that as the magnitude of instability of gross financial flows increases while net foreign financial flows to advanced economies become more and more stable, the distinction between gross inflows and gross outflows becomes crucial. In addition, foreign and domestic investors can be encouraged by varying factors and react differently to various policies and shocks. In most major developing economies, changes in net capital flows are driven by both foreign and domestic players.

Neumann et al. (2009) analyze the impact of financial liberalization on the variability global financial flows and show that the different components of capital flows respond differently to financial liberalization. The study used the financial liberalization chronology and index developed by Kaminsky and Schmukler (2003). This measure of financial liberalization is superior to the one used in Broner and Rigobon (2004b) which only captures liberalization of domestic markets. This index seems to be more powerful in that it depicts the intensity of liberalization and is a broader

measure with components that include liberalization of the capital account, the domestic financial system and stock market liberalization. Surprisingly, portfolio flows which comprise debt and equity flows show insignificant responses for both emerging and advanced economies. However, FDI shows substantial increases in volatility, especially for developing countries as capital is liberalized. Other capital flows such as bank lending and other debt flows show mixed results with a greater probability of a decline in volatility for developed countries. These regression results conflict with conventional wisdom that FDI is long-term and more stable than portfolio flows that are generally regarded as hot money. Forbes and Warnock (2012) focus on identifying crisis periods and countries that are susceptible to crisis, while Neumann et al. (2009) take a much broader perspective on capital flow volatility and its relationship with financial liberalization.

In contrast, Alfaro et al. (2007) focus on the role of domestic variables such as the quality of institutions and government policies (i.e., monetary and fiscal policy) in explaining foreign capital flow volatility. Their studies used a capital control variable that acted as the surrogate for capital market openness and is measured as the median of four dummy variables from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). It is found that a decline in exchange controls promotes greater equity inflows. Regarding capital flow volatility, the study shows that improved quality of financial entities considerably decreases the instability of equity flows but the effect is weakened when the capital control variable is included in the regression. On its own, the capital control variable is not powerful in analyzing the variability of equity flows. However, equity flow volatility was found to be more sensitive and significantly positively related to bank credit and inflation volatility. In this instance, Alfaro et al. (2007) interpret the bank credit variable as a proxy for financial opening. Thus, financial openness may increase bank-intermediated flows and more bank credit which may promote sudden fluctuations in capital flows. In Alfaro et al. (2004), the empirical evidence reveals that government policy variables have more power in explaining the variability of foreign financial flows than poor institutional quality.

Broner and Rigobon (2004a) argue that the variability of international financial flows to emerging markets is 80% more than that of advanced economies. Several studies on capital flow volatility estimate the magnitude of capital flow volatility using the rolling window standard deviation, including Alfaro et al. (2007) and Neumann et al. (2009). In their analysis, Broner and Rigobon

(2004b) show that a number of fundamental variables can influence capital flows such as trade shocks, productivity shocks, GDP, inflation and many more. Because the list of fundamental variables is long, all the variables cannot fit in a single regression model and some influence each other, leading to problems of omitted variables and endogeneity (normally a serious issue when seeking to identify causal relationships). Broner and Rigobon (2004b) argue that the possibility of reverse causation and omitted variables could explain the insignificant relationship between macro-economic fundamentals and capital flow volatility. Given this, the difference in volatility is unlikely to be fully explained by volatile macro-economic variables or by greater sensitivity to the macro-financial variables. Instead, variance in volatility can be explained by certain features of foreign capital flows. Firstly, capital flows to developing economies are more prone to large negative shocks than in developed countries. Secondly, shocks to emerging markets are more persistent than they are in advanced economies. Finally, shocks are subject to contagion. Broner and Rigobon point out that developing countries might be affected by fundamental shocks that have varying stochastic properties compared to those that affect developed nations, such that capital flows might exhibit these properties. In conclusion, their study suggests that, underdevelopment of domestic financial markets, weak financial institutions, and per capita income, are all significantly associated with capital flow volatility.

On the other hand, Karimo and Tobi (2013) argue that rapid changes in foreign capital flows in both financially open and closed economies are accompanied by macro-economic instability. Unlike most studies that confined themselves to domestic macro-economic factors as the drivers of volatility, Frenkel and Menkhoff (2004) and Gelos (2011) point out that increased availability and reliability of information (transparency) can assist in attaining the twin objective of attracting foreign investment flows whilst managing excess capital flow volatility. In addition, foreign capital flow mobility can be driven by external variables such as international interest rates, global output growth, global liquidity, global risk (as measured by the Chicago Board Options Exchange Volatility Index) and global commodity prices.

Recently, Broner, Didier, Erce, and Schmukler (2013) showed that gross financial flows are large, and more volatile and positively related to production cycles than net capital flows. It is further demonstrated that during periods of growth of the domestic economy, foreigners invest in the country, while domestic players purchase foreign assets and vice versa during a crisis. The results

also show that the impact of a crisis on foreign and domestic players is asymmetrical. In conclusion, the size and magnitude of the volatility of gross capital flows are larger than the volatility of net capital flows in both absolute and relative terms. Finally, Broner et al. (2013) demonstrate that gross capital flows are pro-cyclical in behavior and that all types of gross capital flows (direct investments, portfolio flows, etc.) decline significantly during a crisis. In general, gross capital flow patterns are quite distinct from that of net global financial flows; for instance, the global financial crisis period witnessed a sharp drop in aggregate flows throughout the world while net financial flows remained steady.

Levchenko and Mauro (2007) examine whether certain types of global financial flows provide better protection than others during crisis periods. Their study utilizes a large panel data set for developing, emerging and developed countries to examine patterns of global portfolio flows, FDI and other flows to non-bank private companies. In line with the existing literature on capital flow volatility, FDI is regarded as the least volatile type of financial flows. However, portfolio debt was considerably more volatile, declining sharply during a crisis though quick to recover as the economy normalized. Other flows experienced the largest drop during a crisis and remained depressed for a much longer period, thus explaining and identifying episodes in capital flow fluctuations.

Bluedorn et al. (2013b) focus on the variability or volatility of capital flows (gross and net) in a large sample of developing countries. It is established that, generally all flows are volatile for all countries across all types. Employing the standard deviation method, the variability was higher for advanced markets than for developing countries, reflecting huge gross flows to advanced countries. Accordingly, the generally accepted wisdom in the literature that global capital flows are more unstable in emerging economies than developed markets (Broner and Rigobon, 2004b, Becker and Noone, 2008, Levchenko and Mauro, 2007) is put to the test and requires qualification. However, Broner and Rigobon (2004b) and Broner et al. (2013) show that financial flows show little persistence in all countries and across all types of flows. Similarly, Bluedorn et al. (2013b) show that gross flows are more unstable than net foreign financial flows in developed countries, but attribute this to the larger size of gross capital flows. Further to this finding, and after controlling for size, it is shown that the volatility of each unit of gross inflows and outflows as a proportion of GDP is similar to that of net global flows. While the variability of other types of

international finance is identical, employing the coefficient of variation concept indicates that FDI (net or gross) is the least unstable in each economy (Bluedorn et al., 2013a). The results further reveal that equity flows are as volatile as debt capital, and that debt flows are slightly more variable in developing economies than in developed economies across all country groups. The increase in volatility over time is considered to be driven by volumes of flows as each incremental unit of net and gross capital flow relative to GDP becomes more volatile. It has been observed that developed economies experience greater substitutability between alternative types of flows, and that inflows and outflows complement each other well, unlike in developing countries. Bluedorn et al. (2013a) stress that gross outflows in emerging markets are too small to offset the surge in gross inflows; hence, capital flow fluctuations in these economies are driven by foreign investors. In contrast, capital outflows in developed economies are so large that net inflows do not always track gross inflows. Increased investment abroad by domestic players may function as a hedge against capital flow variability shocks in developed countries (Bluedorn et al., 2013a).

As detailed above, several studies focus on explaining the differences in volatility among different types of foreign financial flows. For example, the cross-sectional regressions conducted by Broner and Rigobon (2004b) indicate that global capital flows are more unstable in developing than in developed countries due to the high susceptibility to mismatch buildup which may lead to more instability and financial contagion. Given this, Broto et al. (2011) attempt to explain the sources of volatility of groups of capital flows by firstly, identifying a robust method of estimating capital flows volatility, the Engle and Gonzalo Rangel (2008) approach. The rolling window standard deviation and GARCH (1,1) that have been very popular with researchers suffer from many weaknesses such as missing observations at the beginning of the sample, endogeneity and serial correlation problems. The Engle and Gonazalo Rangel approach is able to overcome these problems. According to this study, FDI is less volatile and more persistent than other types of flows and more resilient during a crisis. However, portfolio and bank flows are considered to be more volatile, perhaps due to their sensitivity to domestic factors. Compared to country specific factors, recent developments show that global variables are gaining more power in explaining the variability of the various types of capital flows.

In contrast to the IMF (2007), Broto et al. (2011) reveal that some macro-economic variables influence FDI volatility quite differently from that of bank flows, making it complex to interpret

results and recommend policies. Domestic financial factors seem to be very crucial in modelling the instability of portfolio flows and the impact is more pronounced when they are disaggregated. A positive relationship between interest rate spread and portfolio flow volatility was found, although not very significant. In contrast, a negative relationship is established between interest rate spread and FDI and bank inflows, suggesting that bank competition can destabilize the two flows. Brafu-Insaidoo and Biekpe (2011) also stress the significant role of political stability in investment volatility in all developing economies. In this case, the political climate and institutional quality are measured by the weighted conflict index and the quality of the legislature suggested by Data Banks International. Similarly, Alfaro et al. (2007) indicate that a steady political environment and vibrant institutions reduce uncertainty in investments.

Global capital flows form a critical source of finance for both developed and developing countries, especially low-income countries with very low savings rates (Osei et al., 2002). Stable financial flows can promote investment while unstable flows can negatively affect it and in turn discourage economic growth (Lensink and Morrissey, 2000). Increased volatility may lead to macro-financial stability problems and may contribute significantly to a financial crisis (Gabriele et al., 2000). Despite the recovery in external financial flows, some developing countries experience a severe scarcity of foreign capital inflows as huge flows are concentrated among a small group of emerging economies (Gabriele et al., 2000). The major challenges with respect to free capital flow mobility are increased volatility and sustainability (Prasad, 2014).

Huge foreign capital flows are normally associated with a sudden increase in credit and investment, inflation, overheating, currency overvaluation, balance of payment problems and financial sector weaknesses, leading to financial crisis and consequently a decline in production (Mohan and Kapur, 2009). During the period 2004-2009, India received a substantial amount of volatile capital flows, but managed to maintain both price and financial stability. This was achieved through active management of the capital account especially external inflows, employing a flexible exchange rate, financial sector deepening and prudential regulation as well as other restrictions (Mohan and Kapur, 2009). Ultimately, inflation and financial stability were attained as the real economy grew rapidly while the global economy experienced a series of financial crises. Rather than relying on a single instrument, an array of instruments was used in conjunction with one another and the desired stability gains were achieved in India. In several economies outside of Asia, retrenchment

by domestic investors played a crucial role in promoting macro-financial stability during the global crisis. As a result, the sudden stops in capital flows were offset by reduced foreign investment by domestic players, leaving net flows relatively stable. Sudden stops in capital flows to India as well as capital flight have been partly attributable to global changes in risk aversion and liquidity as well as domestic macro-economic challenges (Mohan and Kapur, 2009) in the mid-2000s.

In addition, events in neighboring countries such as the Asian crisis also caused sudden stops in 1998. Forbes and Warnock (2012) state that global variables such as global risk and contagion are the most important factors in explaining sharp movements in capital flows. In addition, the findings show that domestic factors are insignificant in predicting the variability of foreign financial flows. The study also shows that capital restrictions do not necessarily reduce a country's risk of experiencing sudden fluctuations in capital flows as it may experience capital flight by domestic investors. In a follow-up study, Forbes and Warnock (2012) investigate aggregate capital flows to determine if the inherent sharp fluctuations are mainly caused by portfolio flows (either equity or debt flows). It was observed that most of the volatility in gross capital flows was caused by shifts in debt flows. For instance, in Asia, 80% of the surges and 79% of the sudden stops in foreign capital inflows are due to debt flows. Forbes and Warnock (2013) find that international variables including the world economy risk index and contagion factors such as economic and trade linkages are responsible for sudden shifts in debt flows. According to Kaminsky (2005), sudden changes in global capital flows have made international investors more important and they are often regarded as the main agents of financial market instability. This is because foreign investors can panic and suddenly withdraw funds even from sound economies.

A currency crisis that is triggered by sudden stops and reversals in capital flows severely impacts emerging market economies and might lead to significant output losses (Sula and Willett, 2009). The increase in such financial crises has generated serious debate on the effects or role of fluctuations in foreign financial flows. The nature and make-up of international financial flows is important to policy makers as some flows are more likely than others to reverse in the event of a crisis. Flows that are regarded as hot or dangerous are more volatile and may easily reverse in a crisis. Foreign direct investment is regarded as more stable than short-term portfolio (stocks and bonds) flows which are hot and dangerous (Sula and Willett, 2009). However, some empirical studies have failed to confirm this general consensus. For instance, Claessens et al. (1995) show

that FDI is as volatile as other types of flows and that there is no considerable distinction between long and short term international financial flows. In contrast, Sula (2010); Sula and Willett (2009) and Sarno and Taylor (1997) show that short term flows are the most unstable type of foreign financial flows while Willett (2004) found that the biggest fluctuations during the Asian crisis were experienced in bank loans.

It has been observed that the pattern of global financial flows is best examined during periods of unexpected financial challenges. The contradictory evidence in the empirical literature on the predictors of foreign capital flow volatility is partially due to the limited time periods, different variables and different samples used (Sula and Willett, 2009). Sula and Willett (2009) found that the variability of aggregate foreign capital flows is less than that of its constituent elements, showing the high substitutability of global capital flows.

Broner and Ventura (2016) recently examined the impacts of globalization in fast developing countries and less developed economies. The study reveals that financial globalization can produce three distinct outcomes: i) domestic financial outflows and net financial flows, investment and growth; ii) global financial inflows and higher investment and growth; iii) unstable financial flows and volatile financial markets. However, these results are influenced by the level of development, productivity, savings and institutional quality. These effects ultimately depend on the level of development, productivity, domestic savings and the quality of institutions. As a result, this study empirically investigates some of these concepts by expanding on the work of Broto et al. (2011) to include the period after the GFC.

### **2.18.2 FACTORS AFFECTING CAPITAL FLOW VOLATILITY**

The empirical literature has until recently concentrated on the drivers of the magnitude of global financial variables, with these are divided into macro-economic, global and financial variables. Recent contributions have mainly focused on the drivers of variability in gross global financial flows. For instance, Bacchetta and Van Wincoop (1998) show that the presence of incomplete information tends to generate volatility in emerging markets, a challenge that is very pronounced during the process of financial liberalization. Arguably, volatility tends to decline as investors realize new investment opportunities. Using a dynamic open economy, Aghion et al. (2004) show that instability of foreign financial capital is higher in countries with economies that are midway



through in terms of financial growth. On the other hand, Martin and Rey (2006) examine the correlation between trade and financial globalization in relation to their effect on the risk of liberalizing countries. They reveal that foreign capital flow volatility is greater in economies that have begun the process of amalgamation with the global financial system without opening up trade. The authors thus recommend that in order to fully benefit from globalization, developing economies should start by opening up to international trade.

Broner and Rigobon (2004b) investigate why global flows are more unstable in developing than in advanced countries using a sample of 58 countries and volatility estimated using the rolling standard deviation method. Their results show that variability in emerging markets was 80% higher than that in industrialized countries during the period 1995-2003. Further regressions reveal that domestic economic factors and global factors explain very little of the volatility differential between emerging and developed countries. Instead, it is explained by differences in the persistence of shocks to foreign financial flows and the probability of rapid spreading. Similarly, Forbes (2012) and Claessens et al. (2001) argue that global variables and contagion are key variables in driving extreme capital flow fluctuations around the world, especially in Asia. Global shocks in this case refer to any significant changes in global variables that simultaneously affect all countries such as changes in commodity prices, while contagion is the transmission of an extreme negative shock from one country to another (Forbes, 2012). Although Broner and Rigobon's (2004b) argument is based on the persistence of shocks and contagion, Broto et al. (2011) point out that variability of global flows is affected by a rise in per capita income, and improved quality of institutions as well as increased financial development. Broto et al. (2011) highlight that the different nature of global capital flows signifies the different volatility and stability dynamics between them. There are several mechanisms through which a shock can be transmitted, namely, trade, portfolio investment, banks and lending institutions.

Regarding extreme capital flow fluctuations in Asia, Forbes and Warnock (2012) reveal that debt flows contributed 80% of the surges and 73% of the sudden stops to capital flows from international investors. Although the study failed to quantify the sudden movements in gross capital flows attributable to equity flows, the authors concluded that sudden shifts in capital flows were a result of global risk and contagion variables such as trade and financial connections among economies. An important factor shaping the size and volatility of capital flows is the integration

of global financial markets; this has led to an increase in trade in equity and bond markets since 1980 (Evans and Hnatkovska, 2014). According to Evans and Hnatkovska (2014), foreign capital flows are large and very volatile during the early stages of financial integration when the focus of global asset trading is on bonds. However, the size and volatility of capital flows decline as integration advances into world equity markets. A decline in volatility was observed during the period 1975-2007 in G-7 economies. In general, capital flow volatility in bond and equity markets slows down as global integration advances. For example, between 1975 and 1995, the volatility of debt outflows and debt inflows decreased by approximately 30% while that of equity outflows declined by about 40% (Evans and Hnatkovska, 2014).

The results reveal that external variables such as the global risk index, world output growth and the shadow rate (instead of the policy rate, the federal funds rate) are key drivers of foreign capital flow volatility in emerging and developing countries. An increase in the global risk index is expected to drive the variability of capital flows in developing countries. Save for portfolio flows, the growth of the US economy negatively impacts on the volatility of total flows in EMDEs. This implies that a rise in the growth of US output leads to greater stability of the global financial system.

Furthermore, (Evans and Hnatkovska, 2014) observed that commodity prices proxied by the oil price are a key determinant of capital flow volatility. For instance, a rise in the oil price was observed to decrease the variability of foreign equity flows and other investments that enter the formal sector, but increase the instability of other investments through the financial sector. Other domestic variables are also significant predictors of capital flow volatility. For example, a rise in domestic output decreases the volatility of global financial flows by attracting stable and long-term flows. However, trade openness or more open economies are usually hit by more volatile capital flows. Finally, Sole Pagliari and Ahmed (2017) suggest that the drivers of volatility are quite different from the determinants of the magnitude of capital flows. For example, global risk aversion is more significant than domestic macro-economic factors such as GDP growth in shaping the volatility of foreign investment flows. The volatility of foreign financial flows is crucial to both advanced and less developed countries and it is important for economists to determine its impacts on the growth of financial markets and overall economies. The determinants of capital flows and their variability are classified from A to D as shown in Table 2.1 below.

**Table 2.1: Determinants of Capital Flow Volatility**

Category	Type of determinant	Variable
A	Domestic macro-economic	<ul style="list-style-type: none"> <li>• Per capita GDP</li> <li>• GDP growth rate</li> <li>• Inflation rate</li> <li>• Reserves</li> <li>• Public debt/deficit</li> </ul>
B	Domestic Financial	<ul style="list-style-type: none"> <li>• Stock market prices</li> <li>• Stock market returns</li> <li>• Interest rates</li> <li>• Domestic banking</li> </ul>
C	Global factors	<ul style="list-style-type: none"> <li>• Global liquidity</li> <li>• Real GDP growth rate</li> <li>• Global interest rates</li> </ul>
D	Legal, institutional and geopolitical	<ul style="list-style-type: none"> <li>• Order and bureaucracy</li> </ul>

**Source: Broto et al. (2011), Neumann et al. (2009), Carp Lenuta (2014)**

*Note: The alphabetical letters A to D represent the categories of determinants of foreign capital flows as indicated in the literature.*

A nonlinear relationship is anticipated between GDP per capita and growth rate and capital flow volatility. According to Carp (2014), the variables CPI and public deficits are generally used to indicate the quality of domestic macro-economic policies, and it is anticipated that economies with high inflation and public deficits will be characterized by volatile capital flows. Low foreign currency reserves signify a liquidity crisis in the affected areas and hence greater capital flow volatility. Furthermore, corruption, and low levels of bureaucracy provide information on the quality of domestic financial institutions and markets.

According to Sole Pagliari and Ahmed (2017), future studies should comprehensively investigate the different aspects of capital flow volatility such as its dynamic linkages with financial depth.

This motivated the current study's focus on the linkages between capital flow volatility and financial depth.

### **2.18.3 GROSS AND NET CAPITAL FLOW VOLATILITY COMPARED**

This section compares the volatility of gross and net capital flows in advanced and developing countries. Empirically, this comparison has been recently supported by Sole Pagliari and Ahmed (2017) and earlier by Broner and Rigobon (2004b) who pointed out that net foreign investment flows are more volatile in emerging and developing economies. Further examination of the dynamics between gross inflows and gross outflows in developing economies reveals that the variability of gross inflows is on average greater than the variability of gross outflows; hence, the high variability of net flows. It has been observed that fluctuations in gross outflows at global level appear to offset fluctuations in gross inflows. The empirical literature indicates that capital flows are more unstable in less developed countries than in developed countries (Broner and Rigobon, 2004b). In contrast, the tendency for gross out flows to offset gross inflows is higher in advanced countries and leads to less volatile net flows (Pagliari and Hannan, 2017).

Although EMDEs are rapidly transforming towards greater financial integration, they are still able to attract foreign investment inflows that significantly exceed investment abroad by domestic investors. Given this situation, net capital flows are crucial to EMDEs (Pagliari and Hannan, 2017). Sole Pagliari and Ahmed (2017) also found that foreign equity and debt flows as well as other investment flows are on average three times more volatile than FDI, and that portfolio debt flows are more unstable than portfolio equity flows. These findings are consistent with existing empirical evidence as FDI is regarded as very stable while portfolio equity is found to be less volatile than portfolio debt. Finally, the observed GARCH and ARIMA estimates for portfolio flow volatility were higher than those produced by rolling window standard deviation. Overall, the GARCH produced higher volatility estimates than ARIMA and RW estimates.

### **2.18.4 OVERREACTION IN DEVELOPING MARKETS**

Developing markets are characterized by a lack of depth and breadth, and are prone to sharp and drastic fluctuations in global financial flows, making them susceptible to financial crises (Pagliari and Hannan, 2017)). Sudden fluctuations in global financial flows can easily be magnified by excessive overreaction to new information or unexpected events by international investors, particularly in equity markets (Agosin and Huaita, 2012, DeBont, 2000). An important observation

in the literature is the identification of market overreaction that is related to psychological factors which can drive prices to levels beyond that caused by fundamental variables (Agosin and Huaita, 2012). Agosin and Huaita (2012) note, that, a surge in prices is usually followed by dramatic downward adjustment. Financial markets that display excess volatility are typical examples of markets with frequent overreaction. This is the case with foreign capital flows to less advanced markets where unexplained volatility has been identified. For instance, Broner and Rigobon (2004b) use panel regressions to show that the instability of foreign investment flows to less advanced economies is 80% higher than those to industrialized economies. Evidence has also shown that the longer the preceding boom, the higher the probability of a sudden stop (Broner and Rigobon, 2004b). Accordingly, some episodes of sudden surges, stops and reversals in capital flows are regarded as a form of overreaction in emerging and developing markets whereby markets react excessively to information, pushing fluctuations in capital flows to levels beyond what would be determined by fundamental factors (Agosin and Huaita, 2012, Leijonhufvud, 2007). These psychological factors have been used to explain capital flow volatility in most financial markets and markets that display excessive volatility are typical examples.

### **2.18.5 STATISTICAL PROPERTIES OF CAPITAL FLOWS**

In order to fully understand the behavior of foreign investment flows, it is important to explain some of their key statistical properties that policy makers and academia have to be familiar with (Broner and Rigobon, 2004b).

#### **I. Crises (left skewed residual)**

According to Broner and Rigobon (2004b), foreign investment flows to less advanced economies are both more volatile and left skewed than capital flows to developed markets. Macro-economic fundamentals have little power to explain this scenario.

#### **II. Persistence**

The degree of endurance of foreign financial flows is a good estimate of their predictability. Persistence is measured as the AR (1) regression coefficient of net and gross flows and their components can be estimated separately for each country over the entire study period. Some

scholars have found no significant differences in the persistence of total net private capital flows across countries, whilst gross inflows and outflows are found to be more persistent for developed countries than for emerging and developing countries (Bluedorn et al., 2013a). Research results on persistence have been mixed. For instance, Broner and Rigobon (2006) suggest that total financial flows are more persistent in EMDEs than they are in developed countries. Furthermore, Levchenko and Mauro (2007) and Becker and Noone (2008) show that net financial flows are more persistent in developed economies than they are in developing countries. In order to study persistence using an econometric model, lags have to be introduced to the specification. Claessens et al. (1995) also investigate persistence, i.e., whether an investment flow is likely to vanish or withdraw in the near future. An autoregressive model is applied in analyzing serial correlations, half-life responses and series predictability.

Estimating and understanding the volatility of international financial flows is crucial even though it is a complex process (Neumann et al., 2009, Broto et al., 2011). The degree of persistence of capital flows over time is a major contributory factor in the estimation of volatility. Indeed, capital flows that are regarded as stable display more evidence of significantly positive correlation with own previous values (Becker and Noone, 2008). The lack of such correlation implies very volatile capital flow which can suddenly change sign and become relatively unpredictable. In econometrics, persistence is measured by calculating serial correlation coefficients for each foreign capital flow in every economy over the study period.

Following Broner and Rigobon (2004b), Becker and Noone (2008) show that the auto correlation coefficients of foreign capital flows are much larger and more positive in advanced economies than they are in developing economies. This implies a considerable degree of persistence in developed nations although it decays as lags increase. This is attributable to the lack of variation from a slow-moving trend to the few shocks that impact on the balance of payment accounts of industrialized countries. The Philippines displayed the weakest evidence of a link between the capital account and its lagged values. However, an analysis of individual components of the capital account for industrialized countries shows no evidence of autocorrelation to prove high persistence; the multipliers are insignificant and change sign frequently. Portfolio debt flows to the US proved more persistent, as it hosts some of the large debt markets and the USD is the internationally accepted reserve currency. In Japan, FDI showed greater persistence largely due to

the deterioration of Japanese production as car manufacturers established assembly plants in other Asian countries with lower labor costs.

### **III. Contagion**

Broner and Rigobon (2004b) also note that capital flows to emerging economies are more correlated across countries compared to flows to developed countries, and that this cannot be explained by economic variables. According to Broner and Rigobon (2004b), the high variability of foreign investment flows to developing countries signals the three statistical properties identified above.

The literature review now turns to the vital concepts of foreign remittance volatility and foreign portfolio investment volatility in sections 2.19 and section 2.20, respectively. Remittance volatility appears to be a fairly recent phenomenon and there has been considerable debate on the sources of such variability. This implies that there are differences of opinion on the stability of remittances as well as their cyclical properties. In the same vein, there appears to be no consensus on the sources of foreign portfolio investment volatility.

#### **2.19 REMITTANCE VOLATILITY**

Remittance flows are regarded as a stable source of foreign funding for both developed and less developed countries. Given the trends and potential impacts of foreign remittance flows, recent studies have focused on the factors that significantly contribute to remittance behavior. The main motives that have been identified to explain the behavior of remittances at micro level are altruism, self-interest and insurance (Chami et al., 2008, Ratha, 2005a, Lucas and Stark, 1985). There has been also a gradual increase in the number of studies focusing on the macro-economic drivers of remittance flows as well as remittance volatility. Macro-economic drivers of remittance behavior include the economic performance of the receiving country (Moore and Greenidge, 2008, Singh et al., 2010); interest rates (Chami et al., 2009b); exchange rates (Craigwell et al., 2010); inflation (Chami et al., 2008); and the age dependency ratio (Buch and Kuchulenz, 2010). However, remittance volatility and its dynamic impacts on low-income countries have received limited attention (Jackman, 2013). The lack of research in this area could be explained by generally accepted wisdom that remittances are a steadier source of finance than other global financial flows

(Ratha, 2005a). In contrast, Jackman (2013) stresses that the magnitude of the volatility of remittances cannot be ignored, and that there is a need to identify the main driver of remittance volatility among global and domestic macro-economic and financial variables.

Following Ratha (2005a), the magnitude of remittance variability is dependent on the targeted use of remittances, that is, are they meant for altruistic purposes, insurance or portfolio investment? There is general consensus among scholars that profit driven remittances are more volatile than remittances meant for other uses (Jackman, 2013). However, Ghosh (2006) argues that even if remittances are meant for insurance or altruistic purposes, their magnitude and variability are expected to increase during times of hardship. Accordingly, such remittances have a downside risk because the more they move counter-cyclically, the more they gain in potential variability. Although the counter-cyclical behavior of remittances is a desirable characteristic, it has negative effects on the level of remittance volatility as it rises during severe shocks or natural disasters and declines as the shock dissipates (Ghosh, 2006).

Furthermore, Jackman (2013) and Craigwell et al. (2010) suggest that irrespective of the intended use of remittances, economic volatility tends to drive remittance variability. They found a significant and desirable relationship between economic volatility and remittance volatility. A positive link was also found between a natural disaster and remittance volatility, implying that remittance volatility is bound to increase in the event of a natural disaster and decline as the natural phenomenon dies down.

Empirical evidence has also revealed the significant role played by interest rates and exchange rates in the variability of foreign remittance flows (Jackman, Craigwell, and Moore, 2009). As a result, the existing literature concurs with the hypothesis that remittance flows comprise an investment component (Jackman, 2013). Regarding remittance flows to meet portfolio objectives, uncertainty in exchange rates and interest rates significantly influences remittance volatility, that is, the more volatile exchange and interest rates are, the higher the volatility in remittance flows. On the other hand, fluctuations in the remitting country's income increase remittance flow volatility, while countries with more educated migrants receive a stable flow of remittances (Jackman, 2013, Jackman et al., 2013). This finding implies that there is a trade-off between brain drain and the stability of remittance flows (Craigwell et al., 2010, Jackman, 2013) as countries



exporting highly skilled labor receive more stable inflows of remittances compared to those exporting a largely unskilled labor force.

Makhlouf and Mughal (2011) investigate the variability of remittance flows to Pakistan by employing the Autoregressive Conditional Heteroscedasticity (ARCH) model. They find that remittances to Pakistan are fairly stable while those to the Middle East and North America are relatively volatile as a result of the variability in output of recipient economies and the migrant's profile. The study also demonstrated that foreign remittance flows from Europe are least volatile and are not affected by shocks to the host economy; hence, they can be used as a steady origin of foreign exchange (Makhlouf and Mughal, 2011). Furthermore, foreign remittance flows have overtaken other foreign financial flows and have become a key source of external finance and foreign currency for emerging countries such as Pakistan. Foreign remittances to Pakistan form the largest international financial flows and are very crucial to the country such that sudden fluctuations in remittances can pose serious risks to the macro-financial system and serious challenges to the country's policymakers (Makhlouf and Mughal, 2011). This is despite the fact that the literature regards remittances as a stable source of foreign exchange flows that is less affected by economic shocks and business cycles than FDI and foreign portfolio flows (Chami et al., 2009c, Ratha and Mohapatra, 2007). Based on Grabel (2008), such low variability is crucial in promoting monetary and fiscal stability which in turn can improve citizens' welfare. Overall, remittance volatility is influenced by various macro-economic factors such as variations in output and exchange rate fluctuations. However, Singh et al. (2011) argue that investigations of the nature of correlations between the magnitude of foreign remittances and the level of economic performance in the recipient economy have not produced conclusive answers. For instance, Yang and Choi (2007) show that income and remittances in the host economy are negatively correlated.

Finally, cyclicity is an important but debatable characteristic of remittances. Several scholars stress that remittances are counter-cyclical and supply a steady flow of external funding to developing economies. However, Sayan (2006) disputes the counter-cyclicity of remittances on the basis that it lacks empirical support. Sayan uses de-trended remittances and de-trended real GDP to compute unconditional correlations for 12 nations and finds that remittances are a-cyclical in most cases or even pro-cyclical at times. Similarly, Yang (2008) finds that Filipino migrants remitted little when the peso lost value due to the Asian financial crisis. An earlier study by

Straubhaar (1986) finds that total foreign remittance flows to Turkey are not influenced by exchange rate fluctuations.

## **2.20 FOREIGN PORTFOLIO INVESTMENT VOLATILITY: EMPIRICAL STUDIES**

Foreign portfolio investment flow refers to cross border investments in both equity and bond markets (Lo Duca, 2012a) and portfolio flows are regarded as a crucial source of private capital for virtually all economies (Karimo and Tobi, 2013). Developing economies stand to benefit immensely from a constant supply of stable capital flows. However, strong and volatile portfolio flows call for sound policy instruments to protect macro-financial stability in receiving economies. Foreign portfolio flows have been observed to be very short-term in nature and are therefore regarded as hot money. According to Lo Duca, these flows are also vulnerable to informational problems and rational herding behavior in financial markets as investors look for international diversification opportunities (Calvo and Mendoza, 2000). A major source of instability that is inherent in portfolio flows emanates from the trading activities of fund managers as they enter and leave the market at the same time (Haley, 2001). An important feature of portfolio stocks and bonds is their high liquidity status which enables investors to dispose of their assets quickly (Lo Duca, 2012). Capital controls have not been observed to have a significant effect on surges and sudden stops in foreign capital flows. Financial markets in low-income countries are shallow and narrow, making them more vulnerable to volatility in portfolio flows. Given the finding that the significance of the drivers of capital flow volatility changes over time and across sectional units, analysis of the sources of volatility becomes complex (Lo Duca, 2012b).

The determinants of foreign portfolio investment flows have been subject to immense debate among scholars and economists. International investors are always interested in the security and expected returns on their investments. An unstable and unpredictable macro-economic environment might chase away investors looking for better, guaranteed returns. On the other hand, emerging and developing markets require external funding to close the savings-investment gap (Karimo and Tobi, 2013). However, emerging or developing markets have to contend with the greater variability associated with international portfolio flows. Extra-ordinary measures are sometimes required to manage the adverse effects of portfolio flow volatility so as to maintain financial stability, and address macro-economic imbalances and asset bubbles. Based on Akçelik

et al. (2015), an appropriate policy mix is required to counter these risks. This might also depend on a variety of country specific considerations including financial stability, financial development and institutional infrastructure.

There are several explanations for why the drivers of capital flows and their volatility change over time. Firstly, information asymmetries can prevent the market clearing at a given price, leading to disequilibrium where the drivers change across time periods depending on whether quantities are influenced by supply or demand (Mody and Taylor, 2003). Secondly, investors have different allocation strategies; hence, the drivers of foreign financial flows change across periods, reflecting the varied perceptions of investors. For instance, Forbes and Warnock (2012) suggest that the drivers of capital flow variability depend on the contribution of domestic or foreign investors. Thirdly, during crisis periods, investors might change their portfolio mix in order to maintain their desired risk profile. As pointed out by Adrian and Shin (2010), this leads to self-enforcing deleveraging cycles. Finally, changes in investors' tastes and preferences can alter their risk appetite. For instance, a sharp rise in the premium between unsecured and secured interest rates in August 2007 indicates that certain events cause changes in the information employed by investors to price risk (Lo Duca, 2012b).

According to finance theory, the integration of a country's stock markets in the global market promotes sharing of risk, provides more liquidity and possibly reduces the risk-free rate of interest. The inherent volatility of capital flows, especially portfolio flows, leads to adverse effects, particularly during economic meltdown in less developed markets with little absorption capacity (Kose et al., 2003a) and weak investor protection. In general, there is a distinction between short-term and long-term foreign investment flows. Short-term investment flows are regarded as volatile hot money while long-term capital flows are regarded as stable cold money. However, Claessens et al. (1995) use time series balance of payment data for five advanced and five less developed economies to indicate that the names short-term and long-term do not capture specific information pertaining to the statistical properties of global financial flows. Long-term flows were found to be as unstable and unpredictable as short-term flows. They add that an appreciation of the type of flow does not improve prediction of aggregate capital account. The increase in foreign portfolio flows across the globe has been linked to liberalization and the integration of financial markets (Waqas et al., 2015) which have promoted the surge in private investment.

According to the portfolio investment theory, international investors are normally lured by high returns because this reduces borrowing costs and the international investor will invest up to a point when interest rates are equalized across the world. However, this theory becomes problematic when risk, unpredictability and instability are introduced (Waqas, Hashmi, and Nazir, 2015). In terms of high volatility, investors prefer to go short-term, but as the environment becomes uncertain, they withdraw their investment (Kodongo and Ojah, 2012). It has been observed that, as part of their decision-making process, foreign investors take into account the variability in the host economy's exchange rate as well as the magnitude and volatility of interest rates. Variability in exchange rates, decreased returns and high inflation increase the volatility of foreign portfolio investment flows (Waqas et al., 2015, Kodongo and Ojah, 2012, Çulha, 2006). Furthermore, stock market performance attracts capital flows and tends to stabilize portfolio flows. Because foreign portfolio flows are viewed as short-term and more volatile in developing and emerging markets, they have attracted huge interest among domestic and international investors, policy makers, regulators and researchers (Karimo and Tobi, 2013, Ferreira and Laux, 2009). It is further argued that at micro-economic level, the effects of portfolio flows on financially constrained firms' access to finance exceed the negative effects of volatility in portfolio flows (Knill and Lee, 2014). Thus, even in crisis periods, portfolio investment remains beneficial and crucial to countries especially as markets become more integrated (Beck et al., 2005). With respect to FPI volatility, Darby et al. (1999) point out that exchange rate fluctuations in the receiving economy increase the volatility of portfolio flows; hence, investors frequently monitor fluctuations in exchange rates. Carrieri et al. (2006) state that the focus should be on real exchange rate fluctuations as opposed to nominal exchange rate variability, because the real currency rate eliminates inflation and is a better predictor of FPI instability. Empirical evidence shows that there is an inverse relationship between exchange rate and portfolio flows (Waqas et al., 2015, Ersoy, 2013, Bleaney and Greenaway, 2001).

Another important factor that influences portfolio flows is the rate of inflation. Higher inflation increases portfolio flow volatility and drives investors away; hence, the negative relationship. Agarwal (1997) found that inflation and exchange rates are negatively related to FPI. However, Broner and Rigobon (2004b) found less convincing evidence on the effect of inflation on portfolio flows while the development of economy is a good predictor. On the other hand, Rai and

Bhanumurthy (2004) found that higher domestic inflation pushes returns upwards inducing international investors to buy more domestic assets; hence, a positive relationship is exhibited.

As noted above, the performance of local equity markets can influence the instability of portfolio investment flows (Bekaert and Harvey, 1998). A substantial and desirable relationship between FPI and equity returns has been observed in EMDEs (Çulha, 2006, Gordon and Gupta, 2003). Increasing equity market returns build global traders' confidence, promoting stability of flows. More importantly, the development of local financial markets is positively and significantly related to more stable portfolio flows (Easterly, Islam, and Stiglitz, 2001). Choong, Yusop, and Soo (2010) stress that the desirable relationship between equity market gains and portfolio flows is heavily dependent on the stage of capital market growth.

The level of industrial production has been observed to play a crucial role in stabilizing foreign portfolio investment volatility. Neumann et al. (2009) found that foreign financial capital is steadier in industrialized economies due to the fairly stable production system in these economies; hence, there is an inverse relationship. National output and industrial production have become more important in explaining capital flow volatility. More studies have also revealed the critical relationship between volatility and real output production in emerging and developing markets (Daude and Fratzscher, 2008, Neumann et al., 2009). Growth in industrial production has been considered a key factor in reducing the variability of foreign portfolio flows. Some studies have considered the production growth rate as a push factor whereas others found industrial production to be a significant pull factor. Mody et al. (2001) obtained mixed results regarding this relationship while De Vita and Kyaw (2008) suggest that output and industrial production are important domestic variables in explaining global portfolio investment variability.

Finally, growth in FDI is inversely related to global portfolio investment variability as it fosters confidence among global financial traders (Gözgör and Erzurumlu, 2010, Waqas et al., 2015). However, Levchenko and Mauro (2007) indicate that during crisis periods, foreign portfolio investment flow is neither consistent nor persistent compared to other capital flows. Portfolio flows are regarded as hot money and have become more volatile following financial or policy liberalization (Ferreira and Laux, 2009).

The preceding sections presented a detailed discussion on some of the drivers of international investment flow variability, particularly remittance flow and portfolio flow volatility in both developed and developing economies. The literature review revealed that there is no consensus on what drives volatility. The differences in the findings can be attributed to a number of reasons such as differences in samples or data used, different research methods, and the fact that the drivers of international investment flow variability are time varying as a result of changes in investors' tastes and preferences (Lo Duca, 2012b, Alfaro et al., 2004).

## **2.21 IMPACTS OF CAPITAL FLOW VOLATILITY**

The increase in capital flows, especially portfolio investment and remittance flows to developing countries offers several benefits such as reduced cost of capital, increased stock returns in the short term (Patro and Wald, 2005), and improved liquidity. It can deepen the markets (Bekaert and Harvey, 2003) as well as promote medium-term real economic growth (Beck et al., 2009). An increase in capital flows reduces reliance on current account imbalances for capital flow and eases firms' financial constraints (Knill and Lee, 2014). Foreign investment flows are often associated with good corporate governance, transparency by governments, investor protection (Beck et al., 2009) and better allocation of capital. However, a surge in capital flows can also have adverse effects when they are short-term in nature and very volatile (Bekaert and Harvey, 2003).

Economic theory suggests that a rise in cross border mobility of foreign financial capital increases investment volatility as a result of increased substitutability between foreign and domestic investment (Hirata, Kim, and Kose, 2004). This has been vigorously supported by empirical evidence (Brafu-Insaidoo and Biekpe, 2011). Furthermore, the surge in global financial capital followed by a number of financial crises over the past couple of years has also raised serious concerns about the effect of fluctuations in global finance on domestic financial markets and real economies (Reinhart and Rogoff, 2009). In addition, the effects of capital flow mobility on investment volatility is influenced by underlying productivity shocks such that, the more persistent and country specific the shocks, the more an increase in capital flow mobility increases investment volatility.

However, when shocks are transitory and common across economies, the effect of increased variability of financial flows would not be very clear. Indeed, relaxing cross border mobility of financial flows would not trigger an increase in investment spending due to the resultant global interest rates. Thus, a non-persistent productivity shock has a marginal effect on investment behavior whilst in the event of a permanent investment such a disturbance may not have any effect on investment behavior.

Contrary to theory, Hirata et al. (2004), Kose et al. (2003a) and Denizer et al. (2002) seem to have failed to offer clarity on the role of global financial flows on investment stability. Unlike the volume or magnitude of foreign capital flows, capital flow volatility impacts negatively on money supply and exchange rates and increases the volatility of domestic stock markets. Such instability can make it very difficult for governments to manage macro-economic policies as volatility can increase the possibility of a crisis occurring in the receiving economy (Knill and Lee, 2014). This is particularly true in the event of huge and sudden reversals of portfolio flows from the equity or debt markets. For instance, Eichler and Maltritz (2011) point out that foreign capital reversals from stock markets may trigger currency crises by running down central bank reserves. It is important for the impacts of volatility to be well understood so that a well-informed cost-benefit analysis of foreign capital flows can be conducted. The reason why improvements in corporate governance, investor protection and transparency are necessary is because foreign capital flows can be extremely volatile.

On the other hand, proponents of global financial flow variability argue that the increased instability of international financial capital may induce firms to further improve corporate governance practices while decreasing the economy's dependence on foreign investment, thus creating a viable environment to stabilize domestic investment (Knill and Lee, 2014). These developments may provide the shock absorbers required to reduce the damaging impacts of extreme foreign investment volatility. Kaminsky and Schmukler (2008) point out that the potential damaging effects of portfolio flow volatility can be regarded as 'short run pain for long run gain' as the negative impacts are normally temporary and are followed by considerable benefits in the long term. In general, FPI volatility is most likely to impact on short-term market liquidity conditions, reversing gains from FPI inflows. Reduced liquidity may impact negatively on small firms' access to finance (Knill and Lee, 2014). In light of this, Kaminsky and Schmukler (2008)

and the IMF recommend controls and regulations to protect against rapid exit of capital which negatively affects the liquidity of markets. According to Knill and Lee (2014), there is no compelling evidence that foreign portfolio investment volatility wipes out all the benefits of portfolio flows.

