The Effects of Dollarisation to the Zimbabwean Economy (1990-2017)

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by

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ABSTRACT

The study aims to establish the effects of dollarisation on the Zimbabwean economy covering a period of 28 years from 1990 to 2017. The study employed Autoregressive Distributed Lag (ARDL) model to establish the short and long run relationship between dollarisation, financial performance indicators (FPIs) (Inflation, foreign direct investment, trade openness and Gross Domestic Product) and non-financial performance indicators (NFPIs) (rule of law). Annual time series data was considered under this study. In the long run dollarisation positively influences gross domestic product and trade openness and negatively influences inflation. In the short run dollarisation is significantly related to gross domestic product, trade openness and inflation. Short run results indicate that dollarisation is negatively related to gross domestic product and inflation and positively related to trade openness. Based on the findings from the empirical analysis, Zimbabwe is discouraged from de dollarizing since it requires a long-term strategy with robust policies put in place. Zimbabwe should return to full dollarisation and select the rand as an anchor currency whilst preparing to join the common monetary area. It is also recommended that Zimbabwe should put in place performance measures to measure governance indicators with emphasis on respect for property and human rights, including fighting corruption.

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DEDICATION

This thesis is dedicated to my late parents, Lovemore and Tabeth Chanakira, who valued education; hence, it became a culture that has been embedded in the whole family.

LIST OF ACRONYMS AND ABBREVIATIONS

ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criterion
AMC	Asset Management Companies
ARDL	Autoregressive Distributed Lag
BG	Breusch Godfrey
BM	Broad Money
BOP	Balance of Payments
CAP	Command Agriculture Programme
CECM	Conditional Error Correction Model
CMA	Common Monetary Area
CPI	Consumer Price Index
CSF	Critical Success Factor
CUSUM	Cumulative Sum
DR	Dollarisation Ratio
DW	Durbin Watson
ECM	Error Correction Model
ECG	Economic Growth
EU	European Union Election Observation Mission
FCC	Foreign Currency in Circulation
FCD	Foreign Currency Deposits (FCD)
FCL	Foreign Currency

FCPD	Foreign Currency Denominated Public Debt
FDI	Foreign Direct Investment
FERR	Fixed Exchange Rate Regime
FP	Financial Performance
FPI	Financial Performance Indicators
GCT	Granger Causality Test
GDP	Gross Domestic Product
GDPP	Gross Domestic Product Per Capita
GG	Gideon Gono
GMB	Grain Marketing Board
GMM	Generalised Method of Moments
GNP	Gross National Product
GNU	Government of National Unity
GPA	Global Political Agreement
IMF	International Monetary Fund
JPM	John Panonetsa Mangudya
KPI	Key Performance Indicators
KYC	Know Your Customer
LCI	Laspeyres Composite Index
LCU	Local Currency
MAA	Monetary Area Agreement
MDC	Movement of Democratic Change

MDG	Millennium Development Goals
MP	Monetary Policy
MU	Monetary Union
NPFI	Non-Financial Performance Indicators
OCA	Optimum Currency Area
OLS	Ordinary Least Squares
PACF	Partial Autocorrelation Function
RBZ	Reserve Bank of Zimbabwe
RMA	Rand Monetary Agreement
ROL	Rule of Law
RTGS	Real Time Gross Settlements
SADC	Southern African Development Community
SARB	South African Reserve Bank
SBC	Schwarz Bayesian Criteria
SOFP	Statement of Financial Position
TB	Treasury Bills
TD	Total Deposits
TDDG	Total Domestic Debt of the Government
TL	Total loans
TOP	Trade Openness
TPD	Total Public Debt
US	United States

USA	United States of America
USD	United States Dollar
VAR	Vector Auto-Regressive
VIF	Variance Inflation Factor
ZANU-PF	Zimbabwe African National Union Patriotic Front
ZEC	Zimbabwe Elections Commission
ZIMSTAT	Zimbabwe National Statistics Agency
ZSE	Zimbabwe Stock Exchange

Chapter 1: Introduction

1.1 Background

Many economists and financial pundits debate the suitability of the dollarisation of an economy. The debate centres on whether or not the adoption of a fixed exchange rate regime is a solution to hyperinflation and economic stagnation. The choice of an exchange rate policy is of critical importance because different exchange rate regimes have associated costs and benefits for the economy of the country. Exchange rate regimes affect the flow of trade, investment, inflation and even have repercussions for political stability. The exchange rate system, therefore, is an important component of managing the economy and safeguarding macroeconomic stability and competitiveness (Yagci, 2001).

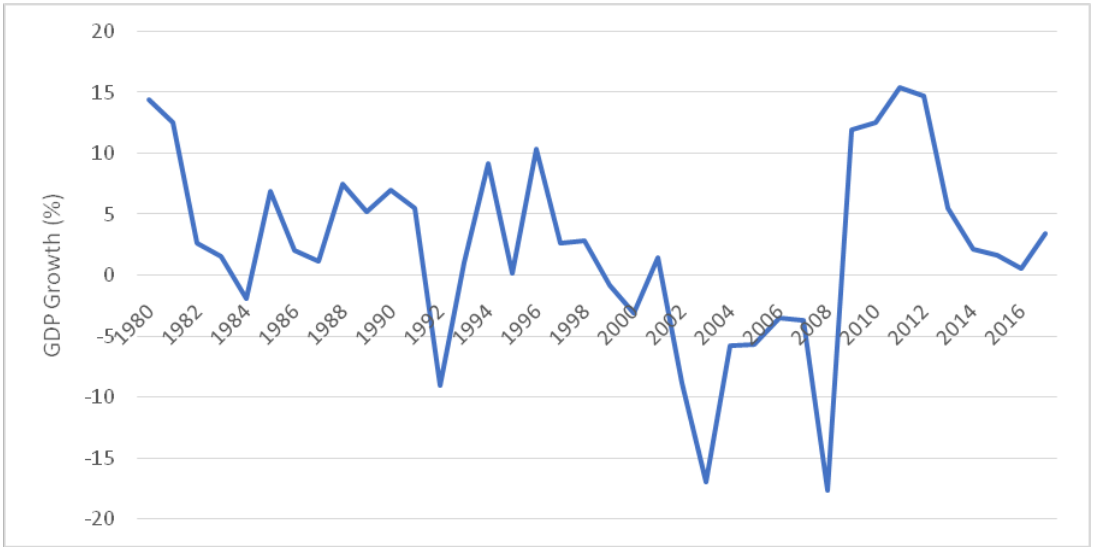
There are different types of exchange rate regimes that can be classified into four categories. The first is floating regimes that include independent and lightly managed float. The second category is intermediate regimes that include managed float and crawling broad bands. Soft peg regimes are included in the third category and comprise a crawling narrow band, crawling peg, pegged within bands and fixed peg. The final category is the hard peg regime that includes a currency board, currency union and dollarisation (Yagci, 2001). Dollarisation is defined as using a foreign currency other than the domestic currency of that country. This definition is not restricted to using the United States (US) dollars (Bannister, Guardberg, & Turunen, 2018). Most countries dollarise to achieve economic stability through the stabilisation of inflation while attaining the goal of fiscal discipline. Dollarisation, however, has a high exit barrier meaning that it is difficult to de-dollarise (Bannister et al., 2018).

1.2 Problem Statement

Following independence in 1980, the Zimbabwean economy grew rapidly, as numerous local and international investors invested in the country after two decades of war, which had frightened off investors and ravaged the country. During the early 1990s, Zimbabwe was ranked the fastest growing country in Africa driven by its agriculture and mining sectors (IMF, 2017). Towards the end of the 1990s, however, growth began to slow because of external competition for local companies as well as other restrictive economic policies arising from the International Monetary Fund (IMF) sponsored economic structural adjustment programme (Noko, 2011).

The economic growth of the country, however, became disastrous following the land reform policy of 2000, which involved the expropriation of land, as can be seen in Figure 1, with the Gross Domestic Product (GDP) contracting by 40% between 2000 and 2007. This was coupled with hyperinflation, as inflation soared to unfathomable heights (a high of 79 billion% in November 2008). The country also experienced current account deficits in the years following the land reform programme, meaning the country imported more than it exported meaning more foreign payments than inflows (Ncube, 2018). Such dire economic conditions resulted in shortages of foreign currency, local currency and daily essentials such as fuel, medicine and food. Furthermore, between 2000 and 2008, Zimbabwe's economy experienced unemployment of over 80% (Sikwila, 2013). The hyperinflation era also had a serious effect on the country's payment systems, as both banking and other information technology systems experienced problems in handling large volumes of transactions that were being processed (Reserve Bank of Zimbabwe (RBZ), 2009).

Figure 1: % Annual Economic Growth



(Source: World Bank Development Indicators Data)

In light of this economic chaos, the government was forced to implement policies to stabilise the economy and prevent the crisis from deepening further. The most critical of these policies was the dollarisation of the economy. It entailed the adoption of the multicurrency system

(using the rand, euro, pound, US dollar, metica and kwacha) instead of the Zimbabwean dollar; but with the US dollar as the dominant currency. According to the then minister of finance, Honourable Tendai Biti, dollarisation aimed to impose fiscal discipline (with perennial fiscal and current account deficits unsustainable), quasi-fiscal activities carried out by the RBZ and eliminate the printing of money. Further to this, dollarisation was meant to address hyperinflation, boost capacity utilisation that would then spur economic growth. Hyperinflation also distorted the exchange rate resulting in currency risk, with the replacement of the Zimbabwean dollar aimed at eliminating this currency risk.