## **2.22 VOLATILITY ESTIMATION: THEORY AND EVIDENCE**

There is substantial theoretical and empirical econometric literature on volatility estimation. Volatility is simply regarded as the sample standard deviation and is an estimate of the variation in the price of a financial asset over time (Financial, 2011). It can be measured historically or implicitly. Predicting and modeling volatility is a crucial research issue in money and capital markets as it aids in investment evaluation, securities pricing, risk management and monetary policy making (Gokbulut and Pekkaya, 2014, Poon and Granger, 2003). Numerous empirical research models have been proposed to improve volatility forecasting models, as more powerful models give rise to better pricing of financial instruments and robust risk management frameworks. However, the focus has been on developing models to predict stock market volatility (Gokbulut and Pekkaya, 2014) with very few studies having been conducted to estimate the variability of international financial flows. While volatility is not exactly the same as risk, when interpreted as uncertainty, it becomes a significant factor in investment and portfolio decisions (Poon and Granger, 2003). Financial market players can assume a certain level of risk and an accurate forecast of volatility is thus a good starting point to examine risk in investments. In addition, volatility of the underlying asset is a critical variable in pricing derivatives and financial products (Poon and Granger, 2003). Since the introduction of the first Basle Accord in 1996, management of financial risk has taken center stage such that quantitative estimation of volatility has become an important risk management tool in several countries. Furthermore, policy makers often depend on market volatility estimates as a measure of financial markets and economies' exposure to risk. For example, the Federal Reserve incorporates the volatilities of stocks, currencies, bonds and commodities when developing monetary policy (Sylvia and Nasar, 1992).

A number of approaches can be used to predict volatility, including the rolling window standard deviation, exponentially weighted moving average method, Stochastic Volatility (SV) models and Generalized Auto Regressive Conditional Heteroskedasticity (GARCH) models. In general,



models that are based on high frequency volatility dominate all the other approaches in the GARCH family (Chen and Ghysels, 2012). Such models stress the significance of persistence (the use of lagged realized variances as predictors) and asymmetry between positive and negative return shocks (Bekaert and Hoerova, 2014). In the finance literature, Christensen and Prabhala (1998) point out that option prices as reflected in implied volatility should have information about future stock market volatility. It is commonly used to refer to the standard deviation of the underlying distribution. An understanding of volatility estimation is important for virtually all time series analysis. However, estimating foreign investment variability is a complex process (Broto et al., 2011). Neumann et al. (2009), and the IMF (2007) apply the variance of foreign financial flows over a moving window of yearly data to approximate volatility. According to Financial (2011), a shorter rolling window means that the standard deviation is more sensitive to volatility changes, but it can be noisy; the opposite is true for a larger window. A volatility cluster is where volatility can be high or low for certain time periods and it normally reacts more to large negative net capital flows than to similar positive ones. This simply implies that volatility changes over time, but only as a more stationary continuous mean-reverting process (ARMA process).

Volatility is important in measuring risk and is applied in almost all financial models such as CAPM, derivative pricing models (Black Scholes), forex trading, and asset allocation decisions (risk-return). Volatility can either be historical, that is, based on past metrics or implied, that is, derived from expected movements in capital flows. This study focuses on past movement in foreign capital flows to estimate historical company valuations and in the design of risk management frameworks. Given these multi-functions of volatility, its accurate prediction is essential for investors, academics and policy makers. Accordingly, several models have been developed and proposed to model volatility, including the Black Scholes model, Stochastic Volatility (SV), and the ARCH/GARCH models.

Generally, econometrics is about estimating how much a variable changes in response to a change in another variable as well as forecasting and analyzing the size of the errors. One of this study's objectives is to estimate capital flow volatility using recently developed techniques where the expected value of squared error terms is not equal but varies over some points (heteroskedasticity). Conversely, in the basic version of least squared where all the squared error terms are assumed

equal, the variables are said to be homoscedastic. However, in the presence of heteroskedasticity the regression multipliers for OLS will still be unbiased, but the standard errors will be too narrow and inaccurate. Instead of this being regarded as a challenge that needs to be rectified, ARCH and GARCH approaches regard heteroskedasticity as a variance that can be modeled or as a forecast for the variance of each residual that can be calculated. In finance, this prediction is of great interest. The main issue of concern will be the value of the error term and what makes it large, particularly in finance where the outcome variable could be return on investment and the variance is identical to the size of the risk level. Accordingly, this study uses the residuals method proposed by Engle and Rangel (2008) to estimate the variability in net capital flows. The rolling window standard deviation could be regarded as the initial ARCH model, based on the assumption that the future is derived from weighted average of squared previous residuals. However, the assumption of equal weights is regarded as unappealing because recent events should carry more weights. In addition, the condition of zero weights for observations older than a month makes the model unappealing. In order to deal with these pitfalls associated with the rolling window standard deviation method of volatility estimation, Engle (1982) introduced the ARCH model to allow determination of efficient weights appropriate for predicting the variance.

### 2.22.1 MOVING WINDOW STANDARD DEVIATION

Using historical time series net foreign capital flow data, the standard deviation is estimated using a sliding window of width  $h$ . This method is an improvement on the simple historical computation of standard deviation as it makes one implicit assumption, that observed volatility in the previous window is a predictor for next period volatility. Based on Neumann et al. (2009), the estimated volatility of foreign capital flows for country  $i$  in year  $t$ ,  $\sigma_{it}$  is determined as follows:

$$\sigma_{it} = \left( \frac{1}{N} \sum_{h=t-(N-1)}^t (flow_{ih} - ecf)^2 \right)^{1/2} \dots\dots\dots 2.1$$

Where;

$$ecf = \frac{1}{N} \sum_{h=t-(N-1)}^t flow_{ih}, \text{ expected capital flow.}$$

$flow_{ih}$  defines capital flows in country  $i$  and period  $h$ .

According to Broto et al. (2011), this model for volatility estimation is subject to some serious challenges. Firstly, it loses observations at the start of the sample as it relies on moving window size,  $h$ . Secondly, it suffers from endogeneity and serial correlation problem as  $\sigma_{it}$  is highly persistent due to dependence on previous periods. Finally, it underestimates volatility when a shock occurs and overestimates thereafter because  $\sigma_{it}$  gives the same weights to  $flow_{it-1}$  and  $flow_{it-n-1}$ .

### 2.22.2 EXPONENTIAL WEIGHTED MOVING AVERAGE STANDARD DEVIATION

The exponential method uses recent estimates of volatility and puts higher weight on more recent estimates. In 1992, JP Morgan established the risk metrics methodology of determining volatility at the market place and termed it the exponential weighted moving average (EWMA) (Financial, 2011). This is an improvement on the rolling window method as it gives higher weight factors to recent flows than later ones. Simply put, today's volatility is a function of the prior day's volatility. The entire series can be reduced to a general formula as stated below:

$$\sigma_t^2 = \lambda \times \sigma_{t-1}^2 + (1-\lambda)cf_{t-1}^2 \dots\dots\dots 2.2$$

Where;  $\lambda$  is the exponential smoothing parameter ( $0 \leq \lambda \leq 1$ )

$$\sigma_t^2 = \lambda \times \sigma_{t-1}^2 + (1-\lambda)cf_{t-1}^2 = \lambda(\lambda \times \sigma_{t-2}^2 + (1-\lambda)cf_{t-2}^2) + (1-\lambda)cf_{t-1}^2 = \lambda^2 \sigma_{t-2}^2 + (1-\lambda)(\lambda cf_{t-2}^2 + r_{t-1}^2)$$

$$\sigma_t^2 = \lambda^3 \times \sigma_{t-3}^2 + (1-\lambda)(\lambda^3 cf_{t-3}^2 + \lambda r_{t-2}^2 + cf_{t-1}^2)$$

$$\sigma_t^2 = (1-\lambda) \sum_{i=1}^T \lambda^{i-1} cf_{t-1}^i \dots\dots\dots 2.3$$

Where;  $\sigma$  is the EWMA volatility,  $cf$  denotes foreign capital flows and  $\lambda$  (=0.94) is the smoothing parameter as indicated by JP Morgan (1992).

According to Financial (2011), the following are some of the desirable features of the EWMA: the weights of this model add up to one and it is an improvement on the moving window standard deviation. Higher weights are given to recent observations, declining exponentially afterwards. The EWMA method produces a slightly lower root mean squared error (RMSE) and is much easier to calculate. On the other hand, the weakness of EWMA lies in the fact that it is a symmetric model

where large negative flows or returns have the same impact as large positive ones. Hence, it does not capture volatility dynamics, but merely smoothen the squared time series. Therefore, it is a good estimator only over a very short horizon. According to JP Morgan (1992),  $\lambda=0.94$  but it can be determined statistically.

### 2.22.3 GARCH METHOD

Empirical findings show that GARCH (1,1) is a more parsimonious and popular method for financial time series volatility forecasting. It has been proven that the exponential weighted moving average (EWMA) is the non-stationary version of GARCH (1,1) where the persistence of parameters adds up to one. Variability endurance can assume distinctive values based on whether it is in a low or high variability period. Normally, a GARCH model is characterized by an exponential decay in the autocorrelation of conditional variances. Regarding squared and real values of investment gains, the autocorrelations take time to decay and are similar to those of an I(d) process. In this case, a disturbance in the variability series appears to have a long memory and effect on future instability over long horizon (Poon and Granger, 2003). On the other hand, the Integrated GARCH approach by Engle and Bollerslev (1986) incorporates this impact but a disturbance in the model affects future volatility over an unlimited variability horizon and unconditional variance does not exist. There are, however, several data generating processes besides the I(d) process that also display a lot of long memory in the covariance. The short memory stationary series with occasional breaks is a good example (Granger and Hyung, 2004).

Broto et al. (2011) utilize and compare different approaches to volatility approximation. Firstly, volatility is approximated using GARCH (1,1) in line with Bekaert and Harvey (1997) and Lagoarde-Segot (2009). This model was, however, modified and simplified by Bollerslev (1986) into a GARCH model where variance is approximated from weighted average values of previous squared residuals at a reducing method, but does not get to nil. The GARCH model has been widely employed as it is easy to use and provides the best prediction of conditional variances. For instance, assume  $v_t$  denotes the variance of the residuals of an analysis model  $y_t = x_t + \sqrt{v_t}\varepsilon_t$ . One of the conditions of GARCH (1,1) is that the variance of  $\varepsilon$  is equal to one. Accordingly, the GARCH model for determining the variance can be defined as:

$$v_{t+1} = \pi + \alpha(y_t - x_t)^2 + \beta v_t = \pi + \alpha v_t \varepsilon_t^2 + \beta v_t \dots \dots \dots 2.4$$

The task will be to estimate the constant  $\pi$  and knowing the previous forecast value of  $v$  and the residual. In this case we assume the weights to be  $(1-\alpha-\beta; \beta; \alpha)$ . In the long term the mean variance is represented as;  $\sqrt{\pi}/1 - \alpha - \beta \sqrt{\pi}/(1 - \alpha - \beta)$  .....2.5

This is valid for:  $\alpha + \beta < 1$  and the weights are all positive, i.e.,  $\alpha > 1; \beta > 1$  and  $\pi > 1$ .

This is a typical unitary GARCH (1,1) in which the first term defines the number of autoregressive lags and the second the number of moving average lags, often referred to as the GARCH terms. In general, GARCH models move back towards the mean and are conditionally heteroskedastic, but have a constant unconditional variance. Some diagnostic tests are also available such as constructing a series of  $\varepsilon_t$  which are assumed to have a non-varying average and variance if the model is specified accurately. For instance, the Ljungbox test with 15 lagged autocorrelations is used to test for autocorrelation in the squares.

While the GARCH (1,1) has been widely accepted and used as the simplest and most robust volatility model, it has some challenges such as its failure to capture the asymmetric leverage effect (Rabemananjaira and Zakoian, 1993, Jaganathan and Runkle, 1991). The estimation approach can be simplified to GARCH (p,q) meaning that it has additional lags especially when used for a long span of data.

A number of modifications have been proposed to the unitary GARCH model, some quite simple and some extra-ordinary. These include Nelson's (1991) EGARCH, and the Threshold-GARCH model suggested by Rabemananjaira and Zakoian (1993) and Glosten Jaganathan and Runkle (1993). Because the GARCH (1,1) is unable to separate asymmetric information, the TGARCH was suggested to specifically deal with this weakness of unitary GARCH and can separately model the different effects of good and bad news.

In the field of finance, the ARCH or GARCH estimation techniques have been utilized successfully in time series data analysis. In particular, financial and investment decisions revolve around understanding the risk-return trade off of financial instruments, but further econometric analysis of risk is key in asset valuations, portfolio balancing and monitoring, and option valuations as well as in management of risk. This study focuses on the volatility of international financial flows with respect to low-income developing economies so as to identify the causes of variability and the

threats associated with exposure to the global market. An area of future study could be to investigate the link between the expected volume of capital flows and volatility.

#### **2.22.4 ENGEL AND RANGEL METHOD**

In this case, volatility comprises two important elements; one that changes slowly and is termed exponential spline while the other is the popular unitary GARCH (1,1). The slow to change volatility aspect is also referred to as the unconditional volatility. The slow frequency volatility is believed to be higher when volatility of macro-economic variables is higher. This approach promotes long horizon forecasts of volatility and delivers estimates of variability anticipated in a recently liberalized economy (Engle and Rangel, 2008).

In this study, remittance and portfolio flow volatility is modelled by adopting the Engle and Rangel (2008) approach as demonstrated by Broto et al. (2011). Volatility is regarded as an amalgamation of aggregate economic effects and time series effects. In this case, high frequency volatility coincides with the high-speed conditional volatility represented by the unitary GARCH component. On the hand, low frequency volatility coincides with the unconditional volatility and is represented by the exponential spline. The exponential spline or the low frequency variability is influenced by volatility in domestic macro-economic variables such output growth, CPI and interest rates. The Engle and Rangel volatility model facilitates long term volatility estimations and is dependent on developments in the macro-financial landscape. The key unsettled problem is the correlation between the condition of the economy and total financial variability. Despite the numerous volatility estimation models, only the Engle and Rangel (2008) approach takes account of economic variables. For instance, it is observed that variability is greater during recessions and following announcements, but these effects turn out to be a small part of measured volatility. Hence, the Spline-GARCH model was introduced to deal with these estimation challenges as it links high frequency financial data to low frequency macro-economic data. Moreover, the assumption that volatility moves back towards the mean to a constant level, which underpins almost all GARCH and SV models estimated over the past 25 years, can be relaxed under the Spline-GARCH model (Engle and Rangel, 2008). In order to mitigate against the problems of GARCH (1.1) and rolling window standard deviation methods, Broto et al. (2011) applied a volatility measure based on Engle and Rangel (2008), which accounts for the uncertainty of macro-economic variables with a lower occurrence than that of financial variables. Accurate prediction

of volatility in financial assets is important as it is used in investment decisions, option pricing and financial market regulation.

The Engle and Rangel approach estimates each variable and then determines a volatility measure based on absolute residuals derived from fitting a suitable autoregressive integrated moving average (ARIMA) model estimated for each country  $c$ , and type of capital flow on a quarterly basis (Broto et al., 2011). The estimation of yearly variance of capital flows as the annual average of absolute value of quarterly residuals,  $R_{it}$  is determined as follows:

$$v_{ct}^2 = \frac{1}{4} \sum_{j=1}^4 |R_{ctj}|$$

Where;

$j = 1, \dots, 4$  representing each quarter of year  $t$  (Broto et al., 2011).

$R_{ct}$  is the yearly average of absolute value of quarterly residuals.

This approach is able to identify periods of financial distress more precisely than the two above methods. Accordingly, the study draws on the Engle and Rangel (2008) approach for portfolio and remittance volatility estimation with regard to low-income SADC countries.

## **2.23 GAPS IN THE LITERATURE**

The study seeks to fill several gaps in the literature. Firstly, this research on net capital flow volatility, particularly net foreign remittance and net foreign portfolio investment volatility with respect to SADC low-income countries, appears to be the first of its kind. Remittances have largely been regarded as very stable; yet their volatility is not too small to be ignored. Moreover, estimation of volatility is based on a more recent approach that relies on the absolute values of model residuals (Engle and Rangel, 2008). This is in contrast to most existing studies such as Broner and Rigobon (2004b) and Neumann et al. (2009) on capital flow volatility that used the weak rolling window standard deviation and exponential weighted moving average with the exception of a study by Broto et al. (2011) that applied the absolute values of residuals approach exclusively on gross capital inflows. In contrast, this study uses net capital inflows.

Secondly, the fact that this study examines the behavior of net capital flow volatility, financial deepening and the performance of the capital markets together makes it unique. To the best of the researcher's knowledge, no previous study has considered the interactions of these concepts together. Previous studies examined these concepts individually in relation to economic growth (Odhiambo, 2008, Levine, 2005, Chakraborty, 2008, King and Levine, 1993), mainly in emerging markets. This is a comprehensive study on low-income economies that provides up-to-date and more meaningful information to policy makers and investors.

In addition, no study that the researcher is aware of has quantitatively investigated the dynamic impacts of net capital flow volatility, particularly in low-income SADC economies. This study seeks to fill this gap by investigating the impulse impacts and variance decomposition due to changes in capital flow fluctuations in low-income SADC countries.

Finally, regarding the research techniques employed, the study adopted contemporary panel data regression methods to address the research questions. For instance, the use of Chudik and Pesaran (2013) P-ARDL, a recent approach, provides robust analysis in investigating the sources of net capital flow volatility. This will update the literature in this field of study.

## **2.24 CONCLUSION**

This chapter presented a detailed examination of the theoretical and empirical literature on the mobility and volatility of foreign capital flows to both developing and developed countries. It examined important theories that shape financial deepening and its linkages with the macro-financial environment and reviewed the various volatility estimation techniques and their strengths and weaknesses. This assisted the researcher in selecting robust techniques to support the research methodology, which is discussed in the following chapter.



## CHAPTER 3 : RESEARCH METHODOLOGY

### 3.1 INTRODUCTION

This chapter discusses the main sources of data used and describes the variables used to fulfill the objectives stated in Chapter 1. The study employs unbalanced quarterly panel data for the period spanning 16 years from 2000 to 2015. This chapter also sets out the step-by-step methodological approach adopted and the instruments used to estimate each objective. In fulfilling the three objectives, panel data analysis methods are employed in order to provide a sizeable number of data points ( $N \times T$ ), thus increasing the number of independent ways the dynamic system can vary and reducing the correlations among the predictor variables (Hsiao, 2007). The focus is on low-income countries where capital flow volatility dynamics have received limited attention as previous studies concentrated on major developing and advanced countries due to perceived low levels of capital flows (Singh et al., 2008). The following table is a list of the selected low-income SADC countries.

**Table 3.1: Sample of low-income SADC countries**

Country	Per capita income (USD)	Income level
Zimbabwe	895.00	Low income
Zambia	1724.00	Lower middle
Tanzania	948.00	Low income
Swaziland	2833.00	Lower middle
Mozambique	599.00	Low income
Malawi	251.00	Low income
Lesotho	952.00	Low income
DRC	440.00	Low income
Madagascar	447.00	Low income

**Source: World Bank Development Indicators (2014) and author's own compilation**

As discussed in Chapter 1, these countries were identified following the World Bank classification as at July 2014 based on per capita income. As indicated in Table 3.1 above, the list includes countries which do not meet the criteria, but are considered relevant to the study such as Swaziland and Zambia that are in the lower middle-income category. This increases the sample size and ensures a more geographically balanced panel as suggested by Broto et al. (2011).

### **3.2 METHOD OF ANALYSIS**

The study uses panel analysis as panel data provides more explanatory power, has minimum correlations among the predictor variables in a regression model and offers more scope for the dynamic system to vary. It is also highly productive compared to time series or cross-sectional data (Hsiao, 2014, Baltagi, 2008, Gurajati 2004). According to Baltagi (2008), panel data fits well with dynamic adjustments and the heterogeneity in individual data can be controlled. Furthermore, panel data analysis enables investigation of complex behavioral models that cannot be analyzed using pure cross section or time series data such as economies of scale (Baltagi, 2008, Gurajati, 2004).

According to Hsiao (1995), dynamic panel data models produce more efficient and more accurate estimates of model parameters. Panel data is multi-dimensional and contains observations on multiple phenomena observed over several periods for the same firms or individuals. However, dynamic panel regression models suffer from heterogeneity bias due to differences among countries in the sample. In addition, this model is subject to the serial or autocorrelation problem which arises from lagging the dependent variable and using it as one of the predictor variables.

### **3.1 OBJECTIVE 1:**

#### **To ascertain the main predictors of net capital flow volatility in low-income SADC countries**

This study follows Broto et al. (2011) and Neumann et al. (2009), where volatility is measured for each country and for each type of capital flow. In this case, running volatilities of net portfolio investment flows and foreign remittance flows are measured using the absolute values of model residuals (Engle and Rangel, 2008). To establish the drivers of net foreign investment flow variability for the period spanning 2000:Q1 to 2015:Q4, a panel data set is constructed where the dependent variables are the Spline-GARCH volatility estimates of net portfolio and net remittance flows. The explanatory variables are made up of a large set of regressors that are divided into three

distinct categories, global factors, and domestic macro-economic and financial variables (Broto et al., 2011). The global variables include the federal funds rate (FFR) and global output growth (also known as WGDP). The domestic macro-economic variables are inflation (regarded as CPI) and domestic output (RGDP) while the financial variables comprise interest rates and money supply (M2). Table 3.2 below lists the explanatory variables used in this study and their proxies as provided in the empirical literature.

The right hand section of the regression model is lagged by one quarter so as to take account of endogeneity issues. After computing volatilities for each capital flow and for individual countries, the study estimates the predictors of volatility in net capital flows in low-income SADC countries using a panel regression model. Due to the scarcity of data and some missing observations, the study utilizes unbalanced panel data.

In finance, predicting volatility is important for many functions such as risk management (Var), asset allocation and valuations as well as option pricing. Estimation of capital flow volatility is imperative for financial and economic agents as it shows the level of risk associated with foreign investment flows. In addition, estimation of volatility can assist in pricing and managing international capital flows to ensure market stability (Cobb and Charnes, 2004). Determination of the size of foreign portfolio and foreign remittance flow volatility is critical to this study as they form the dependent variables of the regression models.

### **3.1.1 DATA DESCRIPTION AND DATA SOURCES**

The study employs quarterly data for the period, spanning 16 years from year 2000 (2000:Q1) to 2015 (2015:Q4). This is the time period in which almost complete and reliable data on foreign capital flows, especially remittances, is obtained. The low-income countries under investigation are listed in Table 3.1 above. The data for FPI and FR flows (in USD) on a quarterly basis is drawn from the IMF's International Financial Statistics (IFS), the World Bank data bank and each country's central bank. In order to get rid of the size effect or produce more stationary variables the capital flows are normalized by real GDP. In cases where monthly or quarterly data was not available, frequency conversion in Eviews was used to convert annual data. For example, foreign remittance and foreign portfolio investment flow data for all the countries under study was converted from quarterly to monthly data to assist in the determination of running quarterly

volatility figures. Moreover, real GDP data for Zimbabwe was converted from annual to quarterly frequency.

**Table 3.2: Explanatory Variables and Proxies**

Variable	Proxy	Explanation
Money supply	M2	This refers to the ratio of broad money supply to GDP. The use of this measure is supported in the literature by Ngalawa and Viegi (2011), Giuliano and Ruiz-Arranz (2009), and Sackey and Nkrumah (2012).
Domestic output	Real GDP	Measures the total economic output for a given year, adjusted for inflation. The use of this variable as a measure of output is also found in Berkelmans (2005) and Broto et al. (2011).
Inflation rate	Consumer price index (CPI)	An estimate of fluctuations in the price level of a basket of household commodities (Raghavan and Silvapulle, 2008).
Domestic interest rate	Bank rate (INT)	The rate at which a central bank lends short-term money to domestic banks. The choice is supported by Ngalawa and Viegi (2011).
Global interest rate	Federal funds rate (FFR)	The overnight lending rate by depository institutions in the US. Supported and also used by Kutu and Ngalawa (2016) and Neumann et al. (2009).
Global output	World GDP	Total monetary value of world output; also used in the study by Broto et al. (2011).

**Source: Author's own compilation**

The major sources of quarterly data for the explanatory variables are the World Bank data bank, Bloomberg and International Financial Statistics (of the IMF) as well as the central statistical offices and central banks of the respective countries.

### **3.1.2 MEASURING CAPITAL FLOW VOLATILITY**

The previous chapter concluded with a discussion on historical volatility estimation approaches that include GARCH (1,1), the rolling window standard deviation method, and exponential

weighted moving average (EWMA) and the Spline-GARCH (residuals approach). The study adopted the Engle and Rangel (2008) residual method which accounts for the unpredictability of domestic economic factors with a lower occurrence than that of financial variables and is based on the absolute values of residuals. This approach was tested in Broto et al. (2011), and produced superior results compared to the GARCH (1,1) and the rolling window standard deviation method.

### 3.1.2.1 GENERATING ABSOLUTE VALUES OF RESIDUALS

According to Broto et al. (2011), absolute values of residuals are produced from an Autoregressive Integrated Moving Average (ARIMA) model calculated by the automatic procedure of TRAMO-SEATS for Windows (TSW) developed by Caporello and Maravall (2003) of the Bank of Spain. In this case, a suitable ARIMA model is approximated for each economy  $c$  and type of foreign investment flow on a quarterly basis. The TSW program is a windows application based on the TRAMO and SEATS programs. However, in this study, the absolute values of residuals are produced using the EViews program as demonstrated by Professor G.W. Schwert (2015). EViews' ability to create a new series from an existing one (i.e., lag values) makes it ideal. A new series is established from the one period lagged values of the original series (AR1 process), making it possible to estimate the regressions and generate the much sought-after absolute values of residual values.

After generating the absolute values of residuals, the quarterly variance of net capital flows is estimated from the quarterly averages of the absolute values of monthly residuals ( $R_{ctj}$ ). Following Broto et al. (2011), the reduced form volatility estimation equation is as follows:

$$v_{ct}^2 = \frac{1}{4} \sum_{j=1}^4 |R_{ctj}| \dots\dots\dots(3.1)$$

Where;

$j$  represents each quarter of year  $t$ .

$R_{it}$  is the yearly average of absolute value of quarterly residuals.

According to Broto et al. (2011), the residuals approach offers robust estimates of historical volatility relative to the values generated by GARCH (1.1) and rolling window standard deviation. The residuals approach also allows for long-term forecasts of volatility to be based on economic

fundamentals and delivers the variability estimates anticipated in a recently liberalized economy. In addition, the Engle and Rangel (2008) approach overcomes the following weaknesses (Broto et al., 2011, Broto et al., 2008) that have been observed in other volatility estimation methods:

The exponential weighted moving average approach is a balanced model where significant negative capital flows have the same impact as significant positive ones. Hence, it fails to fully explain capital flow volatility patterns, but only smoothens the squared time series. The moving window standard deviation loses observations at the start of the sample as it relies on a rolling window. It is also prone to endogeneity and correlation complications as  $\sigma_{it}$  is highly persistent due to dependence on previous periods.

### **3.1.3 ESTIMATION TECHNIQUE**

The objective of this study is to ascertain and explain the main predictors of net capital flow volatility in low-income SADC countries. In order to reveal the most significant drivers of net capital flow volatility, the study follows Rafindadi and Yosuf (2013), Hegerty (2011a), Al Mamun et al. (2013) and Mohaddes and Raissi (2014) in adopting the Panel Autoregressive Distributed Lag (P-ARDL) model of Chudik and Pesaran (2013). The choice of P-ARDL was influenced by a number of advantages that the approach has over conventional or traditional short-run and long-run estimates.

### **3.1.4 WHY THE PANEL-ARDL APPROACH?**

The choice of P-ARDL is based on a number of advantages that include its flexibility with small sample studies. The P-ARDL model accommodates variables that are of different order of integration, that is, it can handle I(0) and I(1) variables. According to Giles (2013), ARDL is a modern-day approach for investigating long- and short-run dynamics. In addition, the P-ARDL model accommodates different variables with distinct lags in the same system (Giles, 2013, Hegerty, 2011a). Furthermore, the P-ARDL approach is simple to set up, implement and interpret as it involves a single equation, but at the same time, it is powerful enough to allow greater than two lags and six variables in the same regression analysis (Oluseye and Gabriel, 2017, Giles, 2013). Moreover, the Chudik and Pesaran (2013) P-ARDL model is ideal for panel analysis as it able to deal with cross sectional dependency (CSD) and allows for one or two structural breaks when carrying out unit roots test. Finally, the P-ARDL is powerful in estimating the long- and short-run variables of the model (Shin, Yu, and Greenwood-Nimmo, 2014, Dritsakis, 2011).

The biggest setback of the panel ARDL model is that it cannot be estimated with I(2) series; hence, unit root tests are required. Suppose that the P-ARDL regression equation for low-income SADC economies is stated as follows:

$$\Delta Y_{it} = \delta_{i0} + \delta_1 \Delta X_{it-1} + \delta_2 \Delta X_{it-2} + \delta_3 \Delta X_{it-3} + \dots + \delta_p \Delta X_{it-p} + \omega_1 y_{it-1} + \omega_2 y_{it-2} + \omega_3 y_{it-3} + \dots + \omega_q y_{it-q} + \varepsilon_{it} \dots \dots \dots 3.2$$

Where;  $Y_{it}$  is a vector of (kx1) vector representing net capital flow volatility.

$i$  represents the low-income SADC countries

$\Delta$  captures first difference operator

$X_i$  and  $Y_{it}$  are the lagged independent variables for every  $i = 1 \dots \dots \dots p$  and  $q$

$\delta_1 - \delta_p$  denote the short-run co-efficiency of the model explaining short-run relationships

$\omega_1 - \omega_q$  correspond to the long-run relationship

$\varepsilon_{it}$  represents the vector of noise term

### 3.2 OBJECTIVE 2:

**To establish the short-run and long-run relationship among net capital flow volatility, financial deepening and capital market performance**

This study examines the short- and long-run relationships among net capital flow volatility, financial deepening and capital market performance in low-income SADC countries. The period of study spans from the first quarter of 2000 (2000:Q1) to the fourth quarter of 2015 (2015:Q4). Preliminary tests carried on the data indicated that the variables are stationary after first differencing and are also co-integrated. Although capital markets mainly comprise of equity and debt markets, this study focuses solely on equity markets due to the unavailability of data and lack of organized debt markets in the selected SADC countries.

#### 3.2.1 DATA DESCRIPTION AND DATA SOURCES

The major variables of interest to fulfill this objective are net FPI volatility, net FR volatility, capital market performance (measured by the change in the main index of each stock market) and

financial deepening measured by the widely accepted M2/GDP (Rahman and Mustafa, 2015, Sackey and Nkrumah, 2012, Giuliano and Ruiz-Arranz, 2009). Data was obtained from the World Bank data bank and the IMF's International Financial Statistics. In line with the existing literature, the study uses stock market index data for each country as an indicator or proxy for capital market performance (Kyereboah-Coleman and Agyire-Tettey, 2008, Liu and Sinclair, 2008, Egly et al., 2010) or log natural of  $(S_t/S_{t-1})$ . It uses quarterly data spanning the period from 2000:Q1 to 2015:Q4.

This investigation is modelled around four critical stages (Mahadevan and Asafu-Adjaye, 2007). Firstly, a panel unit root test is conducted to find out whether or not the variables under study are stationary. Secondly, cointegration analysis is applied to check for the existence of long relationships among the variables in the panel data. The third procedure is to establish the existence of the long-run equilibrium relationship among the variables. Finally, the causal relationships among these variables are established.

### **3.2.2 PANEL UNIT ROOTS**

Panel unit root tests are conducted to establish if the dependent and predictor variables in the equation are stationary in order to avoid spurious regressions. Based on recent econometric studies, unit root tests centered on panel data are more robust than tests based on individual time series data (Hsiao, 2014, Baltagi, 2008, Gurajati, 2004). According to Baltagi (2008), this is a result of information in cross section data that enhances the information contained in time series (Rahman and Mustafa, 2015). In addition, panel unit root tests lead to statistics with normal distribution in the limit. There are a number of ways of conducting panel data unit root tests. These include Levin, Lin and Chu (2002) – LLC; Augmented Dickey Fuller (ADF) and Im, Pesaran and Shin (2003) – IPS. All the tests are applied so that the results can be differentiated and checked for accuracy as well as to maintain consistence. In all three cases, the null hypothesis for the benchmark model is that the instruments have unit root (i.e., are non-stationary). In this investigation, panel unit root tests show that the variables in the model are stationery after first differencing and that they are also cointegrated.

### **3.2.3 PANEL CO-INTEGRATION TESTS**

After determining the stationarity (no unit root) of the panel data, there is need to check for the existence of long-run relationships among capital flow volatility, capital market performance



(*cmp*) and financial deepening (*fd*) in the selected low-income SADC economies. The study employs the Pedron (2004) and Kao Co-integration test to explain the long-run relationship between these variables as the Johansen and Juselius (1992) procedure is not feasible on dynamic panel data. The analysis uses the two tests to ensure robustness and to compare the results. Because these variables exhibit long-run relationships, it is crucial to establish the equilibrium relationship. The ordinary least squares (OLS) estimator is a biased and inconsistent estimator of co-integrated panel data and hence, cannot be used. However, Pedron (2004) suggests a dynamic ordinary least squares (DOLS) method which provides more flexibility in the presence of heterogeneity.

Following Mahadevan and Asafu-Adjaye (2007), the empirical model for conducting co-integration tests is based on the following equations that were estimated individually using the vector error correction method.

$$NFPI\sigma_{ct} = \alpha_i + \delta t + \beta fd_{ct} + \lambda cpm_{ct} + u_{ct} \dots \dots \dots 3.3$$

$$NFR\sigma_{ct} = \alpha_i + \delta t + \beta fd_{ct} + \lambda cpm_{ct} + \mu_{ct} \dots \dots \dots 3.4$$

Where;

$\alpha_i$  and  $\delta t$  are country and time fixed effects, respectively.

$fd_{ct}$  is financial deepening in country  $c$  at time  $t$ .

$NFPI\sigma_{ct}$  is net foreign portfolio investment volatility in country  $c$  at time  $t$ .

$NFR\sigma_{ct}$  is net foreign remittance volatility in country  $c$  at time  $t$ .

$cmp_{ct}$  is capital market performance in country  $c$  at time  $t$

$\mu_{ct}$  is the error term for country  $c$  at time  $t$ .

Pedron's (1999, 2004) method accommodates heterogeneity across individual units of the panel. It considers seven different test statistics, four of which are dependent on pooling the residuals of the regression along the within-dimension of the panel while the other three are based on pooling the residuals of the regression along the between-dimension of the panel. The analysis is based on the null hypothesis that there is no cointegration against an alternative hypothesis of cointegration.

### 3.2.4 ESTIMATION TECHNIQUE

In line with Rahman and Mustafa (2015), the study adopts the dynamic panel vector error correction model (P-VECM) to determine the direction of causality among net capital flow volatility, financial deepening and stock markets. VECM has the advantage of clearly separating long- and short-run relationships among model variables. Its ability to indicate the direction of causal relationships between variables is the most sought after in this analysis. The choice of VECM is also based on the fact that Eviews automatically converts data into first difference. The modeling of this analysis was guided by similar studies such as Sentürk and Sataf (2015), Rahman and Mustafa (2015), and Lee and Chang (2008).

Therefore, suppose the inter-relationships among the variables in this study assume a dynamic trivariate P-VECM form as depicted in the following simultaneous equations:

$$\Delta fpi\sigma_{it} = \pi_{it} + \lambda_{1i}e_{it-1} + \sum_{j=1}^k \lambda_{2ij}\Delta fpi\sigma_{it-j} + \sum_{j=1}^k \lambda_{3ij} \Delta fd_{it-j} + \sum_{j=1}^k \lambda_{4ij}\Delta cmp_{it-j} + \varepsilon_{it} \dots\dots\dots 3.5a$$

$$\Delta fd_{it} = \pi_{it} + \lambda_{1i}e_{it-1} + \sum_{j=1}^k \lambda_{2ij}\Delta fd_{it-j} + \sum_{j=1}^k \lambda_{3ij} \Delta fpi\sigma_{it-j} + \sum_{j=1}^k \lambda_{4ij}\Delta cmp_{it-j} + \varepsilon_{it} \dots\dots\dots 3.5b$$

$$\Delta cmp_{it} = \pi_{it} + \lambda_{1i}e_{it-1} + \sum_{j=1}^k \lambda_{2ij}\Delta cmp_{it-j} + \sum_{j=1}^k \lambda_{3ij} \Delta fpi\sigma_{it-j} + \sum_{j=1}^k \lambda_{4ij}\Delta fd_{it-j} + \varepsilon_{it} \dots\dots\dots 3.5c$$

Where;

$\Delta$  denotes a change dynamic operator;

$fpi\sigma$ ,  $fd$  and  $cmp$  represent foreign portfolio investment ( $fpi$ ) volatility, financial deepening ( $fd$ ) and capital market performance ( $cmp$ ), respectively;

$t$  represents time period;

$\pi_{it}$  is a deterministic constant component of the model;

$\lambda_{1i} \dots\dots \lambda_4$  are coefficients;

$j$  is the optimal lag length determined by AIC, SIC and HQC; we use the number of lags that minimize the criteria;

$e_{it-1}$  is the error correction term and it represents how far the variables are from the equilibrium relationship. The error-correction mechanism estimates how, in the event of an imbalance variables adjust towards parity so as to preserve the long-run relationship. If the set of estimated coefficients ( $\lambda_{2i}$  to  $\lambda_{4i}$ ) on lagged independent variables are non-zero, then there is short-run causality. If the ECM coefficient  $\lambda_{1i}$  is negative and significant then there is long-run causality. The same procedure is conducted involving net remittance volatility ( $fr\sigma$ ) in place of net foreign portfolio investment volatility ( $fpi\sigma$ ).

### **3.3 OBJECTIVE 3:**

#### **To evaluate the dynamic impacts of changes in net capital flow volatility in low-income economies**

The study investigates the dynamic effects of changes in capital flow volatility on low-income SADC economies using a P-VAR model.

#### **3.3.1 DATA DESCRIPTION AND DATA SOURCES**

The study period spans from the first quarter of 2000 (2000:Q1) to the fourth quarter of 2015 (2015:Q4) with all variables captured on a quarterly basis. All the variables are treated as endogenous variables except the global interest rate that captures the open economy of the SADC countries. The inclusion of the external variable is to enable investigation of how global shocks transmit into the domestic economy and to also account for openness. The variables employed in this model include  $FPI\sigma$ ,  $FR\sigma$ , real GDP, M2, domestic interest rate, CPI, and the global interest rate (Federal Funds Rate - FFR). All the variables in this analysis were obtained from the World Bank data bank, the IMF, Bloomberg, and each country's central bank and statistical office.

#### **3.3.2 DEFINITION AND JUSTIFICATION OF VARIABLES**

In line with Ngalawa and Viegi (2011) and Giuliano and Ruiz-Arranz (2009), the study employed money supply (proxy M2), defined as the ratio between broad money supply and GDP. Secondly, the variable domestic output is proxied by real gross domestic output (RGDP) which is a measure of the inflation adjusted value of total economic output for an economy for a given year. This is supported by literature such as the Australian structural VAR (SVAR) by Berkelmans (2005) and

the capital flow volatility study by Broto et al. (2011). Thirdly, the variable inflation as proxied by the CPI estimates fluctuations in the general price level of a basket of household commodities as supported in the SVAR study by Raghavan and Silvapulle (2008). In addition, the study utilized domestic interest rates proxied by bank rate (IN) that is widely supported in the literature (Ngalawa and Viegi, 2011). This is the rate at which the central bank lends short-term funds to local financial institutions. In this study, the global interest rate is employed and is proxied by the FFR as supported in Kutu and Ngalawa (2016) and Neumann et al. (2009). This is an exogenous variable that is defined as the overnight lending rate by depository institutions in the US and is included to capture the open economies of the SADC countries.

### 3.3.3 MODEL SPECIFICATION

Stock and Watson (2001) define VAR as an econometric model in which each variable is explained by its own lagged values, taking into account the current and past values of the remaining variables. According to Gujarati (2003), all the variables are assumed to be endogenous. VAR models are dynamic and make use of economic theory. They are important tools for explaining the dynamic behavior of economic and financial data (Lütkepohl, 2012). Unrestricted VAR with unit roots is undesirable in that it is inconsistent and can mislead policy analysis. Accordingly, this study employs a six-variable panel VAR methodology to estimate the model using the impulse response function and variance decomposition in levels.

Following Cheng (2006), suppose the low-income SADC countries can be represented by the following equation:

$$AY_{it} = \alpha_{it} + B_1Y_{it-1} + B_2Y_{it-2} + \dots + B_pY_{it-p} + \lambda_i X_{it} + D\varepsilon_{it} \quad 3.6$$

where  $A$  is an invertible square ( $6 \times 6$ ) matrix describing the contemporaneous relationships among the variables;  $Y_{it}$  is a ( $6 \times 1$ ) vector of endogenous variables such that ( $Y_{it} = Y_{1it}, Y_{2it}, \dots, Y_{nit}$ );  $\alpha_{it}$  is a ( $6 \times 1$ ) vector of constants;  $B_i$  is a ( $6 \times 6$ ) matrix of coefficients of lagged endogenous variables (*for every*  $i = 1 \dots \dots \dots p$ );  $\lambda_i$  and  $X_{it}$  are the coefficients and vectors of the exogenous variables, respectively, capturing external shocks;  $D$  is a ( $6 \times 6$ ) matrix whose non-zero off-diagonal components accommodate direct impacts of some shocks on more than one endogenous variable in the system; and  $\varepsilon_{it}$  is a vector of uncorrelated or orthogonal white-noise structural disturbances.

The P-VAR shown in equation (3.6) cannot be estimated directly due to the contemporaneous feedback inherent in the VAR process (Enders, 2004). The system incorporates feedback because the endogenous variables are allowed to influence each other in the current and past realisation time path of  $AY_{it}$ . The parameters in the system are unidentifiable and their values cannot be determined because their coefficients are not known. According to Ngalawa and Viegli (2011), the information in the system can be recovered by estimating a reduced form VAR implicit in the equations. Pre-multiplying equation (3.6) by an inverse of  $A$  gives:

$$Y_{it} = A^{-1}\alpha_{it} + A^{-1}B_1Y_{it-1} + A^{-1}B_2Y_{it-2} + \dots + A^{-1}B_pY_{it-p} + A^{-1}\lambda_iX_{it} + A^{-1}D\varepsilon_{it} \quad 3.7$$

One can denote  $A^{-1}\alpha_{it} = C$ ,  $A^{-1}B_1 \dots A^{-1}B_p = A_i$  for  $i = 1 \dots p$ ,  $A^{-1}\lambda_i = \alpha_i$  and  $A^{-1}D\varepsilon_t = \mu_{it}$ . Hence, equation (3.7) becomes:

$$Y_{it} = C + A_1Y_{it-1} + A_2Y_{it-2} + \dots + A_pY_{it-p} + \alpha_iX_{it} + \mu_{it} \quad 3.8$$

The first equation (3.6) is called a long form VAR or primitive VAR system where all variables have contemporaneous effects on each other, while equation (3.8) is called a reduced form VAR or a VAR in standard form in which all the right-hand side variables are predetermined at time  $t$  and no variable has a direct contemporaneous effect on another in the model. In addition, the error term ( $\mu_t$ ) is a composite of shocks in  $Y_t$  (Enders, 2004). By substitution, the reduced form of equation (3.8) can be further stated as follows:

$$Y_{it} = \beta i + A(L)Y_{it} + B(L)X_{it} + \mu_{it} \dots \dots \dots (3.9)$$

where  $Y_{it}$  and  $X_{it}$  are  $6 \times 1$  vectors of variables given by

$$Y_{it} = (NFPI\sigma, RGDP, M2, IN, CPI) \dots \dots \dots (3.10)$$

$$X_{it} = (FFR) \dots \dots \dots (3.11)$$

The first model that captures the dynamic effects of net foreign portfolio investment (NFPI) volatility is represented by equation 3.10 while equation 3.12 below is the second model that captures the dynamic impacts of net foreign remittance (NFR) volatility in low-income SADC economies:

$$Y_{it} = (NFR\sigma, RGDP, M2, IN, CPI) \dots \dots \dots (3.12)$$

$$X_{it} = (FFR) \dots \dots \dots (3.13)$$

Where:

NFPI represents net foreign portfolio investment volatility

NFR represents net foreign remittance volatility

RGDP represents the real GDP growth rate

M2 represents money supply

IN represents the domestic interest rate

CPI represents the consumer price index

FFR represent the federal funds rate that captures the external variable

$Y_{it}$  is a  $(6 \times 1)$  vector of endogenous variables such that  $Y_{it} = Y_{1t}, Y_{2t}, \dots, Y_{6t}$ .  $\beta_i$  is a  $(6 \times 1)$  vector of constants representing country specific intercept terms.

$A(L)$  and  $B(L)$  are matrices of polynomial lags that capture the relationship between the endogenous variables and their lags.

$\mu_{it}$  is a vector of reduced random disturbances (error term).

Therefore, we can summarize the above set of links between innovations and structural shocks as given by Cheng (2006:12) in the following matrices as:

$$\begin{bmatrix} \varepsilon_{it}^{FFR} \\ \varepsilon_{it}^{RGDP} \\ \varepsilon_{it}^{NFPI\sigma} \\ \varepsilon_{it}^{MS} \\ \varepsilon_{it}^{CPI} \\ \varepsilon_{it}^{INT} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ f_{21}^j & 1 & 0 & 0 & 0 & 0 \\ f_{31}^j & f_{32}^j & 1 & 0 & 0 & 0 \\ f_{41}^j & f_{42}^j & f_{43}^j & 1 & 0 & 0 \\ f_{51}^j & f_{52}^j & f_{53}^j & f_{54}^j & 1 & 0 \\ f_{41}^j & f_{41}^j & f_{41}^j & f_{41}^j & f_{41}^j & 1 \end{bmatrix} \begin{bmatrix} \mu_{it}^{FFR} \\ \mu_{it}^{RGDP} \\ \mu_{it}^{NFPI\sigma} \\ \mu_{it}^{MS} \\ \mu_{it}^{CPI} \\ \mu_{it}^{INT} \end{bmatrix} \dots\dots\dots(3.14)$$

$$\begin{bmatrix} \varepsilon_{it}^{FFR} \\ \varepsilon_{it}^{RGDP} \\ \varepsilon_{it}^{NFR\sigma} \\ \varepsilon_{it}^{MS} \\ \varepsilon_{it}^{CPI} \\ \varepsilon_{it}^{INT} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ f_{21}^j & 1 & 0 & 0 & 0 & 0 \\ f_{31}^j & f_{32}^j & 1 & 0 & 0 & 0 \\ f_{41}^j & f_{42}^j & f_{43}^j & 1 & 0 & 0 \\ f_{51}^j & f_{52}^j & f_{53}^j & f_{54}^j & 1 & 0 \\ f_{41}^j & f_{41}^j & f_{41}^j & f_{41}^j & f_{41}^j & 1 \end{bmatrix} \begin{bmatrix} \mu_{it}^{FFR} \\ \mu_{it}^{RGDP} \\ \mu_{it}^{NFR\sigma} \\ \mu_{it}^{MS} \\ \mu_{it}^{CPI} \\ \mu_{it}^{INT} \end{bmatrix} \dots\dots\dots(3.15)$$

Equation 3.14 shows the processes to determine the impact of changes in net foreign portfolio investment volatility in low-income economies while equation 3.15 allows for determination of the impact of changes in net foreign remittances in low-income economies.

The first row estimates the external pressures on the domestic economy from global interest rates represented by the FFR. Transmission of global shocks to the domestic market can be rapid and shocks are transmitted from the global market to the domestic economy and not vice versa (Berkelmans, 2005). For example, in the first equation, global interest rates are assumed to be causing changes in GDP and driving fluctuations in the variability of foreign portfolio and foreign remittance flows as shown in equations 3.14 and 3.15. However, global interest rates are also assumed to be driving their own changes while *GDP* and volatility changes depend on global interest rates and their own changes. It is crucial to realize that some variables in the representation such as *CPI*, *M2* and *IN* are policy variables under the management of the monetary authorities. Shocks to these variables are normally subjected to information delays or lags caused by policy makers (Sims and Zha, 2006, Berkelmans, 2005). The way variables influence each other depends on their position in the identification scheme and their ordering is based on theoretical expectations where interest rates is ordered last in the matrices in order to control for inflation in the economy.

**3.3.4 JUSTIFICATION FOR P-VAR**

The P-VAR approach accounts for endogenous relationships and can summarize empirical relationships without placing too many restrictions on the data used (Berkelmans, 2005). VAR is more powerful than ordinary OLS, GARCH, EGARCH and other approaches in that it makes use of some minimal restrictions known as “Cholesky-one standard deviation” and can accommodate up to seven variables without running out of degrees of freedom (Raghavan and Silvapulle, 2008). The P-VAR model also enables the determination of unbiased impulse response functions (IRFs)

as it takes full advantage of the information contained in the cross-sectional dimension of the sample (Góes, 2016). More importantly, it shows the dynamic behavior and response of every variable to a disturbance that occurs in the economy (Van Aarle, Garretsen, and Gobbin, 2003). In addition, P-VAR in levels allows time and history to determine whether the impact of a shock is temporary or permanent. All the variables are employed with their natural logarithms to minimize heteroscedasticity (Ramaswamy and Sloek, 1998).

### **3.3.5 LAG LENGTH SELECTION**

An ideal lag length ensures that residuals do not suffer from autocorrelation, non-normality and heteroskedacity problems (Hatemi-J and S. Hacker, 2009). The approaches adopted to select an appropriate lag length to use in each equation are: Akaike Information criteria (AIC), Schwarz Information criteria (SIC) and Hannan and Quinn criteria (HQC). We choose the number of lags that minimizes the criteria.

### **3.3.6 IMPULSE RESPONSE FUNCTION (IRF) AND VARIANCE DECOMPOSITION**

Like the standard VAR model, P-VAR models provide convenient instruments in the form of impulse-response function and variance decomposition which provide more information on the impact and transmission of shocks and policy innovations. Impulse response functions are vital for analyzing the dynamic interactions between variables in a VAR model and show the effects of shocks on the adjustment path of the variable. IRF also indicates the response of variables to shocks affecting the system and is shown by way of graphs. In contrast, variance decomposition is a measure of the contribution of each type of shock to the forecast error variance and comes in absolute figures or percentages which must add up to 100.

The study used EViews 10 for all the data analyses.

## **3.4 CONCLUSION**

In conclusion, the selected research techniques contribute immensely to filling the gaps highlighted at the end of Chapter 2. For instance, the P-ARDL model is a recent and powerful model that has the ability to reveal the strengths of relationships among variables in both the short- and long-run. This study should provide interesting and up-to-date findings capable of enriching the existing literature. Moreover, the trivariate P-VECM model is able to accommodate and process the behavior of volatility, financial deepening and capital market performance together in a single



system of equations; it thus makes a significant contribution to filling the gaps identified in the literature. Finally, through its tools of orthogonal impulse response functions and variance decomposition, the P-VAR model show how shocks are transmitted to a system and the responses to shocks can be quantified. This is expected to fill in the gap concerning the paucity of studies that quantify capital flow volatility shocks. The following Chapters, 4, 5 and 6 focus on the analysis and interpretation of the study's results. It is important to note that each chapter or analysis is divided into two sections to clearly distinguish the outcomes of net foreign remittance volatility from net foreign portfolio investment results.

## **CHAPTER 4 : PREDICTORS OF FOREIGN CAPITAL VOLATILITY**

### **4.1 INTRODUCTION**

The previous chapter noted that the drivers of net capital flow volatility are estimated using the P-ARDL. This chapter begins the empirical analysis of the methodology employed and the interpretation of results using P-ARDL. The aim is to ascertain the main predictors of volatility in net foreign remittance flow and net foreign portfolio investment flow in low-income SADC economies.

The significance of foreign remittances and foreign portfolio investment flows in financing stagnant economies and large budget deficits in developing countries cannot be ignored. Furthermore, as noted by Friedman (1986), net foreign remittance and net foreign portfolio investment flows into low-income SADC countries will assist in equilibrating overall savings and investment in the region in order to stimulate economic growth. In line with empirical studies by Al Mamun, Sohag, and Akhter (2013), Rafindadi and Yosuf (2013), and Gerni, Kabadayi, Yurtancikmaz, and Emsen (2013), we adopt the P-ARDL model of Chudik and Pesaran (2013) with quarterly data spanning 16 years from 2000 to 2015 to achieve this objective and address the identified research problems. Based on Kutu and Ngalawa (2016a) and Chudik and Pesaran (2013), the P-ARDL model is the ideal model for this study because it is able to deal with interdependence in cross sectional data and accommodates one or two structural breaks when conducting unit root tests.

#### **4.1.1 VOLATILITY ESTIMATION RESULTS**

This section briefly discusses the times series results of remittance and foreign portfolio investment volatility estimation conducted for individual countries in the SADC region. These results formed a key part of the panel data assembled for the entire study to fulfil all three research objectives. In line with the literature, the volatility estimates were calculated using the absolute values of residuals (Broto et al., 2011; Engel and Rangel, 2008).

The estimation results of net foreign remittance volatility show that, as confirmed by the empirical literature, remittance volatility in the SADC region and the variability in individual countries is too significant to be ignored (Jackman, 2013). For the entire study period, Mozambique recorded

the highest volatility estimates as indicated by a mean volatility of 54.60 and a maximum volatility of 172.58 in 2015. Madagascar and Lesotho also recorded high remittance volatility represented by averages of 33.74 and 32.41, respectively for the entire period. On the other hand, the least and more stable remittances fluctuations were observed in Zambia with a mean of 6.55. This is in line with the thin volumes of remittances received by Zambia for the entire period. The rest of the low-income countries had averages concentrated between 7 and 23.

In line with existing empirical literature, which stipulates that short-term financial flows denominated in foreign currency are highly unstable and regarded as hot money, extreme volatility in portfolio flows was observed in the low-income SADC countries (Prasad, 2013, Ferreira and Laux, 2009). For instance, Mozambique recorded a mean of 125 for the entire period and an all-time maximum volatility of 803.45 in 2013. It was followed by Malawi and DRC with high average volatilities of 80.96 and 71.59, respectively. However, Madagascar recorded very low mean volatility of 0.33 as fluctuations in portfolio flows occurred but in a tight range. These running volatility figures for individual countries, for each year and each type of capital flow were used to set up panel data to conduct the main research.

#### **4.2 PANEL ARDL UNIT ROOT RESULTS**

This investigation checks for the presence of unit roots so as to confirm the stationarity of the data set using the Levin, Lin and Chu (LLC), Im, Pesaran and Shin (IPS) and Augmented Dickey-Fuller (ADF) tests at individual intercept and individual intercept and trend. All three methods of unit root testing are used so as to compare and validate the results, thereby ensuring consistency. This is in line with Demetriades and Fielding (2012) and Ishibashi (2012). The unit roots are presented in Table 4.1 below for both individual, and individual and intercept in order to ensure robustness of the results.

**Table 4.1: Levin et al., IPS and Augmented ADF unit root tests**

Variables	Levin, Lin, Chu (individual intercept)			Levin, Lin, Chu (individual intercept and trend)		
	Order of integration	t* Statistics	P Value	Order of integration	t* Statistics	P- Value
CPI	I(1)	4.65603	1.0000	I(1)	6.45103	1.0000
FFR	I(1)	2.27846	0.9887	I(1)	4.02154	1.0000
M2	I(1)	-1.64776	0.0497**	I(1)	0.25855	0.6020
RGDP	I(1)	-1.77133	0.0383**	I(1)	-0.29918	0.3824
INT	I(1)	-2.26873	0.0116***	I(1)	-0.97997	0.1635
NFR	I(1)	-10.1425	0.0000***	I(1)	-9.27126	0.0000***
NFPI	I(1)	-11.8453	0.0000***	I(1)	-10.9766	0.0000***
WGDP	I(1)	17.1775	1.0000	I(1)	24.1575	1.0000

“\*\*\*”, “\*\*” and “\*” represent statistical significance at 1%, 5%, and 10%, respectively.

Variables	IPS Unit-root test (individual intercept)			IPS Unit-root test (individual intercept and trend)		
	Order of integration	t* Statistics	P Value	Order of integration	t* Statistics	P- Value
CPI	I(1)	-5.71036	0.0000***	I(1)	-5.19741	0.0000***
FFR	I(1)	-4.66213	0.0000***	I(1)	-2.73827	0.0031***
M2	I(1)	-7.42537	0.0000***	I(1)	-6.29529	0.0002***
RGDP	I(1)	-7.70188	0.0000***	I(1)	-6.47770	0.0000***
INT	I(1)	-5.93706	0.0000***	I(1)	-4.33278	0.0000***
NFR	I(1)	-13.9625	0.0000***	I(1)	-12.8962	0.0000***
NFPI	I(1)	-16.2061	0.0000***	I(1)	-15.6238	0.0000***
WGDP	I(1)	-19.0298	0.0000***	I(1)	-18.3034	0.0000***

“\*\*\*”, “\*\*” and “\*” represent statistical significance at 1%, 5%, and 10%, respectively.

Variables	ADF-Fisher Chi Square Unit root-test (individual intercept)			ADF-Fisher Chi Square Unit root-test (individual intercept and trend)		
	Order of integration	t* Statistics	P- Value	Order of integration	t* Statistics	P- Value
CPI	I(1)	74.3710	0.0000***	I(1)	64.0776	0.0000***
FFR	I(1)	52.2533	0.0000***	I(1)	31.2694	0.0268**
M2	I(1)	90.9703	0.0000***	I(1)	70.2317	0.0037***
RGDP	I(1)	97.4040	0.0000***	I(1)	74.0753	0.0000***
INT	I(1)	75.6002	0.0000***	I(1)	54.7766	0.0001***
NFR	I(1)	204.796	0.0000***	I(1)	167.889	0.0000***
NFPI	I(1)	246.136	0.0000***	I(1)	212.052	0.0000***
WGDP	I(1)	297.230	0.0000***	I(1)	254.503	0.0000***

“\*\*\*”, “\*\*” and “\*” represent statistical significance at 1%, 5%, and 10%, respectively.

*Note: CPI (Consumer Price Index), FFR (Federal Funds Rate), M2 (Money Supply), RGDP (Real Gross Domestic Product), INT (Interest Rates), NFR (Net Foreign Remittance), NFPI (Net Foreign Portfolio Investment) & WGDP (World Gross Domestic Product).*

Although the Levin, Lin and Chu unit root test shows that inflation (CPI), WGDP and global interest rates (FFR) are not stationary at I(1), the Im, Pesaran and Shin (IPS) and Augmented Dickey Fuller (ADF) results show otherwise and indicate that all the variables are stable at I(1). Hence, based on the majority, it can be concluded that none of the variables are stationary at I(2). This satisfies Sari et al. (2008) and Katircioglu’s (2009) conditions for running an ARDL model. According to their studies, ARDL can be used with a combination of I(0) and I(1) variables as well as fractionally integrated order or regardless of their order of integration. Except for interest rates that are in natural log form, the rest of the variables have been converted to logarithm form to ensure uniformity. Accordingly, this approach can be used on data or variables whether they are only I(0), I(1), a combination of I(0) and I(1), mutually co-integrated, or regardless of their order of integration but not I(2). Furthermore, Pesaran, Shin, and Smith (2001) indicate that the predicted variable must be I(1). Table 4.1 shows that the predicted variable is I(1); it hence, fulfills the Pesaran et al. (2001) requirement for applying the ARDL approach.

### 4.3 THE TEST FOR CROSS-SECTIONAL DEPENDENCY

Notwithstanding the postulation that the Chudik and Pesaran (2013) P-ARDL model accounts for the dependence of cross-sectional units, and with the alternative standard augmented Dickey–Fuller (ADF) test proposed by Pesaran (2007) to eliminate the effects of interdependence of cross units, the investigation performs the Chow Test to establish whether the data for the SADC countries can be pooled. The Pesaran cross-sectional dependence (Pesaran CD) test is then utilized to establish whether or not the residuals or error term are correlated across units. The benchmark hypotheses that are tested for cross-sectional dependence are:

- $H_0: \beta = 1$ , there is no correlation of the residuals (error term).
- $H_1: \beta \neq 1$ , there is correlation of the residuals (error term).

**Table 4.2: Test for Cross-sectional Dependence**

Test	Statistic	df	Prob
Breusch-Pagan LM	220.9443	36	0.0600
Pesaran scaled LM	21.79118		0.0000
Bias-corrected scaled LM	21.61160		0.0800
Pesaran CD	12.84734		0.2950

Source: Author’s computation from output result from the regression analysis

As shown in Table 4.2, the results of the Pesaran CD test that is conducted on the P-ARDL regression model do not show the presence of cross-sectional dependence or common factors affecting the cross-sectional units in the SADC countries. The t-statistic value of 12.84734 is greater than the Pesaran table value and since the p-value of 0.0950 is statistically insignificant at 5%, the study accepts the null hypothesis of no interdependence of the residuals, but rejects the alternative hypothesis that there is interdependence of the residuals in the model. This suggests that the analysis model is suitable for determining the main predictors of net foreign capital flow volatility in low-income SADC countries.

#### 4.4 THE PANEL ARDL LAG DETERMINATION

Motivated by the need to ensure robustness and consistency of the model, this study used the unrestricted likelihood ratio test for the lag lengths and performed several lag selections in order to determine the optimum lag for the P-ARDL model. The various orders of lags that were performed for this analysis are: sequential modified LR test statistic (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Bayesian Information Criterion (SBIC) and Hannan-Quinn Information Criterion (HQIC). The P-ARDL is conducted for eight (8) lags order as indicated in Table 4.3 below.

**Table 4.3: Lag Length Determination and Selection for the P-ARDL Model**

Lag	LogL	LR	FPE	AIC	SBIC	HQIC
0	-2543.125	NA	7.04e-05	10.30354	10.36300	10.32688
1	-1026.793	2983.651	1.87e-07	4.374923	4.850590	4.561654
2	-833.6341	374.6121	1.05e-07	3.792461	4.684337*	4.142581
3	-31.62334	283.2899*	1.35e-08*	1.739892*	5.129021	3.070350*
4	-788.4704	86.31281	1.06e-07	3.807961	5.116046	4.321471
5	-613.9473	328.5970	6.41e-08	3.300797	5.025091	3.977697
6	-472.8250	261.7176	4.42e-08	2.928586	5.069088	3.768875
7	-292.6309	329.0819	2.60e-08	2.398509	4.955220	3.402188
8	-191.7016	181.4689	2.12e-08	2.188693	5.161613	3.355762

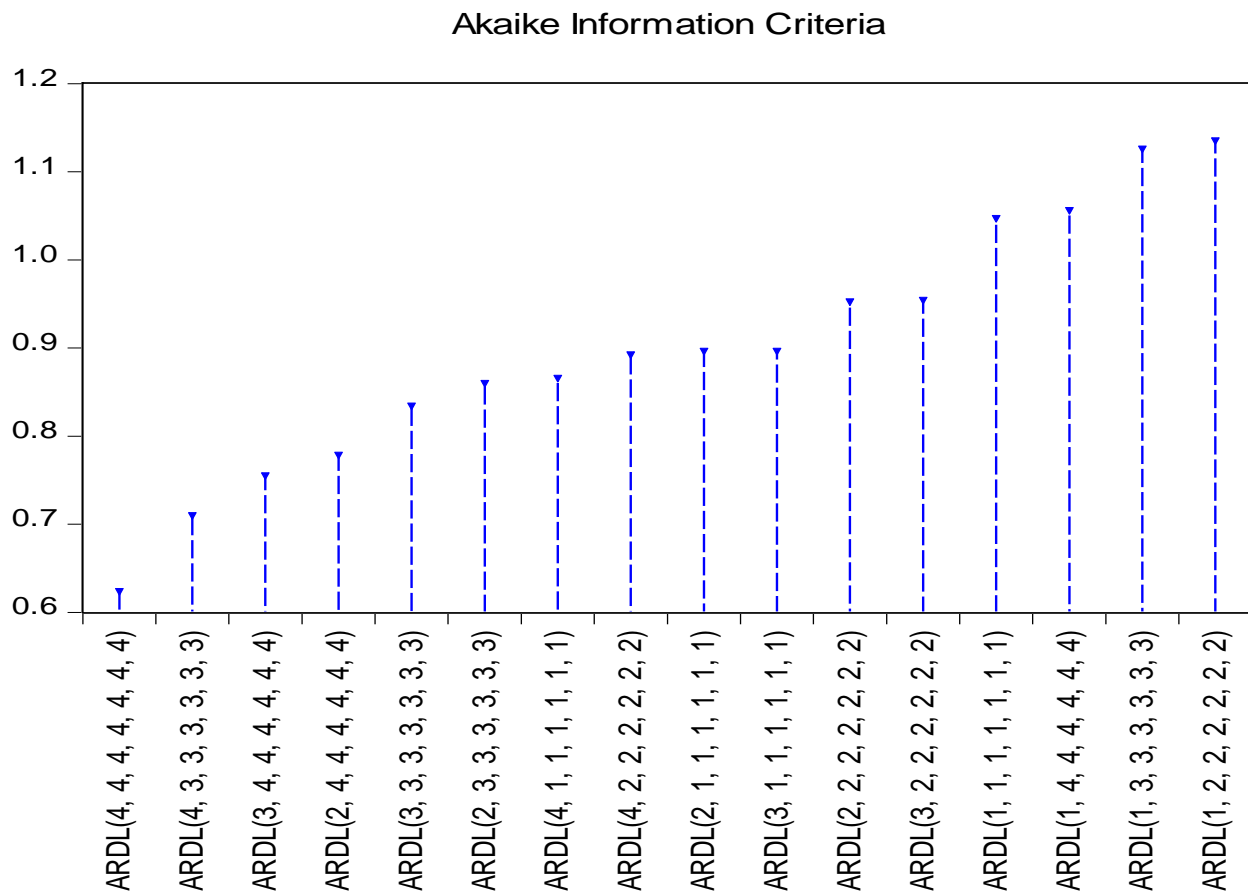
Source: Author's computation from output result from the regression analysis

The results in Table 4.3 show that SBIC selects lag two (2) while LR, FPE, AIC and HQIC select lag three (3). The benchmark hypothesis for choosing the optimum lag is to select the lag that minimizes the value of the criteria. As presented below, lag 3 gives the minimum criteria for the value of LR, FPE, AIC and HQ which are now the optimal lag length for the variables in the system. Therefore, lag 3 is chosen for the P-ARDL model; this is in line with Nowak-Lehmann et al. (2011). In addition, the order of lags selected in the model using LR, FPE, AIC and HQIC are

commonly used in panel estimation (Ali et al., 2008, Raza et al., 2015) and are hence, consistent and efficient.

#### 4.5 DETERMINING THE STRENGTH OF THE MODEL SELECTION CRITERIA

As indicated in Table 4.3 where the LR, FPE, AIC and HQIC select lag three (3), it was found that the AIC gives the smallest number among them. The guiding principle is that the smaller the number, the better the model for selecting optimal lag length. As a progression, in order to establish the robustness of the AIC over other criteria (LR, FPE and HQIC) that chooses 3 lag for model selection in the regression, this study employed the criteria graph to confirm the top 16 different P-ARDL models based on the benchmark analysis that the lower the value of the criteria, the better is the model.



**Figure 4.1: The Criteria Graph**

As revealed in Figure 4.1 above, the first ARDL (4, 4, 4, 4, 4, 4) model seems to be strongly chosen over the others as it gives the smallest value of the AIC. Furthermore, the ARDL (4, 3, 3,



3, 3, 3, 3) model appears to be the second most preferred model. Therefore, the ARDL (4, 4, 4, 4, 4, 4, 4) model seems to be strongly chosen in ascertaining the main predictors of net capital flow volatility in low-income SADC countries.

#### 4.6 THE PANEL ARDL REGRESSION MODEL

Table 4.4 below indicates the results of the P-ARDL regression model that was used to determine the main predictors of net foreign remittance flow volatility in low-income SADC countries.

**Table 4.4: The Panel ARDL Regression Model**

Dependent Variable: D(LOGNFR) Method: ARDL Sample: 2001Q2 - 2015Q4 Model selection method: Akaike info criterion (AIC) Selected Model: ARDL(4, 4, 4, 4, 4, 4, 4)				
Variable	Coefficient t	Std. Error	t-Statistic	Prob.*
Long Run Equation				
LOGFFR	-0.106947	0.043426	-2.462736	0.0143
LOGWGDP	1.203159	0.956431	1.257968	0.2094
LOGRGDP	0.200660	0.028675	6.997670	0.0000
LOGM2	0.323831	0.211700	1.529672	0.0272
LOGCPI	0.018996	0.010184	1.865359	0.0631
INT	-0.000195	6.61E-05	-2.951563	0.0034
Short Run Equation				
-COINTEQ01	-0.037244	0.107766	-12.96551	0.0000
D(LOGNFR(-1))	0.236396	0.086272	2.740126	0.0065
D(LOGNFR(-2))	-0.042701	0.086107	-0.495907	0.0203
D(LOGNFR(-3))	-0.166074	0.103267	-1.608205	0.0088
D(LOGFFR)	0.048170	0.073903	0.651805	0.0000
D(LOGFFR(-1))	-0.006768	0.134647	-0.050263	0.0099
D(LOGFFR(-2))	0.200190	0.097894	2.044967	0.0007
D(LOGFFR(-3))	0.166116	0.093811	1.770745	0.0006
D(LOGWGDP)	0.750414	3.273910	0.229210	0.8189
D(LOGWGDP(-1))	0.190321	2.999378	0.063453	0.9494
D(LOGWGDP(-2))	-5.614315	2.899324	-1.936422	0.0538
D(LOGWGDP(-3))	0.557550	2.740933	0.203416	0.0089
D(LOGRGDP)	1.788409	1.587844	1.126313	0.0009
D(LOGRGDP(-1))	0.610269	0.890128	0.685597	0.0000
D(LOGRGDP(-2))	-1.335447	0.660944	-2.020515	0.0002
D(LOGRGDP(-3))	-1.087628	0.964973	-1.127107	0.0006
D(LOGM2)	-0.704596	1.419410	-0.496401	0.0000
D(LOGM2(-1))	0.360100	0.938703	0.383615	0.0015
D(LOGM2(-2))	1.420124	1.197745	1.185665	0.0067
D(LOGM2(-3))	0.181572	0.567737	0.319818	0.0003
D(LOGCPI)	-0.298771	1.700696	-0.175676	0.0107
D(LOGCPI(-1))	-0.112232	2.306028	-0.048669	0.0000

D(LOGCPI(-2))	-2.367091	3.855482	-0.613955	0.0000
D(LOGCPI(-3))	0.879484	0.738272	1.191273	0.0000
D(INT)	0.014333	0.013548	1.057934	0.0209
D(INT(-1))	0.002194	0.005953	0.368627	0.0127
D(INT(-2))	0.016871	0.014999	1.124807	0.0016
D(INT(-3))	-0.029885	0.021034	-1.420784	0.0004
C	0.014245	0.017292	0.823799	0.0107

Source: Author's computation from output result from the regression analysis

Note: CPI (Consumer Price Index), FFR (Federal Funds Rate), M2 (Money Supply), RGDP (Real Gross Domestic Product), INT (Interest Rates), NFR (Net Foreign Remittance), NFPI (Net Foreign Portfolio Investment) & WGDP (World Gross Domestic Product).

The findings indicate that in the long term, all the variables in the model (except WGDP) are statistically significant in describing net foreign remittance flow volatility. It is observed that prices (CPI), money supply (M2) and real GDP have a positive long-run impact on net foreign remittance flow volatility in low-income SADC countries. This means that an increase in prices (CPI), money supply (M2) and real GDP will lead to a corresponding increase in net foreign remittance flow in these countries. This finding is in conformity with economic theory and empirical evidence as price increases; financial deepening and the growth of GDP will increase net foreign remittance flow into the SADC countries. This is an indication that the economy is growing in the right direction (Maimbo and Ratha, 2005, Adenutsi, 2011).

On the other hand, domestic interest rates (INT) and international interest rates (FFR) have a negative relationship with net foreign remittance flow volatility in the low-income SADC countries. This finding is also in harmony with economic theory and empirical evidence and in line with Omolade and Ngalawa (2014). An increase in interest rates will have an adverse effect on net foreign remittance flow into the SADC countries which can exert a contractionary effect on the economy.

The model revealed mixed results regarding the short-run coefficients of the independent variables as some were statistically insignificant, while some of such variables were found to exert significant impact on remittance volatility. The findings therefore shed more light on which variables are the main predictors of net foreign remittance flow volatility in the selected SADC countries. They show that 95% of the variables in the model are statistically significant in the long run, and hence determine net foreign remittance flow volatility in SADC countries. It is revealed that many variables with a negative impact on net foreign remittance flow appear in the short-run

equation. In line with Dritsakis (2011), the short-run coefficients indicate the dynamic adjustment of all the variables in the model; hence, some of the long-run instability in remittances stem from these short-run dynamics. It is advisable for economic policy makers to capture the short-run behavior of remittance flow volatility as determinants so as to achieve consistency in long-run parameters.

#### 4.7 THE PANEL ARDL COINTEGRATION TEST

The benchmark hypotheses that are tested for the P-ARDL cointegration analysis for the model are stated below:

- $H_0: \beta = 1$ , there is no cointegration relationship in the model.
- $H_1: \beta \neq 1$ , there is a cointegration relationship in the model.

**Table 4.5: The Panel-ARDL Cointegration Test**

Wald Test:			
Equation: ARDL			
Test Statistic	Value	Df	Probability
F-statistic	3.320671	(2, 300)	0.1220
Chi-square	6.459354	2	0.0396

Source: Author's computation from output result from the regression analysis

As depicted in Table 4.5 above, the F-statistics value of 3.320671 is greater than the upper band of the Pesaran critical value of 3.01 at 5% level (Pesaran and Pesaran, 1997). Consequently, the study does not have sufficient evidence to accept the null hypothesis of no cointegration in the model and has therefore failed to reject the alternative hypothesis that there is a cointegration association among the model variables. This reveals the evidence of cointegration among the variables employed. The F-statistics has an insignificant and positive value as supported by the probability value of 0.1220, indicating a long-run cointegration relationship between net foreign remittance flow and other variables in the model.

#### 4.8 THE P-ARDL ERROR CORRECTION TERM (ECT)

Employing the ECT, the study determines the main predictors of net foreign remittance flow volatility in low-income SADC countries. The main predictors are determined in the short- and long-run dynamics using the P-ARDL. The ECT coefficient shows the speed of adjustment through which disequilibrium is restored back to equilibrium. It indicates how quickly or slowly the system returns to equilibrium or steady state.

**Table 4.6: The P-ARDL Error Correction Term (ECT)**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT	-0.713288	0.054839	13.00695	0.0000

Source: Author's computation from output result from the regression analysis

As presented in Table 4.6 above, the negative coefficient of the ECT reveals the presence of disequilibrium in the system in the short run and the significant probability value shows that there will be convergence of the system in the long run. According to Engle and Granger (1987), an error correction mechanism exists for a cointegrated relationship. Therefore, a negative and significant coefficient of the ECT is an indication of cointegration. The ECT value of -0.713288 indicates a comparatively high speed of adjustment from which disequilibrium in the short run is restored back to equilibrium in the long run. Specifically, the result shows that about 71% deviation of the net foreign remittance flow volatility in the short run is restored back to equilibrium in the long run in low-income SADC economies. The significant value of the ECT at 5% is an indication that long-run equilibrium is attainable and that there will be convergence of the system in the long run. This finding is in line with Waliullah and Rabbi (2011) and Kutu and Ngalawa (2016a) who contended that a highly significant ECT is further evidence of the existence of a steady long-run relationship among variables employed in any model. These results imply that there is a stable and predictable relationship between remittance volatility and its main predictors in ascertaining the main predictors of net capital flow volatility in low-income SADC countries, thus creating a necessary condition for economic policy formulation.

## 4.9 CONCLUSION

In the first section of this chapter, we determined the main predictors of net foreign remittance flow volatility in low-income SADC countries using a P-ARDL data analysis method and quarterly data covering the period from 2000 to 2015. The estimation results reveal the existence of a long-run relationship between net foreign remittance flow volatility and a number of variables employed in low-income SADC economies during the period under analysis. This relationship that is derived from the findings is consistent with economic theory and empirical evidence in other countries (Schiopu and Siegfried, 2006). It is deduced that prices, money supply and real GDP have a positive long-run effect on net foreign remittance flow volatility in low-income SADC countries. On the other hand, an increase in interest rates has a negative impact on net foreign remittance flow in these countries. This relationship is also in line with theoretical expectations and empirical evidence, similar to Adenutsi (2011) and Maimbo and Ratha (2005). A similar result was obtained by Jahjah, Chami, and Fullenkamp (2003) in their study on immigrant remittance flows and sources of capital for development.

Furthermore, the ECT result shows that there is a stable and balanced relationship in the establishment of the long-run analysis as revealed by its negative sign and significant value. According to Kutu and Ngalawa (2016a), the ECT incorporates the short-run dynamics with the long-run equilibrium without losing either the short- or long-run information. This is an indication that a relationship exists between net foreign remittance flow and the selected variables in the low-income economies of SADC countries and that long-run equilibrium can be achieved.

Overall, it can be concluded that, in the long run, all the variables employed in the model except WGDP, significantly determine net foreign remittance flow volatility and a stable relationship has been established between net foreign remittance flow volatility and its main predictors in SADC countries. Some of the short run coefficients of the independent variables were statistically insignificant. Nonetheless, some of such variables exerted significant impact. It is therefore recommended that policymakers in SADC countries formulate sound economic policy that targets those predictors that significantly impact net foreign remittance flow in order to achieve stability and economic growth as well as increase savings and investment. Failure to do so will result in contraction of savings and investment and negatively affect the economic growth of the SADC countries from which escape may be difficult.

#### **4.10 DETERMINANTS OF FOREIGN PORTFOLIO INVESTMENT VOLATILITY**

The second section of this chapter analyses the main predictors of net foreign portfolio investment flow volatility in low-income SADC countries using a P-ARDL approach on quarterly data spanning the period from 2000 to 2015. For consistency, the results derived in the first segment of the analysis for the unit root and cross-sectional dependency hold for this second segment. In addition, the results obtained for the lag selection criteria and the criteria graph are also similar to those obtained in the first segment. To save space and avoid repetition and also ensure the adequate flow of information in our analysis or interpretation, the study focuses on the results derived from the P-ARDL regression, the P-ARDL cointegration test and the error correction in order to effectively determine the main predictors of net foreign portfolio investment flow in low-income SADC economies. This is in line with Kutu, Nzimande, and Msomi (2017), and Sari, Ewing, and Soytas (2008) who conducted analysis of six different tests in their studies but in order to save space, only focused on two analyses of the tests in their interpretations since the results are similar.

#### **4.11 THE PANEL ARDL REGRESSION MODEL**

In the estimation of the main predictors of net foreign portfolio investment flow in low-income SADC economies, the results from the P-ARDL show that in the long term, all the model variables are statistically significant in describing net foreign portfolio investment flow volatility (see Table 4.8 below). The findings reveal that world GDP, real GDP, money supply (M2) and prices (CPI) have a positive long-run impact on net foreign portfolio investment flow volatility in the low-income economies of SADC countries while global interest rates (FFR) and domestic interest rates (INT) have a negative impact on net foreign portfolio investment flow in these countries. These results are somewhat different from the results obtained in the first model where world GDP does not significantly determine net foreign remittance volatility in the SADC countries. This could be because foreign portfolio investment represents the entry of funds into an economy as foreign investors purchase shares and bonds in the domestic financial market. Since world GDP is growing, foreign investors may sometimes invest in other countries' stock and bond markets for speculation and in an attempt to diversify and expand their horizons. This correlation is in conformity with economic theory and empirical evidence (Kolodko, 2006). The positive relationship of world GDP, real GDP, money supply and prices is an indication that a rise in these factors will cause a rise in net foreign portfolio investment in SADC countries

**Table 4.4: The Panel ARDL Regression Model**

Dependent Variable: D(DLOGNFPI)				
Method: ARDL				
Sample: 2001Q2 2015Q4				
Model selection method: Akaike info criterion (AIC)				
Selected Model: ARDL(4, 3, 3, 3, 3, 3)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
LOGFFR	-0.042859	0.049179	-0.871486	0.0143
LOGWGD	1.641171	1.042267	1.574616	0.0094
LOGRGDP	0.311668	0.031122	10.01441	0.0000
LOGM2	0.359249	0.240441	1.494127	0.0272
LOGCPI	0.007809	0.010055	0.776610	0.0631
INT	-0.000218	0.000103	-2.116761	0.0034
Short Run Equation				
COINTEQ01	-0.090176	0.130091	-9.917513	0.0000
D(LOGNFPI(-1))	0.178136	0.119742	1.487665	0.0377
D(LOGNFPI(-2))	-0.107388	0.080596	-1.332418	0.0136
D(LOGNFPI(-3))	-0.240658	0.095847	-2.510852	0.0125
D(LOGFFR)	0.042142	0.123384	0.341548	0.0329
D(LOGFFR(-1))	-0.016852	0.077998	-0.216053	0.0291
D(LOGFFR(-2))	0.270397	0.088140	3.067822	0.0023
D(LOGWGD)	-1.230065	2.459037	-0.500222	0.0172
D(LOGWGD(-1))	-4.657543	2.213075	-2.104557	0.0360
D(LOGWGD(-2))	-9.220433	1.991766	-4.629275	0.0000
D(LOGRGDP)	0.636231	0.274501	2.317770	0.0210
D(LOGRGDP(-1))	0.024327	0.199288	0.122069	0.0029
D(LOGRGDP(-2))	0.761555	1.016753	0.749007	0.0544
D(LOGM2)	0.335817	0.822504	0.408286	0.0033
D(LOGM2(-1))	0.770929	0.951959	0.809835	0.0186
D(LOGM2(-2))	2.568602	1.408333	1.823860	0.0690
D(LOGCPI)	1.628125	1.864093	0.873414	0.0330
D(LOGCPI(-1))	3.925465	2.279945	1.721737	0.0060
D(LOGCPI(-2))	2.631819	1.992322	1.320980	0.0174
D(INT)	-0.026431	0.012016	-2.199636	0.0285
D(INT(-1))	0.032609	0.018416	1.770652	0.0775
D(INT(-2))	-0.005390	0.006062	-0.889273	0.0745
C	0.001557	0.015620	0.099683	0.0207

Source: Author's computation from output result from the regression analysis

Note: CPI (Consumer Price Index), FFR (Federal Funds Rate), M2 (Money Supply), RGDP (Real Gross Domestic Product), INT (Interest Rates), NFR (Net Foreign Remittance), NFPI (Net Foreign Portfolio Investment) & WGD (World Gross Domestic Product).

Conversely, interest rates have a negative impact on net foreign portfolio investment flow in low-income SADC countries. This indicates that a contractionary policy will have an adverse effect on

net foreign portfolio investment flow in these countries. This finding is supportive of economic theory and empirical evidence (Neumeyer and Perri, 2005).

Regarding the short run, most of the coefficients of all the explanatory variables were found to be statistically insignificant, indicating that the variables in the model serve as the main predictors of net foreign portfolio investment flow volatility in SADC countries in the long run.

Furthermore, the final outcomes from the panel investigation allow for heterogeneous short-run dynamics and a common long-run cointegrating vector in driving net foreign portfolio investment flow volatility in SADC countries. Finally, in establishing the existence of a suitable model and cointegration, the default parameter estimate of the short-run coefficient (COINTEQ01)<sub>+</sub>, which is found to be significantly negative as anticipated, is an indication that long-run cointegration exists among the variables (otherwise, there would be no cointegration).

#### 4.12 THE PANEL ARDL COINTEGRATION RESULTS

After the automatic parameter estimate of the short-run multiplier (COINTEQ01) showed a sign of long-run cointegration among the variables employed, the study carried out a P-ARDL cointegration test in order to determine the long-run relationship among the variables employed and validate the model results.

**Table 4.5: The Panel ARDL Cointegration Test**

Wald Test:			
Equation: ARDL			
Test Statistic	Value	Df	Probability
F-statistic	5.219264	(2, 227)	0.1061
Chi-square	10.43853	2	0.0954

Source: Author's computation from output result from the regression analysis



As shown in Table 4.9 above, the F-statistics show a p-value of greater than 0.05 in which the F-statistics value of 5.219264 is greater than the upper band of the Pesaran critical value of 3.01 at 5% level (Pesaran and Pesaran, 1997). Therefore, the study fails to accept the null hypothesis of no cointegration and accepts the alternative hypothesis that there is a long-run cointegration association among the model variables. This again shows support for a cointegration relationship. The F-statistics value indicates the existence of a long-run cointegration relationship among net foreign portfolio investment volatility and the rest of model variables.

#### 4.13 THE P-ARDL ERROR CORRECTION TERM (ECT)

**Table 4.6: The P-ARDL Error Correction Term (ECT)**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT	-0.732723	0.117424	6.239988	0.0000

Source: Author's computation from output result from the regression analysis

Table 4.10 above shows the results of the ECT. The negative sign of the ECT multiplier indicates that instability in the short run can be corrected in the long run by a convergence of the system in the long term. The ECT value of -0.732723 demonstrates a relatively high rate of adjustment from the short-run disequilibrium to the restoration of equilibrium in the long run of net foreign portfolio investment volatility. It shows about 73% deviation from the short-run to the long-run equilibrium. The ECT is statistically significant at 5% level, indicating that long-run equilibrium is attainable. These findings are supportive of existing literature as in Waliullah and Rabbi (2011) and Banerjee et al. (1998) on the existence of a long-run equilibrium association.

#### 4.14 CONCLUSION

This second section of this chapter examined the main predictors of net foreign portfolio investment volatility in low-income SADC countries using a P-ARDL model with quarterly data spanning the period from 2000 to 2015.

For the period under study, the findings revealed the existence of a long-run relationship between net foreign portfolio investment volatility and all the factors in the model. This outcome is in line with economic theory and empirical evidence in other nations (Kolodko, 2006). It is revealed that prices, real GDP, world GDP and money supply have a positive long-run effect on net foreign

portfolio investment flow in SADC countries. Conversely, interest rates have a negative impact on net foreign portfolio investment flow volatility in these countries. Such a relationship conforms to general expectations, economic theory and empirical evidence as indicated in Neumeyer and Perri (2005). However, the findings differ from Broto et al. (2011), who found a positive relationship between domestic interest rates and foreign portfolio investment volatility, and that foreign portfolio investment volatility was weakly correlated with macro-economic variables.

More importantly, the results revealed a significant negative value of the ECT. The ECT amalgamates the short-run dynamics with the long-run parity condition with no loss of important information. From the findings it can be concluded that there is a connection between net foreign portfolio investment volatility and the selected variables in low-income SADC economies and that long-run steady state can be achieved.

Regarding the short run, most of the coefficients of all the explanatory variables were found to be statistically insignificant; hence, indicating that the variables in the model serve as the main predictors of net foreign portfolio investment flow volatility in SADC countries in the long run

#### **4.15 INFERENCES AND COMPARISONS BETWEEN THE TWO P-ARDL MODELS IN SADC COUNTRIES**

This chapter investigated the main predictors of net foreign remittance volatility and net foreign portfolio investment volatility in low-income SADC countries using two P-ARDL models. In pooling the data together, the findings from both models do not show the presence of cross-sectional dependence or common factors affecting the cross-sectional units in the SADC countries. This is similar to Pesaran (2004; 2007) who corrected for cross-sectional dependence in his study on general diagnostic tests for cross-section dependence in panels and a simple panel unit root test in the presence of cross-section dependence. The results in the two P-ARDL models showed that the t-statistic value of 21.79118 is greater than the Pesaran table value and since the p-value of 0.0000 is statistically significant at 5%, the study failed to reject the null hypothesis of no correlation of the residuals and rejected the alternative hypothesis that correlation of the residuals exists in the model. The finding is also similar to Gow et al. (2010) that corrected for cross-sectional and time-series dependence in accounting research due to its negative effect on panel analysis.

Furthermore, the unit root test results are consistent with previous empirical studies that employed P-ARDL such as Kutu and Ngalawa (2016a). In addition, the unlimited likelihood ratio test for the lag lengths conducted for various lag selection criteria for the purpose of determining the optimum lag for the two P-ARDL models chose lag 3 as the optimum lag. These various orders of lags were conducted using the sequential modified LR test statistic (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Bayesian Information Criterion (SBIC) and Hannan-Quinn Information Criterion (HQIC). Lag 3 was found to give the minimum criteria for the value of LR, FPE, AIC and HQ which are now the optimal lag length for the variables in the two models. This is consistent with Nowak-Lehmann et al. (2011), Mijinyawa (2015) and Olarewaju et al. (2017). The criteria graphs also exhibit similar trends; it was found that the AIC gives the most minimum number based on the benchmark hypothesis that the smaller the number, the better the model selection for the lag length. The ARDL (4, 4, 4, 4, 4, 4, 4) model was found to be strongly chosen over the other models.

However, there are some disparities in the two models. For example, in the first model, world GDP does not significantly impact net foreign remittance volatility in both the short and long run. This means that world GDP does not serve as a main predictor for net foreign remittance flow volatility in low-income SADC countries. Regardless of the world output growth rate, foreign migrant workers might still transfer money to their family or other individuals at home. However, in the second model, all the factors in the equation were statistically sound in the short run and in the long run; and hence determine net foreign portfolio investment volatility in SADC countries. These results are consistent with theory and empirical studies such as Glytsos (2005), Ramirez (2006), and Akinlo (2004), among others.