The effects of dollarisation were immediate, with inflation bought under control and economic growth revitalised, as is evident in Figure 1, which shows the sharp rise in GDP from 2008 to 2009 and the sustained growth that was achieved in the years thereafter. Dollarisation also stabilised banks, as they were forced to adopt transparent practices (Noko, 2011), resulting in improved confidence in financial institutions (Kwesa, 2009).

Sikwila (2013) conducted a simple analysis of the effects of dollarisation on the Zimbabwean economy by comparing the growth rate in real GDP across sectors in the year prior to dollarisation (2008) to the average in the dollarisation years 2009 to 2012. He found that the real GDP had experienced substantial growth, especially in the agriculture, mining and financial industries. Pasara (2015) studied the nexus between dollarisation and economic growth in Zimbabwe using quarterly data from 2000 to 2014 and found dollarisation to have a positive and significant effect on economic growth in the five years thereafter.

The dollarisation policy was not, however, a panacea for Zimbabwe's problems. Traders of non-essential goods were few because long-term credit was still absent in Zimbabwe, hindering business competition and expansion. The price of Zimbabwean goods was also generally higher than that of imports (Noko, 2011). Most payments were still in cash and/or bank transfers. Civil servants were paid in US dollars, and all transactions were paid for using the US dollar currency. These conditions remain today meaning that there is a need for a continuous supply of US dollars into the economy.

Moreover, in Zimbabwe, the monetisation of deficits is not possible because of financial constraints imposed by dollarisation. The loss of monetary policy independence has resulted in limited countercyclical monetary policy meaning that the RBZ now has limited capacity to

provide liquidity assurance through its lender of last resort function (RBZ, 2014). Zimbabwe's economic growth has slowed substantially in the past three years with the country now in the midst of another economic crisis with acute shortages of cash. The introduction of bond notes by the RBZ in 2016, a quasi-domestic currency, has not eased the cash shortage. Currently, fuel and food supplies are limited, and unemployment continues to increase. Capacity utilisation fell to 36.3% in 2014 after reaching a high in 2012 of 57.2%.

It thus appears that some of the intended benefits of the dollarisation policy might not have been achieved and/or sustained while this policy could also have hampered some areas of the economy (RBZ, 2017). Although two studies have investigated the effects of dollarisation on the Zimbabwean economy, this research has not fully ascertained whether the introduction of dollarisation achieved the numerous objectives that were established when the policy was introduced in 2009, as the time periods examined in these studies were restricted and the focus was exclusively on economic growth and not on other facets of the economy.

This study thus seeks to add to the existing literature on the effects of dollarisation on the Zimbabwean economy by undertaking a thorough statistical analysis covering the period from 1990 to 2017. This allows for a substantial period both pre- and post-dollarisation. In addition, while the previous studies focused exclusively on economic growth, this study seeks to examine the effects of dollarisation on other financial performance indicators (FPIs) such as trade and investment and non-financial performance indicators (NFPIs) such as rule of law.

1.3 Research Question

The research question, which is the focus of this study, is as follows:
What impact has dollarisation had on various financial and non-financial performance indicators of the Zimbabwean economy?

1.4 Research objectives and hypotheses

The main objective of this research is to examine empirically the effects of dollarisation on the Zimbabwean economy, both in the short term and long term. The specific objectives are to:

- establish the effects of dollarisation on FPIs: Gross Domestic Product (GDP), inflation, Foreign Direct Investment (FDI) and trade openness (TOP); and

- establish the effects of dollarisation on NFPI: rule of law (ROL).

These objectives can be translated into the following two sets of hypotheses:

H_o: There is no statistically significant association between dollarisation and FPIs.

H_1: There is a statistically significant association between dollarisation and FPIs.

H_o: There is no statistically significant association between dollarisation and NFPIs.

H_1: There is a statistically significant association between dollarisation and NFPIs.

1.5 Purpose and Significance of the Research

According to the International Monetary Fund (IMF), Zimbabwe appears to be drifting back to a problematic situation that was prevailing in the era before dollarisation (IMF, 2017). The recent economic woes and civil unrest bear testament to this. This study seeks to analyse the extent to which Zimbabwe has achieved the intended objectives of dollarisation. The study will give insights on whether dollarisation is an effective exchange rate mechanism for an economy such as Zimbabwe's. This study will also provide policy direction on whether the government should migrate back to full dollarisation as opposed to the partial dollarisation caused by the introduction of bond notes. In addition, the study also seeks to provide guidance to the government on the importance of other variables such as ROL, which they are currently not giving much attention but has unintended consequences regarding the economy. This study wants to emphasise the importance of combining FPIs and NFPIs in assessing the economic performance of a country as opposed to concentrating only on FPIs.

1.6 Organisation of the Study

The remainder of the study is organised as follows: Chapter 2 explores the theory behind the optimal exchange rate policy for a country, with a specific focus on dollarisation and the associated benefits and drawbacks of this policy. Evidence of the causes and effects of dollarisation across various countries, including previous work on Zimbabwe, is also reviewed. Chapter three presents the methodology employed in building the Autoregressive Distributed Lag (ARDL) model for short- and long-term analysis of the effect of dollarisation on various FPIs and NFPIs on the Zimbabwean economy. Chapter 4 presents and discusses the results of the econometric analysis by drawing on the theory and the findings from other

empirical studies. Finally, Chapter 5 contains the conclusions from the research along with relevant policy recommendations and suggestions for future research.

Chapter 2: Literature Review

2.1 Introduction

The previous chapter provided an introduction and background to the study. This chapter presents an analysis of the theoretical literature of theories supporting the effects of dollarisation on economic growth and other FPIs and NFPIs. The literature gives various definitions of dollarisation from different authors, the theoretical frameworks of the determinants of dollarisation and the effects of dollarisation. After the theoretical literature, an analysis of various related empirical studies is carried out. Finally, a Zimbabwean overview of the determinants and effects of dollarisation on the Zimbabwean economy is given.

2.2 Dollarisation

Dollarisation is the process of replacing the domestic currency of a country with another country's currency to perform all the monetary roles performed by the domestic currency (Feige, 2002, p. 2). According to Adam (2013), the definitions of dollarisation are inconsistent. Adam (2013) defines dollarisation as the extensive use of a foreign currency in a country either in place of or alongside the local currency. Sikwila (2013) affirms this stating that dollarisation is using any currency other than the domestic currency as legal tender. When a country abandons its domestic currency and adopts the foreign currency as its legal tender, the country has fully dollarised. Otherwise, when a country uses a foreign currency for financial transactions and holding of financial assets, the country is partially dollarised (Adam, 2013). IMF defines dollarisation as using a foreign currency other than the domestic currency of that country; however, the definition is not restricted to using the USD (Bannister et al., 2018, p. 6). Dollarisation is when residents of a nation value their assets and liabilities in another nation's currency (Kokenyne, Ley, & Veyrune, 2010, p. 4).

2.2.1 Unofficial/Partial Dollarisation

Unofficial dollarisation (also referred to as *de facto* dollarisation or spontaneous dollarisation) occurs when citizens of a country lose confidence in the local currency, often due to hyperinflation and, therefore, decide to hold a foreign currency parallel to the local currency (Quispe-Agnoli & Whisler, 2006). The central bank might be aware of the circulation of the foreign currency as well as transactions being made in the foreign currency, but do not know the official extent of the foreign currency in circulation (Benoni & Lindahl, 2014). This leads to currency mismatches and can cause exchange rate fluctuations. There are two measures of

partial dollarisation, namely credit and deposit dollarisation. Credit dollarisation is the share of foreign currency loans of total loans while deposit dollarisation is a ratio of foreign currency deposits to the sum of broad money deposits (Bannister et al., 2018, p. 10).

Financial dollarisation involves the introduction of foreign currency contracts instead of contracts in domestic currency because the domestic currency will be losing value. Financial dollarisation is the ratio of deposits and liabilities held in foreign currency to total deposits and liabilities (Bannister et al., 2018, p. 6). Financial dollarisation involves the switching of assets and liabilities from local currency to foreign currency, whereas transaction dollarisation is using foreign currency for the procurement of goods and services. Financial dollarisation can be measured by the value of assets and liabilities held in foreign currency (Kokenyne et al., 2010, p. 4). Any other currency in circulation outside the official banking system is difficult to measure and often omitted (Kokenyne et al., 2010, p.5).

The measure of financial dollarisation is the proportion of foreign currency deposits and loans to total loans and deposits (Naceur, Hosny, & Hadjian, 2015, p. 4). Deposit dollarisation is the ratio of foreign currency deposits to total deposits in the banking system (Catão & Terrones, 2016, p. 3). It is important to note that a single country can have all these forms of dollarisation (Kokenyne et al., 2010, p. 4).

Partial dollarisation can be measured using various dollarisation ratios (Adam, 2013). These measures are described in the table below.