Furthermore, the two P-ARDL models provide evidence of cointegration analyses among the variables employed in the models during the period under investigation. In both findings, the study does not have sufficient evidence to accept the null hypothesis of no cointegration in the model and has therefore accepted the alternative hypothesis that there is a cointegration relationship among the variables in the model. This therefore revealed the evidence of cointegration among the variables employed. Given the values of F-statistics that are significant and positive for the two models, this is an indication of a long-run cointegration association between net foreign remittance volatility and other variables in the first model as well as between net foreign portfolio investment

volatility and other variables in the second model. These findings are in line with various empirical studies such as Giuliano and Ruiz-Arranz (2009), Yang (2008), Li and Liu (2005) and Jahjah et al. (2003), among others. It can therefore be concluded that both net foreign remittance flows and net foreign portfolio investment flows are sources of development for SADC countries.

Finally, employing the ECT for the two models after the evidence of cointegration was revealed, the study found that there is a comparatively high speed of adjustment from which disequilibrium in the short run can be restored back to equilibrium in the long run for the two models. Specifically, the first result showed that about 71% deviation of the net foreign remittance flow volatility in the short run is restored back to equilibrium in the long run in low-income SADC countries while the second result revealed that about 73% deviation of the net foreign portfolio investment volatility in the short run is restored back to equilibrium in the long run in these economies. The values of the ECT for the two models were significant at 5% which is an indication that long-run equilibrium is attainable and that the system converges in the long run. These findings are supportive of those of Waliullah and Rabbi (2011), Kutu and Ngalawa (2016a) and Banerjee, Dolado, and Mestre (1998) who contended that a highly significant ECT is further evidence of the existence of a steady long-run relationship among the variables employed in any model.

The following chapter analyses the causal relationships or financial linkages between capital flow volatility, financial deepening and the performance of capital markets using the panel vector error correction model (P-VECM) in the context of SADC low-income countries.

## **CHAPTER 5 : CAPITAL VOLATILITY, FINANCIAL DEEPENING AND CAPITAL MARKET PERFORMANCE: CAUSAL LINKAGES**

### **5.1 INTRODUCTION**

This chapter presents in detail the Panel Vector Error Correction Model (PVECM) used to establish the short- and long-run relationships among net capital flow volatility, financial deepening and capital market performance in low-income SADC countries. Several econometric regressions are conducted to capture the behavior of data and ensure that the model is correctly specified in order to generate robust results. The methodology examines the appropriateness of the research procedure to establish the short- and long-run relationships among capital flow volatility, financial deepening and capital market performance in low-income SADC countries. It also determines the Granger causality (causal relationships) among the variables employed. The study provides the necessary intellectual platform to link capital flow volatility, financial deepening and capital market performance in an economy. The focus is on the instruments and policy frameworks that can be used by policymakers to stimulate the economy with policy targets. This chapter also sheds light on the misconceptions that surround the concepts of capital flow volatility, financial deepening and capital market performance and the implications for policy formulation and implementation for the growth and development of an economy.

This empirical study contributes to the literature in several ways. Firstly, it examines the causal relationships among capital flow volatility, financial deepening and capital market performance in low-income SADC countries; such an investigation has not been conducted before. Secondly, the research takes advantage of panel data methodologies to provide more robust estimates and confront the potential bias emanating from problems such as endogeneity, heterogeneity and cross-country dependence that may have affected previous related empirical work. This is believed to provide more informative estimates of economic performance that connect capital flow volatility, financial deepening and capital market performance in an economy. Finally, the study deepens our knowledge of how key macro-financial variables interact in this region.

## 5.2 DESCRIPTIVE STATISTICS

### 5.2.1 SUMMARY STATISTICS

The following Table 5.1 shows the descriptive analysis of the results of all the activities regarding the causal relationships among capital flow volatility, financial deepening and capital market performance in low-income SADC economies for the period 2000Q<sub>1</sub> – 2015Q<sub>4</sub>. Descriptive statistics is based on raw data which has not been transformed, that is neither differenced nor logged.

**Table 5.1: Descriptive Analysis**

	CMP	RGDP	CPI	FD	INT	NFR
Mean	1.63428	202114	0.42538	0.52243	-1.15215	0.03206
Median	0.00000	-44.1104	0.40183	0.30247	-18.3653	0.00003
Maximum	147.353	547134	3.64380	6.71254	185.260	15.2764
Minimum	-22.2340	-410604	-4.86240	-4.71062	-88.3651	-38.0671
Std. Dev.	18.9632	210157	8.81073	1.13007	41.4009	7.16027
Skewness	4.45076	5.12241	-1.47321	1.17524	2.61714	-1.35205
Kurtosis	26.1732	29.7543	31.7503	14.6334	14.8535	16.1806
Jarque-Bera	2412.10	1846.22	9044.52	2501.14	3306.43	3959.56
Probability	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Source: Author's computation from output result from the regression analysis

The mean represents the average value of the data set. Attention is paid to CMP, FD and NFR because they are the core variables of interest. The CMP captures capital market performance, FD represents financial deepening and NFR is net foreign remittances that capture the volatility in capital flows from migrant workers to their home country. The results reveal the mean values of capital market performance (1.634), financial deepening (0.522) and capital flow volatility (0.032). The values show that the mean lies at the bottom part of the distribution. The implication is that average capital market performance and financial deepening in SADC countries is small and not encouraging. This means that the majority of our data values on capital market performance and financial deepening for all the countries are concentrated at the lower end. However, capital flow volatility is very low. The maximum and minimum capital market performance, financial deepening and capital flow volatility are 147.35 and -22.23, 6.71 and -4.71 and 15.28 and -38.07, respectively. The standard deviation values of 18.96, 1.13, and 7.16 reveal the rate at which capital market performance, financial deepening and capital flow volatility deviate from their respective average or expected value. It was also found that capital market performance and financial deepening, with skewness values of 4.45 and 1.17, respectively, are positively skewed because

their distribution has a long tail to the right, while capital flow volatility with a skewness value of -1.35 is negatively skewed because the distribution has a long tail to the left. Skewness estimates the equality or lack of equality in a probability distribution of a real-valued random distribution around the mean. The skewness measure can either be negative or positive or undefined. A zero value means that the tails on both sides of the mean balance out and this is the case for a symmetric distribution, but when one tail is longer but thin (as seen in this study), this is asymmetric distribution. However, the kurtosis of all the variables in the model and those under consideration are leptokurtic in nature because the kurtosis coefficient indexes are all positive and modestly sized deviations. The kurtosis measures the ‘tailedness’ of the probability distribution of a real-valued random variable. Finally, the Jarque-Bera and probability values revealed that capital market performance, financial deepening and remittance flow volatility are not normally distributed but statistically significant in examining the relationships among capital flow volatility, financial deepening and capital market performance in low-income SADC economies. This is an indication that the patterns of growth and market performance in these countries have been somewhat unstable.

## 5.2.2 PANEL UNIT ROOT TEST

**Table 5.2: Panel Unit Root Tests**

*Levin et al. unit root tests*

Variables	Levin, Lin, Chu (individual intercept)			Levin, Lin, Chu (individual intercept and trend)		
	Order of integration	t* Statistics	P Value	Order of integration	t* Statistics	P- Value
CPM	I(1)	-6.97204	0.0000***	I(1)	-6.29404	0.0000***
RGDP	I(1)	-9.58031	0.0000***	I(1)	-9.68166	0.0000***
FD	I(1)	0.01807	0.0072***	I(1)	-2.01903	0.0217**
CPI	I(1)	-11.1076	0.0000***	I(1)	-10.5426	0.0000***
INT	I(1)	-1.42506	0.0771*	I(1)	0.65947	0.7452
NFR	I(1)	-14.8314	0.0000***	I(1)	-14.7586	0.0000***
NFRI	I(1)	-16.6544	0.0000***	I(1)	-15.6724	0.0000***

“\*\*\*”, “\*\*” and “\*” represent statistical significance at 1%, 5%, and 10%, respectively.

**IPS unit root tests**

Variables	IPS Unit-root test (individual intercept)			IPS Unit-root test (individual intercept and trend)		
	Order of integration	t* Statistics	P Value	Order of integration	t* Statistics	P- Value
CPM	I(1)	-9.18816	0.0000***	I(1)	-7.50122	0.0000***
RGDP	I(1)	-7.95114	0.0000***	I(1)	-6.83203	0.0000***
FD	I(1)	-5.49237	0.0000***	I(1)	-3.48632	0.0002***
CPI	I(1)	-11.1534	0.0000***	I(1)	-9.70885	0.0000***
INT	I(1)	-5.06879	0.0000***	I(1)	-4.57255	0.0000***
NFR	I(1)	-12.6476	0.0000***	I(1)	-11.4039	0.0000***
NFRI	I(1)	-20.5327	0.0000***	I(1)	-20.0243	0.0000***

“\*\*\*”, “\*\*” and “\*” represent statistical significance at 1%, 5%, and 10%, respectively.

**Augmented ADF unit root tests**

Variables	ADF-Fisher Chi Square Unit root-test (individual intercept)			ADF-Fisher Chi Square Unit root-test (individual intercept and trend)		
	Order of integration	t* Statistics	P- Value	Order of integration	t* Statistics	P- Value
CPM	I(1)	118.282	0.0000***	I(1)	85.1439	0.0000***
RGDP	I(1)	98.2837	0.0000***	I(1)	76.2896	0.0000***
FD	I(1)	62.7523	0.0000***	I(1)	38.1736	0.0037***
CPI	I(1)	152.320	0.0000***	I(1)	116.657	0.0000***
INT	I(1)	57.2924	0.0000***	I(1)	49.3323	0.0001***
NFR	I(1)	179.571	0.0000***	I(1)	142.717	0.0000***
NFRI	I(1)	326.436	0.0000***	I(1)	284.537	0.0000***

“\*\*\*”, “\*\*” and “\*” represent statistical significance at 1%, 5%, and 10%, respectively.



Note: CPM (Capital Market Performance), RGDP (Real Gross Domestic Product), FD (Financial Deepening), CPI (Consumer Price Index), INT (Interest Rates), NFR (Net Foreign Remittance) & NFPI (Net Foreign Portfolio Investment).

The panel unit root test presented in Table 5.2 above shows that all the variables were stationary after first differencing I(1). Capital market performance, real GDP, inflation rate, financial deepening, interest rate and capital flow volatility were all stationary at order one I(1) at both individual intercept and trend during the period under investigation. The reason is that the probability of Levin, Lin and Chu, Im, Pesaran and Shin (IPS) and Augmented Dickey Fuller (ADF) test statistics values: 0.000, 0.000 and 0.000 for each of the variables was less than the probability of the error margin 0.05, allowed for in the estimate in this study. The results imply the presence of a short-run equilibrium association among the model variables. The short-run stability of these variables as shown by the panel unit root test led to further description of the variables in choosing the lag selection criteria, the level of correlation between them and the estimation of cointegration to establish the long-term equilibrium relationship or stability of the linear combination of the variables in the long run.

### 5.2.3 OPTIMAL LAG SELECTION

This study applies different lag selection criteria in order to determine the optimal lag structure for the model. According to Gutiérrez (2007), an important feature of empirical research based on the Vector Autoregressive (VAR) or Vector Error Correction (VEC) model is the choice of the lag order, since all inference in the VAR/VEC model is based on the correct model specification.

**Table 5.3: VECM Lag Order Selection Criteria**

Endogenous variables: DCMP DRGDP DCPI DFD DINT DNFR						
Exogenous variables: C						
Sample: 2000Q1 2015Q4						
Included observations: 495						
Lag	LogL	LR	FPE	AIC	SBIC	HQIC
0	-29784.17	NA	7.56e+14	12.36433	120.4153	120.3843
1	-29235.69	1081.450	9.54e+22	11.29376	118.6505	118.4338
2	-28951.34	553.7703	3.50e+12*	11.29039*	117.9528	117.5504
3	-28681.87	518.2592	1.36e+17	11.34696	117.3153	116.7271
4	-27884.69	1513.836	6.29e+23	13.27151	114.5456	113.7716
5	-26801.54	2030.623	9.15e+34	109.0406	110.6205	109.6608
6	-25729.27	1984.254	1.39e+22	104.8536	106.7393	105.5939

7	-24731.67	1821.869	2.86e+21	100.9684	103.1598	101.8287
8	-16421.98	14974.24*	8.69e+21	67.53930	70.03656*	68.51964*
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: Author's computation from output result from the regression analysis

Table 5.3 above shows the results of the vector error correction model of lag length to be selected for this study. From the results, the vector error correction model of a lag order of eight (8) is discovered using the LR, SBIC and HQC while the vector error correction model of a lag order of two (2) is discovered using the FPE and AIC. All these information criteria are statistically significant at 5% level. However, to reach a decision, the smallest lag order as revealed by FPE and AIC was selected for this study. The implication is that the null hypothesis that there is no autocorrelation is accepted at lag length two. Therefore, the VECM estimates are not affected by the problem of serial correlation; hence, their estimates remain consistent and efficient in establishing the short-run and long-run relationship among net capital flow volatility, financial deepening and capital market performance.

### 5.3 PANEL COINTEGRATION TEST

The advantages of recognizing cointegration rank and using the VECM in an integrated vector process of integration is that it results in improved forecast performance, and is easy to understand and implement. Cointegration is defined as the presence of a long-run connection between financial factors such that cointegrated variables pave the way for the correction of short-term disturbances in the long term. According to Abadir and Taylor (1999), a cointegration test is conducted on a series to test for significant deviation of integrated variables from a definite relationship. Following the results derived from the unit root test where all the variables are integrated of the same order  $I(1)$ , there is a need to test for the existence of cointegration relationships among the model variables in this study.

In this regard, the Pedroni (2004) ADF residual-based and Johansen Fisher panel cointegration tests are used to check for the existence of cointegration relationships among the variables under

study. The advantages of using both approaches include the need to ensure consistency and check for robustness as well as validate the results.

**Table 5.4: Pedroni ADF Residual based Cointegration Test**

Ho: There is no Co-integration ( $H_0 : \varpi = 1$ )		
Trend Assumption: No deterministic Trend		
	<b>t-Statistic</b>	<b>Prob</b>
ADF	-10.44930	0.3493

Source: Author's computation from output result from the regression analysis

The result from the Pedroni Residual ADF test in Table 5.4 is insignificant at 5% with t-statistics  $-10.44930$ ; hence, the null hypothesis is rejected and there is established evidence that the variables are co-integrated in the long run.

**Table 5.5: Johansen Fisher-Based Cointegration Test of Variables**

Eigen value	Trace Statistic	5% Critical Value	Hypothesised No. of CE(s)
0.771964	1558.525	95.75366	None *
0.407932	760.2689	69.81889	At most 1 *
0.362378	477.2368	47.85613	At most 2 *
0.198270	234.2320	29.79707	At most 3 *
0.115343	114.9006	15.49471	At most 4 *
0.086274	48.72101	3.841466	At most 5 *
Eigen value	Maximum Eigen Value Statistic	5% Critical Value	Hypothesised No. of CE(s)
0.771964	798.2565	40.07757	None *

0.407932	283.0322	33.87687	At most 1 *
0.362378	243.0048	27.58434	At most 2 *
0.198270	119.3313	21.13162	At most 3 *
0.115343	66.17963	14.26460	At most 4 *
0.086274	48.72101	3.841466	At most 5 *

Source: Author’s computation from output result from the regression analysis

*Note: “\*\*\*” represents rejection of null hypothesis at 5% level of significance*

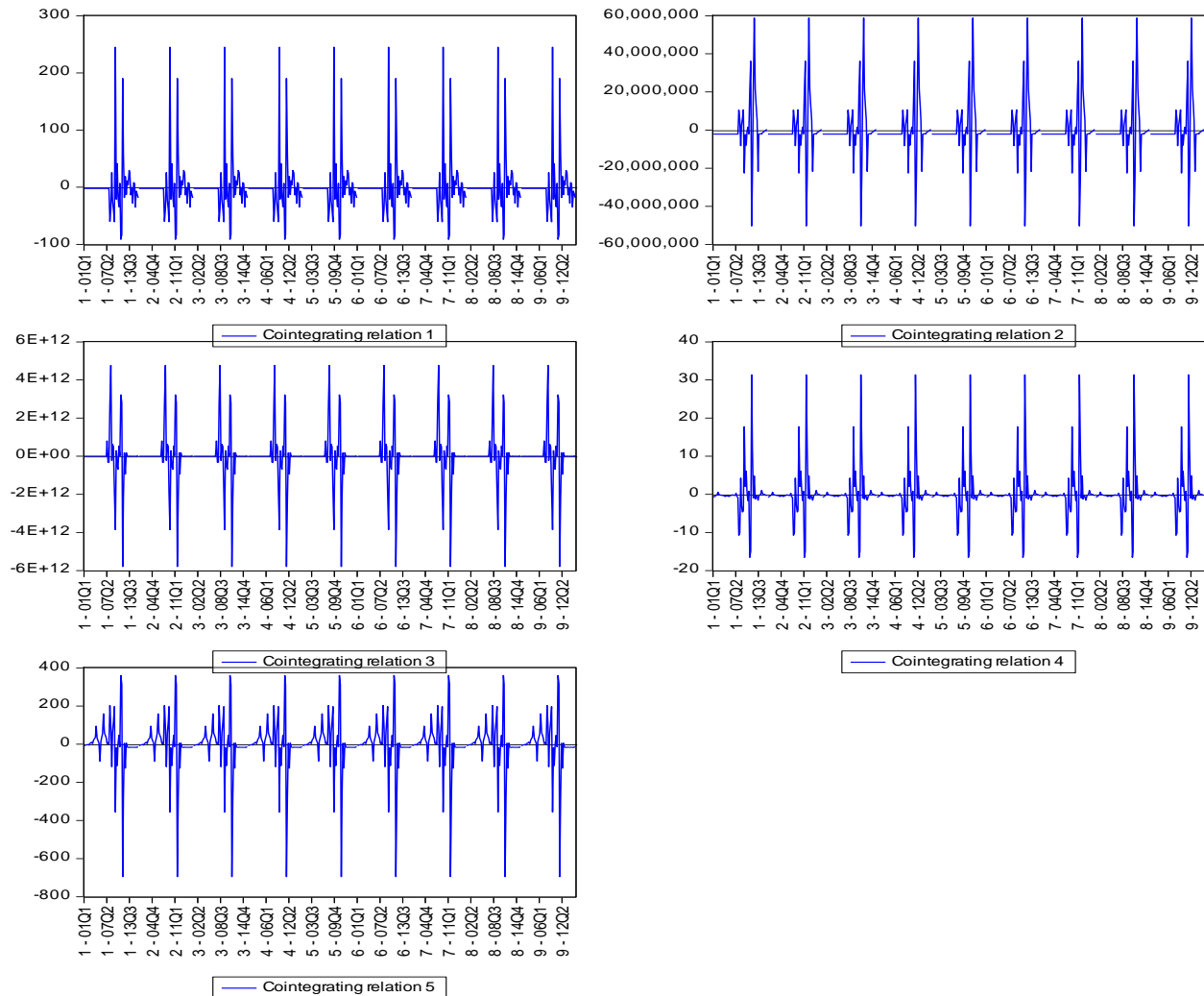
Employing the Johansen cointegration test methodology to estimate the cointegrating relationship among the variables; two likelihood estimators were used for the cointegrating rank test: the trace test and the maximum Eigen value test. The cointegration relationship was properly tested using the trace and the maximum Eigen value statistical tests. As shown in Table 5.5, the trace test statistics show five cointegrating vectors at 5% level of significance. This finding is similar to that of Österholm and Hjalmarsson (2007) who carried out a cointegration analysis using the Johansen methodology when variables are near-integrated. The finding in this study implies that a long-run equilibrium association exists among the variables under investigation. Hence, the short- and long-run relationships among capital flow volatility, financial deepening and capital market performance can be established in low-income SADC countries. In addition, the maximum Eigen value test indicates five standardized cointegrating equations at 5% level of significance. Further details on the five cointegrating equations for the trace test and the maximum Eigen value test and their adjustment coefficients are presented in Table 5.6 below.

**Table 5.6: Cointegration Equations**

5 Cointegrating Equation(s):		Log likelihood	-31197.31		
Normalized cointegrating coefficients (standard error in parentheses)					
DCMP	DRGDP	DCPI	DFD	DINT	DNFR
1.000000	0.000000	0.000000	0.000000	0.000000	-5.888835
					(0.63878)
0.000000	1.000000	0.000000	0.000000	0.000000	1289019.
					(155809.)
0.000000	0.000000	1.000000	0.000000	0.000000	1.84E+11
					(2.3E+10)
0.000000	0.000000	0.000000	1.000000	0.000000	-0.985046
					(0.08788)
0.000000	0.000000	0.000000	0.000000	1.000000	21.51139
					(2.23091)
Adjustment coefficients (standard error in parentheses)					
D(CMP)	-1.059024	4.07E-07	-2.29E-11	-0.337647	-0.025547
	(0.07068)	(9.4E-08)	(2.2E-12)	(0.89272)	(0.02276)
D(RGDP)	-69175.23	-0.955139	3.71E-06	1303892.	-36207.70
	(28639.0)	(0.03802)	(9.0E-07)	(361701.)	(9222.82)
D(CPI)	-2.51E+09	101.5832	-1.409793	-2.96E+11	-2.06E+08
	(2.9E+09)	(3837.98)	(0.09052)	(3.7E+10)	(9.3E+08)
D(FD)	0.015850	-1.65E-08	1.38E-12	0.100455	-0.003352
	(0.00386)	(5.1E-09)	(1.2E-13)	(0.04874)	(0.00124)
D(INT)	-0.179295	-2.95E-07	-1.46E-11	-10.18948	-0.394649
	(0.13025)	(1.7E-07)	(4.1E-12)	(1.64503)	(0.04195)
D(NFR)	-0.057986	-1.92E-07	6.65E-12	2.692062	-0.009834
	(0.02541)	(3.4E-08)	(8.0E-13)	(0.32096)	(0.00818)

Source: Author's computation from output result from the regression analysis

Note: CPM (Capital Market Performance), RGDP (Real Gross Domestic Product), FD (Financial Deepening), CPI (Consumer Price Index), INT (Interest Rates), NFR (Net Foreign Remittance) & NFPI (Net Foreign Portfolio Investment).



**Figure 5.1: Graphical Representation of Co-integrating Equations**

Table 5.6 and Figure 5.1 above show the standardized cointegrating equations coefficients with their standard error in parentheses. The standardized cointegrating error coefficients are given on capital flow volatility with positive coefficients. As a result, the table reveals that capital market performance shown by the cointegrating equations in Figure 5.1 and adjustment coefficients (standard error in parentheses) in Table 5.6 may be determined by the future-state and the stability of real GDP, prices, financial deepening, interest rates and capital flow volatility. The cointegration adjusted coefficients measure the long-run equilibrium or stability of capital market performance. The real GDP value of -1.059024 with a significant value of (0.07068) reveals a negative impact on capital market performance in SADC countries, indicating that instability in the economy will negatively affect capital market performance. In the second and third cointegrating equations, the

performance of the financial sector or capital market performance arising from prices with a value of -0.955139 (0.03802) and financial deepening with a value of -1.409793 (0.09052) improved significantly in determining capital market performance, although still negative. Finally, the results in the 5<sup>th</sup> and 6<sup>th</sup> columns in the table show that interest rates with a value of -0.394649 (0.04195) and capital flow volatility with a value of -0.009834 (0.00818) significantly determine capital market performance. These results imply that more attention should be paid to all the variables in the model due to their long-run impacts arising from their standardized cointegrating equations coefficients in determining capital market performance in low-income SADC countries. The results revealed the presence of a long-run association between the model variables such that cointegrated variables provide room for the correction of short-term disturbances in the long run.

#### 5.4 PANEL VECM ESTIMATION

Based on Mahadevan and Asafu-Adjaye's (2007) study, there are two common methods of estimating the direction of causality between cointegrated variables, namely, VAR and VECM models. However, the VECM approach is preferred for this study as it clearly shows both the long-run and short-run causal relationships among the variables employed. The VECM with five (5) simultaneous equations is estimated to establish the short-run and long-run relationships among capital flow volatility, real GDP, prices, financial deepening, interest rates and capital market performance in low-income SADC economies. A VECM is a restricted VAR used for non-stationary cointegrated series. As indicated in the model, the cointegration term built in the VECM is known as the ECT. Any deviation from the long-run equilibrium is corrected with a steady speed of short-run adjustment. Following the studies of Asari et al. (2011) and Hyndman and Athanasopoulos (2014), the VECM is estimated on a chosen optimal lag two (2) as revealed by the FPE and AIC and is presented below.

**Table 5.7: Vector Error Correction Estimates**

Sample (adjusted): 2001Q1 2015Q4						
Included observations: 540 after adjustments						
Standard errors in ( ) & t-statistics in [ ]						
Cointegrating Eq:	CointEq1	CointEq2	CointEq3	CointEq4	CointEq5	
DCMP(-1)	1.000000	0.000000	0.000000	0.000000	0.000000	
DRGDP(-1)	0.000000	1.000000	0.000000	0.000000	0.000000	

DCPI(-1)	0.000000	0.000000	1.000000	0.000000	0.000000	
DFD(-1)	0.000000	0.000000	0.000000	1.000000	0.000000	
DINT(-1)	0.000000	0.000000	0.000000	0.000000	1.000000	
DNFR(-1)	-5.888835 (0.64123) [-9.18370]	1289019. (156405.) [ 8.24156]	1.84E+11 (2.3E+10) [ 8.03968]	-0.985046 (0.08822) [-11.1664]	21.51139 (2.23944) [ 9.60571]	
C <sub>1</sub>	-0.116485	-2152117.	-73262794	-0.481249	0.004269	
Error Correction:	D(CMP)	D(RGDP)	D(CPI)	D(FD)	D(INT)	D(NFR)
CointEq1	-1.059024 (0.07096) [-14.9253]	-69175.23 (28748.6) [-2.40621]	-2.51E+09 (2.9E+09) [-0.86571]	0.015850 (0.00387) [ 4.09141]	-0.179295 (0.13075) [-1.37129]	-0.057986 (0.02551) [-2.27298]
CointEq2	4.07E-07 (9.4E-08) [ 4.32384]	-0.955139 (0.03816) [-25.0279]	101.5832 (3852.65) [ 0.02637]	-1.65E-08 (5.1E-09) [-3.21684]	-2.95E-07 (1.7E-07) [-1.69773]	-1.92E-07 (3.4E-08) [-5.65961]
CointEq3	-2.29E-11 (2.2E-12) [-10.2862]	3.71E-06 (9.0E-07) [ 4.11670]	-1.409793 (0.09087) [-15.5143]	1.38E-12 (1.2E-13) [ 11.3367]	-1.46E-11 (4.1E-12) [-3.57772]	6.65E-12 (8.0E-13) [ 8.32999]
CointEq4	-0.337647 (0.89614) [-0.37678]	1303892. (363084.) [ 3.59116]	-2.96E+11 (3.7E+10) [-8.08142]	0.100455 (0.04893) [ 2.05323]	-10.18948 (1.65132) [-6.17050]	2.692062 (0.32219) [ 8.35545]
CointEq5	-0.025547 (0.02285) [-1.11802]	-36207.70 (9258.09) [-3.91093]	-2.06E+08 (9.3E+08) [-0.22017]	-0.003352 (0.00125) [-2.68687]	-0.394649 (0.04211) [-9.37271]	-0.009834 (0.00822) [-1.19700]
D(CMP(-1))	-0.054541 (0.05791) [-0.94184]	188015.2 (23462.7) [ 8.01335]	6.21E+09 (2.4E+09) [ 2.62284]	-0.011731 (0.00316) [-3.71049]	0.094191 (0.10671) [ 0.88268]	0.158471 (0.02082) [ 7.61136]
D(CMP(-2))	-0.035424 (0.03689) [-0.96039]	133376.2 (14944.6) [ 8.92468]	-1.56E+09 (1.5E+09) [-1.03694]	0.002818 (0.00201) [ 1.39931]	0.057190 (0.06797) [ 0.84141]	0.074671 (0.01326) [ 5.63062]
D(RGDP(-1))	-5.83E-07 (8.2E-08) [-7.11385]	0.084804 (0.03319) [ 2.55519]	10028.85 (3350.49) [ 2.99325]	1.32E-09 (4.5E-09) [ 0.29429]	1.81E-07 (1.5E-07) [ 1.20066]	-8.94E-09 (2.9E-08) [-0.30350]



D(RGDP(-2))	-2.61E-07	0.164199	8175.800	2.13E-09	9.68E-08	1.11E-07
	(7.6E-08)	(0.03060)	(3089.56)	(4.1E-09)	(1.4E-07)	(2.7E-08)
	[-3.44962]	[ 5.36526]	[ 2.64627]	[ 0.51770]	[ 0.69534]	[ 4.09458]
D(CPI(-1))	1.12E-11	-2.06E-06	0.609797	-1.06E-12	7.49E-12	-2.55E-12
	(2.0E-12)	(8.1E-07)	(0.08202)	(1.1E-13)	(3.7E-12)	(7.2E-13)
	[ 5.60002]	[-2.53197]	[ 7.43499]	[-9.71249]	[ 2.02801]	[-3.54086]
D(CPI(-2))	1.45E-11	-4.95E-07	-0.018856	-3.01E-13	7.49E-12	-2.03E-12
	(1.8E-12)	(7.1E-07)	(0.07194)	(9.6E-14)	(3.2E-12)	(6.3E-13)
	[ 8.25885]	[-0.69403]	[-0.26211]	[-3.13026]	[ 2.31131]	[-3.21021]
D(FD(-1))	8.742015	262867.2	1.36E+11	-0.432872	4.543602	-0.443601
	(1.30011)	(526760.)	(5.3E+10)	(0.07098)	(2.39573)	(0.46743)
	[ 6.72405]	[ 0.49903]	[ 2.56072]	[-6.09845]	[ 1.89654]	[-0.94901]
D(FD(-2))	8.657954	-1006028.	-3.02E+11	0.152720	4.620095	-1.623058
	(1.28228)	(519536.)	(5.2E+10)	(0.07001)	(2.36287)	(0.46102)
	[ 6.75199]	[-1.93640]	[-5.76671]	[ 2.18150]	[ 1.95529]	[-3.52055]
D(INT(-1))	-0.028978	17448.72	-1.57E+08	0.002436	-0.068160	0.009632
	(0.02635)	(10676.8)	(1.1E+09)	(0.00144)	(0.04856)	(0.00947)
	[-1.09964]	[ 1.63427]	[-0.14550]	[ 1.69290]	[-1.40367]	[ 1.01668]
D(INT(-2))	-0.011270	11207.53	-3.54E+08	0.001971	0.082036	0.008252
	(0.02405)	(9745.70)	(9.8E+08)	(0.00131)	(0.04432)	(0.00865)
	[-0.46852]	[ 1.15000]	[-0.36004]	[ 1.50063]	[ 1.85083]	[ 0.95419]
D(NFR(-1))	-1.057903	1978407.	-2.17E+10	0.014892	0.125182	0.653986
	(0.18694)	(75742.0)	(7.6E+09)	(0.01021)	(0.34448)	(0.06721)
	[-5.65902]	[ 26.1203]	[-2.84236]	[ 1.45915]	[ 0.36340]	[ 9.73024]
D(NFR(-2))	-0.413805	1003860.	-3.89E+10	0.036236	0.194001	0.143846
	(0.16104)	(65248.9)	(6.6E+09)	(0.00879)	(0.29675)	(0.05790)
	[-2.56954]	[ 15.3851]	[-5.90840]	[ 4.12137]	[ 0.65374]	[ 2.48438]
C <sub>2</sub>	-0.512786	137969.0	3.35E+09	0.007542	0.237772	0.086015
	(0.62533)	(253363.)	(2.6E+10)	(0.03414)	(1.15231)	(0.22483)
	[-0.82002]	[ 0.54455]	[ 0.13092]	[ 0.22091]	[ 0.20634]	[ 0.38258]
R-squared	0.810812	0.720826	0.505735	0.402967	0.222053	0.641505
Adj. R-squared	0.804650	0.711734	0.489639	0.383523	0.196717	0.629830
Sum sq. resids	109917.9	1.80E+16	1.84E+26	327.6320	373234.3	14208.50
S.E. equation	14.51105	5879372.	5.94E+11	0.792242	26.73964	5.217217
F-statistic	131.5974	79.28249	31.41848	20.72492	8.764507	54.94626

Log likelihood	-2201.525	-9174.032	-15396.13	-631.3137	-2531.593	-1649.134
Akaike AIC	8.220464	34.04456	57.08938	2.404866	9.442936	6.174570
Schwarz SC	8.363516	34.18762	57.23243	2.547918	9.585989	6.317623
Mean dependent	-0.284667	46098.36	-0.006966	0.007003	0.333031	0.000348
S.D. dependent	32.83165	10950512	8.31E+11	1.009020	29.83468	8.575079

Source: Author's computation from output result from the regression analysis

*Note: CPM (Capital Market Performance), RGDP (Real Gross Domestic Product), FD (Financial Deepening), CPI (Consumer Price Index), INT (Interest Rates), NFR (Net Foreign Remittance) & NFPI (Net Foreign Portfolio Investment).*

As revealed by the Pedroni ADF residual-based cointegration test and the Johansen Fisher-based cointegration test of variables in the equation, the existence of cointegration between variables indicates a long-run association among the factors under investigation. Therefore, the VECM can be employed. Table 5.7 presents the vector error correction estimate with standard error in parenthesis for the long-run relationships among capital flow volatility, financial deepening and capital market performance in low-income SADC countries. The negative value of  $C_1$  in the cointegrating equation is a good sign (-0.116485) that there was disequilibrium in the past and the significant value of 0.004269 shows that it is being corrected in the present. This implies that it will take 11.6% in the speed of adjustment for the instability and disequilibrium in the cointegrating equations to attain a long-run equilibrium or stability. In examining the impact of the error correction of the relationships among capital flow volatility, financial deepening and capital market performance in low-income SADC economies, it was found from the fitted vector error correction model that capital market performance at lags one and two, real GDP at lags one and two, interest rates at lags one and two and capital flow volatility at lags one and two have inverse relationships with capital market performance, meaning that capital market performance will be affected negatively. However, prices at lags one and two as well as financial deepening at lags one and two have a direct positive relationship with capital market performance and will hence improve such performance. The  $C_2$  estimates also revealed that capital market performance can be enhanced and improved through policies that target all the variables in the model as they make a significant contribution to capital market performance during the period under investigation.

In addition, the significance of the VECM was analyzed using the R-square statistic and it was revealed that 81% variation in the error is associated with the performance of the capital market in SADC countries while the adjusted R square is the R square that has been adjusted and shows the explanatory power of the model. Hence, the adjusted R square of 80% shows a high explanatory

power of the regression model that contains different numbers of predictors. In this study, low adjustment R square implies that the variables have weak explanatory power and cannot be relied upon. The F-statistic value of 131.5974 is greater than the table value at  $F_{0.05}$  (5%), showing that the model is fitted and statistically significant; hence, it is adequate and reliable for establishing the short-run and long-run relationships among capital flow volatility, financial deepening and capital market performance in low-income SADC economies.

## 5.5 GRANGER CAUSALITY ESTIMATION

The VAR/VECM Granger causality Block Exogeneity Wald Test is used to examine the causal relationships among three or more variables. It tests whether an endogeneous variable can be treated as exogeneous. However, the fact that a cointegration relationship exists between two or more variables does not explicitly indicate the direction of the causal relationships obtainable between those variables. The Granger causality tests for block exogeneity Wald test and Pairwise are conducted to identify the presence and directions of causal relationships between the variables. According to Gul and Ekinici (2006), “a causal relationship (both short- and long-run causality) between variables can be established using probability and chi-square statistics under the null hypothesis of no causality”. Below are the estimates of chi-square statistics and the probability values for the VECM Block Exogeneity Wald Test. At 5%, the significant value shows the causal relationships when each of the endogeneous variables is treated as exogeneous or vice versa.

**Table 5.8: VECM Block Exogeneity Wald Test**

Sample: 2000Q1 2015Q4			
Included observations: 540			
Dependent variable: D(CMP)			
Excluded	Chi-sq	Df	Prob.
D(RGDP)	80.50400	2	0.0000
D(CPI)	11.84126	2	0.0027
D(FD)	42.13496	2	0.0000
D(INT)	6.122647	2	0.0468
D(NFR)	13.46639	2	0.0012
All	364.0611	10	0.0000
Dependent variable: D(RGDP)			
Excluded	Chi-sq	Df	Prob.
D(CMP)	132.9366	2	0.0000

D(CPI)	58.82963	2	0.0000
D(FD)	3.066986	2	0.2158
D(INT)	1.639606	2	0.4405
D(NFR)	848.1291	2	0.0000
All	873.8358	10	0.0000
Dependent variable: D(CPI)			
Excluded	Chi-sq	Df	Prob.
D(CMP)	11.40047	2	0.0033
D(RGDP)	0.583398	2	0.7470
D(FD)	34.96996	2	0.0000
D(INT)	0.009734	2	0.9951
D(NFR)	32.35562	2	0.0000
All	95.66215	10	0.0000
Dependent variable: D(FD)			
Excluded	Chi-sq	Df	Prob.
D(CMP)	12.13974	2	0.0023
D(RGDP)	0.098922	2	0.9517
D(CPI)	21.52882	2	0.0000
D(INT)	0.022897	2	0.9886
D(NFR)	26.10128	2	0.0000
All	48.73614	10	0.0000
Dependent variable: D(INT)			
Excluded	Chi-sq	Df	Prob.
D(CMP)	0.651598	2	0.7220
D(RGDP)	0.101803	2	0.9504
D(CPI)	1.262323	2	0.5320
D(FD)	0.722883	2	0.6967
D(NFR)	0.784974	2	0.6754
All	2.069756	10	0.9958
Dependent variable: D(NFR)			
Excluded	Chi-sq	Df	Prob.
D(CMP)	85.77827	2	0.0000
D(RGDP)	79.36714	2	0.0000
D(CPI)	19.35011	2	0.0001
D(FD)	17.63937	2	0.0001
D(INT)	2.792856	2	0.2475
All	171.3397	10	0.0000

Source: Author's computation from output result from the regression analysis

Note that “\*\*\*\*” represents rejection of  $H_0$  at 1%, “\*\*\*” represents rejection of  $H_0$  at 5% and “\*\*” represents rejection of  $H_0$  at 10%. Note also: CPM (Capital Market Performance), RGDP (Real Gross Domestic Product), FD (Financial Deepening), CPI (Consumer Price Index), INT (Interest Rates), NFR (Net Foreign Remittance) & NFPI (Net Foreign Portfolio Investment).

In the same vein, Table 5.9 below shows the pairwise Granger causality between these variables. The pairwise Granger causality test was conducted following the empirical study of Duruechi, Ojiegbe, and Chigbu (2014) who established the causal relationship between variables using F-statistics and their respective probability values.

**Table 5.9: Pairwise Granger Causality Test**

Null Hypothesis:	Obs	F-Statistic	Prob.	Decision	Type of Causality
DRGDP does not Granger Cause DCMP	549	5.95145	0.0028	Reject	DRGDP↔DCMP
DCMP does not Granger Cause DRGDP		4.42192	0.0124	Reject	DCMP↔DRGDP
DCPI does not Granger Cause DCMP	549	137.800	4.E-49	Accept	No causality
DCMP does not Granger Cause DCPI		0.64593	0.5246	Accept	No causality
DFD does not Granger Cause DCMP	549	124.099	4.E-45	Accept	No causality
DCMP does not Granger Cause DFD		1.66738	0.1897	Accept	No causality
DINT does not Granger Cause DCMP	549	0.58989	0.5547	Accept	No causality
DCMP does not Granger Cause DINT		0.74999	0.4729	Accept	No causality
DNFR does not Granger Cause DCMP	549	35.5987	3.E-15	Accept	No causality
DCMP does not Granger Cause DNFR		27.2979	5.E-12	Accept	No causality
DCPI does not Granger Cause DRGDP	549	1.2E-08	1.0000	Accept	No causality
DRGDP does not Granger Cause DCPI		5.4E-08	1.0000	Accept	No causality
DFD does not Granger Cause DRGDP	549	0.64366	0.5258	Accept	No causality
DRGDP does not Granger Cause DFD		2.41608	0.0902	Reject	DRGDP→DFD
DINT does not Granger Cause DRGDP	549	2.16032	0.1163	Accept	No causality
DRGDP does not Granger Cause DINT		0.74267	0.4763	Accept	No causality
DNFR does not Granger Cause DRGDP	549	112.646	1.E-41	Accept	No causality
DRGDP does not Granger Cause DNFR		6.84776	0.0012	Reject	DRGDP→DNFR
DFD does not Granger Cause DCPI	549	24.9036	4.E-11	Accept	No causality
DCPI does not Granger Cause DFD		34.7407	6.E-15	Accept	No causality
DINT does not Granger Cause DCPI	549	1.30393	0.2723	Accept	No causality
DCPI does not Granger Cause DINT		0.20548	0.8143	Accept	No causality
DNFR does not Granger Cause DCPI	549	1.38189	0.2520	Accept	No causality
DCPI does not Granger Cause DNFR		6.21029	0.0022	Reject	CPI→DNFR

DINT does not Granger Cause DFD	549	4.73166	0.0092	Reject	DINT→DFD
DFD does not Granger Cause DINT		1.61193	0.2005	Accept	No causality
DNFR does not Granger Cause DFD	549	3.29761	0.0377	Reject	DFD↔DNFR
DFD does not Granger Cause DNFR		4.77082	0.0088	Reject	DNFR↔DFD
DNFR does not Granger Cause DINT	549	0.17719	0.8377	Accept	No causality
DINT does not Granger Cause DNFR		0.12935	0.8787	Accept	No causality

Source: Author's computation from output result from the regression analysis

*Note that “\*\*\*” represents rejection of  $H_0$  at 1%, “\*\*” represents rejection of  $H_0$  at 5% and “\*” represents rejection of  $H_0$  at 10%. Note also: CPM (Capital Market Performance), RGDP (Real Gross Domestic Product), FD (Financial Deepening), CPI (Consumer Price Index), INT (Interest Rates), NFR (Net Foreign Remittance) & NFPI (Net Foreign Portfolio Investment). → denotes unidirectional causality and ↔ denotes bi-directional causality.*

From the pairwise test, real GDP Granger causes capital market performance at 5% level of significance; this conforms to the findings generated from the VECM Block Exogeneity Wald Test to reaffirm that in SADC countries, as GDP grows, capital market performance also grows. There is also a bidirectional relationship between capital market performance and real GDP, implying that when the capital market (the financial system that raises capital by dealing in shares, bonds, and other long-term investments) adheres to the required capital conservation, it will generate higher returns in the economy and if it operates with sufficient returns, it will be liquid to finance all the activities and requirements of the regulatory bodies of which capital markets and financial agents are key. Similar to the VEC Wald test, this study also finds causality running between real GDP and financial deepening as well as between real GDP and capital flow volatility. The findings also indicate that prices Granger cause capital flow volatility in low-income SADC economies. A rise in the CPI will lead to inflow of capital from foreign countries. This is in line with Aitken and Harrison's (1999) finding that firms benefit from FDI as prices increase. In addition, there is causality running between interest rates and financial deepening. Interest rates are found to Granger cause financial deepening in the economy. A contractionary monetary policy (increase in interest rates) will negatively affect financial deepening, while expansionary monetary policy will strengthen the level of financial deepening in SADC countries. Finally, the study reveals a bidirectional relationship between financial deepening and foreign remittances flow volatility, which implies that when growth opportunities are not properly explored, in the long run, an increase in the provision of financial services (financial deepening), may lead to capital flow volatility due to anticipated instability in the economy.

### 5.5.1 DIAGNOSTIC TESTS ON THE PVECM MODEL

Given that a model with 2-lags has been selected as the best PVECM model, further investigations are performed to check the model for autocorrelation, heteroskedasticity and normality in order to establish the appropriateness and robustness of the equation. The standard null hypotheses that are tested for serial correlation, heteroskedasticity and normality tests are:

- $H_0: \alpha = 1$ , there is no serial correlation, no heteroskedasticity and the residuals are normally distributed.
- $H_1: \alpha \neq 1$ , there is serial correlation, heteroskedasticity and non-normality of residuals.

**Table 5.10: Serial Correlation LM Test**

<i>Null Hypothesis: no serial correlation at lag order h</i>		
Lags	LM-Stat	Prob
1	60.64638	0.1062
2	46.55161	0.1120
3	112.0585	0.0900
4	342.1826	0.3001
5	77.71302	0.1001
6	16.16266	0.9982

Source: Author's computation from output result from the regression analysis

“\*\*\*” “\*\*” and “\*” represent statistical significance at 1%, 5%, and 10%, respectively.