Table 1: Other Measures of Partial Dollarisation

Dollarisation ratio	Definition
DR_1 = FCD / BM	Foreign currency deposits (FCD) in the domestic banking system as a percentage of broad money (BM) (usually defined as M2)
DR_2 = FCD / TD	FCD in the domestic banking system as a percentage of total deposits (TD) – this ratio is known as deposit dollarisation
DR_3 = (FCC + FCD) / EBM	Foreign currency in circulation (FCC) and FCD as a percentage of EBM – EBM is BM plus FCC
DR_4 = FCL / TL	Loans denominated in foreign currency (FCL) as a percentage of total loans (TL)
DR_5 = FCPD / TPD	Foreign currency denominated public debt (FCPD) as a percentage of total public debt (TPD)
DR_6 = Composite Index (DR1;ExD / GNP; FCDDG / TDDG)	Composite index of three indicators of dollarisation namely (i) DR_1; (ii) total external debt (ExD) as a percentage of GNP; and (iii) foreign currency denominated or linked domestic debt of government as a percentage of total domestic debt of the government (TDDG)

Source: Adapted from Adam (2013)

2.2.2 Full/ Official Dollarisation

Full dollarisation is when foreign currency is the only legal tender. Full dollarisation is usually adopted as a control mechanism for inflation and fiscal indiscipline. It, therefore, does not normally consider the choices of entities and individuals regarding which currency to use regarding the anchor currency since it is a matter of national interest (Bannister et al., 2018, p. 6). Official dollarisation is when the USD is given a status of legal tender. If that status does not exist, then it is referred to as *de facto* dollarisation (Kokenyne et al., 2010, p. 4). Official dollarisation occurs when a country officially adopts a foreign currency as a legal tender (Benoni & Lindahl, 2006). In this case, foreign currency as legal tender completely replaces local currency. All transactions and settlements can now be performed in foreign currency.

Full dollarisation is difficult to measure due to the limited amount of data on foreign currency cash holdings. The ideal measure for full dollarisation will be the total foreign currency held by the whole country (Bannister et al., 2018, p. 10). Binary variables can be used to measure dollarisation (Edwards & Magedzo, 2003). Zero value represents a pre-dollarisation period, and a value of one (1) represents a post-dollarisation period. Zero value signals the non-existence of dollarisation while one (1) represents full or 100% dollarisation. From the above definitions, it is clear that dollarisation can either be partial or full.

2.2.3 Euroisation

Euroisation is another form of dollarisation. There is official and unilateral euroization, but it can be used interchangeably with dollarisation (Winkler et al,. 2004). Euroisation is the adoption of foreign currency by a country. It is used to characterise the US dollar and Euro cases as well as where other currencies such as the British pound and Australian dollar are adopted (Winkler et al., 2004).

2.3 Theoretical Framework

2.3.1 Currency Substitution View

Currency substitution is using foreign currency as a means of payment for goods and services (IMF, 2015). In the absence of official dollarisation, entities and individuals can choose to transact in foreign currency, thereby shunning their domestic currency, known as currency substitution (Feige, 2002, p. 2).

In the early 1970s, dollarisation was purely a currency substitution process. Most countries in Latin America used to avoid hyperinflation by substituting their currencies with the USD (Catão & Terrones, 2016, p. 4). The currency substitution theory views foreign currency as a tool for hedging against inflation; however, the theory has been subject to a lot of criticism because, in Latin America, dollarisation was attributed to high inflation rates. After dollarising, the countries achieved low and stable inflation rates, but they still continued with dollarisation in the 1990s, even after the decline and stabilisation of inflation rates. The proponents of the theory attributed this to behaviour, but the critics are of the view that dollarisation is an asset substitution concept (Mecagni & Maino, 2015, p. 5).

2.3.2 Asset Substitution View

The asset substitution view refers to foreign currency being used as a store of value (Levy & Yeyati, 2006). In the absence of official dollarisation, entities and individuals can opt for foreign currency denominated assets rather than local domestic currency denominated assets to safeguard their value, known as asset substitution (Feige, 2002, p. 2). Financial dollarisation is a form of asset substitution. The risk associated with asset substitution is the mismatches in the balance sheet. Asset substitution is also referred to as asset dollarisation (Catão & Terrones, 2016, p. 4).

Naceur et al. (2015, p. 5) said that financial dollarisation involves complex macroeconomic management techniques that result in high financial risks due to currency mismatches. It, however, is important to note that both asset substitution and currency substitution are processes of unofficial/*de facto*/spontaneous dollarisation and they involve the co-circulation of foreign currency holdings (Feige, 2002, p. 2; Zoryan, 2005).

2.3.3 The Theory of Optimum Currency Area (OCA)

The optimum currency theory is divided into two theories, namely the old OCA theory and the new OCA theory.

a. The Old OCA theory

The old OCA theory uses various key performance indicators (KPIs) to assess the effectiveness of dollarisation/euroisation for various countries. The KPIs are factor mobility, integration via fiscal transfers, and real and financial integration. There is a positive

correlation between dollarisation and factor mobility, integration via fiscal transfer, and real and financial integration (Kramarenko et al., 2010). Factor mobility refers to the ability to move factors of production, that is labour, capital or land, out of one production process to another or even from one country to another (Kramarenko et al., 2010).

Labour migration from one country to anchor countries could, in turn, promote remittances that might increase a country's foreign currency inflows (Winkler et al., 2004). The adopting countries might also benefit from expertise migration from anchor countries thereby benefitting from the transfer of technologies (Hitselberger et al., 2001, as cited in Winkler et al., 2004). This has an indirect effect of creating employment, as the transfer of technology could end up boosting the service and manufacturing industry. Labour mobility is critical and could take over the role played by a floating exchange rate regime regarding it being a control mechanism used to stabilise the economy (Lourenco, 2004).

The above explanation clearly illustrates the importance of location in the OCA theory. For a country to derive the full benefits of dollarisation regarding offshore finance, tourism, labour and the associated integration, location is a critical success factor (CSF). In other words, for OCA theory to be effective, the location or proximity to the anchor country has to be correct. For example, regarding tourism, it is difficult to integrate the natural beauty and cultural heritage of countries that are located in different continents (Winkler et al., 2004).

Using a currency similar to the anchor country's currency induces fiscal transfer and promotes sound public finances that reduce the need for fiscal support from the anchor country (Winkler et al., 2004). This, in turn, reduces domestic and external debt for the adopting countries. From the previous explanations, one can assume that the adopting countries seek authorisation of the anchor countries before dollarising. Political credibility, however, could influence the willingness of the anchor country in performing fiscal transfers to adopting countries.

On promoting real and financial integration, dollarisation has an implicit value that also supports other instruments such as customs unions. By using a similar currency, it integrates the individual adopting states, thereby forming a larger union that serves the same purpose as a customs union (Winkler et al., 2004), and as such, aids in attracting market-based FDI. Dollarisation increases financial sector credibility through the benefits derived from statutory

and regulatory advantages associated with the anchor country. Banking sector credibility increases prospects of FDI because local banks could serve as attractive offshore financial centres (Suss, Williams, & Mendes, 2001).

In conclusion, all the above KPIs are dependent on the political credibility of the adopting state. For any country to attract reasonable FDI or fiscal transfer, the investors must be confident of the political environment prevailing in the adopting country; that is to say, a low sovereign risk will be ideal. This includes policy consistency and ideal tax and exchange control regulations (Winkler et al., 2004). The other factors are the economic size, the degree of openness including the geographic and commodity trade diversification, inflation variability of the member countries and synchronisation of business cycles with their trading partners (Lourenco, 2004). Lourenco (2004) argued that joining an OCA can only be possible if adopting countries have sufficient foreign reserves and a sound and closely monitored financial system, with an embedded fiscal discipline.

b. The New OCA Theory

The new OCA theory is a performance measurement tool. It uses various KPIs to assess the effectiveness of dollarisation/ euroisation for various countries (Winkler et al., 2004). The theory involves a critical analysis of the following KPIs, namely inflation, interest rates, bond spreads, fiscal imbalances and current account imbalances. This theory assesses the relationship between increased credibility and its effect on the above KPIs.

The theory underlines that dollarisation is negatively related to inflation and interest rates. This means that dollarisation lowers inflation and interest rates, as these will be aligned to the anchor economy (Winkler et al., 2004). The new OCA incorporates the Maastricht Treaty of 1992 that states that inflation rates and bond yields should be kept low and should be uniform in all member countries (Chlond, 2018; 5). The adverse variance on the budget should not exceed a 3% threshold while a benchmark of below 60% has been set on the debt to GDP ratio (Chlond, 2018, p. 5).

The new OCA is a performance measurement tool for all member states in a monetary union to control any fiscal imbalances that might arise (Chlond, 2018). There is a positive correlation between dollarisation and fiscal discipline and or current account balances. This means that the future debt obligations of a government might not vary significantly from the

future income streams, thereby creating surpluses in the balance of payments (BOP) (Winkler et al., 2004).

c) Common Monetary Area (CMA) / Rand Monetary Agreement (RMA)

The CMA is a mixture of both the currency board and monetary union, but it does not contain all the elements of the two. When benchmarked against the Eurozone, it is clear that the Eurozone contains all features of a monetary union (Chlond, 2018, p. 8). The CMA emerged as an informal arrangement during the colonial era but was formalised by the signing of a monetary area agreement known as the RMA in 1974 (Tavlas, 2008). This is a monetary agreement between South Africa, Lesotho, Swaziland and Namibia and this makes the rand the common legal tender among these member countries (Chlond, 2018). The CMA entails a fixed exchange rate regime between the four member-countries, while, South Africa, adopts a floating exchange rate policy between the rand and other currencies. There is no real loss of profit through seigniorage for Lesotho, Swaziland and Namibia, as South Africa compensates these member countries for the loss of seigniorage (Chlond, 2018).

The CMA, however, is not a full monetary union, as member states are allowed to use their own currencies alongside the rand. The domestic currencies must be backed by foreign exchange reserves (Tavlas, 2008). Although other member countries have their own monetary policies, they closely follow that established by the South African Reserve Bank (SARB), which is achieved by quarterly meetings of the governors of the four CMA central banks (Tavlas, 2008). The RMA denies the other member countries access to finance from the SARB.

The Southern African Development Community (SADC) was established in 1992 with the objective of monetary integration and the creation of a Common Market Area. At inception, SADC comprised of 14 member-countries that instructed its governors of the individual central banks to meet in 2005. At the meeting, they proposed the formation of a monetary union (MU) and the adoption of a fixed exchange rate regime (FERR) among the member countries, a common SADC currency and the central bank (Tavlas, 2008). All these were supposed to be attained by 2018 but nothing has materialised, except for the free trade area and customs union.

According to Tavlas (2008), the benefits of CMA are that the central bank's functions of the member countries (excluding South Africa) are not completely surrendered to the SARB. The CMA countries have their own monetary policies that also act as internal control mechanisms in case of shocks, and the free floating of the rand enables the other CMA members to benefit from the fair value determined in the open market. The CMA ensures budgetary discipline through the conditions stipulated in the agreement, thereby lowering inflation and attracting Foreign Direct Investment (FDI). The CMA also further helps in attracting market-seeking FDI because of using a single currency that integrates the market.

On the contrary, the free floating of the Rand will expose the individual countries' weaknesses through Rand value loss, and by adopting the Rand, there is an inherent risk associated with the sovereign risk of South Africa (Tavlas, 2008). The Rand is legal tender in all CMA countries, but the other CMA currencies are not legal tender in South Africa. This means that the other three CMA countries need to convert their currencies if they want to transact in South Africa. This, however, comes at a cost, known as transaction costs.

Each of the SADC countries has different degrees of controls on capital flows, and these countries vary in structure and size. South Africa is the largest economy in SADC regarding GDP, and it is more industrialised and diversified as compared to others, which are smaller in size and undiversified (Masson & Pattillo, 2005, as cited in Tavlas, 2008). This makes the establishment of such an arrangement complex since the CMA has to consider such KPIs. When proper due diligence is not carried out on member countries, it might result in problems such as the debt crisis of the Eurozone in 2009 (Chlond, 2018, p. 6).

The CMA has been tested for compliance with OCA. Regarding the Maastricht test, the CMA member countries complied with the debt GDP ratio threshold, except Lesotho, which was above 60% in 2000 (Chlond, 2018). Concerning inflation, all the member countries had the lowest inflation rates when benchmarked against their SADC peers (Chlond, 2018). Regarding capital mobility, the CMA banking sector is closely linked due to the presence of South African banks in other CMA countries; hence, they comply with the capital mobility requirement of OCA (Chlond, 2018). Labour mobility was perfect during the growth stage of the South African mining sector, which attracted numerous skilled labourers from member states.

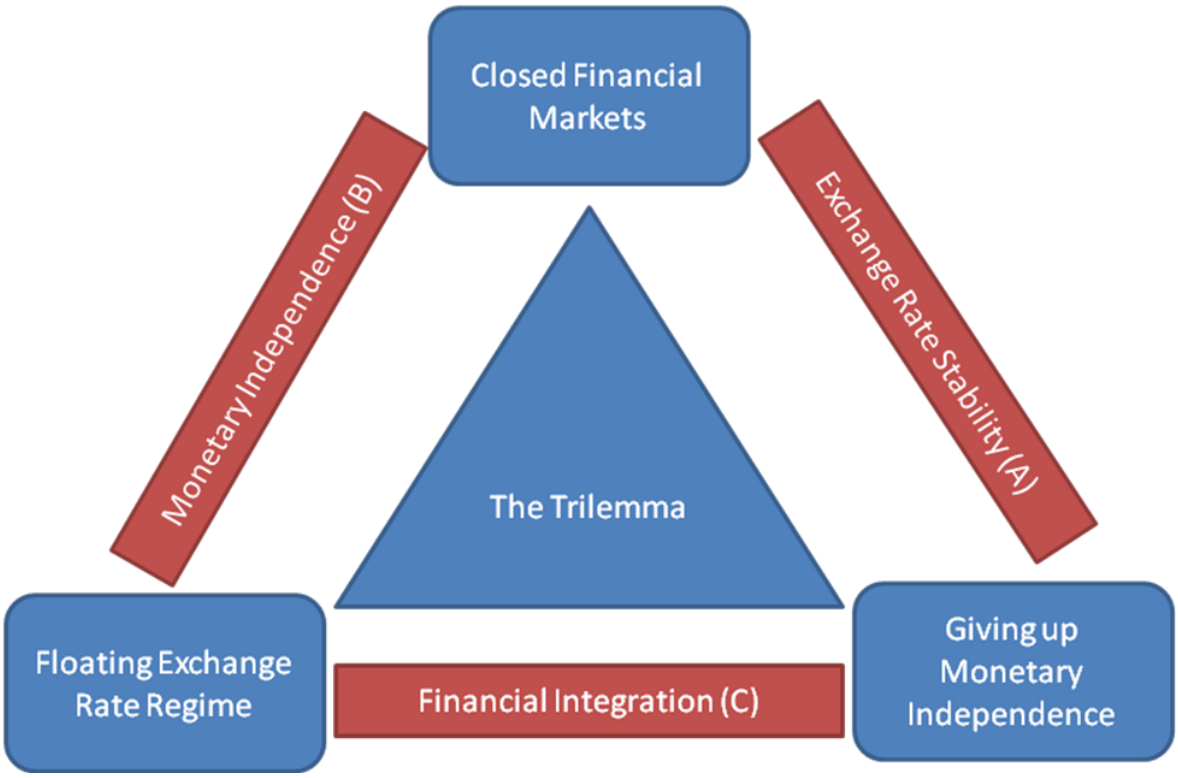
The introduction of work permits by South Africa affected labour mobility, but the SADC initiative on the migration of workers addressed this issue (Chlond, 2018, p. 12). CMA does not comply with the OCA requirements of diversified similar economic structures. They specialise in different sectors of production. Regarding the fiscal transfers, if one is to consider substance over form, there is a level of compliance with that requirement because of the revenue distribution under the guise of seigniorage compensation, although fiscal transfers are not permitted. In conclusion, CMA complies with the OCA requirements bearing in mind that the smaller member states are significantly open for trade (Chlond, 2018, p. 12).

2.3.4 The Trinity Trilemma Theory

The trinity trilemma theory, also referred to as the impossible trinity, is a powerful tool used by policymakers and advisors at the World Bank and IMF (Grenville, 2011) that seeks to explain the trade-off that countries face in determining optimal policy. Drawing from the Mundell-Fleming model, the impossible trinity states that a country cannot simultaneously maintain exchange rate stability, free capital movement and monetary independence to achieve its domestic goals (Aizenman, 2018, p. 2). It must choose any two for control and leave the other to market forces. The Trilemma triangle in Figure 2 best illustrates this theory.

If a country wants to fix its exchange rate and has perfect capital mobility, capital flows will determine the country's money supply, making it impossible to run an independent monetary policy (MP). Some economists argue that combining an independent MP and control of the exchange rate with capital controls is the best way to deal with the impossible trinity, but in practice, such policies do not always work. Even when a currency is flexible, problems can arise.

Figure 2: The Trilemma



Source: Adopted and modified from IMF (2014)

Note: Blue boxes show policy choices and red boxes show policy goals

Option A refers to when a country forgoes its monetary independence and enjoys free capital flows to achieve exchange rate stability. Countries in the Eurozone are a perfect example of such a policy combination (Davis, 2016). This policy combination will lower the adopting country's risk premium, resulting in an increased FDI and international trade, which also affects prices (that is to say price reduction). The disadvantage of high levels of exchange rate stability, however, is that it cannot be used as a tool to absorb shocks (Aizenman, 2011).

Option B is a combination of a floating exchange rate and closed financial markets with the goal of promoting monetary independence. A perfect example is the USA that enjoys an open capital account that allows free capital flow while also allowing the value of the US dollar to be determined by market forces (Davies, 2016). Open financial markets lead to the efficient

allocation of resources due to economic growth, the stimulation of domestic savings that supports local production while also promoting the transfer of skills and technology. It, however, is also important to note that an open financial market has been blamed for economic crises due to reversed capital flows and boom-bust cycles (Kaminsky & Schmukler, 2002).

Option C is a combination of a floating exchange rate and maintaining an independent monetary policy with the goal of promoting financial integration. China is a perfect example of such a scenario. Dollarisation is classified under option C because of a concept known as floating against the others. In 2003, there were three major currencies in the world namely the USD, the Euro and The Japanese Yen. All these currencies continue to float; hence, if any country decides to fix their exchange rate with one of the major currencies, that anchor currency will still be floating against the others despite the fact that dollarisation is a fixed exchange rate regime (Bailliu & Murray, 2002–2003, p. 23).

Fear of Floating

This relates to most countries that officially announce their adoption of the free-floating exchange rate regime and yet, the real situation on the ground is different. In actual fact, they will interfere with the exchange rate using tools such as interest rates and other market interventions such as bailout packages for banks (Lourenco, 2004, p. 130). Analysts have noted that very few economies, either emerging or industrial, are sincere about floating their currencies. Most countries under the flexible exchange rate regime show evidence of a fear of floating because of their regular interference with the exchange rate to stabilise prices and employment (Bailliu & Murray, 2002–2003, p. 23).

Reasons for fear of floating can be attributed to three factors. The first one pertains to the psychological belief in emerging markets that markets cannot be trusted because their movement is difficult to predict. The second reason relates to the inability of emerging economies to produce robust monetary policy measures. The third reason is about the lack of robust control mechanisms to target inflation; hence, currency depreciation in emerging economies is attributed to economic contractions rather than growth (Bailliu & Murray, 2002–2003, p. 23–24). Fear of floating in most countries is due to the dollarisation of

liabilities; hence, if the exchange rate is allowed to float, it creates much uncertainty regarding the fair value of those liabilities (Haoudi & Rabhi, 2017).