**Table 5.11: Heteroscedasticity Test**

<i>Heteroscedasticity Test: joint test</i>		
<i>Null Hypothesis: no Heteroscedasticity</i>		
Chi-sq	Df	Prob.
321.20	1218	0.3051

Source: Author's computation from output result from the regression analysis

“\*\*\*” “\*\*” and “\*” represent statistical significance at 1%, 5%, and 10%, respectively

**Table 5.12: The PVECM Normality test**

Com	Skewness				Kurtosis				Jarque-Bera		
	Skew	Chi-sq	Df	Prob	Kurtosis	Chi-sq	Df	Prob	Jarque	df	Prob
1	0.993426	88.82049	1	0.0000	6.070090	212.0727	1	0.0000	300.8932	2	0
2	0.018115	0.029533	1	0.8636	8.052522	574.3794	1	0.0000	574.4090	2	0
3	-0.49319	21.89130	1	0.0000	9.563286	969.2264	1	0.0000	991.1177	2	0
4	0.123629	1.375572	1	0.2409	5.254361	114.3482	1	0.0000	115.7238	2	0
5	0.503333	22.80099	1	0.0000	8.846783	769.1595	1	0.0000	791.9605	2	0
6	-0.15992	2.301577	1	0.1292	8.339865	641.5686	1	0.0000	643.8702	2	0
Joint		137.2195	6	0.0000		3280.755	6	0	3417.974	12	0

Source: Author's computation from output result from the regression analysis

“\*\*\*” “\*\*” and “\*” represent statistical significance at 1%, 5%, and 10%, respectively

Table 5.10 indicates that there is no autocorrelation (similarity between observations) in the equation. Table 5.11 presents the heteroscedasticity test results for the model. The probability value confirms that the equation is heteroscedasticity (a system whereby the variability of a variable is uneven across the range of values that are estimated) free.

Finally, the normality test is conducted on the basis of the three known tests, which are skewness, kurtosis and Jarque-Bera. The results show that 90% of the variables in the model passed the normality test, both individually and jointly (see Table 5.12). The test results further show that the residuals are normally distributed and that the data sets are well modelled. This is shown by the probability values at 5% level of significance. The inference is that the data distribution and the residuals of the model for the SADC countries are normally distributed. Overall, the null hypothesis of no serial correlation, no heteroscedasticity and normality of the residuals cannot be rejected. These results show that the PVECM is consistent and favorable in establishing the short- and long-run relationships among capital flow volatility, financial deepening and capital market performance in low-income SADC economies.

## 5.6 CONCLUSIONS

Having established the short- and long-run relationships among capital flow volatility, financial deepening and capital market performance and examined the causal relationships among the variables employed in low-income SADC economies, it can be deduced that through policies and



programs, policymakers can stimulate these economies by targeting and enhancing capital market performance and increasing the sustainability of financial deepening. It was revealed that there is a two-way directional linkage between capital market performance and growth of the economy (RGDP); hence, any policy that is directed at enhancing the stability of capital market performance will propagate and stimulate the economy. Furthermore, financial deepening displayed a positive relationship and Granger causes the RGDP in SADC countries. Increased provision of financial services (financial deepening) will thus have an effect on both individuals and societies' economic situation. As pointed out by Di Giovanni (2005), this will generate developmental activities through viable investment opportunities and inflows of foreign capital. Finally, the results from the Granger causality tests show a bi-directional relationship between foreign remittance flow volatility and financial deepening. In developing economies like the SADC countries, capital flows can be particularly volatile as the economy may experience periods of rapid growth and subsequent contraction. The results also indicated that the volatility of capital is prone to shocks from financial deepening in particular and the economy in general. Therefore, foreign remittances flow volatility remains a challenge for policymakers as it has significant implications for policy formulation and implementation for the development and economic growth. This result is supportive of Sole Pagliari and Ahmed's (2017) study on the variability of international financial flows in emerging markets.

Overall, it is recommended that policymakers and other stakeholders in the economy should take proactive measures to reduce capital flow volatility and further improve the financial deepening of the SADC economies to boost the performance of the capital market and achieve overall economic performance in the region. Policy makers should implement unambiguous measures to increase deposits and savings as well as increase credit to the private sector. Coupled with financial inclusion programs, these measures should boost financial deepening and stock market performance in low-income SADC countries.

## 5.7 FOREIGN PORTFOLIO INVESTMENT VOLATILITY, FINANCIAL AND CAPITAL MARKET PERFORMANCE: CAUSAL LINKAGES

### 5.7.1 DESCRIPTIVE ANALYSIS

Based on the technique employed in the first model where the PVECM estimation was applied to establish the short- and long-run relationships among foreign remittance flow volatility, financial deepening and capital market performance in the low-income economies of SADC countries, this section explores the short and long-run financial linkages among net foreign portfolio investment volatility, financial deepening and capital market performance in these countries since it has been observed that foreign investment promotes output growth and employment creation. Granger causality and the direction of causality among the variables employed are also explored.

**Table 5.13: Descriptive Analysis**

	CMP	RGDP	CPI	FD	INT	NFPI
Mean	1.823016	2093066.	0.942738	0.442209	-1.091910	0.019769
Median	0.000000	-83.54114	0.301988	0.200244	-17.53250	0.000000
Maximum	154.4200	67473497	3.69E+12	5.881224	157.9213	37.56576
Minimum	-32.46000	-19416027	-3.69E+12	-3.847166	-90.38656	-48.13548
Std. Dev.	21.86765	10101557	7.09E+11	1.130006	32.66409	12.38749
Skewness	5.334966	4.491941	-1.03E-06	1.195666	2.106112	-1.007627
Kurtosis	38.04608	28.98636	23.56677	12.58934	11.44835	10.13796
Jarque-Bera	31706.52	17860.53	9993.182	2307.546	2105.400	1299.653
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Source: Author's computation from output result from the regression analysis

Table 5.13 above presents the descriptive analysis of the results pertaining to the causal relationships among net foreign portfolio investment volatility, financial deepening and capital market performance in the selected SADC countries. The table provides a brief descriptive analysis of coefficients that summarize the data set employed in this study, which represents the sample of SADC countries. The statistics are broken down into measures of central tendency and measures of variability, or spread that includes the mean, median and standard deviation, among others. The mean is the average value of the data set. The focus of the study is CMP, FD and NFPI as they are the variables of interest. As noted earlier, CMP captures capital market performance, FD represents financial deepening and NFPI is net foreign portfolio investment volatility for the SADC countries. The aim is to investigate how capital market performance, financial deepening and other variables in the model impact net foreign portfolio investment volatility in stimulating

the economy. The results revealed the mean value of capital market performance (1.823), financial deepening (0.442) and net foreign portfolio investment volatility (0.019). These figures indicate that the mean values hover around the bottom part of the distribution. This finding is identical to the result derived from the first PVECM model, indicating that our result is consistent and valid. However, the implication is that average capital market performance, financial deepening and net foreign portfolio investment volatility in the SADC countries are small and not encouraging. Therefore, it can be concluded that the bulk of our data values on capital market performance, financial deepening and net foreign portfolio investment volatility for all the countries are concentrated in a particular segment (sector) at the lower end.

The maximum and minimum values for capital market performance, financial deepening and net foreign portfolio investment volatility as well as the standard deviation values also concur with the results derived from the first model. This is further indication that the model is robust and dynamic in describing the relationships among net foreign portfolio investment volatility, financial deepening and capital market performance in low-income SADC countries. The outcomes from the Jarque-Bera and probability values revealed that capital market performance, financial deepening and net foreign portfolio investment volatility are not normally distributed, and have been fairly unstable, but significant in explaining the relationships among the variables.

### 5.7.2 OPTIMAL LAG SELECTION

Table 5.14 below shows the lag length result of the VECM employed in this study to establish the short- and long-run relationships among net foreign portfolio investment, financial deepening and capital market performance in low-income SADC countries. The lag length determines when a variable in the system responds to an exogenous shock.

**Table 5.14: VECM Lag Order Selection Criteria**

Endogenous variables: DCMP DRGDP DCPI DFD DINT DNFPI						
Exogenous variables: C						
Sample: 2000Q1 2015Q4						
Included observations: 495						
Lag	LogL	LR	FPE	AIC	SBIC	HQIC
0	-30150.97	NA	3.33e+45	71.69445	121.8973	121.8664
1	-29571.69	1142.181	3.71e+44	71.88451	120.0080	119.7913
2	-29329.31	472.0230	1.61e+44	71.68532*	119.4800	119.0775
3	-28816.41	986.4416	2.35e+43	116.8905	117.8588	117.2707

4	-28220.06	1132.456	2.44e+42	114.6265	115.9006	115.1267
5	-27010.46	2267.696	2.13e+40	109.8847	111.4646	110.5049
6	-26112.40	1661.869	6.54e+38	106.4016	108.2873	107.1419
7	-24546.20	2860.291	1.35e+36	100.2190	102.4104	101.0793
8	-17448.12	12790.88*	5.49e+23*	112.3349	74.18258*	72.66566*
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SBIC: Schwarz information criterion						
HQIC: Hannan-Quinn information criterion						

Source: Author's computation from output result from the regression analysis

Eight different lag lengths were tested to allow for maximum adjustment in the model. The Akaike Information Criterion (AIC) selects lag two (2) while the Schwarz Bayesian Information Criterion (SBIC), Hannan-Quinn Information Criteria (HQIC), Final Prediction Error (FPE) and Sequential modified LR test statistic (LR) chose lag eight (8). All these information criteria are statistically significant at 5%. Overall, the AIC gives the lowest number with a lag value of 71.685. It is on this basis that a VECM lag order two (2) is used for this study which is also in line with the first model and various empirical studies such as Elbourne (2008). The choice of 2-lag length offers an accurate and more robust dynamic model without necessarily widening the estimation sample too much; and allows for no autocorrelation in the equation.

## 5.8 PANEL COINTEGRATION TEST

The study employed two approaches to check for integration so as to compare and validate the results.

### 5.8.1 PEDRONI ADF RESIDUAL COINTEGRATION TEST

**Table 5.75: Pedroni ADF Residual-based Cointegration Test**

Ho: There is no Co-integration ( $H_0 : \varpi = 1$ )		
Trend Assumption: No deterministic Trend		
	<b>t-Statistic</b>	<b>Prob</b>
ADF	-12.83351	0.1172

Source: Author's computation from output result from the regression analysis

Table 5.15 presents the result from the Pedroni Residual ADF test where the probability value is statistically insignificant at 5% with t-statistics -12.83351; therefore, the null hypothesis is rejected and there is substantial evidence that the variables are co-integrated in the long run.

## 5.8.2 JOHANSEN FISHER-BASED COINTEGRATION TEST

**Table 5. 16: Johansen Fisher-based Cointegration Test of Variables**

Eigen value	Trace Statistic	5% Critical Value	Hypothesised No. of CE(s)
0.895434	2080.209	95.75366	None *
0.452893	860.9211	69.81889	At most 1 *
0.353074	535.2411	47.85613	At most 2 *
0.233605	300.0586	29.79707	At most 3 *
0.175175	156.3872	15.49471	At most 4 *
0.092464	52.39211	3.841466	At most 5 *
Eigen value	Maximum Eigen Value Statistic	5% Critical Value	Hypothesised No. of CE(s)
0.895434	1219.288	40.07757	None *
0.452893	325.6800	33.87687	At most 1 *
0.353074	235.1825	27.58434	At most 2 *
0.233605	143.6714	21.13162	At most 3 *
0.175175	103.9951	14.26460	At most 4 *
0.092464	52.39211	3.841466	At most 5 *

Source: Author's computation from output result from the regression analysis

“\*\*\*” represents rejection of null hypothesis at 5% level of significance

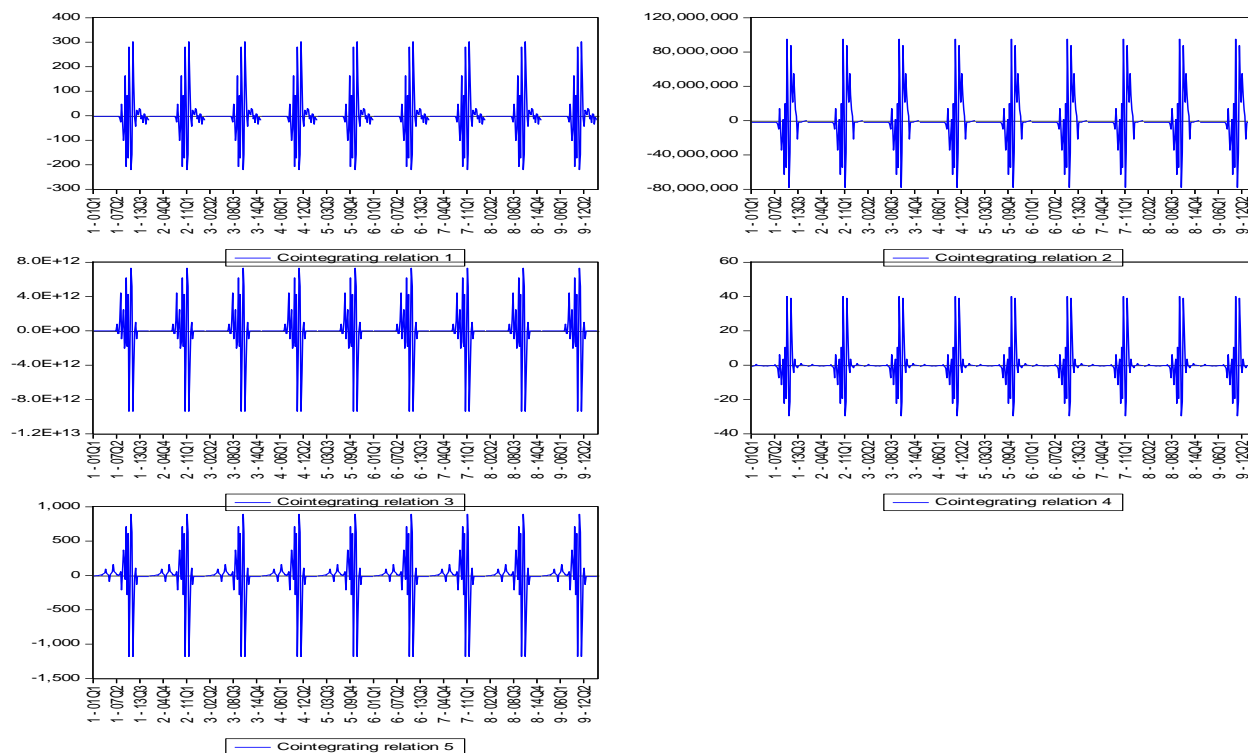
Furthermore, the study employs the Johansen cointegration test to investigate the cointegrating association among the model variables using the trace test and the maximum Eigen value test. As revealed in Table 5.16 above, both the trace test statistics and the maximum Eigen value test show five cointegrating vectors at 5% level of significance. This finding is similar to Österholm and Hjalmarsson (2007) who carried out a residual-based cointegration test for near unit root variables. The results are identical to the outcomes in the first model which implies that a long-run equilibrium association exists among the variables under study. This establishes the short- and long-run relationships among net foreign portfolio investment volatility, financial deepening and capital market performance in low-income SADC countries. Table 5.17 below shows further details of the five cointegrating equations for the trace test and the maximum Eigen value test and their adjustment coefficients.

### 5.8.3 COINTEGRATION EQUATIONS

**Table 5. 17: Cointegration Equations**

5 Cointegrating Equation(s):		Log likelihood	-31347.45		
Normalized cointegrating coefficients (standard error in parentheses)					
DCMP	DRGDP	DCPI	DFD	DINT	DNFPI
1.000000	0.000000	0.000000	0.000000	0.000000	-6.186663 (0.20975)
0.000000	1.000000	0.000000	0.000000	0.000000	-2019655. (172839.)
0.000000	0.000000	1.000000	0.000000	0.000000	1.95E+11 (6.9E+09)
0.000000	0.000000	0.000000	1.000000	0.000000	-0.807000 (0.02591)
0.000000	0.000000	0.000000	0.000000	1.000000	24.18732 (1.19785)
Adjustment coefficients (standard error in parentheses)					
D(DCMP)	-1.244894 (0.08155)	2.14E-07 (9.9E-08)	-1.78E-11 (2.5E-12)	2.955353 (1.17623)	-0.063344 (0.02352)
D(DRGDP)	109727.4 (30173.6)	-0.752812 (0.03652)	7.25E-07 (9.2E-07)	2149828. (435212.)	-19653.83 (8702.27)
D(DCPI)	-2.87E+09 (3.1E+09)	-3688.405 (3746.57)	-1.343053 (0.09479)	-3.04E+11 (4.5E+10)	23423138 (8.9E+08)
D(DFD)	0.017301 (0.00413)	-7.46E-09 (5.0E-09)	1.26E-12 (1.3E-13)	0.057961 (0.05960)	-0.004278 (0.00119)
D(DINT)	-0.299970 (0.13745)	-4.83E-07 (1.7E-07)	-1.50E-11 (4.2E-12)	-10.77511 (1.98259)	-0.346873 (0.03964)
D(DNFPI)	0.342295 (0.03579)	-1.25E-07 (4.3E-08)	-1.13E-13 (1.1E-12)	1.037089 (0.51619)	0.020835 (0.01032)

Source: Author's computation from output result from the regression analysis



**Figure 5.2: Graphical Representation of Co-integrating Equations**

For further confirmation of the cointegration relationship among the variables employed in this study, Figure 5.2 and Table 5.17 present the standardized cointegrating equations coefficients with their standard error in parentheses. The results reveal the presence of a long-run association between economic variables in the model such that co-integrated variables provide room for the correction of short-term disturbances in the long run. The cointegration adjusted coefficients measure the long-run equilibrium and stability among the variables employed. These findings infer that more attention should be paid to all the variables in the model due to their long run-impacts arising from their standardized cointegration equations coefficients in determining the relationships among net foreign portfolio investment volatility, financial deepening and capital market performance in low-income SADC economies.

## 5.9 PANEL VECM ESTIMATION

In line with the first model, the VECM with five (5) simultaneous equations is estimated to establish the short- and long-run relationships among net foreign portfolio investment volatility, financial deepening and capital market performance in low-income SADC economies. Table 5.18 indicates the outcomes derived from the estimation. The  $C_1$  in the cointegration equation has a negative sign (-0.198614) meaning that disequilibrium and instability in the past can be corrected

in the current period as revealed by the significant p-value of 0.008993. This means that it will take 19.8% in the speed of adjustment for the instability or disequilibrium in the cointegration equations to be corrected and attain long-run equilibrium or stability. In addition, it was discovered from the fitted vector error correction model that capital market performance at lags one and two, real GDP at lags one and two and interest rates at lag one have an indirect relationship with capital market performance and will thus worsen the performance of the capital market in SADC countries. This is an indication that instability in real GDP and contraction of interest rates will negatively impact capital market performance. However, prices at lags one and two, financial deepening at lags one and two and net foreign portfolio investment at lags one and two have a positive and direct relationship with capital market performance and will hence strengthen and improve capital market performance in SADC countries. The  $C_2$  in the second model is in line with the results derived in model one. Its estimates also reveal that capital market performance can be enhanced and improved through policies that target all the variables in the model as they make a significant contribution to capital market performance during the period under investigation.

Finally, the R-square statistic reveals that 76.9% variation in the error is associated with the performance of the capital market in SADC countries. The F-statistic value of 102.2746 is greater than the table value at  $F_{0.05}$  (5%), showing that the model is fitted and statistically significant and hence adequate and reliable for determining the short- and long-run relationships among net foreign portfolio investment volatility, financial deepening and capital market performance in the selected SADC countries.

**Table 5.18: Vector Error Correction Estimates**

Vector Error Correction Estimates						
Date: 11/28/17 Time: 21:15						
Sample (adjusted): 2001Q1 2015Q4						
Included observations: 540 after adjustments						
Standard errors in ( ) & t-statistics in [ ]						
Cointegrating Eq:	CointEq1	CointEq2	CointEq3	CointEq4	CointEq5	
DCMP(-1)	1.000000	0.000000	0.000000	0.000000	0.000000	
DRGDP(-1)	0.000000	1.000000	0.000000	0.000000	0.000000	
DCPI(-1)	0.000000	0.000000	1.000000	0.000000	0.000000	
DFD(-1)	0.000000	0.000000	0.000000	1.000000	0.000000	



DINT(-1)	0.000000	0.000000	0.000000	0.000000	1.000000	
DNFPI(-1)	-6.186663 (0.21055) [-29.3828]	-2019655. (173500.) [-11.6407]	1.95E+11 (6.9E+09) [ 28.0461]	-0.807000 (0.02601) [-31.0253]	24.18732 (1.20243) [ 20.1154]	
C <sub>1</sub>	-0.198614	-2151532.	-6897767.	-0.481614	0.008993	
Error Correction:	D(DCMP)	D(DRGDP)	D(DCPI)	D(DFD)	D(DINT)	D(DNFPI)
CointEq1	-1.244894 (0.08186) [-15.2074]	109727.4 (30289.0) [ 3.62268]	-2.87E+09 (3.1E+09) [-0.92521]	0.017301 (0.00415) [ 4.17124]	-0.299970 (0.13798) [-2.17401]	0.342295 (0.03592) [ 9.52812]
CointEq2	2.14E-07 (9.9E-08) [ 2.15623]	-0.752812 (0.03666) [-20.5345]	-3688.405 (3760.90) [-0.98072]	-7.46E-09 (5.0E-09) [-1.48539]	-4.83E-07 (1.7E-07) [-2.89305]	-1.25E-07 (4.3E-08) [-2.86876]
CointEq3	-1.78E-11 (2.5E-12) [-7.08556]	7.25E-07 (9.3E-07) [ 0.78147]	-1.343053 (0.09515) [-14.1150]	1.26E-12 (1.3E-13) [ 9.91504]	-1.50E-11 (4.2E-12) [-3.56067]	-1.13E-13 (1.1E-12) [-0.10248]
CointEq4	2.955353 (1.18073) [ 2.50298]	2149828. (436877.) [ 4.92091]	-3.04E+11 (4.5E+10) [-6.77860]	0.057961 (0.05983) [ 0.96883]	-10.77511 (1.99017) [-5.41417]	1.037089 (0.51816) [ 2.00147]
CointEq5	-0.063344 (0.02361) [-2.68302]	-19653.83 (8735.55) [-2.24987]	23423138 (9.0E+08) [ 0.02614]	-0.004278 (0.00120) [-3.57586]	-0.346873 (0.03979) [-8.71664]	0.020835 (0.01036) [ 2.01094]
D(DCMP(-1))	0.134791 (0.06683) [ 2.01685]	-90272.05 (24728.4) [-3.65054]	4.59E+09 (2.5E+09) [ 1.81067]	-0.010876 (0.00339) [-3.21174]	0.203319 (0.11265) [ 1.80490]	-0.064394 (0.02933) [-2.19553]
D(CMP(-2))	0.157910 (0.04232) [ 3.73174]	-53160.85 (15656.9) [-3.39536]	7.53E+08 (1.6E+09) [ 0.46879]	-0.001426 (0.00214) [-0.66532]	0.094976 (0.07132) [ 1.33161]	-0.151664 (0.01857) [-8.16709]
D(RGDP(-1))	-6.34E-07 (9.0E-08) [-7.05848]	-0.021184 (0.03322) [-0.63770]	7568.282 (3407.85) [ 2.22083]	3.14E-09 (4.5E-09) [ 0.68942]	3.33E-07 (1.5E-07) [ 2.20262]	-2.52E-07 (3.9E-08) [-6.39100]
D(RGDP(-2))	-3.60E-07 (8.1E-08) [-4.43223]	0.044844 (0.03009) [ 1.49010]	7542.799 (3087.30) [ 2.44317]	3.33E-09 (4.1E-09) [ 0.80857]	1.65E-07 (1.4E-07) [ 1.20688]	1.04E-07 (3.6E-08) [ 2.90905]
D(CPI(-1))	8.01E-12 (2.3E-12) [ 3.49201]	-2.43E-06 (8.5E-07) [-2.86854]	0.594608 (0.08707) [ 6.82944]	-9.85E-13 (1.2E-13) [-8.47627]	8.17E-12 (3.9E-12) [ 2.11215]	7.41E-12 (1.0E-12) [ 7.36269]
D(CPI(-2))	1.71E-11 (2.1E-12) [ 8.21147]	-1.21E-06 (7.7E-07) [-1.57192]	-0.081650 (0.07891) [-1.03474]	-2.84E-13 (1.1E-13) [-2.69685]	8.32E-12 (3.5E-12) [ 2.37350]	4.88E-12 (9.1E-13) [ 5.34674]

D(FD(-1))	7.605827 (1.53189) [ 4.96501]	-2677393. (566805.) [ -4.72366]	1.98E+11 (5.8E+10) [ 3.40521]	-0.432874 (0.07762) [ -5.57695]	4.403010 (2.58205) [ 1.70524]	7.416183 (0.67227) [ 11.0316]
D(FD(-2))	11.19820 (1.53688) [ 7.28631]	-1427260. (568654.) [ -2.50989]	-2.89E+11 (5.8E+10) [ -4.96140]	0.103007 (0.07787) [ 1.32279]	4.725141 (2.59047) [ 1.82405]	4.258796 (0.67446) [ 6.31437]
D(INT(-1))	-0.017659 (0.02876) [ -0.61394]	7843.976 (10642.6) [ 0.73704]	-3.13E+08 (1.1E+09) [ -0.28692]	0.002978 (0.00146) [ 2.04313]	-0.091966 (0.04848) [ -1.89692]	-0.011404 (0.01262) [ -0.90344]
D(INT(-2))	0.001383 (0.02642) [ 0.05234]	4349.480 (9777.04) [ 0.44487]	-5.48E+08 (1.0E+09) [ -0.54612]	0.002338 (0.00134) [ 1.74638]	0.067288 (0.04454) [ 1.51077]	-0.005521 (0.01160) [ -0.47613]
D(NFPI(-1))	0.085939 (0.10244) [ 0.83889]	991668.8 (37904.9) [ 26.1620]	-6.50E+09 (3.9E+09) [ -1.67152]	-0.000108 (0.00519) [ -0.02074]	-0.190636 (0.17267) [ -1.10402]	1.109604 (0.04496) [ 24.6811]
D(NFPI(-2))	0.364429 (0.07412) [ 4.91698]	504125.4 (27423.4) [ 18.3830]	-9.90E+09 (2.8E+09) [ -3.52063]	0.001652 (0.00376) [ 0.43982]	-0.039222 (0.12493) [ -0.31396]	0.477719 (0.03253) [ 14.6873]
C <sub>2</sub>	-0.434885 (0.69096) [ -0.62939]	75672.02 (255659.) [ 0.29599]	2.75E+09 (2.6E+10) [ 0.10467]	0.007423 (0.03501) [ 0.21203]	0.257729 (1.16464) [ 0.22130]	-0.036175 (0.30323) [ -0.58100]
R-squared	0.769095	0.715838	0.480488	0.372381	0.205574	0.862441
Adj. R-squared	0.761575	0.706584	0.463569	0.351941	0.179702	0.857961
Sum sq. resids	134155.3	1.84E+16	1.93E+26	344.4167	381140.3	25836.88
S.E. equation	16.03130	5931660.	6.09E+11	0.812282	27.02136	7.035335
F-statistic	102.2746	77.35192	28.39939	18.21850	7.945771	192.5138
Log likelihood	-2255.327	-9178.813	-15409.58	-644.8033	-2537.252	-1810.584
Akaike AIC	8.419728	34.06227	57.13919	2.454827	9.463898	6.772533
Schwarz SC	8.562780	34.20532	57.28225	2.597879	9.606950	6.915585
Mean dependent	-0.284667	46098.36	-0.006966	0.007003	0.333031	-1.81E-05
S.D. dependent	32.83165	10950512	8.31E+11	1.009020	29.83468	18.66728
Determinant resid covariance (dof adj.)		1.31E+43				
Determinant resid covariance		1.07E+43				
Log likelihood		-31347.45				
Akaike information criterion		116.6128				
Schwarz criterion		117.7095				

Source: Author's computation from output result from the regression analysis

Note: CPM (Capital Market Performance), RGDP (Real Gross Domestic Product), FD (Financial Deepening), CPI (Consumer Price Index), INT (Interest Rates), NFR (Net Foreign Remittance) & NFPI (Net Foreign Portfolio Investment).

## 5.10 GRANGER CAUSALITY ESTIMATION

The study employed two approaches to compare and validate the results.

### 5.10.1 VECM BLOCK EXOGENEITY WALD TEST

**Table 5.19: VECM Block Exogeneity Wald Test**

VEC Granger Causality/Block Exogeneity Wald Tests			
Date: 11/28/17 Time: 21:12			
Sample: 2000Q1 2015Q4			
Included observations: 540			
Dependent variable: D(CMP)			
Excluded	Chi-sq	Df	Prob.
D(RGDP)	18.87456	2	0.0001
D(CPI)	30.26423	2	0.0000
D(FD)	21.72095	2	0.0000
D(INT)	4.440424	2	0.1086
D(NFPI)	13.80461	2	0.0010
All	314.7952	10	0.0000
Dependent variable: D(RGDP)			
Excluded	Chi-sq	Df	Prob.
D(CMP)	59.04469	2	0.0000
D(CPI)	8.080883	2	0.0176
D(FD)	13.50990	2	0.0012
D(INT)	0.739153	2	0.6910
D(NFPI)	699.1715	2	0.0000
All	719.8724	10	0.0000
Dependent variable: D(CPI)			
Excluded	Chi-sq	Df	Prob.
D(CMP)	15.40820	2	0.0005
D(RGDP)	3.084990	2	0.2138
D(FD)	27.67846	2	0.0000
D(INT)	0.103558	2	0.9495
D(NFPI)	6.062197	2	0.0483
All	69.71322	10	0.0000
Dependent variable: D(FD)			
Excluded	Chi-sq	Df	Prob.
D(CMP)	0.473776	2	0.7891
D(RGDP)	1.506197	2	0.4709
D(CPI)	11.51391	2	0.0032
D(INT)	0.016590	2	0.9917
D(NFPI)	0.771827	2	0.6798
All	19.93113	10	0.0299

Dependent variable: D(INT)			
Excluded	Chi-sq	Df	Prob.
D(CMP)	0.112884	2	0.9451
D(RGDP)	0.051213	2	0.9747
D(CPI)	0.935672	2	0.6264
D(FD)	0.713926	2	0.6998
D(NFPI)	0.157624	2	0.9242
All	1.067513	10	0.9998
Dependent variable: D(NFPI)			
Excluded	Chi-sq	Df	Prob.
D(CMP)	119.2972	2	0.0000
D(RGDP)	54.09535	2	0.0000
D(CPI)	121.7373	2	0.0000
D(FD)	94.54052	2	0.0000
D(INT)	0.039112	2	0.9806
All	285.0669	10	0.0000

Source: Author's computation from output result from the regression analysis

*Note: CPM (Capital Market Performance), RGDP (Real Gross Domestic Product), FD (Financial Deepening), CPI (Consumer Price Index), INT (Interest Rates), NFR (Net Foreign Remittance) & NFPI (Net Foreign Portfolio Investment).*

Table 5.19 shows the VECM Granger causality block exogeneity Wald test that establishes the causal relationship among the variables employed. The Granger causality tests for the block exogeneity Wald test and Pairwise are also conducted for the second model to identify the presence and direction of the causal relationship between the variables. At 5% (chi-square statistics and the probability values for the VECM block exogeneity Wald test), the significant value confirms the causal relationships when each of the endogenous variables are treated as exogeneous or vice versa. Hence, both short- and long-run causality between the variables are established.

## 5.10.2 PAIRWISE GRANGER CAUSALITY

**Table 5.80: Pairwise Granger Causality Test**

Null Hypothesis:	Obs	F-Statistic	Prob.	Decision	Type of Causality
DRGDP does not Granger Cause DCMP	549	5.95145	0.0028	Reject	DRGDP↔DCMP
DCMP does not Granger Cause DRGDP		4.42192	0.0124	Reject	DCMP↔DRGDP
DCPI does not Granger Cause DCMP	549	137.800	4.E-49	Accept	No causality
DCMP does not Granger Cause DCPI		0.64593	0.5246	Accept	No causality
DFD does not Granger Cause DCMP	549	124.099	4.E-45	Accept	No causality
DCMP does not Granger Cause DFD		1.66738	0.1897	Accept	No causality
DINT does not Granger Cause DCMP	549	0.58989	0.5547	Accept	No causality
DCMP does not Granger Cause DINT		0.74999	0.4729	Accept	No causality
DNFPI does not Granger Cause DCMP	549	10.3466	4.E-05	Accept	No causality
DCMP does not Granger Cause DNFPI		82.2020	6.E-32	Accept	No causality
DCPI does not Granger Cause DRGDP	549	1.2E-08	1.0000	Accept	No causality
DRGDP does not Granger Cause DCPI		5.4E-08	1.0000	Accept	No causality
DFD does not Granger Cause DRGDP	549	0.64366	0.5258	Accept	No causality
DRGDP does not Granger Cause DFD		2.41608	0.0902	Reject	DRGDP→DFD
DINT does not Granger Cause DRGDP	549	2.16032	0.1163	Accept	No causality
DRGDP does not Granger Cause DINT		0.74267	0.4763	Accept	No causality
DNFPI does not Granger Cause DRGDP	549	89.5912	2.E-34	Accept	No causality
DRGDP does not Granger Cause DNFPI		2.36073	0.0953	Reject	DRGDP→DNFPI
DFD does not Granger Cause DCPI	549	24.9036	4.E-11	Accept	No causality
DCPI does not Granger Cause DFD		34.7407	6.E-15	Accept	No causality
DINT does not Granger Cause DCPI	549	1.30393	0.2723	Accept	No causality
DCPI does not Granger Cause DINT		0.20548	0.8143	Accept	No causality
DNFPI does not Granger Cause DCPI	549	2.21670	0.1100	Accept	No causality
DCPI does not Granger Cause DNFPI		11.9022	9.E-06	Accept	No causality
DINT does not Granger Cause DFD	549	4.73166	0.0092	Reject	DINT→DFD
DFD does not Granger Cause DINT		1.61193	0.2005	Accept	No causality
DNFPI does not Granger Cause DFD	549	3.05183	0.0481	Reject	DNFPI→DFD
DFD does not Granger Cause DNFPI		11.4391	1.E-05	Accept	No causality
DNFPI does not Granger Cause DINT	549	0.00032	0.9997	Accept	No causality
DINT does not Granger Cause DNFPI		0.03948	0.9613	Accept	No causality

Source: Author's computation from output result from the regression analysis.

Note: “\*”, “\*\*” and “\*\*\*” represent 10%, 5% and 1% significance level, respectively. → denotes unidirectional causality and ↔ denotes bi-directional causality. Note also CPM (Capital Market Performance), RGDP (Real Gross Domestic Product), FD (Financial Deepening), CPI (Consumer Price Index), INT (Interest Rates), NFR (Net Foreign Remittance) & NFPI (Net Foreign Portfolio Investment).

Furthermore, Table 5.20 indicates the outcomes of pairwise Granger causality between these variables in the model. The pairwise Granger causality test was conducted using the F-statistics

and their respective probability values. From the pairwise test, it is revealed that there is a bi-directional relationship between capital market performance and real GDP where real GDP Granger causes capital market performance and capital market performance also Granger causes real GDP at 5% level of significance. Accordingly, the results from the pairwise Granger causality tests conform to the outcomes from the VECM block exogeneity Wald tests regarding the causal relationship between CMP and RGDP. This is also in tandem with model one outcomes regarding the two variables where economic growth promotes capital market performance. In addition, the results are identical to the VECM block exogeneity Wald test and model one results where causality runs from RGDP to FD as well as running from RGDP to NFPI volatility.

This is an indication that an increase in inflows of foreign capital investment will lead to a rise in productivity growth (real GDP) as well as an increase in financial deepening. The transmission or propagation effect is that net foreign portfolio investment, financial deepening and capital market performance will spur economic growth in low-income SADC economies. The findings also reveal that interest rates Granger causes financial deepening and net foreign portfolio investment volatility Granger causes financial deepening. An increase in interest rates (contractionary monetary policy) will negatively affect financial deepening while a decrease in interest rates (expansionary monetary policy) will positively affect and strengthen the level of financial deepening in SADC countries. Overall, it can be deduced that the short- and long-run relationships among net foreign portfolio investment volatility, financial deepening and capital market performance in low-income SADC countries have been established and that, in the long run, increased provision of financial services (financial deepening) will create opportunities for stable inflows of foreign portfolio investment and subsequently lead to economic growth and hence, may lead to capital market performance in the economy.

#### **5.10.1 DIAGNOSTIC TESTS ON THE PVEM MODEL**

Following the structure adopted and carried out in the first model, this study also tests for the PVECM autocorrelation, heteroskedasticity and normality in order to ascertain the suitability and robustness of the P-VECM. The standard null hypotheses that are tested for the autocorrelation, heteroscedasticity and normality tests are:

- $H_0: \alpha = 1$ , there is no autocorrelation, no heteroskedasticity and the residuals are normally distributed.
- $H_1: \alpha \neq 1$ , there is serial correlation, heteroskedasticity and non-normality of residuals.

**Table 5.21: Serial Correlation LM Test**

<i>Null Hypothesis: no serial correlation at lag order h</i>		
Lags	LM-Stat	Prob
1	33.15473	0.6047
2	52.08980	0.0404
3	83.70179	0.1102
4	333.4940	0.3300
5	74.69271	0.0382
6	13.90087	0.9997

Source: Author’s computation from output result from the regression analysis  
 “\*\*\*\*” “\*\*\*” and “\*” represent statistical significance at 1%, 5%, and 10%, respectively

**Table 5.22: Heteroscedasticity Test**

<i>Heteroscedasticity Test: joint test</i>		
<i>Null Hypothesis: no Heteroscedasticity</i>		
Chi-sq	Df	Prob.
7128.073	1639	0.4916

Source: Author’s computation from output result from the regression analysis  
 “\*\*\*\*” “\*\*\*” and “\*” represent statistical significance at 1%, 5%, and 10%, respectively

**Table 5.23: The PVECM Normality test**

Com	Skewness				Kurtosis				Jarque-Bera		
	Skew	Chi-sq	Df	Prob	Kurtosis	Chi-sq	df	Prob	Jarque	df	Prob
1	1.253864	141.4958	1	0.0000	7.846072	528.3994	1	0.0000	669.8952	2	0.0000
2	-1.08167	105.3006	1	0.0000	9.697257	1009.198	1	0.0000	1114.499	2	0.0000
3	-0.86703	67.65610	1	0.0000	10.97230	1430.045	1	0.0000	1497.701	2	0.0000
4	0.163552	2.407441	1	0.1208	6.342244	251.3383	1	0.0000	253.7458	2	0.0000
5	0.499962	22.49659	1	0.0000	8.866587	774.3789	1	0.0000	796.8755	2	0.0000
6	-0.61499	34.03866	1	0.0000	3.746841	12.54986	1	0.0004	46.58853	2	0.0000
Joint		373.3952	6	0.0000		4005.910	6	0	4379.305	12	0

Source: Author’s computation from output result from the regression analysis.

“\*\*\*\*”, “\*\*\*” and “\*” represent statistical significance at 1%, 5%, and 10%, respectively

According to the outcomes derived in Table 5.21 above, there is no link between observations (no serial correlation) in the equation. Furthermore, Table 5.22 presents the heteroscedasticity test

results for the model. The probability result from the table confirms that the equation is heteroscedasticity (a system whereby the variability of a variable is uneven across the range of values that are estimated) free.

Finally, following Bai and Ng (2005) and Dufour (2003), the normality test is similarly conducted based on skewness, kurtosis and Jarque-Bera. The results show that 98% of the variables in the model passed the normality test, both individually and jointly (see Table 5.23). The test results further show that the residuals are normally distributed and the data sets are well modelled. This is shown by the probability values at 5% level of significance. The inference is that the data distribution and the residuals of the model for the SADC countries are normally distributed. Overall, the null hypothesis of no serial correlation, no heteroscedasticity and normality of the residuals cannot be rejected. These results show that the P-VECM is consistent and favorable in establishing the short- and long-run relationships among net foreign portfolio investment volatility, financial deepening and capital market performance in low-income SADC countries.

The recommendation derived from these findings is that policymakers should embark on programs that promote more players in the domestic market to enhance financial deepening and market performance, thereby strengthening long-run causality with net portfolio investment volatility. This can be complemented by the formulation and implementation of sound risk management frameworks to increase confidence in domestic capital markets in order to attract stable foreign portfolio flows to the region.

## **5.11 CONCLUSIONS**

This section of the study examined the short- and long-run relationships among net foreign portfolio investment, financial deepening and capital market performance in low-income SADC countries. Through various econometric tests the model proved to be well fitted and statistically significant for the results to be relied upon. After establishing that the variables have a long equilibrium relationship, it was also revealed that there is a two-way directional association between real GDP and capital market performance, meaning that real GDP can Granger cause capital market performance or capital market performance can cause real GDP growth. In addition, there is one-way causality running from NFPI volatility to financial deepening, meaning that foreign portfolio flows lead to financial deepening in low-income SADC countries. There is also one-way causality running from real GDP to net foreign portfolio investment volatility. Given this,



there is need for policies and programs to stimulate economic performance in order to attract and stabilize foreign investment inflows that will, in turn, lead to financial development and enhance capital market performance. The short- and long-run causality among the variables were established and the model is found to be fitted and statistically significant and hence, adequate and reliable for determining the short- and long-run relationships among net foreign portfolio investment, financial deepening and capital market performance in low-income SADC countries.

#### **5.12 INFERENCES AND COMPARISONS BETWEEN THE TWO PVECMS IN SADC COUNTRIES**

While the first PVECM investigates the short- and long-run relationships among *net foreign remittance flow volatility*, financial deepening and capital market performance, the second PVECM investigates the short- and long-run relationships among *net foreign portfolio investment volatility*, financial deepening and capital market performance in low-income SADC countries.

The findings from both analyses have shown the short- and long-run association among the variables employed. In the first model, it was revealed that there is a short- and long-run relationship among net foreign remittance flow volatility, financial deepening and capital market performance. There is causality running from capital market performance to real GDP as well as from RGDP to capital market performance. This finding is in line with Coşkun et al. (2017) who carried out a similar study on Turkey's economy. Their findings reveal that there is a long-run cointegrating association between capital market development and economic growth and also causality running from capital market development to growth of the economy.

Furthermore, the study showed that there is a long-run equilibrium relationship between capital market performance and financial deepening. This finding is supported by Andabai and Igbodika's (2015) causality analysis of financial deepening and the performance of the Nigerian economy from 1990 to 2013. They confirmed that there is a long-run equilibrium correlation between financial deepening and the performance of the Nigerian economy and the results confirm that about 70% short-run speed of adjustment is needed to correct the long-run disequilibrium.

In the second model, the study also established short- and long-run relationships among net foreign portfolio investment, financial deepening and capital market performance in low-income SADC countries. There is long-run causality running from real GDP to financial deepening as well as

causality running between real GDP and net foreign portfolio investment. The findings also revealed that net foreign portfolio investment Granger causes financial deepening and, in turn, leads to increased provision of financial services and capital market performance in the economy. This is in tandem with empirical evidence that notes that financial market performance is a key requirement for enhancing economic growth (Bencivenga and Smith, 1991, King and Levine, 1993, Chakraborty, 2008). On the other hand, Arikpo and Adebisi (2017) found that financial market performance has no long-run causal relationship with net foreign portfolio investment in Nigeria. Nonetheless, this study is supported by Ibrahim, Akinbobola, and Ademola, (2017) who revealed that net foreign portfolio investment has a significantly positive effect on the growth of the economy in the long run. Several other studies have also demonstrated that in the long run, net foreign portfolio investment has a significant impact on the economy and established a causal relationship among net foreign portfolio investment, financial deepening and capital market performance (Bakang, 2015, Baharumshah and Almasaied, 2009, Choong, Yusop, and Soo, 2005).

## **CHAPTER 6 : DYNAMIC EFFECTS OF NET CAPITAL FLOW VOLATILITY**

### **INTRODUCTION**

This chapter presents the empirical analysis for interpreting the results obtained from the methodology used and discussed in the earlier chapter. The emphasis of the empirical investigation is to analyze the processes shown on the estimated Panel Vector Autoregressive (P-VAR) model to determine the impact of changes in net foreign capital flow volatility on low-income economies. The chapter is divided into two sections that separately analyze the impacts of net foreign remittance volatility and the impacts of net foreign portfolio investment volatility.

In total, 6 variables are ordered to determine the simultaneous relationships in the model. The Orthogonalization Cholesky analysis procedures take account of the chosen lag length criteria, impulse response functions, variance decompositions and economic interpretation of the econometric results. The results obtained from these procedures are derived from the levels specification of the P-VAR which is in line with various empirical studies (Smets and Wouters, 2002, Uhlig, 2005, Vonnák, 2005, Cheng, 2006, Seleteng and Motelle, 2016).

### **6.1 NON-STATIONARITY**

In line with Fève and Guay (2010), Uhlig (2005) and Ibrahim and Amin (2005), this investigation applies a levels VAR. The advantage of using level VAR is to avoid the loss of important information about the data sets which might occur in the process of differencing. In addition, it has been posited that the addition of lagged lengths of the variables in the VAR will allow the residuals to be stationary even with non-stationary data (Berkelmans, 2005). Many recent empirical studies have also employed this technique, including Ngalawa and Viegi (2011), Elbourne (2008) and Mordi and Adebisi (2010). In conformity with the aim and objectives of this study, this level VAR is further carried out in a panel form in order to cover all the SADC countries and ensure a large sample size with large degree of freedom. Theoretically, the larger the sample size, the better the estimates. Therefore, the PVAR will offer a better estimate for this study.