According to Aizenman (2018), events have overtaken the Trilemma, meaning that it has lost relevance in the modern world. Aizenman argues that the Trilemma was more relevant during the Bretton Woods regime in the 1950–60s; hence, it is now being referred to as a textbook triangle (Aizenman, 2018, p. 2). The Trilemma is inapplicable in the modern world where countries choose a mixture of regimes (Aizenman, 2018, p. 2).

2.3.5 The Bipolar View

The bipolar view appears to be a result of the impossible trinity binary principle (Lourenco, 2004, p. 127–128). The bipolar theory chooses either hard pegs or floating exchange rate regimes. This is also referred to as hollowing out or a corner solution (Lourenco, 2004, p. 127–128). Dollarisation is a corner solution under giving up monetary independence (refer to Figure 2). The view asserts that the country benefits more from regaining monetary credibility through dollarisation (Winkler et al., 2004).

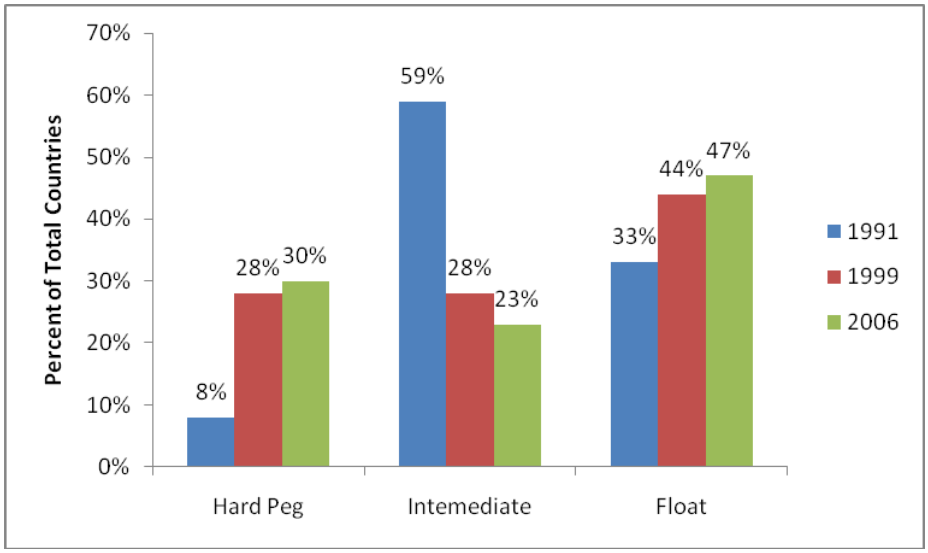
Dollarisation is seen as a much cheaper and quicker way of regaining monetary credibility (Winkler et al., 2004). Credibility results in improved investor confidence, which in turn improves FDI inflows leading to an increase in economic activities (Pasara, 2015). The rate of financial development will also increase. The view also asserts that credibility will improve since both inflation and interest rates will converge and decrease because of dollarisation (Pasara, 2015).

Floating exchange rates are more useful in emerging market economies and group-7 economies. The choice of exchange rate regime is important because it can be used as a tool to control the pricing of goods and services in an economy (Fischer, 2001). Most of the proponents of the bipolar view, who include Maurice and Rogoff (1995) and Eichengreen et al. (1998), agree that there is an existing intermediate regime that they claim will vanish after the integration of global and domestic capital markets. An intermediate regime is of the view that two goals can be combined, for example, half stability and half independence (Fischer, 2008, p. 369).

Most developed economies prefer either the hard or soft pegs, but as for emerging economies, most of them are either floating or intermediate (Fischer, 2008, p. 371). Other proponents

namely Williamson (2000) and Masson (2000) also concur with the existence of the intermediate regime but believe that it is not likely to disappear (Bailliu & Murray, 2002–2003). Fisher (2001) carried out empirical research on exchange rate regimes and the results do not point towards the vanishing of the intermediate regime (Balliu & Murray, 2002–2003). This is also supported by the bar graph in Figure 3.

Figure 3: Advanced and Emerging Market Countries: Exchange Rate Regimes 1991, 1999 and 2006



Source: Adapted from Fischer (2008, p. 370)

This view is also supported by Hammond (2006) who suggests that the bipolar view is a discredited theory that is not supported by empirical evidence.

2.4 Empirical Literature

2.4.1 Determinants of Dollarisation

Bailey (2003) argued that dollarisation is a result of relaxing exchange controls, thus permitting residents to hold foreign currency. This results in a steady rise of foreign currency in use in a country. Macroeconomic instability can emanate from the liberalisation of foreign exchange controls. High import costs due to the depreciation in the exchange rate translate into higher domestic prices, and this creates challenges to achieving monetary stability. According to Bailey (2007), shocks to import costs, expansionary monetary and fiscal

policies accompanying liberalisation, translate into domestic inflation, thereby resulting in dollarisation. In theory, a depreciating currency results in inflation, thereby increasing costs of imports and services passing the costs to the consumer (Carrière-Swallow et al., 2016).

Ecuador experienced a severe banking and financial crisis that resulted in the abandonment of their national currency (Sucre) in early 2000. Dollarisation was attributed to the lack of trust in the economic system and currency that resulted in extremely high levels of inflation during 1998 and 1999. Dollarisation was viewed as the only solution to end the crisis, and the USD was regarded as the only credible option (Benoni & Lindahl, 2014). Civil wars can also lead to dollarisation.

El Salvador adopted the USD after a long period of civil war that ended in 1992. The country tried to stimulate the economy by dollarising in early 2001 (Benoni & Lindahl, 2014). Countries that have experienced economic, social and political disturbances that led to instability and poor economic growth have dollarised their economies (Sikwila, 2013). Yinusa (2009) conducted a study of the determinants of dollarisation, and political risk factors were cited as part of the causes of dollarisation.

ROL can be defined from a monetary perspective under property rights. Any government has a duty to safeguard the value of its domestic currency. Failure to do that is non-compliance with the ROL. If a government has the power to devalue the domestic currency, it means property rights are at risk of being taken away (Hanke, 2003). The result of this non-compliance is dollarisation because people and entities will abandon the domestic currency for a safer currency as supported by empirical evidence in the case of Ecuador in 2000 (Hanke, 2003).

Dollarisation also leads to the reinforcement of policy credibility (Quispe-Agnoli, 2002). Countries that do not comply with the ROL create many challenges regarding implementing dollarisation. Their institutions will have serious structural challenges resulting in failure to achieve the dollarisation objectives. Cambodia introduced anti-corruption laws to improve its institutions (Duma, 2011). The quality of governance also plays a crucial role in determining dollarisation and the extent of dollarisation (Raheem & Asongu, 2016). Countries exercising ROL do not necessarily need to dollarise because there is improved investor confidence,

respect of property rights and minimum political risk that does not drive investors away and could lead to confidence in the local currency (Duma, 2011; Raheem & Asongu, 2016).

According to Shinichi (2007), there is a positive correlation between rule of law and financial development and there is an inverse relationship between dollarisation and ROL. There is a positive relationship between dollarisation and FDI. For a country to attract FDI, ROL plays a key role because investors always consider the quality of economic governance of any country before investing (Yerabbati & Hawkes, 2016).

Adam (2012), in his study of the Maldives, indicated that dollarisation was driven by institutional factors and the rapid development of the tourism sector. Ize and Yeyati (2003), as cited in Adam (2012), noted that in any economy where there is high and unstable inflation, currency instability and real exchange rate depreciation will result in dollarisation. Empirical evidence from a study carried by Yinusa (2009) also supports the view that inflation is a major determinant of dollarisation. This is because citizens, investors and other economic agents will try to protect their assets from a variety of shocks that might result from these economic variables.

The authors Adam (2012) and Ize and Levy- Yeyati (2003) argued that institutional factors such as foreign exchange and capital controls can also determine dollarisation. Institutional failure can also be a catalyst to dollarisation. There should be a strong positive relationship between dollarisation and the inflation rate (Adam, 2013). Countries with an inflationary propensity have a higher probability of being dollarised (Edwards & Magendzo, 2003).

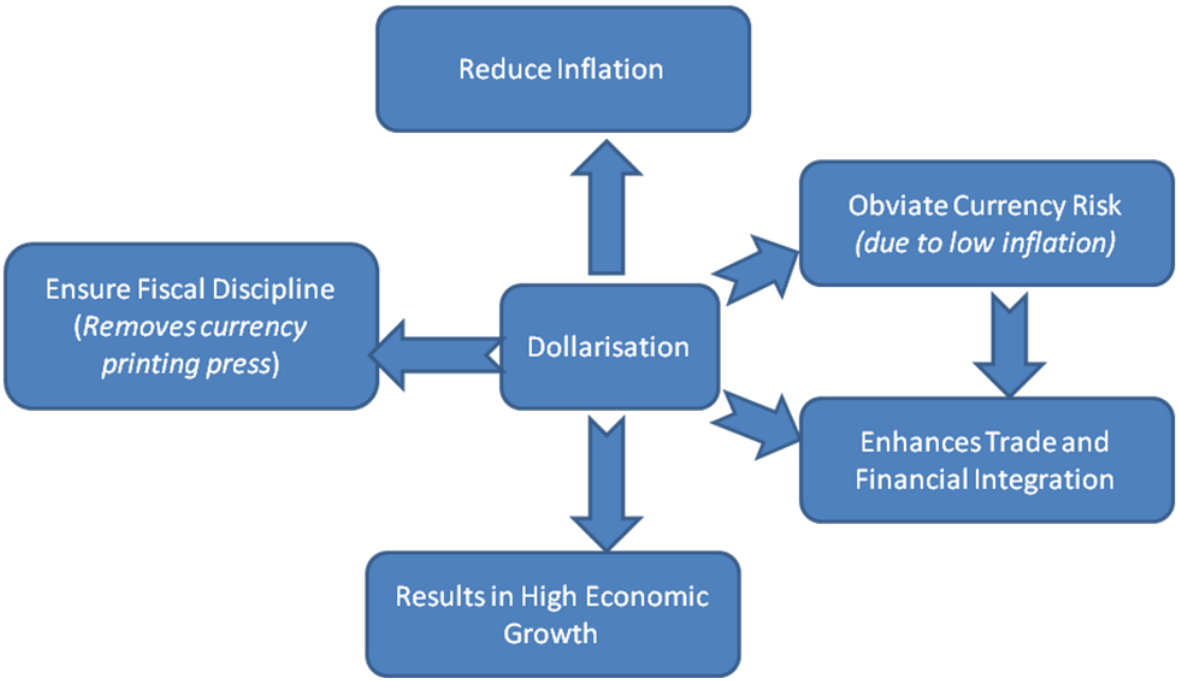
Interest rate differentials, as proposed by Adam (2012), could also lead to dollarisation. Traders can create expectations of the future exchange rate between two currencies and set the premium, or discount on the current market exchange rate. Traders believe that dollarisation boosts investor confidence and would lead to lower spreads on international borrowings. Dollarisation reduces country risk, thereby reducing interest rates (Berg & Borensztein, 2000). Dollarisation emanates from the desire to reduce country risk and manage the risk of sharp exchange rate adjustments, thereby achieving stability of international capital flows (Berg & Borensztein, 2000).

Shinichi (2007) argued that the main determinant of dollarisation is *de facto* remittances that lead to unofficial dollarisation. This occurs when citizens of the adopting country working

abroad remit some of their savings back home to help their families financially. Remittances are now the most important sources of finance for most developing countries, especially low-income countries (World Bank, 2005). The presence of the informal economy also leads to *de facto* dollarisation (Shinichi, 2007). Individuals smuggle foreign currency by exporting goods. There is a positive correlation between deposit dollarisation and the size of the informal economy (Shinichi, 2007).

2.4.2 Benefits of Dollarisation

Figure 4: Benefits of Dollarisation



Source: Adopted and modified from Saamoni (2011, p. 19)

As depicted in Figure 4 above, dollarisation is aimed at lowering inflation, removing currency risk, enhancing market integration, boosting economic growth and induce fiscal discipline.

Most developing countries adopt dollarisation as a policy tool to address hyperinflation, achieving pricing stability and strengthening macroeconomic variables, thereby inducing economic growth (Saamoi, 2011). According to Yagci (2001), the main advantages of dollarisation are that it enhances policy credibility for the economic regime, eliminates

hyperinflation, reduces the risk of currency crisis and brings about low transaction costs, lowers and stabilise interest rates and eliminates inflationary bias. Dollarisation lowers inflation because of low inflation rates in the host country and the adoption of inflation targeting policy from the host country (Benoni & Lindahl, 2014).

Dollarisation erodes inflation tax (Ortiz, 1983). Inflation tax refers to the penalty of holding cash in a period of hyperinflation. In areas that have had past experiences of hyperinflation, dollarisation might improve financial deepening resulting in financial development through stability (Bannister et al., 2018, p. 7).

Edwards and Mangedzo (2001) conducted an analysis of the effects of dollarisation on inflation using a panel dataset and multivariate regressions. The study compared inflation rates in dollarised countries with those of non-e dollarised countries. The results of the study indicated that there was low inflation in Panama compared to all other non-ed dollarised Latin American countries (Edwards & Mangedzo, 2001). This confirms why governments use dollarisation as a macroeconomic policy tool for lowering inflation, since hyperinflation in developing countries has serious political and economic ramifications.

Saamoi (2011) argued that dollarisation leads to economic growth. Dollarisation results in a high growth rate in real GDP due to lower inflation interest rates and increased investment and trade (Benoni & Lindahl, 2014; Masunda, 2014). Other scholars, however, such as Edwards and Magendzo (2001) whose research was based on dollarisation in Panama seem to have a different view. The researcher argued that dollarisation in small states leads to the stagnation of the economy and the reversal of current account gains.

Some literature suggests that dollarisation impedes financial efficiency through reduced financial deepening, thereby slowing down financial development having a negative effect on economic growth (Bannister et al., 2018, p. 2). Financial development has a positive relationship with economic growth (Bannister et al., 2018, p. 6).

Deposit dollarisation means some of the deposits will be paid offshore resulting in reduced financial deepening (Bannister et al., 2018, p. 6–7). It, however, is important to note that in areas with a history of hyperinflation, dollarisation brings stability and stimulates financial development resulting in economic growth (Bannister et al., 2018, p. 7). Foreign currency deposits enhance financial deepening through increased confidence associated with

dollarisation in countries that were affected by hyperinflation and economic instability, which will result in economic growth (Shinichi, 2007, p. 4).

In highly dollarised countries, banks tend to reduce the amount they loan to good projects and invest in risk-free foreign currency denominated assets. This behaviour has negative effects on financial development, thereby reducing economic growth (Shinichi, 2007, p. 9). Dollarisation is associated with low transaction costs, low interest rates and exchange rate stability, which attracts FDI, thereby increasing economic growth and development (Berg & Borensztein, 2000; Masunda, 2014; Mpofu, 2015, p. 54). Foreign direct investors will be assured of a return on investment because of reduced currency risk. In neoclassical models of growth, FDI increases the volume of investment and its efficiency and leads to long-term level effects and medium-term transitional increases in economic growth (Nair-Reihert & Weinhold, 2001).

According to Edwards and Magendzo (2001), dollarisation is ordinarily appropriate to smaller economies situated adjacent to larger and vibrant economies, as it facilitates trade and financial integration. There is a higher business correlation between countries with shared currency than countries with their own currency (Engel & Rose, 2000). Low inflation, fiscal responsibility and transparency because of dollarisation could help dollarising countries engage with the world. This leads to opening the economy to capital mobility (Masunda, 2014).

A country that adopts dollarisation becomes part of the dollar bloc and benefits from lower transaction costs within the bloc (Benoni & Lindahl, 2014). Lower transaction costs and deeper integration facilitate trade. Dollarisation can enhance global financial integration, as it promotes closer economic integration with the global economy. This would contribute to accelerating the convergence of the country to the income levels of the advanced economies (Berg & Boretzstein, 2003). This is particularly true for countries such as Panama and Ecuador in relation to the United States of America (USA). Liberia dollarised but had to abandon because of a lack of proximity to a large and vibrant economy and constraints inflicted on the public sector by a dollarised monetary policy (Edwards, 2001). There is a positive relationship between dollarisation, TOP and financial integration (Raheem & Asongu, 2016). Dollarisation eliminates transaction costs due to foreign exchange risk,

resulting in more trading and financial integration that will result in financial deepening (Winkler et al., 2004).

Where there is financial deepening, banks can lend money for productive purposes, thereby stimulating economic growth. Bonga and Dhoro (2015) argued that dollarisation increases confidence in financial institutions, as citizens are assured of storage of value. Shortages of foreign currency and reintroduction of local currency to ease cash crisis might, however, lead to many withdrawing their savings leading to financial fragility.

Generally, developing economies are viewed as corrupt that cannot be trusted with the fiscal management of economies (Saamoi, 2011, p. 13). The deficits in most of these countries are funded by seigniorage and money creation through money printing of the domestic currency has disastrous repercussions and inflation, which later develops into hyperinflation.

According to Goldfajn and Olivares (2000), on a positive note, dollarisation induces fiscal discipline. The excessive costs associated with reversing full dollarisation could ensure that authorities commit to prize stabilisation and fiscal discipline. This, according to Quispe-Agnoli (2002), will lead to the reduction of inflation fears. Hyperinflation generally brings with it political instability (Einchengreen et al., 1998). Dollarisation, therefore, is assumed to control the fiscal deficit, as it literally removes the printing press from the hands of a reckless government, and therefore, governments are forced to operate a near-balanced budget. The removal of the printing press halts artificial money creation, which, in turn, eliminates hyperinflation due to reduced money supply (Yagci, 2001).

Dollarisation does induce fiscal discipline due to the non-existence of a printing press. It, however, is important to note that printing money is not the only option that can be used to finance budget deficits. The government can also use other instruments in a dollarised economy and still continue with the indiscipline (Goldfajn & Olivares, 2000, p. 6). There is no consensus that dollarisation instils fiscal discipline because the government can always borrow to fund its obligations (Del Cristo & Gomez-Puig, 2015, p. 3).

Dollarisation is a tool that transfers obligations to the future, for example, the government can issue foreign currency denominated ten-year treasury bills but still continue with their indiscipline (Del Cristo & Gomez-Puig, 2015, p. 3). Dollarisation might instil fiscal discipline, as it eliminates seigniorage and borrowings with inflationary pressure (Del Cristo

& Gomez-Puig, 2015, p. 3). After dollarising the economy, the government will be aware that financing the budget deficit by printing money will no longer be an option; hence, it might instil fiscal discipline (Fabris et al,. 2004, p. 17).

It is believed that dollarisation results in fiscal discipline because of the reduction of funding options available to the government, thereby leaving the government with no option but to stick to balanced budgets, which is an indicator of fiscal discipline (Saamoi, 2011, p. 13). Dollarisation does not create any safeguards regarding the misallocation and misappropriation of funds (Saamoi, 2011, p. 13).