## 6.2 THE LAG LENGTH

The lag length provides a suggestion of the time between policy action responses to volatility in the economy in order to determine the impact of changes in net foreign remittance flow volatility on low-income economies. Since the data sets are quarterly, the study tests for different types of lag selection criteria to allow for variations in the model and the realization of well-behaved residuals. Therefore, the different types of lag length tested for this model follow the standard Akaike Information Criteria (AIC), Sequential Modified LR test statistic (LR), Final Prediction Error (FPE), Schwartz Bayesian Information Criteria (SBIC) and Hannan-Quinn Information Criteria (HQIC). They all suggested that an optimal lag length of four would suit for the model. Table 6.1 presents the P-VAR lag order selection criteria using different lag lengths (lag order of 5). On the basis of the results obtained, the LR, FPE, AIC, SBIC and the HQIC selected 4-lags. All of them give the minimum number among the lag lengths by choosing 4-lag length for the overall analysis of this study. These 4-lags tend to suggest values of k that are generally too small for unit root tests to have good sizes and prevent distortion (Ng and Perron, 2001). The selection of the optimum 4-lags is well supported by previous literature (Elbourne, 2008) and is an attempt to achieve a robust and dynamic result without necessarily shortening the analysis sample.

**Table 6.1: The P-VAR Lag Order Selection Criteria**

Endogenous variables: LOGFFR LOGRGDP LOGNFR LOGMS LOGCPI INT						
Exogenous variables: C						
Sample: 2000Q1 2015Q4						
Lag	LogL	LR	FPE	AIC	SIC	HQC
0	-2462.580	NA	136.4108	21.94293	22.03403	21.97970
1	998.0945	6706.018	8.21e-12	-8.498618	-7.860946	-8.241251
2	1976.534	1843.814	1.89e-15	-16.87585	-15.69161	-16.39789
3	3139.331	2129.211	8.46e-20	-26.89183	-25.16100	-26.19326
4	29659.38	47146.75*	4.9e-122*	-262.3056*	-260.0282*	-261.3864*
5	35250.55	8814.008	2.77e-63	30.87651	31.00987	30.00048
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: Author's computation from output result from the regression analysis

### 6.3 DIAGNOSTIC TESTS ON THE PVAR MODEL

After the lag length tests revealed an optimum lag length of 4 to be the best fit for the model, the study further tests for the P-VAR normality, heteroskedasticity and serial correlation in order to show the appropriateness and robustness of the model. The benchmark criteria for the null hypotheses that are tested for the serial correlation, heteroscedasticity and normality tests are:

- $H_0: \alpha = 1$ , there is normality of the residuals, no heteroskedasticity and no serial correlation.
- $H_1: \alpha \neq 1$ , there is non-normality of residuals, heteroskedasticity and serial correlation.

**Table 6.2: The P-VAR Normality test**

Com	Skewness				Kurtosis				Jarque-Bera		
	Skew	Chi-sq	Df	Prob	Kurt	Chi-sq	df	Prob	Jarque	df	Prob
1	0.034674	0.064925	1	0.7989	3.951912	12.23285	1	0.0005	12.29778	2	0.0021
2	- 0.333575	6.008719	1	0.0142	3.688285	6.395437	1	0.0114	12.40416	2	0.0020
3	- 0.131801	0.938067	1	0.3328	2.822436	0.425643	1	0.5141	1.363710	2	0.5057
4	0.925790	46.28274	1	0.0000	3.574224	4.451404	1	0.0349	50.73414	2	0.0000
5	0.326719	5.764248	1	0.0164	2.629609	1.852055	1	0.1735	7.616302	2	0.0222
6	0.725884	28.45299	1	0.0000	6.439233	159.6823	1	0.0000	188.1353	2	0.0000
Joint	Joint	87.51168	6	0.0000		185.0397	6	0	272.5514	18	0.0000

Source: Author's computation from output result from the regression analysis

“\*\*\*”, “\*\*” and “\*” represent statistical significance at 1%, 5%, and 10%, respectively

In Table 6.2, the normality test is shown on the basis of skewness, kurtosis and Jarque-Bera. The findings show that 95% of the variables in the model are normally distributed and passed the normality test individually and jointly. It is further revealed that the residuals are normally distributed and the data sets are well modelled. This is shown by the probability values at 1% and 5% level of significance. The effect is that the data distribution and the residuals of the model for the SADC countries are normally distributed. Overall, the null hypothesis of normality of the residuals, no heteroscedasticity and no serial correlation cannot be rejected. These results show that our model is reliable and advantageous in determining the impact of changes in net foreign capital flow volatility on low-income SADC countries.

Table 6.3 presents the heteroscedasticity test results for the model in determining the impact of changes in net foreign remittance flow volatility on low-income economies. The probability value confirms that there is no heteroscedasticity in the model.

**Table 6.3: Heteroscedasticity Test**

<i>Heteroscedasticity Test: joint test</i>		
<i>Null Hypothesis: no Heteroscedasticity</i>		
Chi-sq	Df	Prob.
5424.000	446	0.2110

Source: Author's computation from output result from the regression analysis

\*\*\*\*, \*\*\* and \* represent statistical significance at 1%, 5%, and 10%, respectively

**Table 6.4: Serial Correlation LM Test**

<i>Null Hypothesis: no serial correlation at lag order h</i>		
Lags	LM-Stat	Prob
1	101.5999	0.5207
2	142.8431	0.0703
3	141.5943	0.2276
4	556.4239	0.1729
5	93.39794	0.0938
6	97.93459	0.2641

Source: Author's computation from output result from the regression analysis

\*\*\*\*, \*\*\* and \* represent statistical significance at 1%, 5%, and 10%, respectively

Furthermore, Table 6.4 above presents the test for autocorrelation for the equation in determining the impact of changes in net foreign capital flow volatility on low-income economies. The probability value confirms that the model is free from serial correlation. This means that there is no serial correlation found in repeating patterns, where the current level of a variable affects its future level.

## 6.4 THE IMPULSE RESPONSE FUNCTIONS

An impulse response indicates how any dynamic system reacts in response to external changes in the economy. The P-VAR estimation system applied in this study helps to determine the effect of changes in net foreign remittance flow volatility on low-income SADC economies. The impulse response functions will further help to analyze the dynamic characteristics of the model in achieving the study's objective.

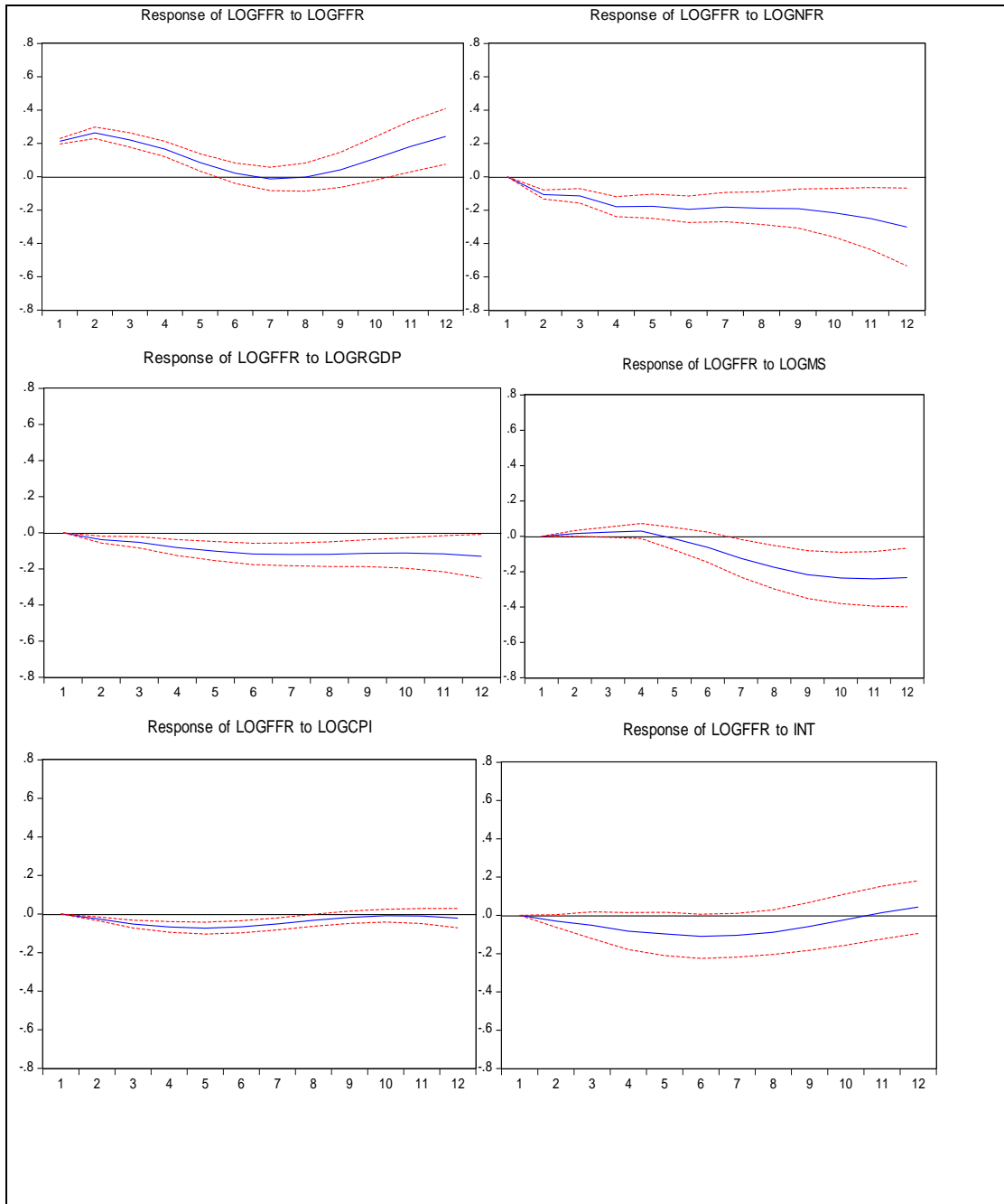
Therefore, the impulse response is developed from shocks or volatility to all the variables in the P-VAR model as it provides an exogenous source of volatility that enables us to detect the economy's response to policy shocks in net foreign remittance flow volatility. In addition, it provides an appropriate summary and properties of the relationships of the larger number of estimated coefficients in the model. The impulse response functions described in the graphs are generally in line with the modern empirical evidence for African countries and many other regions (Tsangarides, 2010, Oni, 2013). The graphs show the impulse impact of Cholesky one-standard innovation or deviation of policy shock defined as an exogenous, unanticipated and temporary rise in all the variables in the P-VAR model. Impulse response functions show the economy's response to volatility. The dynamic impacts of various macro-economic and financial shocks on policy and non-policy related variables in the model that shape the effect of changes in net foreign remittance flow volatility in low-income SADC economies are shown below.

#### **6.4.1 THE IMPULSE RESPONSE OF FEDERAL FUND RATES (FFR)**

Since the study employed quarterly series, the periodical bases covering a 12-quarter horizon are covered. However, in order to achieve a simple and suitable analysis of the impulse response functions, they are further divided into 4-quarter to cover the 12-quarter horizon (as shown on the horizontal axis in Figures 6.1 to 6.6) to highlight the economy's response to the volatility and identify the process through which it occurs and is transmitted to other variables in the model.

Figure 6.1 shows the impulse response function of the external shocks from the global market and the impact of global shocks and volatility on the low-income economies. Following Kutu and Ngalawa (2016b), the study utilizes the Federal Funds Rate (FFR) as a proxy for global interest rates. It is believed that shock/volatility is transmitted from the global market to the domestic market and not the other way around and that the transmission of international shock/volatility can be very rapid (Berkelmans, 2005). Thus, global interest rates serve as a channel through which shock/volatility is transmitted from the global market to the domestic market. Based on the results in Figure 6.1, domestic interest rates do not significantly impact the global interest rate. This is because, when it comes to monetary policy formulation, the US acts as a leader (being the most industrialized economy in the world). In addition, the Dollar influences SADC economies as most trading and transactions in the region are done in foreign currency. Hence, the domestic interest rate does not affect the global interest rate. However, shocks to GDP, NFR, MS and CPI

significantly impact global activities. This may be the result of the strength of the SADC economies as Africa is well-endowed with mineral resources that can contribute to global growth if properly harnessed and utilized. This result confirms Broadman's (2008) observation on why China and India have looked to Africa in the new deal to develop the world. Wallerstein (2011) also notes that Africa is a turning point for the world economy as it offers opportunities to giant investors.



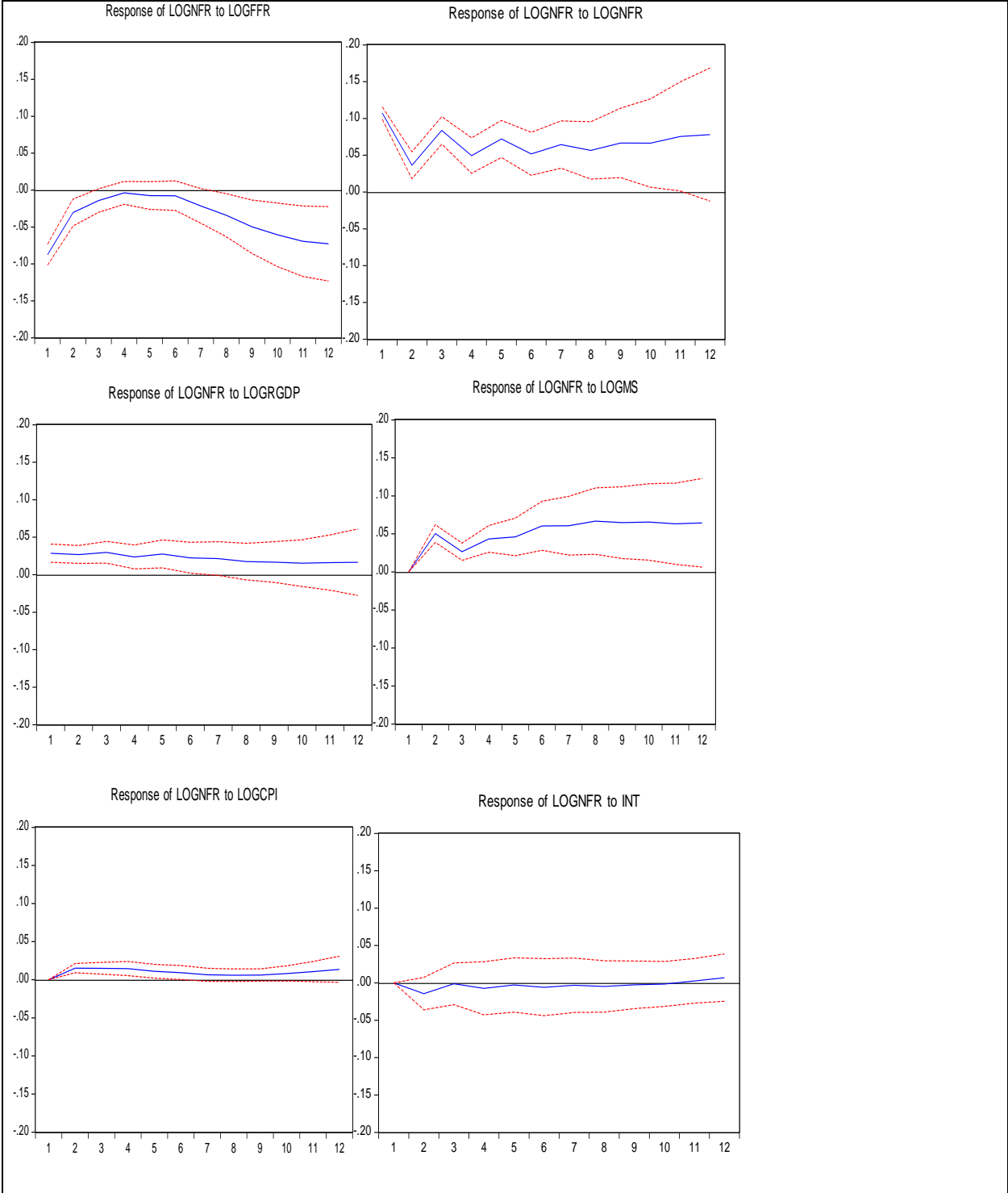
**Figure 6.1: The Impulse Response of Federal Fund Rates (FFR)**



#### **6.4.2 THE IMPULSE RESPONSE OF NET FOREIGN REMITTANCE (NFR)**

The results in Figure 6.2 show that external shocks negatively impact net foreign remittance volatility and affect the amount that foreign workers can send to their families or other individuals in their home countries. This conforms to theory and empirical analysis that global shocks are rapidly transmitted to domestic economies (Berkelmans, 2005). The global interest rate is a proxy that captures external shocks and it is found to significantly impact net foreign remittance in SADC countries. This means that, a global shock reduces net foreign remittance flows to low-income SADC economies. In addition, real GDP has a stable and positive substantial effect on net foreign remittance volatility in the selected SADC countries. For example, as shown in the graph, a stable growth rate in the SADC countries will attract foreign migrants to invest in the domestic economy and send money to their home countries while instability and sluggish growth, may not encourage them to do so. This finding is in line with Hussain and Anjum (2014) who carried out an empirical investigation of workers' remittances and GDP growth in Pakistan for the period 1973 to 2011. The study reveals that workers' remittances are positive as well as significant with GDP growth and also play an active role in Pakistan's economy. Money supply and prices also significantly impact foreign remittances in low-income SADC economies. Money supply has a positive and significant impact on net foreign remittance from the first quarter to the fourth quarter in SADC countries. The significantly positive effect of prices on net foreign remittance is also observed from the first quarter to the second quarter. Conversely, the domestic interest rate does not have a significant impact on net foreign remittance in SADC countries.

**Figure 6.2: The Impulse Response of Net Foreign Remittance Volatility (NFR)**

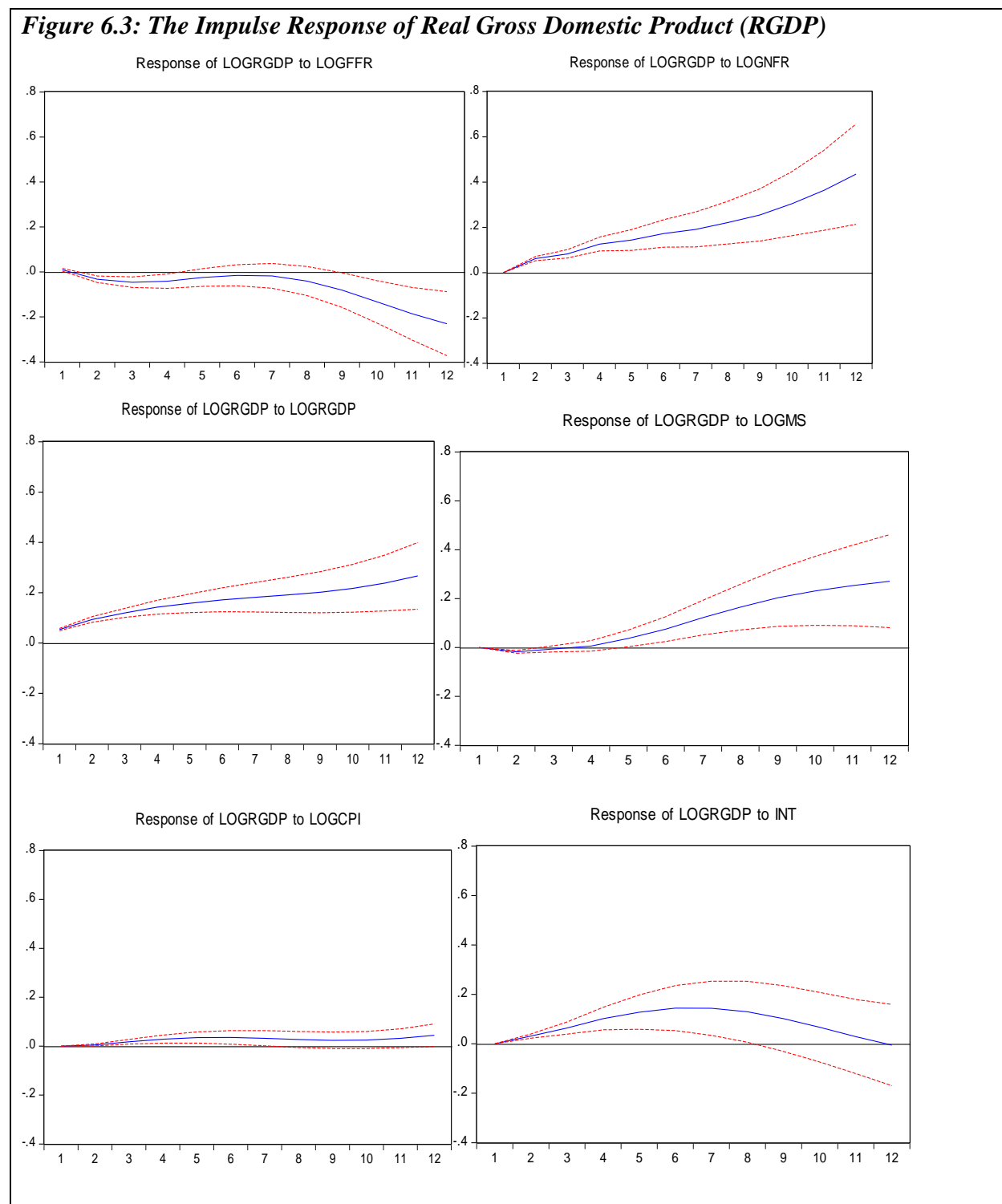


#### **6.4.2 THE IMPULSE RESPONSE OF REAL GROSS DOMESTIC PRODUCT (RGDP)**

The impulse response of real Gross Domestic Product (RGDP) is shown in Figure 6.3 below. The result reveals that global volatility (FFR) has a negative impact on real GDP in low-income SADC countries. This result supports Green, King, and Miller-Dawkins (2010) who analyze the impact of the global economic crisis on developing countries. In addition, Sadwick (2010) reveals how the global economic crisis has affected the economic performance of the SADC region. On the other hand, the shocks from Net Foreign Remittance (NFR) volatility and Money Supply (MS) have a strong positive impact on the growth rate of GDP in the SADC countries. For instance, a shock from NFR volatility and MS significantly and sharply increases the GDP growth rate between the first and fourth quarter. It was observed that they both contribute significantly to growth of the RGDP in low-income SADC countries for the entire period. Foreign remittance is the transfer of money by a migrant worker to their families or other individuals in their home country. In many countries, foreign remittances constitute a significant portion of GDP (up to a third in some cases) as revealed in low-income SADC countries. This means that the impact of changes in net foreign remittance flow volatility significantly affects the growth rate of GDP in low-income economies (Hassan and Shakur, 2017). Regarding money supply, the results are also in line with Seleteng and Motelle (2016) who identified money supply as a contributory source of economic growth in SADC countries in impacting on poverty and employment. This also conforms to economic theory that a boost in bank credit or an increase in money supply empowers an economic entity to undertake viable ventures, which ultimately grows the economy (Cecchetti and Kharroubi, 2012). A consequent decrease may mean that some of the money supply in the form of loans in the economy and foreign remittance inflows becomes toxic over time, which reduces the GDP growth rate. Conversely, prices (CPI) have a sluggish and positive significant impact on RGDP. An increase in the prices of goods and services also increases the growth of GDP in the SADC countries. Prices have a considerable effect on the growth rate of domestic output (GDP) from the first to the third quarter. It trends slowly and steadily from the beginning of the third quarter until it subsides and turns insignificant at the beginning of the fourth quarter.

In terms of volatility arising from domestic interest rates, the GDP growth rate decreases for the entire period. This conforms to the theory that a contractionary monetary policy (increase in interest rates) has a lasting impact on the GDP growth rate. This is in line with Di Giovanni and Shambaugh (2008) who concluded that high interest rates have a contractionary effect on annual

real GDP growth. It is also in line with *a priori* expectation theory and empirical evidence as demonstrated in Beck et al. (2013) and Fofack (2005).

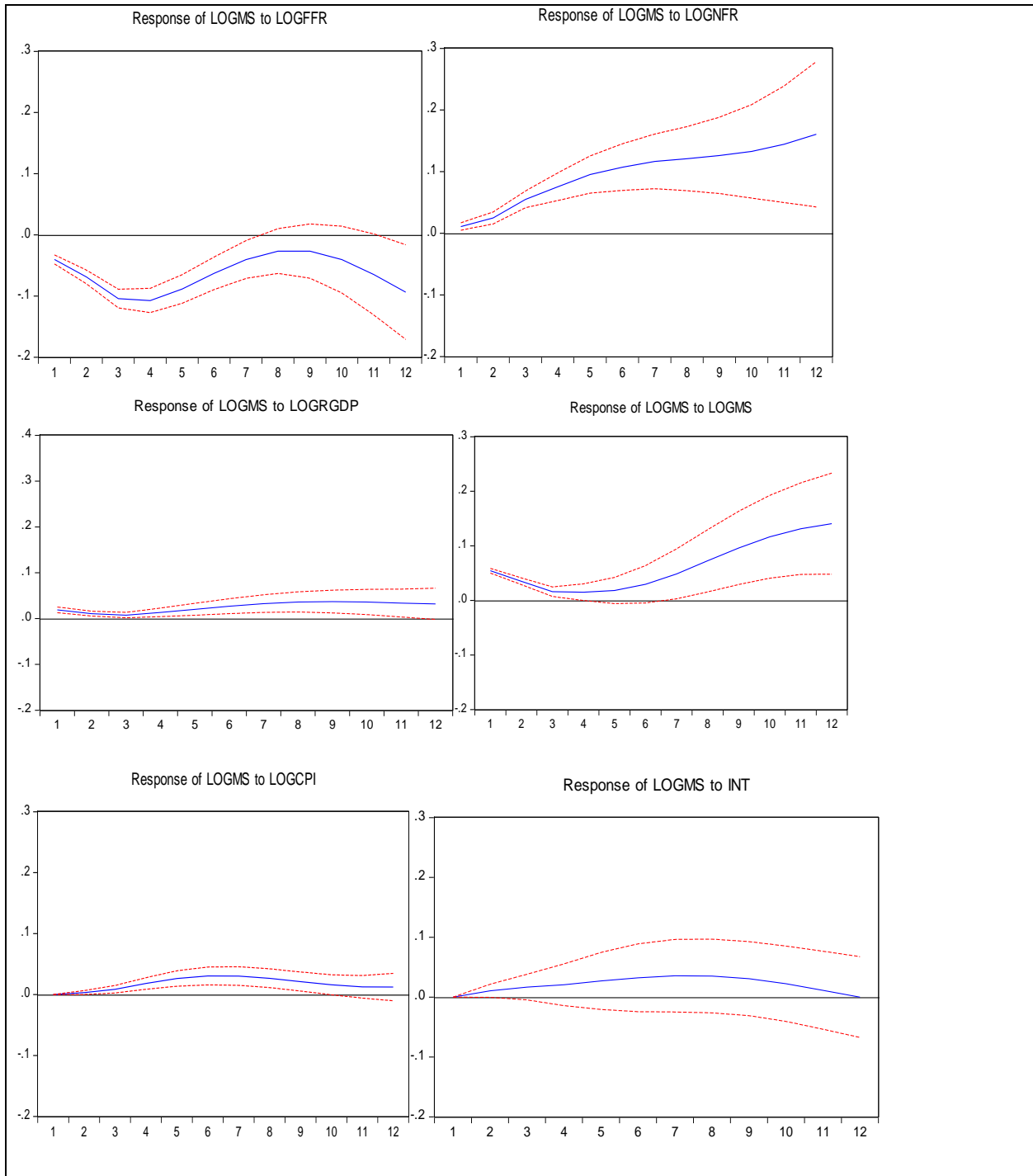


#### **6.4.4 THE IMPULSE RESPONSE OF MONEY SUPPLY (MS)**

Figure 6.4 below shows that external shocks have a negative impact on money supply in SADC countries. Global shocks have a negative impact on money supply in low-income economies. Adler and Tovar Mora (2012) note that developing countries (including SADC) are prone to external shocks due to the dominant influence of the US Dollar on their economies. The volatility from real GDP and net foreign remittance significantly increases money supply in SADC countries. Theoretically, an increase in the GDP growth rate also leads to an increase in employment which eventually results in an increase in money supply (and vice versa). Moreover, foreign remittance transfers by migrant workers to their families or other individuals in their home countries positively contribute to the growth of money supply. This is revealed in Karikari, Mensah, and Harvey's (2016) study that found that foreign remittances affect the availability of credit to the private sector, bank deposits intermediated by financial institutions and money supply in Africa.

Furthermore, prices (inflation or CPI) also significantly contribute to the growth of money supply in the low-income economies of the SADC countries. As revealed by the impulse response functions, price volatility significantly impacts the quantity of money supply in the economy. The response of money supply to inflation shock/volatility begins on an increasingly significant positive trend from the first quarter to the third quarter. In contrast, an innovative shock from interest rates does not significantly affect money supply in the SADC countries. This is contrary to expectations that the monetary policy instrument (interest rate) is expected to affect the target variable (inflation) in stabilizing and reducing inflation in the economy. However, some SADC countries like Zimbabwe, may be suffering from the liquidity trap which may assist in accounting for this finding.

**Figure 6.4: The Impulse Response of Money Supply (MS)**

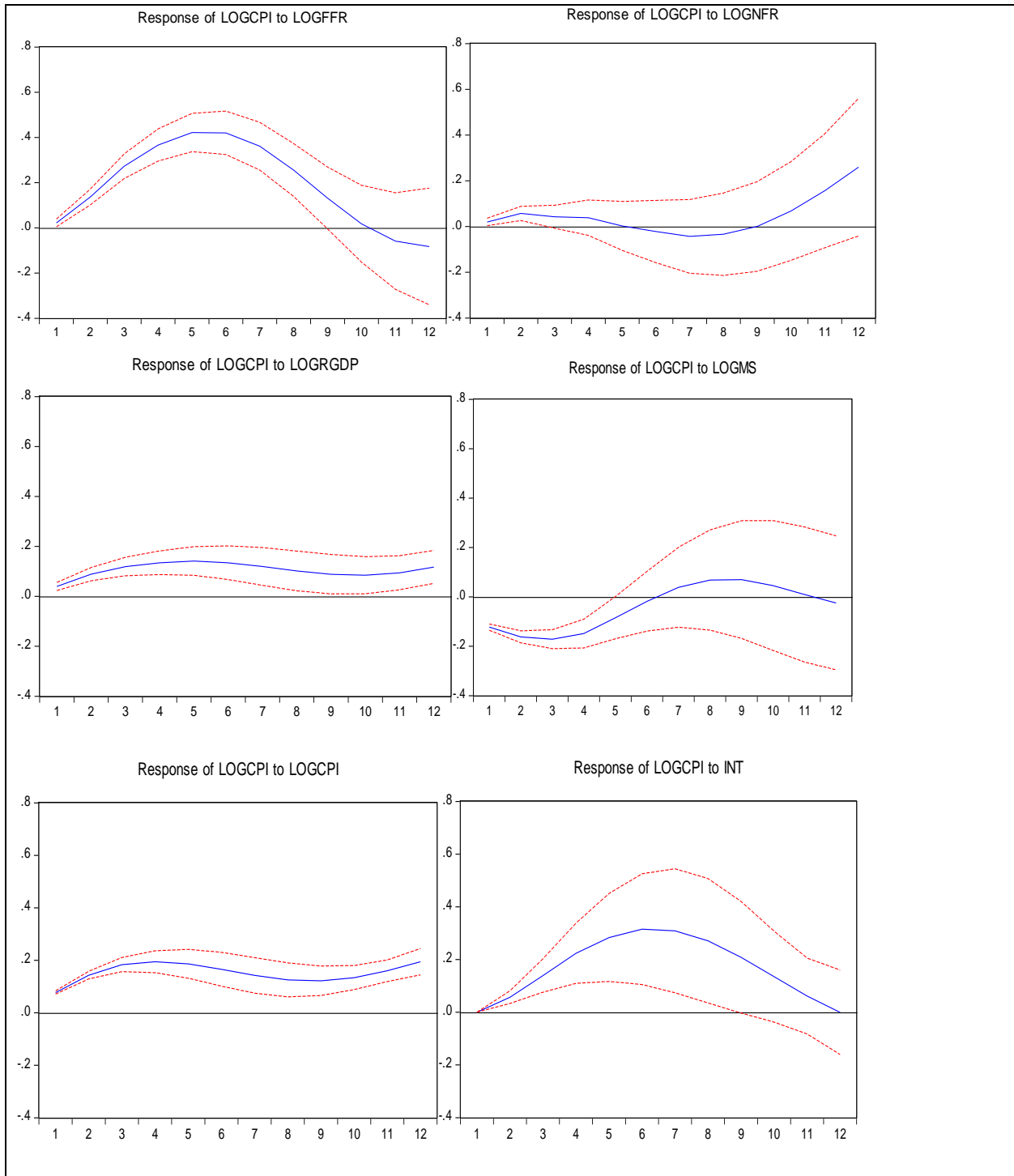


**6.4.5 THE IMPULSE RESPONSE OF CONSUMER PRICE INDEX (CPI)**

The impulse response function of inflation (prices) to shocks or volatility from other variables is shown in Figure 6.5. There appear to be sharp responses from all the variables in determining the

impact of movements in the prices of goods and services. Firstly, the impact of global volatility significantly increases the price level from the first to the second quarter and later reduces it from the second to the third quarter. This is in line with Krugman (2009) who reveals how economists got it wrong in their assertion on the impact of a global shock or volatility on prices. Global shocks can have a positive or negative impact on prices depending on the nature of the shock. Secondly, volatility from net foreign remittance significantly affects the general price level in the first quarter but becomes insignificant for the remaining periods. Thirdly, volatility from real GDP has a positive impact on prices from the first to the second quarter. A positive output shock causes inflation to increase instantaneously, bottoming out after about the first quarter before turning insignificant for the rest of the periods. On the other hand, volatility in money supply leads to a negative impact on the prices of goods and services. Based on the impulse response functions, the volatility of prices to money supply changes reveals a short-run negative significant impact in SADC low-income economies. This conforms to the theoretical expectation that a rise in money supply will drive inflation in the economy. Finally, the response of prices to volatility of the interest rate also showed a positive significant impact for all the periods. The monetary policy instrument (interest rate) reduces the inflation rate in the economy. This result is in line with Alam and Uddin (2009) who found that the interest rate has significant impact on the general price level in both developed and developing countries.

**Figure 6.5: The Impulse Response of Consumer Price Index (CPI)**



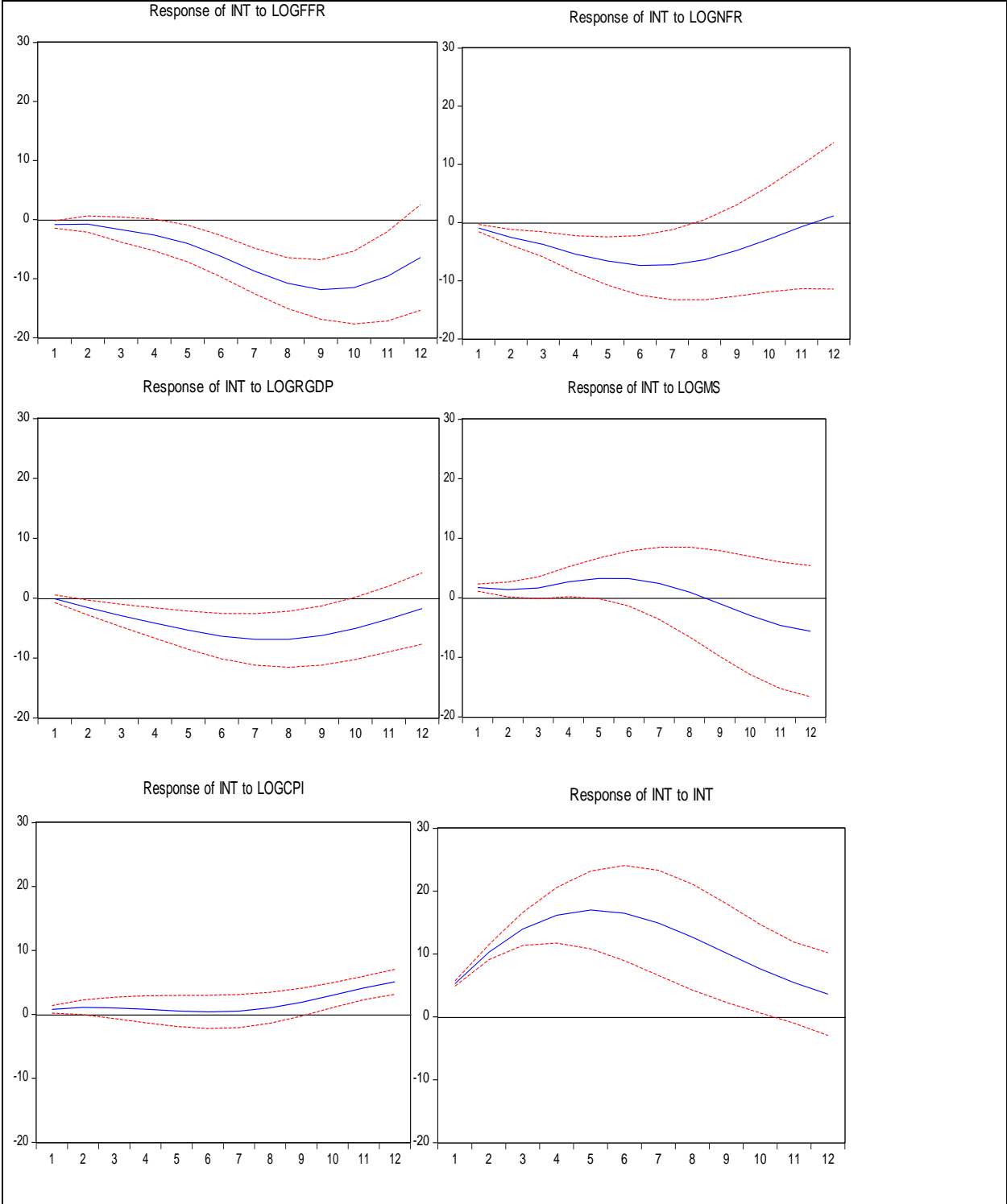


#### **6.4.6 THE IMPULSE RESPONSE OF INTEREST RATES (IN)**

Figure 6.6 shows the impulse responses of the monetary policy instrument to global volatility, foreign remittance, real GDP, money supply and prices. The results show that a one standard deviation of global volatilities in FFR and NFR as well as real GDP strongly and negatively causes a steady fall in the domestic interest rates of SADC countries. As pointed out by Berkelmans (2005), the impact of global shocks is easily and rapidly transmitted to the domestic economy. For example, a rise in the global interest rate will attract investors to the global market, hence, leading to movement of capital to developed countries. However, reactionary efforts to prevent capital flight cause a fall in domestic interest rates as revealed by the impulse response functions of interest rate to the FFR. In addition, an increase in net foreign remittance flows increases the supply of money in domestic markets, subsequently leading to a fall in domestic interest rates. This is in conformity with economic theory that a rise in money supply (expansionary monetary policy) will lead to a fall in interest rates.

Furthermore, volatility in real GDP causes a gradual decline in domestic interest rates. This implies that as the economy grows, the cost of borrowing will contract. However, an increase in GDP will raise demand for money because more people will need it to transact; that is, the transactions demand effect. This may push interest rates higher. Furthermore, an increase in money supply (response of interest rate to money supply) also leads to a fall in the interest rate in the low-income economies of SADC countries. Larger money supply lowers market interest rates. Conversely, smaller money supplies tend to raise market interest rates. Finally, prices do not have a significant effect on interest rates (response of interest rates to CPI). This is expected as interest rates that are a policy instrument are expected to affect prices (inflation) and not the other way around.

**Figure 6.6: The Impulse Response of Interest Rates (IN)**



## **6.5 THE VARIANCE DECOMPOSITION**

Variance decomposition is defined as the source of volatility of a particular variable arising from its own volatility and innovation or those arising from other variables. According to Raghavan and Silvapulle (2008), “the variance decomposition describes what percentage of a shock to a specific variable is related to either its own innovations or those associated with other dependent variables, at various forecasted time limits in a model”. In the context of this study, the variance decomposition helps to establish the relative importance of variability to variables in the model in determining the impact of changes in net foreign remittance flow volatility on low-income economies. The variance decomposition is always expressed in percentage terms with respect to different time horizons or periods under investigation in the model. In this study, for the low-income SADC economies under the spotlight, a 12-quarter period covering three years is examined. The 3<sup>rd</sup>, 6<sup>th</sup>, 9<sup>th</sup> and 12<sup>th</sup> quarters (see Tables 6.5 to 6.10) have been specifically reviewed for convenient and easy interpretation of the results as shown below:

### **6.5.1 THE VARIANCE DECOMPOSITION OF FEDERAL FUNDS RATE (FFR)**

Table 6.5 shows the variance decomposition of the FFR. The results reveal that about 81.77% of the volatility in the FFR is explained by volatility to itself, leaving the rest of variables in the model to contribute the remaining 18.23% in the first quarter. This suggests that in the short run, volatility to FFR has by far the biggest impact in explaining the variations in itself. This confirms the result derived under the impulse response functions where external shocks are deemed to be transferred to the domestic economy and not from the domestic economy to the global market. Over time however, the impact declines from the second quarter to the fourth quarter. It is observed that in the third and fourth quarter, volatility from net foreign remittance contributes the highest impact (33.80% and 35.88%) in accounting for variations in the FFR. By the third and fourth quarter, volatility to INT, CPI and GDP maintains a declining trend with their explanation of the volatility to the FFR being very low. This implies that in the long run, only net foreign remittance (NFR) and money supply (MS) increasingly contribute to the volatility of the FFR from the first quarter to the fourth quarter in the low-income SADC economies.

**Table 6.5: The Variance Decomposition of Federal Funds Rate (FFR)**

Period	S.E.	LOGFFR	LOGNFR	LOGRGDP	LOGMS	LOGCPI	INT
3	0.446840	81.77943	14.06903	0.278033	0.401149	1.681714	1.790644
6	0.643714	47.89454	36.73583	2.025355	1.387597	4.257885	7.698786
9	0.825441	29.40740	41.89759	3.109277	14.50943	3.175457	7.900838
12	1.095217	25.36861	43.45324	2.383280	22.23655	1.856279	4.702041

## 6.5.2 VARIANCE DECOMPOSITION OF NET FOREIGN REMITTANCE VOLATILITY

Table 6.6 below depicts the variance decomposition of net foreign remittance volatility in the SADC countries. This is the second variable in the model that captures the impact of global volatility on the low-income economies of SADC countries. The table reveals that the highest volatility to foreign remittance comes from its own shocks, followed by the FFR that accounts for 25.07% in the first quarter. All the other variables (except money supply) do not significantly contribute to the volatility of net foreign remittance. It is further observed that interest rates, prices and GDP do not significantly contribute to the volatility of net foreign remittance for the entire periods. In contrast, volatility from money supply increasingly contributes to variations in net foreign remittance from the first to the fourth quarter. This implies that in the short run, as money supply increases, net foreign remittance also increases. However, while the influence of the FFR diminished to about 16.05% and 15.30%, respectively in the second and third quarter, it picked up in the fourth quarter to 20.82%, indicating that global volatility will continue to have an impact on net foreign remittance in low-income countries. Meanwhile, the volatility arising from its own shocks diminished from 62.79% in the first quarter to 49.52% at the end of the fourth quarter. Nonetheless, the volatility to its own shock still accounts for the highest volatility for the entire periods and maintains an average of about 50% of the explanation of the variations in itself.