The instability of the currencies of many developing countries has been put forward as the major reason for dollarisation, as it reduces currency risk (Yacgi, 2001; Masunda, 2014). This is because of fixed exchange rates; inflation and interest rates would be pegged to those of foreign countries. In both Ecuador and El Salvador, interest rates and inflation fell and stabilised after dollarisation (Benoni & Landahl, 2014, p. iv).

Currency fluctuations, generally, present the risk of domestic currency devaluation and affects trade and the general welfare of the general population (Yagci, 2001). According to Bencivenga, Huybens, and Smith (2001), currency risk is the most important reason for dollarising as compared to other variables such as inflation. The cost of currency conversion for international transactions and the exposures of the domestic currency to speculative attacks are the major causes of dollarisation in developing countries. Developed countries can still be open to speculative attacks on their economies, but they have monetary policy tools to address shocks in the economy, unlike a dollarised developing country that would have surrendered its monetary policy (Yagci, 2001).

The other immediate benefit of reduced currency risk would be the reduction of the country's risk premium, thereby reducing interest rates (Berg & Borensten, 2003). The reduced interest rates will also have a positive effect of lowering the fiscal cost of servicing public debt, thereby stimulating both investment and economic growth (Berg & Borensztein, 2000). It, however, is important to note that dollarisation does not eliminate sovereign risk (Berg & Borensztein, 2000, p. 5).

2.4.3 Costs of Dollarisation

Dollarisation is associated with the loss of seigniorage (Berg & Borensten, 2003). Seigniorage is the difference between the value of currency or money and the cost of producing it. Both partial and full dollarisation lead to loss of seigniorage revenue (Tweneboah, 2016). In a partially dollarised setup, economic agents choose among foreign currencies in circulation and the local currency. The more stable and stronger currency is chosen for use by these economic agents. If the local currency is weak, the government faces a loss of seigniorage (Tweneboah, 2016). Governments or central banks could lose the extra value created when it can no longer produce their own money because of official dollarisation. High levels of official dollarisation reduce the possible profits obtainable from seigniorage (Tweneboah, 2016).

Other authors have tried to quantify the seigniorage loss in various studies of countries that have dollarised, but Chang (2000) argues that such calculations are only accurate in countries where there is macroeconomic policy credibility. Chang (2000) argued that the loss of seigniorage is taken as a serious loss in countries where policy credibility is guaranteed.

The lender of last resort function is also lost for the central bank in a highly dollarised economy (Berg & Borenzsten, 2003). The role of central banks is to provide short-term liquidity to solvent financial institutions facing liquidity challenges and insurance in the face of a systemic bank run (Tweneboah, 2016). This function is linked to producing their own money that will enhance the insurance status of the central bank. This means that banks and other financial institutions will have to look for external funding, which would result in them borrowing from foreign banks with interest (Berg & Borenzsten, 2000). This will result in a fragile financial sector because external borrowings will have an inherent risk associated with foreign exchange risk (Levy & Yeyati, 2006; Mecagni & Maino, 2015).

In the face of foreign exchange risks, banks can self-insure against their exposure to risks by reducing the amount of foreign currency credit extended to borrowers and investing in either safe and liquid assets abroad or in foreign currency reserves at the domestic central banks (Shinichi, 2007). The overall effect will be a shallow financial sector that will have a negative effect on economic growth. Capital flight resulting from public fear can result in dollarisation (Mecagni &Maino, 2015). Currency mismatches in partially dollarised countries can create

risks from unmatched foreign currency assets and liabilities. These risks are severe when banks hold large amounts of foreign currency deposits or other liabilities while its assets are mostly denominated in local currency. This means that banks will be exposed to solvency problems when the local currency depreciates drastically leading to public panic (Mecagni, 2015).

The nexus between financial fragility and dollarisation has been supported by De Nicolo, Honohan and Ize (2003) and De Nicolo et al. (2003). Partial dollarisation has its own inherent risk of the statement of financial position (SOFP) figures and currency mismatches (Bannister et al., 2018, p. 6). This type of dollarisation has an inherent foreign exchange risk that will result in inaccurate financial reporting making the systems more prone to fraud that auditors might fail to detect due to increased audit risk (Kokenyne et al., 2010, p. 4). According to Goldfajn and Olivares (2000), a currency crisis could lead to corporate and sovereign default.

Due to the reliance on USD, which may be in short supply, governments might fail to service some of the credit facilities extended to them by the IMF, World Bank and similar institutions. This could motivate governments to reintroduce local currencies in a bid to reduce a cash crisis and possibly de-dollarise their financial systems resulting in partial dollarisation. Partial dollarisation could lead to currency mismatches because of exchange rate depreciation leading to a rise in inflation in the long term (Ozge, 2005).

Drastic depreciation of the domestic currency value of foreign currency denominated liabilities of banks and firms cause their net worth to fall because of a sudden increase in bankruptcy risk and credit markets stopping their normal functions completely (Shinichi, 2007). This will lead to the collapse of investment and overall economic activities. According to Quispe-Agnoli (2002), dollarisation leads to the circulation of counterfeit currency. The efficiency of payments is also affected because local financial institutions have no control over the quality of foreign bank notes (Bannister et al., 2018). This undermines the security of the financial sector. Bonga and Dhoro (2015) argued that dollarisation could damage the nation's sense of pride since local currency will be a symbol of sovereignty.

Levy and Yeyati (2006) documented that there is greater instability in money demand for financially dollarised economies, which would make monetary policy less effective. Full dollarisation also undermines the effectiveness of the central bank's monetary policy. This is

supported by the former president of Liberia, Samuel Doe, when he re-introduced the local currency as a way of addressing the ineffectiveness of macroeconomic policies caused by dollarisation (Edwards & Magendzo, 2003). Dollarisation is mainly associated with small countries with small economies and many are city-states well integrated into their neighbours' economies. These countries are extremely open, with most of them having no control over capital mobility or on any type of financial transaction (Edwards & Magendzo, 2003).

Shinichi (2007) argued that *de facto* dollarisation stagnate financial development. De facto dollarisation promotes a self-insurance mechanism which, in turn, weakens the organisational capabilities to screen and monitor private borrowers in the environment associated with deposit dollarisation. Shinichi (2007) argues that dollarisation leads to large informal foreign exchange markets or the *de facto* exchange markets that are outside the government's control. This is because individual traders will try to evade taxes and government financial regulations. This informal trading of foreign currency leads to local efficiency, but it does not imply wide system efficiency. The inabilities of the government to enforce regulatory laws will lead to the collapse of financial institutions in the long term (Shinichi, 2007).

Yagci (2001) further highlighted the disadvantages of dollarisation such as difficulty in exiting from dollarisation. De-dollarisation cannot be rushed because it requires policy consistency and implementation of sound economic policies that are market driven. This makes de-dollarisation a long-term strategy that cannot yield the intended results if rushed because it requires time (Mecagni & Maino, 2015).

2.5 Empirical Evidence

Swiston (2011) analysed the effects of official dollarisation as a monetary regime in El Salvador. The economy of El Salvador is closely aligned with that of the US and, as such, the adoption of US monetary policy through dollarisation is optimal for the country in line with the OCA theory (Swiston, 2011). The standard Taylor Rule analysis showed how the monetary policy of the US has led to the output and price stabilisation in El Salvador. Further to this, the results revealed that dollarisation has led to a reduction in the currency risk premium implicit in Salvadorian interest rates, generating substantial savings for the economy. The author, however, admitted that several facets of El Salvador's macroeconomic performance such as growth in economic activity, international trade and financial integration

were not included in the model and thus, it was impossible to analyse the effects of dollarisation in these areas.

Ozge (2005) investigated currency substitution in Turkey. The Sequential Portfolio Balance Model (SPBM) that was estimated showed that there is a long-term relationship between currency substitution and the expected exchange rate in Turkey. The elasticity of currency substitution appeared to be high and was consistent with those of other high inflation developing countries, which means that financial dollarisation reduces inflation.

Edwards and Magendzo (2003) analysed the macroeconomic record of strictly dollarised economies. The researchers investigated whether dollarised countries have historically exhibited faster growth and lower volatility than countries with domestic currency. This was estimated using a treatment regression analysis that estimated the joint probability of a country being dollarised and the outcome equations (Edwards & Magendzo, 2003). The treatment was dollarisation and the effect of the treatment was measured in the outcome equation. Edwards and Magendzo (2003) used a dummy variable to represent dollarisation; a value of 1 meaning a strictly dollarised economy and 0 a non-dollarised economy. Two variables were used to measure the effects of dollarisation in the outcome equation; GDP per capita and growth volatility (Edwards & Magendzo, 2003). The results of the analysis indicated that the probability of a country being dollarised depends on regional, geographical, political and structural variables. The results suggest that GDP per capita growth has not been statistically different in dollarised and non-dollarised countries. The authors also found that volatility in growth has been significantly higher in dollarised than in non-dollarised economies (Edwards & Magendzo, 2003).

Bailey (2005) investigated the role of financial dollarisation in the movement of inflation in Jamaica using a vector autoregression (VAR) model based on monthly data from March 1996 to December 2004. Exchange rate, inflation, base money, public sector prices and dollarisation ratio were used as study variables. All series were logged to adjust for scaling differences (Bailey, 2005). The consumer price index (CPI) was used as a proxy for inflation and the dollarisation ration (DR) proxied dollarisation. DR was taken as a ration of foreign currency deposits to a total of currency in circulation and domestic time, savings, demand deposits and foreign currency deposits (Bailey, 2005). The results indicated an inverse relationship between dollarisation and exchange rate. Bailey (2005) concluded that

dollarisation lowers inflation leading to the erosion of inflation tax. This study is insightful on the effects of dollarisation on FPIs but excluded NFPIs that have an indirect key effect on the economy.