**Table 6.6: The Variance Decomposition of Net Foreign Remittance (NFR)**

Period	S.E.	LOGFFR	LOGNFR	LOGRGDP	LOGMS	LOGCPI	INT
3	0.187187	25.07328	62.79651	0.934724	9.297030	1.297167	0.601291
6	0.235640	16.05208	61.10442	1.019416	19.69316	1.579009	0.551912
9	0.291542	15.30777	55.03100	0.693882	27.39524	1.163875	0.408235
12	0.358691	20.82942	49.52320	0.486732	27.79292	1.053203	0.314527

### 6.5.3 THE VARIANCE DECOMPOSITION OF REAL GROSS DOMESTIC PRODUCT (RGDP)

Table 6.7 below shows that real GDP responds variably to the volatility of different factors in the model. Real GDP is the total value of goods and services produced annually in the SADC countries. In the context of this study, quarterly GDP is employed. The results in the table show that four variables appear to have very high influence on GDP, namely, the FFR, net foreign remittance volatility, money supply and interest rates, while prices do not significantly contribute to fluctuations in GDP growth from the first quarter to the fourth quarter. The trend of effect of the volatility in real GDP shows that variations in net foreign remittance have the highest contribution for the entire periods. Net foreign remittances show increasing contributions of 42.94%, 49.24%, 51.28% and 56.03% in the first, second, third and fourth quarter in that order in accounting for the volatility in real GDP. In addition, the shock or volatility of the monetary policy instruments (money supply and interest rates) grows as the period continues; the implication is that volatility of prices (though very low) is gradually transmitted through the monetary policy instrument to output growth (RGDP). In other words, the fall in the contribution of price shocks from 0.74% to 0.62% and the increase in the contributions of both money supply and interest rate shocks as the period progresses is a clear indication that volatility from prices goes through the monetary policy transmission mechanism to output growth (Mordi and Adebisi, 2010). Finally, the FFR also contributes significantly to the volatility of real GDP with about 7.14% in the first quarter, 2.34% in the second quarter, 2.20% in the third quarter and 7.74% in the fourth quarter.

**Table 6.7: The Variance Decomposition of Real Gross Domestic Product (RGDP)**

Period	S.E.	LOGFFR	LOGNFR	LOGRGDP	LOGMS	LOGCPI	INT
3	0.213651	7.149495	42.94909	37.34828	0.764281	0.749851	11.03901
6	0.497703	2.349779	49.24423	22.67117	3.018188	1.482836	21.23380
9	0.806657	2.206339	51.28732	16.16293	13.99718	0.925554	15.42068
12	1.243687	7.741727	56.03767	10.49443	18.26749	0.623088	6.835588

### 6.5.4 THE VARIANCE DECOMPOSITION OF MONEY SUPPLY (MS)

Table 6.8 shows the variance decomposition of the total money supply in the economies of low-income SADC countries. It is observed that two external variables that capture the effects of global volatility are found to have the highest impact in contributing to the volatility of money supply in

the low-income economies of SADC countries from the first to the fourth quarter. In addition, volatility in domestic interest rates and real GDP explain about 1.43% and 1.96% of fluctuations, respectively in the first quarter, while volatility in consumer prices accounts for only 0.30% of the volatility in money supply. This may imply that in the short run among the selected variables, only external shocks or volatility exert a greater influence on fluctuations in money supply. However, in the second and third quarter, interest rates, prices and real GDP increasingly contribute to the volatility of money supply in the SADC countries. It can therefore be deduced that the monetary policy instrument (interest rate and money supply) align with each other in the long run and work together to stabilize prices (inflation) and the output growth rate of low-income SADC countries. This may be due to the feedback effects in interest rates, prices and real GDP in contributing to the volatility of money supply.

**Table 6.8: The Variance Decomposition of Money Supply (MS)**

Period	S.E.	LOGFFR	LOGNFR	LOGRGDP	LOGMS	LOGCPI	INT
3	0.164944	63.29135	16.72182	1.963553	16.28624	0.306843	1.430194
6	0.298111	45.62350	40.50979	2.077596	6.598525	2.277518	2.913066
9	0.415680	25.22666	52.49147	3.240847	13.16149	2.373465	3.506073
12	0.565638	18.19202	52.48624	2.834677	22.93987	1.456815	2.090379

### 6.5.5 THE VARIANCE DECOMPOSITION OF CONSUMER PRICE INDEX (CPI)

Table 6.9 below describes the variance decomposition of the CPI (inflation or prices) in SADC countries. Inflation is an asset price and also a monetary policy intermediate target. It has a large percentage of contributions from virtually all the shocks or volatility in the model. In line with their mandate, the monetary authorities' use of the monetary policy variable, that is, interest rate appears to make a significant contribution to the response and volatility of the inflation rate from the first to the fourth quarter. The results reveal that the monetary authorities are capable of achieving price stability in the low-income economies of SADC countries. In addition, money supply also significantly contributes to the volatility of the inflation rate in SADC countries for the entire periods. It is observed that global volatility (the FFR) makes the highest significant contribution to the volatility of prices at about 32.91%, 48.69%, 46.33% and 40.36% in the first, second, third and fourth quarter in that order. The implication is that global volatility leads to an increase in the general price level in low-income SADC countries. In addition, net foreign remittance also significantly contributes to the volatility of prices from about 4.78% in the first

quarter to about 7.80% in the fourth quarter. This also aligns with the FFR that global volatility leads to an increase in the general price level in low-income SADC countries. Finally, real GDP significantly contributes to the volatility of inflation (prices), accounting for about 8.32% in the first quarter, 6.66% in the second quarter, 6.53% in the third quarter and 7.10% in the fourth quarter.

**Table 6.9: Table 6.9: The Variance Decomposition of Consumer Price Index (CPI)**

Period	S.E.	LOGFFR	LOGNFR	LOGRGDP	LOGMS	LOGCPI	INT
3	0.533245	32.91857	4.789601	8.323341	24.83176	21.17282	7.963918
6	1.093631	48.69265	1.765833	6.667769	8.370873	13.40453	21.09835
9	1.310091	46.33833	1.277763	6.533857	6.476420	12.29921	27.07442
12	1.413044	40.36035	7.801812	7.109540	5.706841	14.65080	24.37065

### 6.5.6 THE VARIANCE DECOMPOSITION OF INTEREST RATES (IN)

Finally, Table 6.10 below shows the impacts and contributions of each volatility to interest rate variability. The table shows that innovation from its own volatility contributes the highest shock/volatility of about 87.46% in the first quarter, 76.55% in the second quarter, 63.36% in the third quarter and 55.81% in the fourth quarter individually. It is further observed that the second highest contribution to the volatility of interest rate emanates from global shocks. Both the volatility in FFR and net foreign remittances significantly account for the volatility of interest rates from the first quarter to the fourth quarter. This is an indication that global shocks appear to have a direct effect on interest rates without passing through prices that make a very low contribution to the volatility of interest rates from the first quarter to the fourth quarter. The implication is that domestic interest rates are very responsive to global shocks in low-income SADC countries. This effect is maintained for all four periods shown in the table below. It points to the fact that the monetary policy instrument is highly susceptible to global shocks in the selected SADC countries. Again, money supply significantly accounts for the volatility of interest rates. The table reveals that its contribution to the volatility of interest rate increased from 2.01% in the first quarter to 3.38% at the end of the fourth quarter. This is an indication that money supply is directly responsive to interest rate and vice versa.

**Table 6.10: The Variance Decomposition of Interest Rates (IN)**

Period	S.E.	LOGFFR	LOGNFR	LOGRGDP	LOGMS	LOGCPI	INT
3	19.39367	1.106262	7.525125	1.133133	2.018443	0.756981	87.46006
6	38.77086	4.389105	13.67095	2.743610	2.384484	0.260466	76.55138
9	50.83871	15.39507	14.87101	4.336121	1.686596	0.344091	63.36711
12	55.81847	21.30126	12.95360	4.599602	3.381244	1.952813	55.81147

## 6.6 CONCLUSIONS

As stated in Chapter one, the main aim of this study is to determine the impact of changes in net foreign capital flow volatility on low-income economies. This section presented the analytical tools and interpretation of the results extracted from the model. After estimating the P-VAR equation, the estimated model passed several residual diagnostic checks, lag selections, orthogonalised impulse responses and the variance decomposition analyses.

Having understood the dynamics of these estimation techniques, analyses were then carried out with P-VARs in levels. The results from the impulse response analysis indicate that the SADC countries respond favourably to global volatility and that, global shocks are transmitted to the domestic economy and not the other way around. The estimated impulse response results are acceptable, and in all cases, reveal standard results. It was revealed that monetary tightening is followed by a decrease in prices as shown in price and interest rate (Log CPI and IN). Although monetary tightening of an increase (volatility) in interest rate (IN) led to an initial increase in the price level in the first quarter, it contracted and led to a fall in the general price level. It is further observed that the price level change (inflation) has significant effects on the economy. The volatility and shocks from global interest rates led to a negative decrease in real GDP and money supply while that of net foreign remittance led to a positive increase in real GDP and money supply. This is an indication that net foreign remittances contribute positively to GDP growth and money supply growth (in the form of capital inflow) in low-income SADC economies, while volatility in the global interest rate (FFR) has a negative impact on real GDP. The overall results show that changes in net foreign remittance flow volatility impact on the growth rate of low-income SADC countries.



Finally, the results from the variance decomposition show that the FFR, net foreign remittance volatility, money supply and interest rates have very high impacts on GDP while prices do not significantly contribute to GDP growth from the first quarter to the fourth quarter. The trend in the effect of volatility on real GDP shows that net foreign remittance volatility has the highest contribution for all periods. This is in line with the result derived from the impulse response analysis that changes in net foreign capital flow volatility significantly impact on the RGDP growth rate in low-income SADC countries. In addition, the effects of volatility in monetary policy instruments (money supply and interest rates) on RGDP grow as the period continues. It is also observed that the two external variables capturing the effects of global volatility are found to have the highest impact in contributing to the volatility of money supply in the selected SADC countries from the first to the fourth quarter. Therefore, in line with their mandate, using the monetary policy variable interest rates, the monetary authorities contribute significantly to the volatility of inflation (prices) from the first to the fourth quarter. It can be deduced from the results that the monetary authorities in low-income SADC countries can achieve price stability using monetary policy instruments (money supply and interest rates).

## **6.7 IMPACTS OF NET FOREIGN PORTFOLIO INVESTMENT VOLATILITY**

Following the technique adopted in the first model where the study employed the P-VAR estimation to determine the impact of changes in net foreign remittance volatility on low-income SADC countries, the study further extends the P-VAR to determine the impacts of changes in net foreign portfolio investment volatility on low-income SADC economies. In order to effectively achieve this objective, various lag lengths were tested for different selection criteria using the standard Akaike Information Criteria (AIC), Sequential Modified LR test statistic (LR), Final Prediction Error (FPE), Schwartz Bayesian Information Criteria (SBIC) and Hannan-Quinn Information Criteria (HQIC). All these selection criteria suggested that an optimal 4-lag is appropriate for the model. Table 6.11 below shows the P-VAR lag order selection criteria using the lag order of 5. The results show that the LR, FPE, AIC, SIC and the HQC choose 4-lags for the model. This is good for the overall analysis as it suggests the value of  $k$  that is generally too small for unit root tests to have good sizes and prevent distortion. It further allows for a robust and dynamic result without necessarily shortening the analysis sample too much.

**Table 6.11: The P-VAR Lag Order Selection Criteria**

Endogenous variables: LOGFFR LOGNFPI LOGRGDP LOGMS LOGCPI INT						
Exogenous variables: C						
Sample: 2000Q1 2015Q4						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2595.242	NA	443.5835	23.12215	23.21324	23.15891
1	1037.574	7039.590	5.78e-12	-8.849549	-8.211877	-8.592182
2	2257.426	2298.743	1.56e-16	-19.37268	-18.18843	-18.89471
3	3866.447	2946.296	1.32e-22	-33.35508	-31.62426	-32.65651
4	29230.90	45092.36*	2.2e-120*	-258.4969*	-256.2195*	-257.5777*
5	4554.605	7114.007	765.000	334.8441	34.33186	23.66842
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: Author’s computation from output result from the regression analysis

## 6.8 DIAGNOSTIC TESTS ON THE PVAR MODEL

Since an optimum 4-lag has been chosen as the lag length, the study further tests for normality, heteroskedasticity and serial correlation in order to show the appropriateness and robustness of the P-VAR model. The benchmark criteria for the null hypotheses that are tested for normality, heteroskedasticity and serial correlation are:

- $H_0: \alpha = 1$ , there is normality of the residuals, no heteroskedasticity and no serial correlation.
- $H_1: \alpha \neq 1$ , there is non-normality of residuals, heteroskedasticity and serial correlation.

**Table 6.12: The P-VAR Normality test**

Com	Skewness				Kurtosis				Jarque-Bera		
	Skew	Chi-sq	Df	Prob	Kurt	Chi-sq	df	Prob	Jarque	df	Prob
1	0.399389	8.613646	1	0.0033	3.009121	0.001123	1	0.9733	8.614769	2	0.0135
2	0.065652	0.232749	1	0.6295	3.269506	0.980555	1	0.3221	1.213303	2	0.5452
3	-0.80856	35.30345	1	0.0000	5.556411	88.22572	1	0.0000	123.5292	2	0.0000
4	0.404025	8.814771	1	0.0030	3.084523	0.096445	1	0.7561	8.911216	2	0.0116
5	-0.52915	15.11999	1	0.0001	2.913141	0.101850	1	0.7496	15.22184	2	0.0005
6	1.178041	74.94011	1	0.0000	6.765209	191.3868	1	0.0000	266.3269	2	0.0000
Joint		143.0247	6	0		280.7925	6	0	423.8172	18	0.0000

Source: Author's computation from output result from the regression analysis

“\*\*\*”, “\*\*” and “\*” represent statistical significance at 1%, 5%, and 10%, respectively

**Table 6.13: Heteroscedasticity Test**

<i>Heteroscedasticity Test: joint test</i>		
<i>Null Hypothesis: no Heteroscedasticity</i>		
Chi-sq	Df	Prob.
3107.010	703	0.4461

Source: Author's computation from output result from the regression analysis

“\*\*\*”, “\*\*” and “\*” represent statistical significance at 1%, 5%, and 10%, respectively

**Table 6.14: Serial Correlation LM Test**

<i>Null Hypothesis: no serial correlation at lag order h</i>		
Lags	LM-Stat	Prob
1	101.3178	0.0001
2	172.3733	0.3319
3	118.5196	0.0000
4	599.9358	0.1010
5	82.09230	0.7720
6	98.25347	0.8002

Source: Author's computation from output result from the regression analysis

“\*\*\*”, “\*\*” and “\*” represent statistical significance at 1%, 5%, and 10%, respectively.

Table 6.12 presents the results for the normality test using skewness, kurtosis and Jarque-Bera techniques. The empirical results show that 75% of the variables in the model are normally distributed and passed the normality test at individual level while 100% of the variables jointly passed the normality test. It is further revealed that the residuals are normally distributed and the data sets are well modeled as revealed by the probability values at 1% and 5% level of significance. The results indicate that data distribution and the residuals of the model for the SADC countries are normally distributed. The null hypothesis of normality of the residuals cannot be rejected.

Furthermore Tables 6.13 and 6.14 above present the heteroscedasticity test results and serial correlation test for the model in determining the impact of changes in net foreign portfolio investment volatility on low-income SADC economies. The probability value confirms that there is no heteroscedasticity and serial correlation in the model. The test for serial correlation for the model confirms that it is free from serial correlation. This means that no serial correlation is found

in repeating patterns, whereby the current level of a variable affects its future level. Overall, the null hypotheses of normality of the residuals, no heteroscedasticity and no serial correlation cannot be rejected. These results show that the model is reliable and advantageous in determining the impact of changes in net foreign portfolio investment volatility in low-income SADC countries.

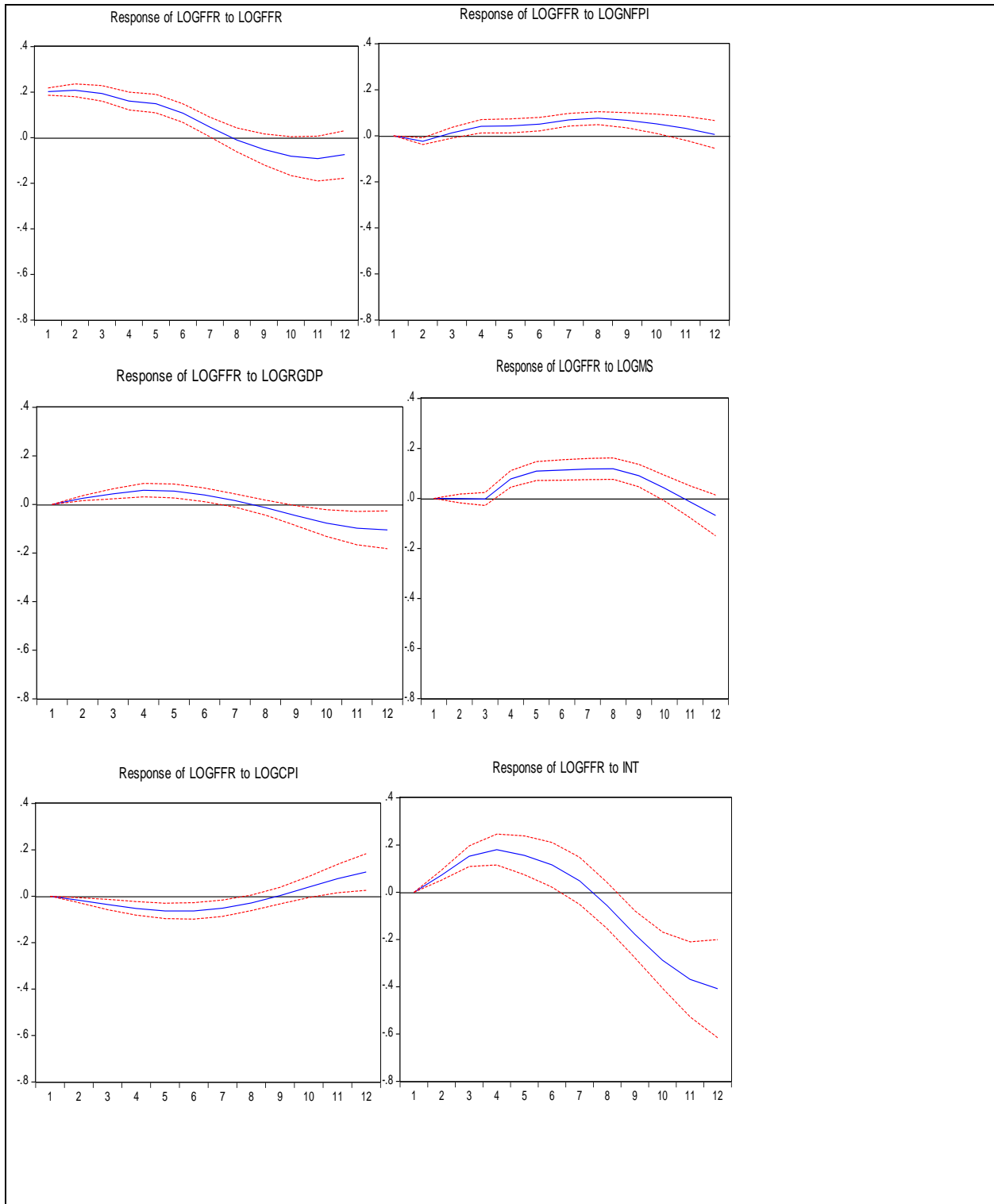
## **6.9 THE IMPULSE RESPONSE FUNCTIONS**

The impulse response functions employed in this section also help to determine the impact of changes in net foreign portfolio investment volatility on low-income SADC economies. They further help to investigate the dynamic characteristics of the model in achieving the study's objective. The graphs show the impulse impact of Cholesky one-standard innovation or deviation on all the variables in the P-VAR model. Using the impulse response functions, the dynamic impacts of different volatility on low-income SADC economies are discussed as follows:

### **6.9.1 THE IMPULSE RESPONSE OF FEDERAL FUND RATES (FFR)**

Figure 6.7 below shows the impulse response of a global shock (FFR) to a one standard deviation in another global shock (net foreign portfolio investment volatility), monetary policy instruments, and the intermediate monetary variables as well as the GDP growth rate. In comparison to the model, the inclusion of net foreign portfolio investment flows volatility (funds received in the domestic economy for investment on the money market, stock market or bond markets) as against net foreign remittance flow volatility, reveals an impact on global monetary policy action on the international interest rate (FFR). The results may confirm the role of corruption and money laundering activities in African countries by various government agents. The shocks have a steady impact on global interest rates, causing them to rise gradually in the short run although it remains muted and insignificant in the long run. This supports Berkelmans' (2005) conclusion that global shocks are transmitted to the domestic economy (and not from the domestic economy to the global economy) and are rapidly transmitted. The price shock is negative and significant, especially from the first to the second period. That is, price shocks cause a steadily fall, although it appears to be picking up gradually as the period progresses before it dies off and remains insignificant in the long run.

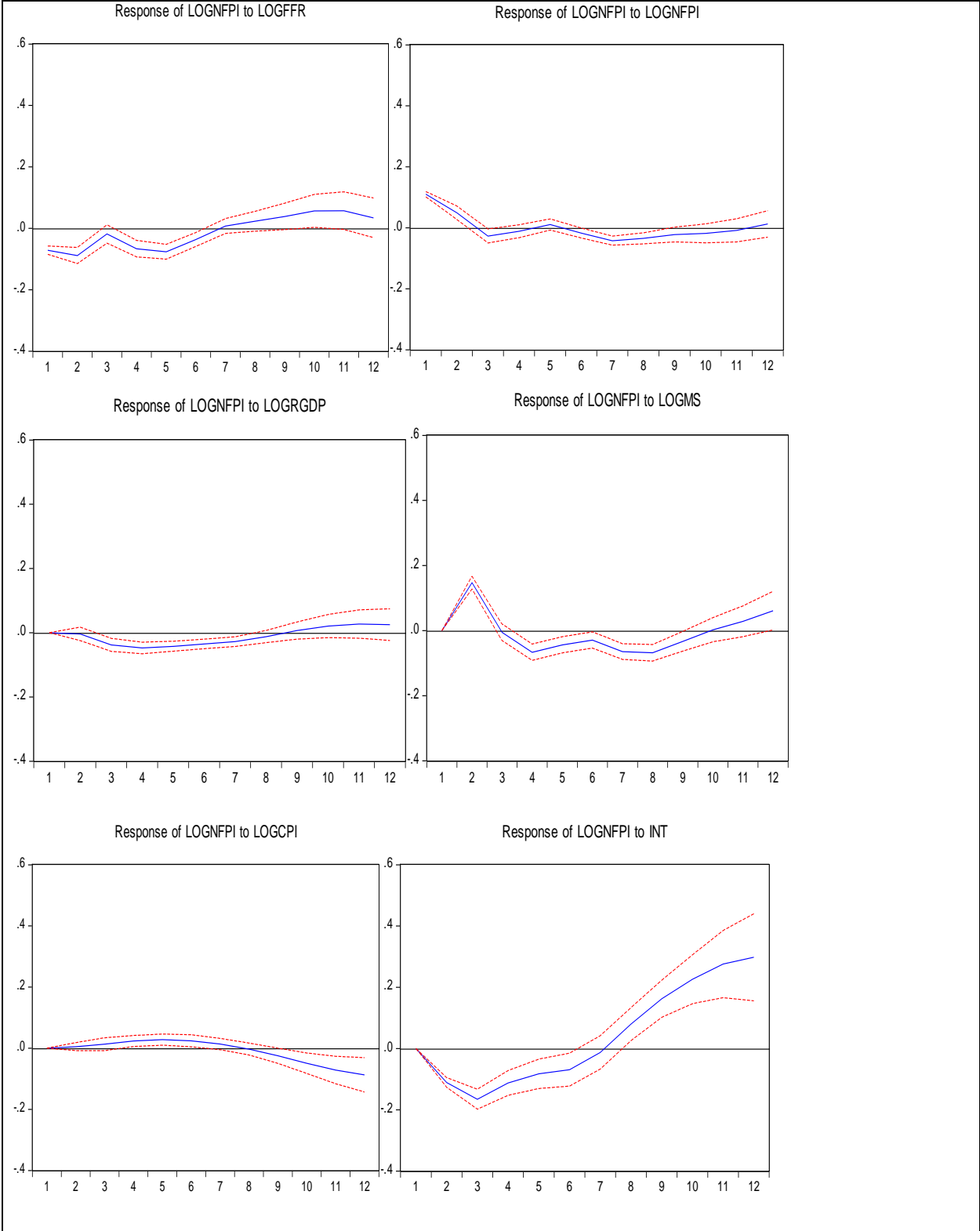
**Figure 6.7: The Impulse Response of Federal Fund Rates (FFR)**



## **6.9.2 THE IMPULSE RESPONSE OF NET FOREIGN PORTFOLIO INVESTMENT VOLATILITY (NFPI)**

The impulse response of net foreign portfolio investment volatility to selected variables is illustrated in Figure 6.8 below. From the impulse response functions, global interest rates, GDP, money supply and interest rates have a negative effect on net foreign portfolio investment volatility in the first and second quarter. Regarding global interest rates, it is observed that an extreme global shock triggers a negative response from the SADC countries from the first to the eighth period. This is similar to the results obtained by Yaha, Singh and Rabanal (2017) when they examined how extreme global shocks affect foreign portfolio investment in India. The response is similar to the impact of GDP shocks, where it has been observed that volatility in GDP has a negative significant impact on net foreign portfolio investment volatility from the first period to the eighth period. A shock in interest rates causes net foreign portfolio investment to rise steadily but, contrary to expectation, shocks to inflation rate (prices) lead to a fall in net foreign portfolio investment volatility from the eight months. A rise in the CPI is expected to drive net foreign portfolio investment upwards. The response of net foreign portfolio investment to volatility in prices reveals a downward trend over the eight months and lasted for the entire period. Interest rate volatility has an increasing impact on net foreign portfolio investment volatility. While interest rates initially had a negative impact on net foreign portfolio investment, as the graphs below show, it later became positive.

**Figure 6.8: The Impulse Response of Net Foreign Portfolio Investment (NFPI)**

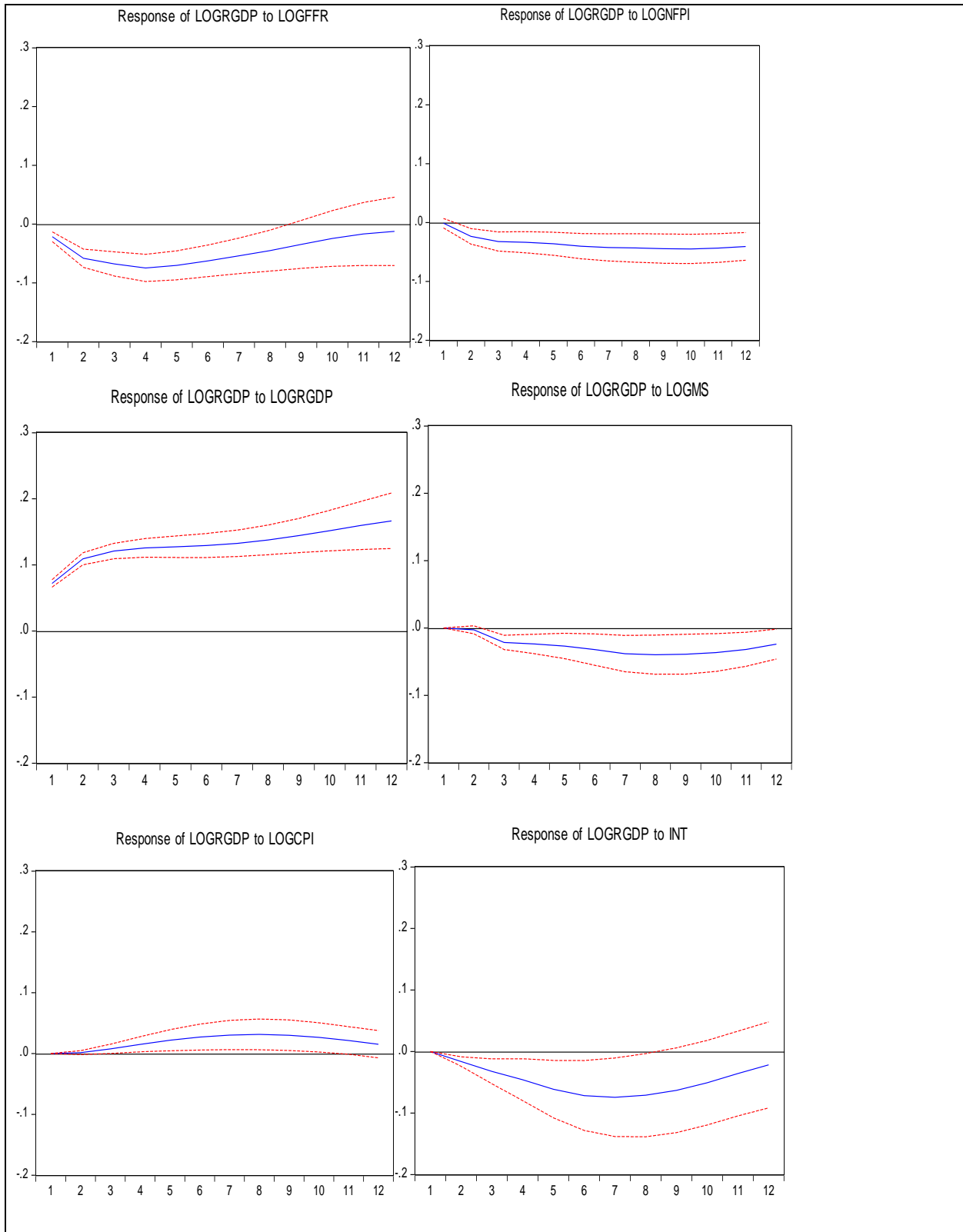


### **6.9.3 THE IMPULSE RESPONSE OF REAL GROSS DOMESTIC PRODUCT (RGDP)**

The impulse response of RGDP is presented in Figure 6.9. Global or external volatility (international interest rates and net foreign portfolio investment) has a negative impact on the GDP growth rate in low-income SADC economies. It was observed that volatility from the global market is transmitted to the domestic economy and negatively impacts real GDP in SADC countries. These findings are in line with Raddatz (2008) who argued that external shocks are relatively important sources of output instability in African countries. Sato et al. (2009) also confirm that external shocks affect macro-economic stability including real GDP in their study on “The impact of global disturbances on macroeconomic changes: implications for a monetary union in East Asia”. In addition, volatility of money supply is found to have a negative impact on real GDP. A decrease in the supply of money affects the GDP growth rate in the selected SADC countries. Conversely, prices are found to have a significantly positive impact on real GDP in low-income SADC economies. An increase in the general price level also increases output. Finally, the monetary policy response (increase interest rates) to an increase in the price level negatively impacts on the GDP growth rate in low-income SADC economies. This conforms to the theoretical expectation that a contractionary monetary policy will reduce the total output (GDP) of goods and services produced. This finding is in line with Mutinda’s (2014) finding of a negative association between interest rates and domestic output growth.



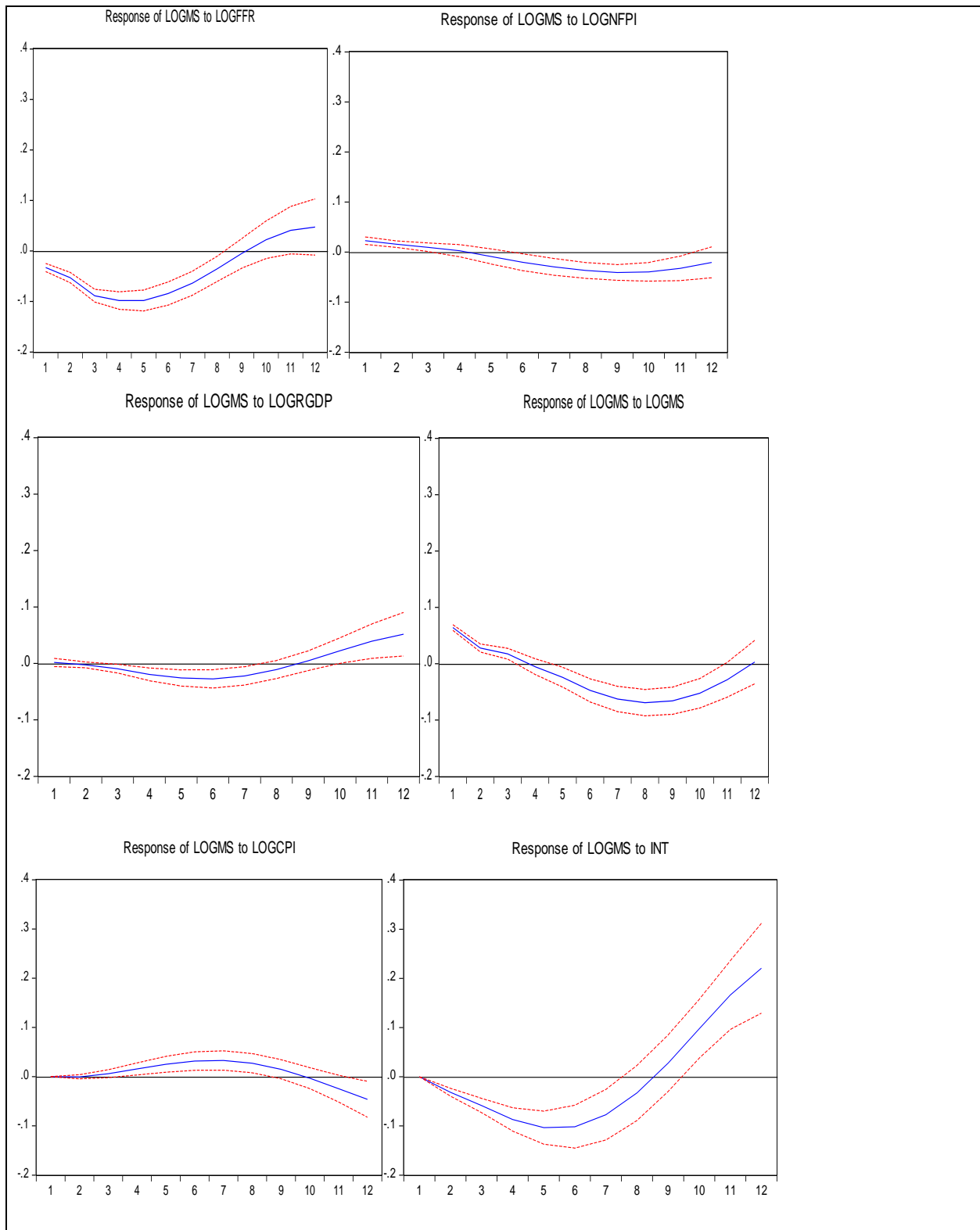
**Figure 6.9: The Impulse Response of Real Gross Domestic Product (RGDP)**



#### **6.9.4 THE IMPULSE RESPONSE OF MONEY SUPPLY (MS)**

The impulse response of money supply is presented in Figure 6.10 below. The two variables capturing external shocks and volatility from real GDP have an undesirable effect on money supply in SADC countries. The results show that money supply contracts as a result of variability in the international market and instability in the growth of the domestic economy. It is observed that there is a downward and negative trend of money supply due to external shocks and volatility in real GDP. This conforms to Berkelmans' (2005) conclusion that external shocks are transmitted to the domestic economy and negatively impact macro-economic variables. Interestingly, prices have a positive significant impact on money supply. A rise in the CPI or volatility in prices leads to an increase in money supply in the economy. According to the quantity theory of money, if real income was fixed and the rest of the factors did not influence demand for money or were constant, there would be a proportional relationship between the price level and the nominal quantity of money relative to real income. In other words, the growth rate of money supply would be equal to the inflation rate. As prices increase, money supply also increases. This supports Strano (2009) who finds a substantial positive relationship between long-run inflation and the money supply growth rate. There is a significant linkage between inflation and money supply growth in both high- (and hyper-) inflation and low-inflation countries. Finally, a contractionary policy (increase in interest rates) reduces money supply. It is observed that volatility in interest rates has a negative significant impact on money supply. This shows that there is a negative response of money supply to volatility of interest rates in SADC countries. An increase in interest rates leads to a rise in the cost of borrowing which influences investment and hence, reduces the quantity of money in circulation.

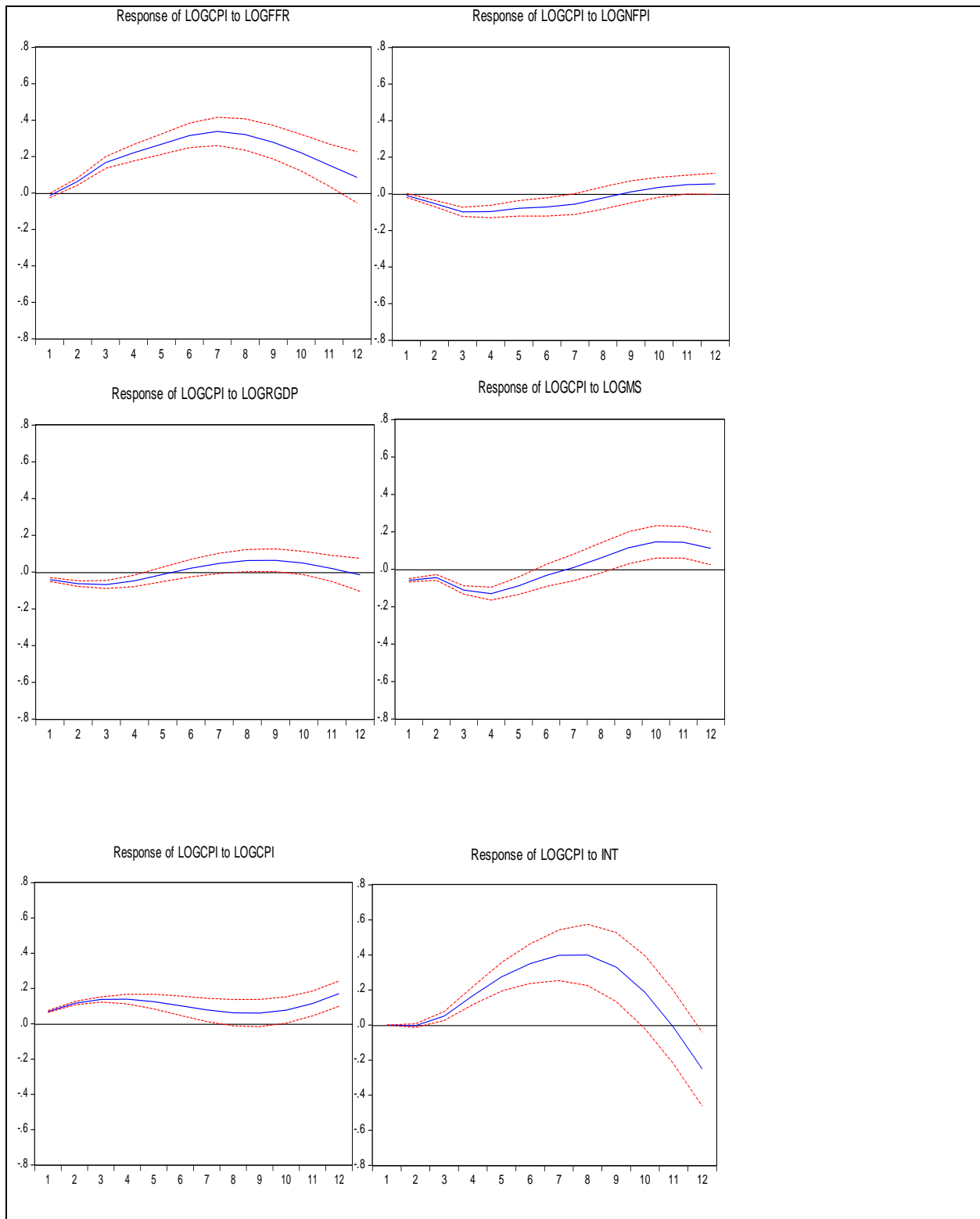
**Figure 6.10: The Impulse Response of Money Supply (MS)**



### **6.9.5 THE IMPULSE RESPONSE OF CONSUMER PRICE INDEX (CPI)**

Figure 6.11 below shows the response of inflation (prices) to a one standard deviation of all the variables in the model. Based on the results, the volatility from international interest rates has an increasing (although it later declines) positive impact on prices in SADC countries while the volatility from net foreign portfolio investment has a decreasing negative impact. This indicates that external shocks have both positive and negative impacts on domestic prices in SADC countries. The implication is that, a rise in interest rates in the global market increases prices in the domestic economy from the first period to the sixth periods before it declines steadily for the entire periods while the volatility from net foreign portfolio investments decreases prices from the first to the second periods but eventually picks up on an increasing trend from the second to the eighth periods towards a positive note before becoming insignificant. It can therefore be inferred that external shocks have both positive and negative impacts on domestic prices and that the impacts of external shocks increase over time (Al-Jawarneh and Sek, 2012). In addition, it is observed that the volatility from RGDP and money supply have increasing and significant impacts on domestic prices. This is supportive of the theoretical expectation that a rise in the GDP growth rate and a rise in money supply will lead to an increase in the general price (inflation) level. This might not be unconnected to the increase in demand for goods and services in the market, which may have led to the initial price increase. Furthermore, the resultant volatility (increase) from interest rates reduces prices (inflation) in the long run. A slight increase is observed at the initial point but it declines sharply to reduce inflation from the fourth to the tenth months. This is an indication of the effectiveness of monetary policy instruments in stabilizing prices in low-income SADC countries. It conforms to Walsh's (2009) recommendation that monetary policy should be used to stabilize economic activity.

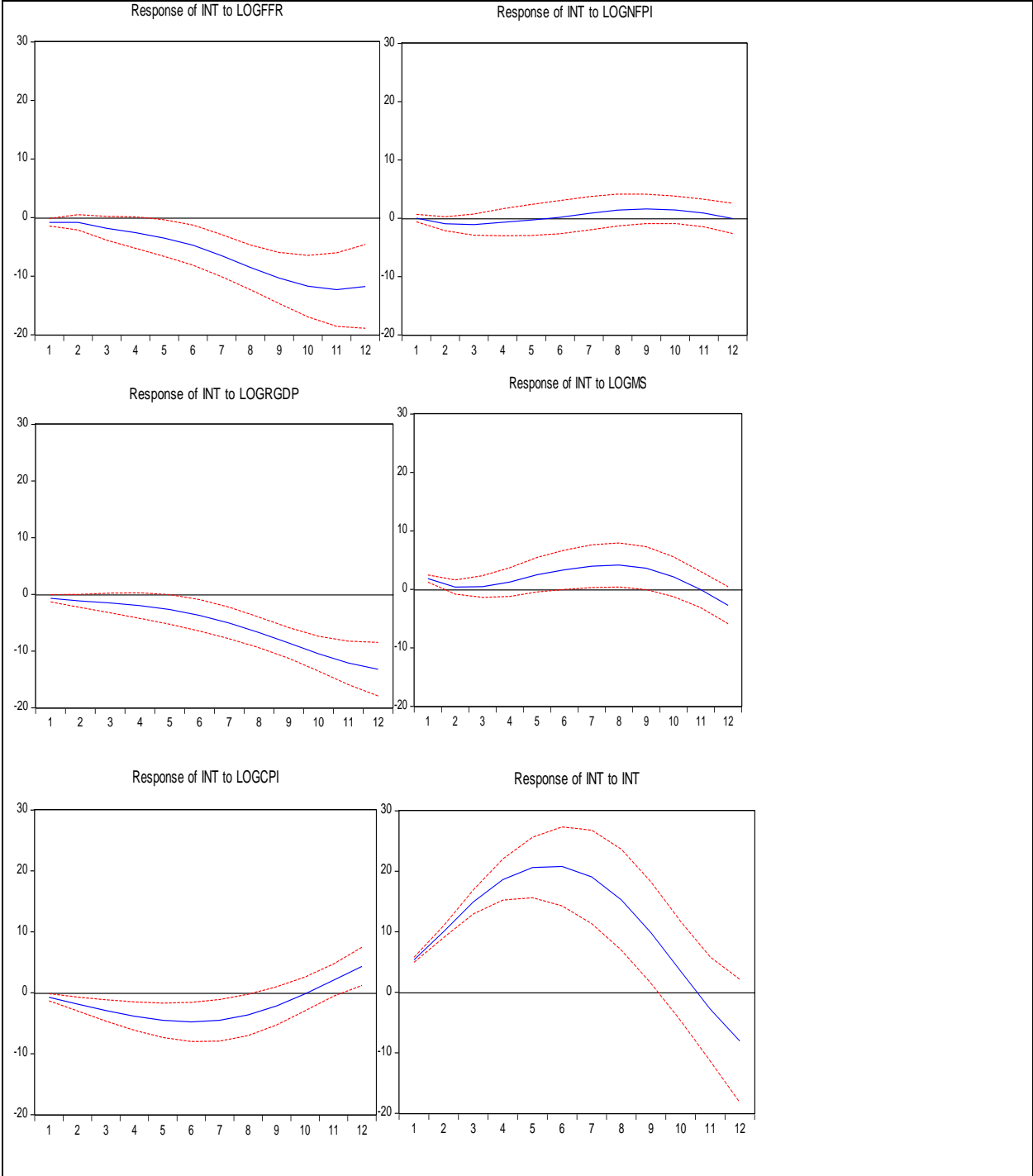
**Figure 6.11: The Impulse Response of Consumer Price Index (CPI)**



### **6.9.6 THE IMPULSE RESPONSE OF INTEREST RATES (IN)**

Figure 6.12 below shows the responses of domestic interest rates to volatility or shocks from international interest rates, net foreign portfolio investment, real GDP, money supply and prices. The effect of the external shock or volatility in international interest rates on domestic interest rates is identical to that of the real GDP shock. It is observed from both shocks that the domestic interest rate begins to fall for the entire periods. There are negative and significant impacts of external shocks and GDP growth on interest rates in SADC countries. This conforms to the theoretical expectation that as the economy grows, the cost of borrowing will be reduced due to an increase in money supply. Conversely, volatility arising from net foreign portfolio investment does not significantly impact domestic interest rates in SADC countries for the entire periods. Nonetheless, money supply has a significant impact on interest rates. The implication is that, interest rates respond to increases in money supply. As the supply of money increases, the interest rate falls as observed in the first and second periods as well as from the fifth period to the ninth period before becoming insignificant. Finally, the price shock or volatility also causes the interest rate to fall. It is further observed that a rise in the CPI causes interest rates to fall. This conforms to economic theory that both prices (inflation) and interest rates work in an opposite direction in line with the Philip's curve where there is an inverse relationship between inflation and unemployment. There is also a negative linkage between interest rates and inflation. As the interest rate increases, inflation falls (vice versa).

**Figure 6.12: The Impulse Response of Interest Rates (IN)**



## 6.10 THE VARIANCE DECOMPOSITION

Next, the study analyzes the variance decomposition of the shocks or volatility. As previously defined, variance decomposition explains the percentage or unit response of each variable in the model to different one standard deviation innovations or shocks. In other words, this study seeks to explain the contribution of various innovations or volatility in global interest rates, net foreign portfolio investment volatility, RGDP, money supply, inflation and interest rate. A 12-quarter period covering three years is examined below. The 3<sup>rd</sup>, 6<sup>th</sup>, 9<sup>th</sup> and 12<sup>th</sup> quarters (see Tables 6.15 to 6.20) are also specifically reviewed for convenient and easy interpretation of the results.

### 6.10.1 THE VARIANCE DECOMPOSITION OF FEDERAL FUNDS RATE (FFR)

Table 6.15 shows the contribution of each volatility to changes in the international interest rate. In the first quarter, the table shows that its own volatility (about 78.47%) accounts for much of the volatility in the international interest rate. Furthermore, except for domestic interest rate, which is another monetary policy instrument that contributes about 18.37%, all the other variables do not significantly contribute to the volatility of international interest rates. However, the tide changes over time and its own volatility diminishes from 78.47% in the first quarter to 22.94% in the fourth quarter. The contributions of domestic interest rate, money supply and real GDP to the volatility of the global interest rate continue to increase. For example, the domestic interest rate's contribution increases from 18.37% in the first quarter to 57.84% in the fourth quarter; while the contribution of inflation increases from 1.02% in the first quarter to 3.79% in the fourth quarter and real GDP's contribution increases from 1.64% in the first quarter to 4.37% in the fourth quarter. This is an indication that domestic interest rates, real GDP and prices may have an effect on global interest rates. It is also observed that global interest rates are responsive to net foreign portfolio investment volatility and money supply only in the short run. Their contributions diminish over time and hence, do not significantly account for the volatility of the global interest rate in the long run.

**Table 6.15: The Variance Decomposition of Federal Funds Rate (FFR)**

Period	S.E.	LOGFFR	LOGNFPI	LOGRGDP	LOGMS	LOGCPI	INT
3	0.394009	78.47913	0.470054	1.647814	0.003928	1.025335	18.37374
6	0.584073	53.18670	2.001258	3.097756	9.079897	3.631196	29.00319
9	0.663941	42.27752	4.996852	2.980975	15.24889	3.612191	30.88357
12	0.949559	22.94387	2.865039	4.378870	8.178671	3.791009	57.84254



### 6.10.2 THE VARIANCE DECOMPOSITION OF NET FOREIGN PORTFOLIO INVESTMENT (NFPI)

As noted in Table 6.16, the contribution of different shocks or volatility to net foreign portfolio investment volatility reveals that an interest rate shock, which is a monetary policy instrument, makes the highest percentage contribution to net foreign portfolio investment variability. This is maintained for all four periods shown in the table. This suggests that the growth rate of portfolio investment responds to interest rate changes. Again, global interest rates also contribute significantly to the volatility of net foreign portfolio investment. Global interest rates record a marginal increase in contribution from the first to the second quarter (14.50% to 17.45%) but decline in the third and fourth quarter. This is a sign that the global interest rate may not contribute significantly to the volatility of net foreign portfolio investment in the long run. Real GDP and money supply exhibit the same trend and may not contribute significantly to the volatility of net foreign portfolio investment in the long run. However, it is observed that inflation continues to contribute to the volatility of net foreign portfolio investment in SADC countries. Its contribution increases significantly from 0.21% in the first quarter to 4.12% in the fourth quarter. This means that the level of inflation (prices) can determine the variability of net foreign portfolio investment in low-income SADC economies.

**Table 6.16: The Variance Decomposition of Net Foreign Portfolio Investment (NFPI)**

Period	S.E.	LOGFFR	LOGNFPI	LOGRGDP	LOGMS	LOGCPI	INT
3	0.302990	14.50567	16.64589	1.595420	23.73072	0.217517	43.30478
6	0.377541	17.45723	11.10213	4.742268	20.34212	1.477541	44.87872
9	0.439027	13.98485	10.01737	4.010562	20.19085	1.514539	50.28182
12	0.662178	7.891158	4.531688	2.170887	9.915482	4.124959	71.36583

### 6.10.3 THE VARIANCE DECOMPOSITION OF REAL GROSS DOMESTIC PRODUCT (RGDP)

Table 6.17 shows real GDP's response to the various one standard deviation shocks. Four major volatilities appear to have a very large impact on GDP growth, namely, global volatility (international interest rates and net foreign portfolio investment), money supply and interest rate volatility. The trend of effect of the volatility of the GDP growth rate shows that its own shock makes the highest contribution for the entire periods, but such contribution is on a downward trend

from 72.70% in the first quarter to 63.60% in the third quarter, later increasing to 69.46% in the fourth quarter. Subsequently, the two external variables capturing the impacts of global shocks or volatility are also found to contribute significantly to the volatility of real GDP for the entire periods. While the impact of the volatility of global interest rates is found to diminish over time (from 19.39% in the first quarter to 9.76% in the fourth quarter), the effect of the variability of net foreign portfolio investment is on an increasing trend in contributing to the volatility of real GDP from 3.67% in the first quarter to 5.46% in the fourth quarter. This is an indication that, in the long run, global interest rates may not contribute significantly to the volatility of real GDP; rather, the volatility of net foreign portfolio investment may account for real GDP growth. With regard to the study's objective, net foreign portfolio investment volatility has a significant impact on real GDP variations in low-income SADC countries. Furthermore, it is found that prices account for a lower contribution to GDP from the second to the fourth quarter. The contributions of money supply and interest rates are highly noticeable for the entire horizon.

**Table 6.17: The Variance Decomposition of Real Gross Domestic Product (RGDP)**

Period	S.E.	LOGFFR	LOGNFPI	LOGRGDP	LOGMS	LOGCPI	INT
3	0.208865	19.39250	3.674524	72.70759	1.077279	0.138983	3.009124
6	0.354329	18.23137	4.498123	64.04574	2.217413	1.194466	9.812890
9	0.465444	13.41134	5.207918	63.60074	3.382438	1.990136	12.40742
12	0.555109	9.764927	5.461602	69.46993	3.322924	1.852409	10.12821

#### **6.10.4 THE VARIANCE DECOMPOSITION OF MONEY SUPPLY (MS)**

The outcomes of variance decomposition of money supply are depicted in Table 6.18 below. Of all the volatility in the first quarter, only global interest rates, net foreign portfolio investment and domestic interest rates contribute significantly to the volatility of money supply while real GDP and prices do not. Global interest rates account for the highest contribution among the variables that contribute significantly. For example, global interest rates account for about 52.40%, domestic interest rates account for 19.80% and net foreign portfolio investment volatility accounts for 3.82%. This is an indication that interest rates as monetary policy instruments have significant effects on money supply in low-income SADC countries. This continues for all the periods from 19.80% in the first quarter to 57.20% in the fourth quarter. It is an indication that interest rates have a direct impact on money supply. Again, it is observed that real GDP growth also contributes

to the volatility of money supply in the long run. Its contribution grows from 0.45% in the first quarter to 3.27% in the fourth quarter. This means that as real GDP grows, money supply also increases; an indication that all is well with the economy. Conversely, the contributions of external shocks (both global interest rates and net foreign portfolio investment) continue to diminish over time. For example, the contribution of global interest rates diminishes from 52.40% in the first quarter to 21.62% in the fourth quarter while that of net portfolio investment volatility diminishes from 3.82% in the first quarter to 3.74% in the fourth quarter. These findings reveal that external shocks or volatility may not account for the volatility of money supply in low-income SADC countries. Finally, it is observed that prices significantly account for the volatility of money supply in SADC countries. This is confirmation that the shock or volatility from prices appears to influence the money supply in the economy.

**Table 6.18: The Variance Decomposition of Money Supply (MS)**

Period	S.E.	LOGFFR	LOGNFPI	LOGRGDP	LOGMS	LOGCPI	INT
3	0.149512	52.40556	3.828215	0.453321	23.34976	0.161035	19.80211
6	0.290469	45.18118	1.600728	2.241361	9.567864	2.259865	39.14900
9	0.342228	37.10928	4.471949	2.157517	18.02105	3.371524	34.86868
12	0.470602	21.62139	3.740741	3.278659	11.13726	3.019870	57.20208

### 6.10.5 THE VARIANCE DECOMPOSITION OF CONSUMER PRICE INDEX (CPI)

Table 6.19 below shows the contributions of each shock in the model to fluctuations in prices (inflation rate). As noted in previous discussions, monetary policy instruments directly influence the supply of money in the economy. The effect of interest rates on the volatility of prices is very high compared to that of other volatility in the system, apart from global interest rates. It can be concluded from the analysis that the monetary policy instrument effectively stabilizes prices in the economy. Interest rates make an increasing contribution to the volatility of prices, from 2.36% in the first quarter to 44.10% in the fourth quarter. Global interest rates also contribute significantly to the volatility of prices from 28.57% in the first quarter to 36.58% in the fourth quarter. However, the contributions of net foreign portfolio investment volatility, real GDP and money supply are on a downward trend and a departure from what we witnessed in the volatility of interest rates. For example, the contribution of net foreign portfolio investment declines from 11.20% in the first quarter to 2.56% in the fourth quarter, real GDP declines from 9.10% to 1.54% and money supply declines from 15.73% to 6.72%. However, the contribution of money supply picked up in the

fourth quarter, indicating that an increase in money supply will lead to an increase in the volatility of prices in the economy. This is in line with economic theory that a rise in money supply will cause inflation in the economy. Overall, monetary policy instruments (interest rates and money supply) are effective tools in stabilizing the general price level in the low-income economies of SADC countries.

**Table 6.19: The Variance Decomposition of Consumer Price Index (CPI)**

Period	S.E.	LOGFFR	LOGNFPI	LOGRGDP	LOGMS	LOGCPI	INT
3	0.335771	28.57281	11.20866	9.107629	15.73230	33.01061	2.367985
6	0.809427	38.51927	5.102461	2.005912	6.654770	12.64786	35.06973
9	1.192729	38.46657	2.616164	1.646689	4.255727	6.793103	46.22175
12	1.308874	36.58438	2.567006	1.543575	6.723321	8.476849	44.10487

### 6.10.6 THE VARIANCE DECOMPOSITION OF INTEREST RATES (IN)

Finally, Table 6.20 below shows the contributions of each shock to fluctuations in interest rates. The results show that interest rate volatility contributes the most to its own volatility for the entire periods. Again, this underscores the importance of interest rates in the model as a monetary policy instrument. However, net foreign portfolio investment volatility does not contribute significantly to the volatility of interest rates for the entire period. Conversely, global interest rates continue to have a considerable effect on domestic interest rates. This is due to the fact that the Federal Reserve acts as a leader in setting monetary policy (Elbourne, 2008) and the US is the most industrialized economy in the world (Reinhart and Rogoff, 2008). Real GDP also makes an increasingly significant contribution to the volatility of interest rates in SADC countries. This finding is also a clear departure from our previous results where real GDP was observed to have a decreasing impact on prices. The contribution of GDP to the volatility of interest rates increases from 1.08% in the first quarter to 15.65% in the fourth quarter. This is an indication that the GDP growth rate will reduce the interest rates charged in the economy. As the economy grows, the cost of borrowing also declines. The primary benefit of low interest rates is their stimulus effect on economic activity. By reducing interest rates, the monetary authorities can help spur business spending on capital goods — which also enhances the economy’s long-term performance — as well as household expenditure on homes or consumer durables like automobiles. Finally, we also observed that both prices and money supply contribute to the volatility of interest rates. Money supply is a monetary policy instrument while price is a target variable. Their significant impact on interest rates shows

that the policy and target variables work in harmony in the low-income economies of SADC countries.

**Table 6.20: The Variance Decomposition of Interest Rates (IN)**

Period	S.E.	LOGFFR	LOGNFPI	LOGRGDP	LOGMS	LOGCPI	INT
3	19.47585	1.234030	0.554487	1.085560	0.993390	3.274697	92.85784
6	41.56170	2.645106	0.157699	1.667292	1.319898	4.084769	90.12524
9	53.62989	9.285514	0.277169	6.022480	2.395492	3.782714	78.23663
12	62.09552	17.98407	0.279961	15.65469	2.099411	3.421321	60.56054

## 6.11 CONCLUSIONS

Using a 6 by 6 matrix and similar variables on low-income SADC countries to obtain results for the study's third objective, the second *PVAR* model determines the impact of changes in net foreign portfolio investment volatility on low-income economies. After estimating the model, the results from the orthogonalized impulse responses and the variance decomposition reveal that global volatility has strong effect on real GDP growth in these low-income economies. The two external variables capturing the impacts of global shocks or volatility are found to contribute significantly to the volatility of real GDP for the entire periods. In particular, the impact of volatility on net foreign portfolio investment has been on an increasing trend in contributing to the volatility of real GDP for the entire periods. This reveals that net foreign portfolio investment volatility has a great impact in causing the variability of real GDP in low-income SADC countries. Furthermore, it is revealed that prices, money supply and interest rates impact significantly on the economic activities of low-income SADC countries.

With reference to monetary policy instruments, interest rates have a high influence on money supply in SADC countries. This continues for the whole periods from 19.80% in the first quarter to 57.20% in the fourth quarter. This is an indication that interest rates have a direct impact on money supply. It is further observed that prices significantly account for the volatility of money supply in SADC countries. This confirms that the shock or volatility from prices appears to influence money supply and leads to inflation in the economy. Notwithstanding, monetary policy instruments (interest rates and money supply) are effective tools in stabilizing the general price level in the low-income economies of SADC countries.

## **6.12 INFERENCES AND COMPARISONS BETWEEN THE TWO PVAR MODELS IN SADC COUNTRIES**

The first PVAR model determines the impact of changes in the net foreign remittance volatility of low-income SADC countries while the second PVAR model determines the impact of changes in net foreign portfolio investment variability on the low-income economies of SADC countries. The findings from both the impulse response functions and variance decomposition analyses have shown the diverse ways through which volatility from net foreign remittance and net foreign portfolio investment volatility affect the performance of the SADC economies. Firstly, the results from both models have shown that SADC countries respond favourably to global volatility. Global interest rates, net foreign remittance and net foreign portfolio investment volatility have some impacts on low-income SADC countries. The results of this investigation conform to Berg et al.'s (2011) study on global disturbances and their effect on less developed economies. The study reveals that global shocks sharply reduced aggregate output because low-income countries were unusually synchronized and that the growth rate declines on average, leading to a decline in export demand.

Secondly, it can be deduced from these analyses that global shocks are rapidly transmitted to the domestic economy. These shocks are found to impact all the variables in the two models and sometimes lasted for a long period. This is in line with Claessens et al.'s (2010) study that found that there was cross-country spread and transmission of global shocks (severity of the real economic impacts) for the 58 advanced countries and emerging markets investigated. It is revealing in the case of SADC countries that the effect of global shocks or volatility is felt directly on the economy.

It is also apparent from the impulse response analyses in both models that pressure on the price level and money supply contribute substantially to output growth (real GDP) in the SADC countries. As the price level increases, total output of goods and services also increases. The effect of a rise in the money supply growth rate as a result of a fall in interest rates reflects on output. For instance, a shock from money supply produces a falling inflation rate, but output growth rises in response to the same shock; and a shock from interest rates produces a fall in inflation and money supply. The variance decomposition analysis also appears to support this behavior. The response of output (GDP) to an inflation shock is also found to be significant for the entire periods. Both

money supply and interest rate shocks have been shown to have an impact on the real GDP growth rate as the period progresses. On comparative grounds, it can be inferred from the impulse response analyses and the variance decomposition that interest rate shocks are most likely to have a negative effect on output, while money supply shocks appear to have a desirable effect on the growth of output in SADC countries. The variance decomposition results also reveal that output growth responds significantly to the two monetary policy operating tools, that is money supply shock and interest rate shock.

Overall, the results from the two models reveal that changes in net foreign remittance volatility and net foreign portfolio investment volatility impact on the growth rate (RGDP) of the low-income SADC economies. The results have shown that shocks in net foreign remittance volatility impact positively on real GDP, while changes in NFPI volatility exert negative pressure on real GDP. This might be connected to the fact that investors are profit driven and will always invest in an economy where a high rate of return can be guaranteed. The economic and political instability in some SADC countries may have accounted for the negative impact of net foreign portfolio investment on the economy as investors may easily withdraw their investments due to perceived volatility in the economy (for example, in the case of Zimbabwe). Conversely, the positive impact of net foreign remittance on the economy may be due to the necessity of foreign migrants sending money to their family at home irrespective of the economic situation and also to show some support for their country. It can therefore be inferred from the study's results that the volatilities of net foreign remittance and net foreign portfolio investment flows have significant impacts on low-income SADC economies. Policymakers thus need to be conscious of and consider both impacts when formulating and implementing policies that can impact on the economy.

Chapters 4, 5 and 6 focused on the analysis of the findings with respect to each of the research objectives set out in Chapter 1. Chapter 7 concludes the study by providing a summary of the entire thesis and makes recommendations to policy makers, investors and academia.

## **CHAPTER 7 : SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

### **7.1 MAIN AIM AND OUTLINE OF THE STUDY**

This study investigated the main sources of net foreign capital flow volatility in low-income SADC countries and also explored the dynamic effects of changes in net capital flow volatility in these economies. It was revealed that low-income economies are characterized by shallow and narrow, illiquid financial markets that are highly susceptible to sudden surges, stops and reversal in foreign capital flows. To this end, the study further examined whether the relationship among the concepts of net capital flow volatility, financial deepening and the performance of capital markets is causal in low-income SADC countries. The motivation for this study stemmed from the need to promote sustainable economic and financial growth in low-income SADC countries supported by stable inflows of foreign capital. The research focused on only two disaggregated net foreign capital flows, namely, net foreign portfolio and net foreign remittances flows as they have recently experienced phenomenal growth in developing countries. These capital flows have been an invaluable source of critical finance to fund the persistent savings-investment gap in developing countries. However, the limited absorption capacity of low-income financial markets coupled with uncertainty surrounding the unpredictability of capital flow fluctuations poses serious policy challenges and dilemmas regarding these inflows. Further motivation for the study was also derived from the need to provide quality, valuable and empirically tested quantitative information on low-income SADC countries which can guide economic policy makers, investors and academia. In addition, sudden growth in the magnitude, importance and volatility of portfolio and remittance flows which have occurred simultaneously with financial deepening poses threats to the performance and stability of developing economies. To address these concerns, the study set three major and measurable objectives:

- Ascertain the main predictors of net capital flow volatility in low-income SADC countries
- Establish the short-run and long-run causal relationships among net capital flow volatility, financial deepening and the performance of capital markets in low-income SADC countries
- Evaluate the dynamic impacts of changes in net capital flow volatility in low-income SADC countries.



The remainder of the chapter focuses on the literature reviewed to support the study and how the research objectives were fulfilled as well as a summary of the research findings.

## **7.2 SUMMARY OF THE LITERATURE REVIEWED**

The theoretical and empirical literature was examined in detail in Chapter 2 of this study. Theories that support free mobility of capital flows as well as those governing the process of financial deepening and the important concept of capital market liberalization in developing countries were discussed. Furthermore, the empirical literature that supports the study of capital flow volatility was extensively reviewed, targeting portfolio and remittance flow volatility.

### **7.2.1 CAPITAL FLOW MOBILITY THEORIES**

Four theories were introduced in order to explain the magnitude and direction of cross border movement of capital across the globe. Firstly, the *Neo-Classical model* predicts that capital should flow from advanced economies with high capital to labor ratios to less developed countries with low capital to labor ratios (Frenkel, Frunk, and Stadtmann, 2000, Hossein, 2005). Given this hypothesis, capital should flow from advanced economies to developing countries and not vice versa.

Secondly, the *Portfolio Theory of International Capital Flows* suggests that the currency composition of national portfolios contributes to capital flow movement between two economies (Devereux and Saito, 2006). For instance, a current account shortfall is financed by net financial inflows which reflects differential movements in holdings of assets and liabilities. This entails that capital should move from surplus agents to deficit agents.

Thirdly, the study applied the *Portfolio Balance Framework* pioneered by Fernandez-Arias (1996) and Fernandez-Arias and Montiel (1996), which stipulates that investors diversify portfolio holdings between domestic and foreign financial assets that comprise bonds and equity depending on expected rates of return. On this basis, the direction of international financial flows can be determined by the percentage gain on financial instruments in the receiving economy.

Finally, Moody and Taylor (2004) proposed the *Disequilibrium Approach to Capital Flows* whereby the determinants of supply and demand for capital flows are also critical in determining the direction of flow of international financial capital. The theoretical appeal of this approach stems

from its argument that capital flows might not be responsive to interest rate movement as a result of credit rationing such that financial markets will fail to clear. If the markets consistently lack equilibrium, foreign capital will be mobile.

### **7.2.2 CAPITAL MARKET LIBERALISATION (CML)**

Capital market liberalization entails the removal of financial restrictions targeted at reducing global financial flows and also includes issues around the convertibility of domestic currency in global financial transactions (Kaminsky and Schmukler, 2008). These reforms have been considered crucial, particularly in the study of low-income countries that are undergoing rapid transformation. On the other hand, some empirical literature has indicated the need to put in place prudential measures to achieve and preserve financial stability in the economy (Mohan and Kapur, 2010, Kaminsky and Schmukler, 2008). Given this, a well-planned and sequenced model of capital account opening can promote economic growth. However, opponents of CML deny the existence of a connection between growth and openness (Akçelik et al., 2015). Furthermore, critics continue to argue that the liberalization of capital flows is responsible for the instability that haunts most economies (Stiglitz and Ocampo, 2008).

### **7.2.3 CAPITAL FLOW PROBLEMS: THEORIES**

Three major theories proposed by Fernández-Arias and Hausmann (2000) were reviewed in Chapter 2 to explain the challenges associated with foreign capital flows to developing countries. Firstly, *Theories of Too Much* suggest that excessive capital flows lead to too much credit in the economy that can distort allocation of resources and may lead to the moral hazard problem. Secondly, *Theories of Too Little* suggest that distortions in the economy can inhibit enforcement of contracts, resulting in limited capital flows and frequent crises. This theory assists in explaining a persistently worrying economic theory which predicts that capital should move from capital surplus economies to capital deficit economies and equalize labor ratios. However, after several years of free capital mobility, capital to labor disparities remain very high. Finally, the third set of theories focuses on the instability of financial markets in developing countries and the unreliability of foreign capital flows to sustain growth and development. This points to *Theories of Too Volatile* that have been widely used to explain recent crises and financial contagion.

#### **7.2.4 FINANCIAL DEEPENING**

The concept of financial deepening was pioneered by Edward (1973), who defined it as the mechanism that explains changes in the financial system that promote provision of diverse financial services targeting all levels of society. A number of approaches have been proposed in the empirical literature to measure financial deepening. These include the ratio of money supply to GDP (Rahman and Mustafa, 2015, Sackey and Nkrumah, 2012, Giuliano and Ruiz-Arranz, 2009, Gupta et al., 2009); or ratio of private sector credit to GDP (Di Giovanni, 2005) and the ratio of market capitalization or liquidity to GDP (Rahman and Mustafa, 2015). Regarding financial deepening, the Keynesian school of thought highlighted the role of government by indicating that government expenditure on its projects increases money supply to the economy, thereby driving financial deepening. However, the question of the causality between financial deepening and economic growth has remained unresolved in the econometric literature because it is difficult and complex to determine. Two distinct schools of thought have emerged that attempt to explain this relationship. The *supply leading hypothesis* argues that financial deepening supports economic growth (King and Levine, 1993, Chakraborty, 2008) while the *demand following hypothesis* argues that economic growth leads to financial development (Odhiambo, 2008, Waqabaca, 2004, Agbetsiafa, 2003).

#### **7.2.5 FOREIGN REMITTANCES VOLATILITY**

No consensus has been reached on whether or not remittances promote economic growth (Wadood and Hossain, 2015, Siddique et al., 2012). Although foreign remittances increase the level of income in the recipient economy and also assist in poverty reduction, it is not yet certain whether this increases output and promotes long-term growth. Previous correlation studies between the magnitude of remittances and economic performance in the receiving economy have not been conclusive (Singh et al., 2010). For instance, Yang and Choi (2007) found a negative relationship between income and remittances. Remittances have been widely regarded as a stable and critical source of external finance for the developing world (Chami, 2009, Ratha and Mohapatra, 2007). However, this study has a keen interest in the notion that the magnitude of remittance volatility is significant enough and policy makers cannot afford to ignore it (Jackman, 2013, Ghosh, 2006). In line with this argument, volatility of remittances has been observed to rise during times of hardship or natural disasters (a common feature of low-income countries). Following this argument, several factors have been linked to remittance volatility. These include macro-economic volatility, that is,

interest rate and exchange rate fluctuations, and the nature of remittances whether or not they are investment or profit driven (Jackman, 2013). Furthermore, there is a tradeoff between brain drain and remittance stability as skilled migrants result in more stable flows (Jackman, 2013, Craigwell et al., 2010). Makhoul and Mughal (2011) found that remittances to Pakistan were more stable than flows to the Middle East or North America as a result of differences in output variability and the profile of migrants.

### **7.2.6 FOREIGN PORTFOLIO INVESTMENT VOLATILITY**

Portfolio flows have been described as cross border investments in both equity and debt markets (Lo Duca, 2012b) that are also a vital source of private capital to virtually all economies (Karimo and Tobi, 2013). The literature has indicated that portfolio flows are short term in nature and they have been described as hot money due to their reversibility. This has been partly attributed to investors' herding behavior as they diversify and seek opportunities (Lo Duca, 2012b). Receiving economies have to contend with the degree of volatility in foreign portfolio investment flows and some policy mix may be required to address the risks associated with these capital flows (Akçelik et al., 2015). Several variables have been suggested in the literature as the main drivers of volatility in portfolio flows. These include exchange rates, level of returns, inflation rate, stock market performance (Waqas et al., 2015, Kodongo and Ojah, 2012, Çulha, 2006), real exchange rates (Carrieri et al., 2006) and industrial production (Neumann et al., 2009, Daude and Fratzscher, 2008). An important finding in the literature is that the drivers of capital flow volatility change over time due to information asymmetries, and changes in tastes and preferences as well as allocation strategies (Lo Duca, 2012b, Adrian and Shin, 2010).

### **7.2.7 VOLATILITY ESTIMATION**

There is a significant body of theoretical and empirical econometric literature on volatility approximation. Prediction and modelling of volatility is important in investment markets because it assists in investment appraisal, securities pricing, risk management and the design of monetary policy (Gokbulut and Pekkaya, 2014, Poon and Granger, 2003). The need for a more accurate and robust measure of volatility has resulted in on-going research and more recent approaches to volatility estimation. Some of the models that can be considered in volatility estimations are *Rolling Window Standard Deviation*, *Exponentially Weighted Moving Average (EWMA)*, *Stochastic Volatility Models* and the *GARCH models*. However, the study adopted the Engle and

Rangel Residual method following similar studies on capital flow volatility such as Broto et al. (2011) and Neumann et al. (2009). Unlike other approaches, the residual method proved to be a robust approach that permits long-term volatility forecasts to be based on macro-economic factors and offers the volatility estimates anticipated in a newly opened economy (Engle and Rangel, 2008). This approach was appropriate for this study on low-income SADC economies which are undergoing significant financial and economic reforms in order to liberalize their markets.

### **7.3 OVERVIEW OF RESEARCH METHODS**

The study employed different panel data regression methods to address its three objectives. Panel data has more explanatory power, minimizes collinearity among the variables employed and provides more degrees of freedom compared to time series and cross-sectional data (Hsiao, 2014, Baltagi, 2008, Gurajati, 2004). Panel data analysis facilitates the investigation of complex behavioral models such as economies of scale that cannot be entertained in time series models (Baltagi, 2008, Gurajati, 2004). Furthermore, dynamic panel data improves the efficiency of econometric estimates by producing more accurate inferences of model parameters.

#### **7.3.1 PANEL AUTOREGRESSIVE DISTRIBUTED LAG (P-ARDL)**

The P-ADRL approach was employed to address the study's first objective, namely, to ascertain and explain the main predictors of net capital flow volatility in low-income SADC countries. After estimating volatility for each capital flow and each country, a panel data was set up. The choice of this estimation technique was based on rigorous analysis of its merits and demerits which resulted in its strengths outweighing its limitations. Its powerful advantages include the fact that this technique is flexible with small sample studies, it is able to accommodate variables that are of different order of integration, that is,  $I(0)$  and  $I(1)$  variables and it is also able to account for cross sectional dependency. Finally, by using this technique different variables can be assigned different lags in the same model.

#### **7.3.2 PANEL VECTOR ERROR CORRECTION MODEL (P-VECM)**

The second objective of the study required the estimation of short-run and long-run causal relationships among net capital flow volatility, financial deepening and the performance of the capital markets in low-income SADC countries. The choice of this approach was guided by similar studies such as Rahman and Mustafa (2015), and Mahadevan and Asafu-Adjaye (2007). This

method is very powerful in clearly distinguishing between short-run and long-run causal relationships and is also able to indicate the direction of causality.

#### **7.3.4 PANEL VECTOR AUTOREGRESSION (P-VAR)**

Finally, the study's third objective was to evaluate the dynamic impacts of changes in net capital flow volatility in low-income SADC countries. This was achieved by using the panel vector autoregression model which is powerful in indicating the propagation of shocks through its tools of impulse response functions and variance decomposition. Based on Lütkepohl (2012), a VAR system is an important tool for examining the dynamic behavior of economic and financial data. However, it was noted that an unrestricted VAR with unit root tests is undesirable as it lacks consistency and can mislead policy analysis.

#### **7.3.5 SAMPLE, DATA AND DATA SOURCES**

The study focused on a unique sample and quarterly data set of low-income SADC countries for the period spanning 16 years from 2000 to 2015. The major macro-financial variables of interest were net foreign portfolio investment volatility, net foreign remittance volatility, stock market indices, inflation, domestic interest rates, real domestic product, money supply, federal funds rate and WGDP. Data for these variables was retrieved from the World Bank data bank, the IMF's IFS, Bloomberg for mostly financial data, and the central banks of each country and their respective statistical offices.

### **7.4 SUMMARY OF RESEARCH FINDINGS**

The study used different models for each of the three objectives. As indicated in Chapters 4, 5 and 6, each objective was divided into two sections with the first focused on net remittance volatility as the dependent variable while the second section dealt with net foreign portfolio investment volatility.

#### **7.4.1 SOURCES OF NET CAPITAL FLOW VOLATILITY**

Firstly, the volatility of net capital flows across the entire study was calculated based on the absolute values of residuals (Engle and Rangel, 2008, Broto et al., 2011). Secondly, a panel Autoregressive Distributed Lag (P-ARDL) model was used to determine the main predictors of net capital flow volatility in low-income SADC countries. The analysis presented empirical evidence on the variables that support the behavior of remittance volatility in low-income

countries. The estimation of net foreign remittance and net foreign portfolio flows volatility using the Engle and Rangel (2008) residual approach for macro-economic variables is in itself unique.

The findings of the study revealed that prices (CPI), money supply and real GDP have a positive long-run effect on net remittance flow volatility in low-income SADC economies. On the other hand, global interest rates (FFR) and domestic interest rates were negatively related with remittance volatility. These findings are in line with theoretical expectations and empirical evidence as in Adenutsi (2011) and Maimbo and Ratha (2005). Identical results were also obtained by Jahjah et al. (2003) in their study on immigrant remittance flows and sources of capital for development. Overall, it can be deduced that all the factors used in the equation with the exception of world GDP significantly determine net foreign remittance volatility and a stable relationship was established as reflected in the negative and significant value of ECT of **-0.713288**. All the macro-financial variables were identified as significant drivers of remittance volatility.

This study revealed some of the policy challenges and dilemmas encountered in trying to address volatile capital flows resulting from the varying behavior of capital flows across type, time and cross-sectional units. Given these results, economic policy makers are advised to design sound economic policies that target the main predictors that significantly impact on remittance volatility to achieve stability and growth using remittance flows. A sound remittances policy should increase savings and investment while a poor policy can lead to high remittance instability, resulting in low savings and investment which will negatively affect the economic growth of low-income countries.

The second segment of the study dealt with the sources of net portfolio investment volatility in low-income SADC countries. After running the P-ARDL model, all the model variables indicated that they have a long-run equilibrium relationship with net foreign portfolio investment volatility. In this regard real GDP, world GDP, prices and money supply have a positive long-run effect on net portfolio investment volatility in the selected SADC countries. Conversely, but identical to the first section, global interest rates and domestic interest rates negatively influence net foreign portfolio investment volatility. The results conform to economic theory and findings in other countries (Kolodko, 2006, Neumeyer and Perri, 2005). All the variables were identified as good predictors of portfolio flows as supported by the negative and significant value of ECT of **-0.732723**. Similar to Broto et al. (2011), the study confirms the increasing significance of global variables as the major drivers of foreign portfolio investment volatility.

The results also suggest the need for policy consistency to attract foreign portfolio flows to the region so as to make stock and bond markets viable and stable. With the exception of global interest rates (FFR), the monetary and fiscal authorities are empowered to adjust the variables in both the short run and long run so as to manage adverse movements in portfolio flows in line with their policy objectives.

#### **7.4.2 NET CAPITAL FLOW VOLATILITY, FINANCIAL DEEPENING AND CAPITAL MARKET PERFORMANCE**

The second objective of the study was to determine causal and directional relationships among the three concepts of net capital flow volatility, financial deepening and the performance of capital markets in the selected SADC countries. In its two sections, the objective was fulfilled using the dynamic panel Vector Error Correction Model (P-VECM).

In the first segment involving net foreign remittance volatility, the Granger causality tests produced a bidirectional relationship between net foreign remittance flow volatility and financial deepening in the SADC countries. Remittances can be particularly volatile, especially when the economy experiences episodes of sudden growth and contraction. In addition, remittance volatility can be subject to shocks from financial deepening and the economy in general. The study further revealed that financial deepening does not Granger cause capital market performance and that capital market performance does not Granger cause financial deepening; hence, there is no causality. There was also no causality between capital market performance and net foreign remittance volatility. However, financial deepening was found to be bi-directionally related to real GDP.

Foreign remittance volatility remains a challenge to policy makers as it has significant implications for policy formulation and implementation. It is therefore recommended that policy makers and other stakeholders should target reduced remittance volatility while promoting gradual deepening of financial markets in the SADC region in order to enhance capital market performance as well as overall economic performance. Unambiguous measures are required to increase deposits and savings and, in turn, private sector credit. Coupled with financial inclusion programs, such policies could boost financial deepening and stock market performance in developing countries.



As detailed in Chapter 5, the second segment of the second objective summarizes the findings from the investigation of causal and directional linkages among net portfolio investment volatility, financial deepening and capital market performance. A well fitted and statistically significant P-VECM revealed a bidirectional relationship between GDP and the performance of capital markets. Furthermore, one-way causality was observed running from net foreign portfolio investment volatility to financial deepening, implying that portfolio flows can lead to increased financial services and capital market performance in low-income SADC countries. The findings also pointed to one-way causality from real GDP to net portfolio investment volatility. These outcomes conform to the empirical literature that shows that financial market performance is a key requirement to enhance domestic output growth (Bencivenga and Smith, 1991, King and Levine, 1993, Chakraborty, 2008). However, Arikpo and Adebisi (2017) found that financial market performance has no long-run causal relationship with net foreign portfolio investment in Nigeria. Nonetheless, this study is supported by Ibrahim et al. (2017) who concluded that net foreign portfolio investment has a significant positive impact on the development of the economy in the long run. Several other studies have also demonstrated that in the long run, net foreign portfolio investment has a significant impact on the economy and have established a causal relationship among net foreign portfolio investment, financial deepening and capital market performance (Baharumshah and Almasaied, 2009, Choong et al., 2005, Bakang, 2015).

Policy makers should thus embark on policies and programs that promote economic performance in order to attract foreign portfolio flows which will lead to financial development and increased capital market performance. There is also need to attract players in the domestic market so as to enhance financial deepening and the performance of the capital market to further strengthen the long-run causality with net foreign portfolio investment volatility. Supported by sound risk management frameworks, this could increase confidence in domestic markets and hence attract both domestic and international investors.

### **7.4.3 DYNAMIC EFFECTS OF NET CAPITAL FLOW VOLATILITY**

The third and final objective of the study focused on the dynamic effects of changes in net capital flow volatility in the selected SADC countries. This was achieved using the panel Vector Auto Regression (P-VAR) model. This objective was also divided into two parts to deal separately with the effects of net remittance flow volatility and net portfolio investment volatility.

Based on the results from impulse response analysis, SADC countries responded favorably to global volatility and global shocks are rapidly transmitted to the domestic economy and not vice versa. It was revealed that monetary policy tightening is followed by a decline in price and interest rates. Monetary policy tightening of an increase in interest rates led to a short-run price increase but contracted and led to a general price decline in the long run. More importantly, global interest rate volatility led to a negative decrease in real GDP and money supply while remittance volatility caused a positive increase in real GDP growth and money supply growth (in the form of foreign capital inflows) in low-income SADC countries. Overall, the results indicate that changes in net remittance volatility significantly impact on the growth of low-income SADC countries. On the other hand, the results from variance decomposition showed that global interest rates, remittance volatility, money supply and domestic interest rates have very high impacts on real GDP, while prices contributed significantly to economic growth for the entire period. Remittance volatility made the highest contribution to real GDP, conforming to the impulse response results where remittance volatility recorded significant impacts on economic growth. The effect of volatility in monetary policy instruments, that is, money supply and interest rates, on real GDP grew from the short run to the long run. Furthermore, the two external variables of remittance volatility and global interest rates recorded the highest contribution to money supply volatility in the low-income countries.

Given these results, in line with their mandate, the monetary authorities should use the monetary policy, variable interest rates to promote price stability. Price stability can also be achieved by controlling money supply and interest rates.

The second section of the third objective focused on the impacts of net foreign portfolio investment volatility in low-income SADC countries. The findings from orthogonalized impulse response and variance decomposition depict that global volatility significantly impacts on domestic output growth in these countries. During the entire periods, the federal funds rate and net foreign portfolio investment volatility capturing global volatility and shocks, significantly impacted on real GDP growth. This showed that net portfolio investment volatility had significant impacts and caused the variability of real GDP. Similarly, money supply, interest rates and prices significantly impacted on economic activities in the selected economies. Regarding variance decomposition, interest rates and general price shocks contributed significantly to money supply volatility. The

study also revealed that the monetary policy instruments of interest rates and money supply are effective in achieving price stability in the SADC low-income countries. In both models, global shocks were found to impact on all the variables in the model, in some cases lasting for longer periods as supported by Claessens et al. (2010). It is clear from the two P-VAR models that as price level increases, total output of goods and services also increases. In addition, a rise in money supply due to a fall in interest rates impacts on output growth. Finally, the two models indicated that changes in remittance and portfolio flow volatility significantly impact on the economic growth of low-income countries. In particular, shocks in net foreign remittance volatility positively impact on real GDP, while changes in net foreign portfolio investment volatility exert negative pressure on real GDP growth in low-income SADC countries. This could be explained by the fact that investors are profit driven and always look to invest in economies where high rates of return are guaranteed. Moreover, economic and political instability in some of the low-income countries may have led to the undesirable effects of net foreign portfolio investment volatility, especially those such as Mozambique, DRC and Zimbabwe. Conversely, the positive impacts of remittance volatility could be attributable to its role as insurance against drought or crisis.

Given these findings, economic policy makers need to be conscious of and should consider both impacts when formulating and implementing economic and financial policies.

## **7.5 CONTRIBUTION TO KNOWLEDGE**

The study is unique in that it focused on the volatility of net capital flows that were decomposed into portfolio flows and remittance flows in low-income SADC countries. A superior estimate of the volatility measure was used as proposed by Engle and Rangel (2008). The study used robust and contemporary research techniques such as Chudik and Pesaran (2013) P-ARDL to examine the sources of foreign financial flow volatility; this assisted in providing up-to-date solutions and recommendations. To the best of our knowledge, this is the first comprehensive study to jointly analyze the directional relationships among net capital flow volatility, financial deepening and capital market performance in low-income economies. Furthermore, the study is very distinct in that it quantitatively investigated the impacts of changes in capital flow volatility, thereby providing meaningful information to economic policy makers, investors and academia. Finally, contemporary and rigorous econometric methods were employed to provide up-to-date recommendations and solutions.

## **7.6 LIMITATIONS OF THE STUDY**

Decomposition of foreign capital flows into portfolio and remittance flows assists in unmasking relevant results that are hidden when one focuses on aggregate capital flows. Broto et al. (2011) indicated that analysis of aggregate financial flows is probably the most relevant variable for policy makers. The study is confined to a sample of low-income SADC countries, prompting the need for a much bigger and wider sample in future studies to minimize statistical biases.

## **7.7 AREAS FOR FUTURE RESEARCH**

This study could be expanded by examining the variability of total net capital flows and their impacts in the broader developing world. Future studies could also consider the behavior of foreign bank loans in relation to volatility in commodity prices in the developing world. In addition, an analysis could be conducted to compare the behavior of the concepts of capital volatility, financial deepening and the performance of capital markets in low-income, middle-income and high-income countries in the sub-Saharan African region.

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25 June 2018

Mr Kuziva Mamvura (215081310)  
School of Accounting, Economics & Finance  
Westville Campus

Dear Mr Mamvura,

**Protocol reference number: HSS/0683/018D**

**Project Title:** Capital Flow Volatility, Financial Deepening and Capital Market Performance in low-income countries

**Approval Notification – No Risk / Exempt Application**

In response to your application received 21 June 2018, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.

**PLEASE NOTE:** Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

.....  
Professor Shenuka Singh (Chair)

/ms

Cc Supervisor: Professor M Sibanda and Dr R Rajaram  
Cc Academic Leader Research: Professor Josue Mbanigaba  
Cc School Administrator: Ms Nondumiso Mfungeni

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**Humanities & Social Sciences Research Ethics Committee**

Professor Shenuka Singh (Chair)

Westville Campus, Govan Mbeki Building

Postal Address: Private Bag X54001, Durban 4000

Telephone: +27 (0) 31 260 3587/8350/4557 Facsimile: +27 (0) 31 260 4600 Email: [ximband@ukzn.ac.za](mailto:ximband@ukzn.ac.za) / [snymam@ukzn.ac.za](mailto:snymam@ukzn.ac.za) / [mohunp@ukzn.ac.za](mailto:mohunp@ukzn.ac.za)

Website: [www.ukzn.ac.za](http://www.ukzn.ac.za)



Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

## CAPITAL FLOW VOLATILITY

### ORIGINALITY REPORT

<b>11</b> %	<b>10</b> %	<b>5</b> %	<b>2</b> %
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

### PRIMARY SOURCES

<b>1</b>	<b>nrb.org.np</b> Internet Source	<b>1</b> %
<b>2</b>	<b>www.econstor.eu</b> Internet Source	<b>&lt;1</b> %
<b>3</b>	<b>www.cgu.edu</b> Internet Source	<b>&lt;1</b> %
<b>4</b>	<b>wscholars.com</b> Internet Source	<b>&lt;1</b> %
<b>5</b>	<b>macro.soc.uoc.gr</b> Internet Source	<b>&lt;1</b> %
<b>6</b>	<b>mpra.ub.uni-muenchen.de</b> Internet Source	<b>&lt;1</b> %
<b>7</b>	<b>Submitted to University of Exeter</b> Student Paper	<b>&lt;1</b> %
<b>8</b>	<b>scholar.sun.ac.za</b> Internet Source	<b>&lt;1</b> %
<b>9</b>	<b>eprints.kingston.ac.uk</b> Internet Source	<b>&lt;1</b> %