2.6 The Zimbabwean Overview

2.6.1 Background

In the 1990s, Zimbabwe used to have one of the best economies in Africa. Agriculture, mining and a few remaining industries are the only pillars left to support the fragile economy (IMF, 2017, p. 1). In 1997, the government of Zimbabwe, in an effort to appease war veterans, granted pay-outs to approximately 60 000 war veterans, amounting to 3% of the GDP. The World Bank had to temporarily withdraw the balance of payment support amounting to USD$62.5 million until the government had demonstrated fiscal discipline.

In November 1997, the then president, Robert Mugabe, in an effort to remain in power, announced plans to seize white commercial farms and distribute these to the black majority. These policy changes contributed to low investor confidence, which culminated in the Zimbabwean dollar losing 75% of its value against the USD on 14 November 1997. The exchange rate continued to fluctuate, signalling the start of hyperinflation. In 1998, there were drastic increases in prices and the government tried to control the price ceiling leading to artificial shortages. Because of the land reform programme and violation of property rights, tobacco earnings experienced a sharp decline from about USD$600 million in 1999 to about USD$250 million in 2004.

Ellyne and Daly (2013) argued that the agricultural output declined by 85.7% between 2002 and 2009 and the country shifted from being a net food exporter to a net food importer. Further to this, the funding for land redistribution has been found one of the major sources of inflation (Ellyne & Daly, 2013). The destabilisation of the agricultural sector between 2000 and 2011 has been estimated to have cost Zimbabwe USD$33 billion (Theron, as cited in Ellyne & Daly, 2013). Tobacco by then was the major foreign exchange earner for the country (World Bank, 2008).

Zimbabwe has arrears that have accumulated since 2000. This was a result of corruption, fiscal indiscipline and an unplanned land reform programme that was not implemented in accordance with ROL. This affected the economic performance of the country. Most donors

imposed economic sanctions on Zimbabwe because of disputed elections, disorderly land reform and human rights abuses (World Bank, 2016).

On 1 December 2003, a new central bank governor, Dr Gideon Gono (GG), was appointed to deal with inflation, which was 236% at the time, by implementing inflation targeting policy. Inflation rose to 5 242% in the first quarter of 2004 but dropped to 130% by year-end. The quasi-fiscal activities were then introduced to fuel support for the ruling party and these increased in 2008. Around USD$ 1.1 billion (which is equal to 36% of GDP) and USD$0.8 billion (23% of the GDP) was allocated towards fiscal activities involving election-related expenses, subsidies to parastatals, subsidised directed lending, provision of farm equipment and allocation of subsidised foreign exchange (IMF, 2009).

The central government revenue and expenditure effectively collapsed in 2008 (IMF, 2009). Budget revenue fell from US$1 billion (25% of the GDP) in 2005 to US$133 million (4% of GDP) in 2008 (IMF, 2009). In March 2008, hyperinflation reached 417 823% (Kairiza, 2009). Hyperinflation seriously affected the country's payment system, as it experienced capacity constraints in dealing with large amounts and multiple figures of Zimbabwean dollars in transactions that were being processed (RBZ, 2008). High cash demands led to a cash crisis resulting in pressure in Real Time Gross Settlements (RTGS).

The then governor of the central bank, GG, referred to 2008 as the worst year in the history of Zimbabwe in terms of economic hardships (Gono Monetary Policy Statement, 2009, p. 4). The situation was compounded by the global economic crisis of 2008, where the global economy fell into recession. In the case of Zimbabwe, there was a political stalemate that resulted from the disputed harmonised elections of March 2008. The governor highlighted that it had an effect on business because of the intricate relationship between the political environment and the economic fortunes of any country (Gono Monetary Policy Statement, 2009, p. 19; World Bank, 2016). Zimbabwe was viewed as a country that lacked political maturity that resulted in reduced international capital flows into the country, creating much uncertainty in the eyes of foreign investors (Gono Monetary Policy Statement, 2008, p. 20).

The 2008 elections were marked by serious violence and human rights abuses that resulted in the Southern African Development Community (SADC) intervention. The SADC intervention led to the formation of the government of national unity (GNU) (World Bank,

2016). This marked the end of the prolonged political impasse. The governor also highlighted that the political impasse was unnecessarily prolonged and resulted in serious unintended consequences, which were only reflected in terms of negative economic consequences. The governor referred to this as a stubborn reality that cannot be ignored by any central bank governor. The governor also described what he referred to as hard realities that affected Zimbabwe as a safe destination for foreign direct investment. The realities are:

- respect of property rights that also need to be protected by enforceable legal agreements with legal evidence to support that; and
- the clarification of the indigenisation laws.

If these two factors are not addressed, Zimbabwe will face serious difficulties in attracting foreign direct investment. The global economic crisis resulted in most nations relying on their capital reserves to contain the effects of the crisis, thereby leaving less available to invest outside their borders (Gono Monetary Policy Statement, 2009, p. 21). The governor clearly highlighted the importance of an attractive destination for FDI in a competitive world.

The January 2009 monetary policy highlighted many issues that had affected Zimbabwe in the past. The governor highlighted these issues without fear or favour, meaning he practised professional scepticism because the statement is clearly independent in appearance, thereby reflecting an independent mind (ACCA). This is why this monetary policy statement is key in assessing the Zimbabwean situation because it demystifies issues.

The policy statement also highlighted the absence of lines of credit or balance of payment support for Zimbabwe due to economic sanctions. This has negatively affected the monetary policy as a tool to address any shocks to the economy, leaving the central bank with limited options to counter any attacks on the economy. This also affected the attainment of Millennium Development Goals (MDGs) because the government had to rely on domestic banks to finance developmental programmes that are capital intensive (Gono Monetary Policy Statement, 2009, p. 23). According to the IMF (2009), there had not been significant progress in achieving the MDGs. Child and maternal mortality were high in that period. In 2008, the need for food and health assistance increased, with 70% of the population requiring assistance (IMF, 2009).

Zimbabwe is one of the wealthiest countries in the world regarding natural resources and human capital. These natural resources are not helping the country in any way because they require much capital to be extracted. The governor referred to it as a stubborn reality because people were languishing in poverty. Corruption also affected the economic recovery because of its associated high transaction costs, scaring away investors. The governor also highlighted the abandonment of price controls that had affected most companies (Gono Monetary Policy Statement, 2009, p. 26).

What is sad about this 2009 monetary policy statement is that the governor believed that printing money was the best solution for the country. The monetary policy statement states that the government of Zimbabwe was placed under economic sanctions by the German government, which had a 50-year contract to supply currency printing paper, spare parts, machinery and ink that resulted in the abrupt termination of the contract. The replacement was capital intensive and would require a lead time of two years with a capital outlay of USD$500 million. This resulted in the printing of high denominations to avert cash shortages to which the governor referred as the "Reserve Bank mischief" and as the stubborn reality, which primarily led to hyperinflation within a hyperinflationary environment (Gono Monetary Policy Statement, 2009, p. 28).

The financial sector of Zimbabwe was characterised by a lot of indiscipline through companies listed on the Zimbabwe Stock Exchange (ZSE). These companies created a concept known as "burning money" using foreign currency that was exchanged with the local currency at an exorbitant rate determined by the old mutual implied rate on the ZSE (Gono Monetary Policy Statement, 2009, p. 29). This process created multi-sextrillionaires from nothing.

In January 2009, the governor emphasised the need to improve production output in farms because the IMF had highlighted that the country's situation was grave. The IMF made the following recommendations:

- RBZ to stop all quasi-fiscal activities.
- Removal of price controls.
- Removal of international payment restrictions (Gono Monetary Policy Statement, 2009).

The governor also highlighted that the targeted sanctions on Zimbabwe emanating from the land reform programme were affecting the economy through lack of balance of payment support. Following recommendations from SADC and IMF, the governor instituted currency reforms that resulted in the introduction of the multicurrency system while keeping the Zimbabwean dollar. The governor made it clear in his policy statement that he was not dollarising (Gono Monetary Policy Statement, 2009, p. 39). Soon after the introduction of the multicurrency system in January 2009, by the first of February 2009, both the public and the traders rejected the Zimbabwean dollar. This resulted in the demise of the domestic currency, leaving the government with no choice but to dollarise (Biti Budget Statement, 2009, p. 10).

The effects of this dollarising were the impairment of all financial assets that were denominated in Zimbabwean dollars to a value of zero, resulting in serious loses. The poverty levels were unprecedented affecting the country's ability to meet its MDGs (Biti Budget Statement, 2009, p. 10). Biti Budget Statement (2009, p.10), the then finance minister, introduced a cash budgeting approach to which he also referred as "we eat what we kill" or "what we gather is what we eat". The new finance minister was a representative of the Movement of Democratic Change (MDC) after the two main parties had crafted a global political agreement (GPA) that culminated in the formation of government of national unity (GNU) (World Bank, 2016). The GPA emphasised the following factors that were highlighted in the new minister's budget:

- the need for a new people-driven constitution;
- respect of property rights;
- political legitimacy;
- respecting the ROL;
- freedom and liberties;
- moving out of isolation from the rest of the world; and
- media reforms (Biti Budget Statement, 2009, p. 16).

This clearly highlights the importance of ROL, property rights and political legitimacy in an economy. The governor, in his January 2009 monetary statement, highlighted that most financial institutions were involved in money laundering, deliberately ignoring the "know your customer" (KYC) regulatory requirements. The economy had too many asset management companies (AMCs) that were involved in illegal foreign currency transactions.

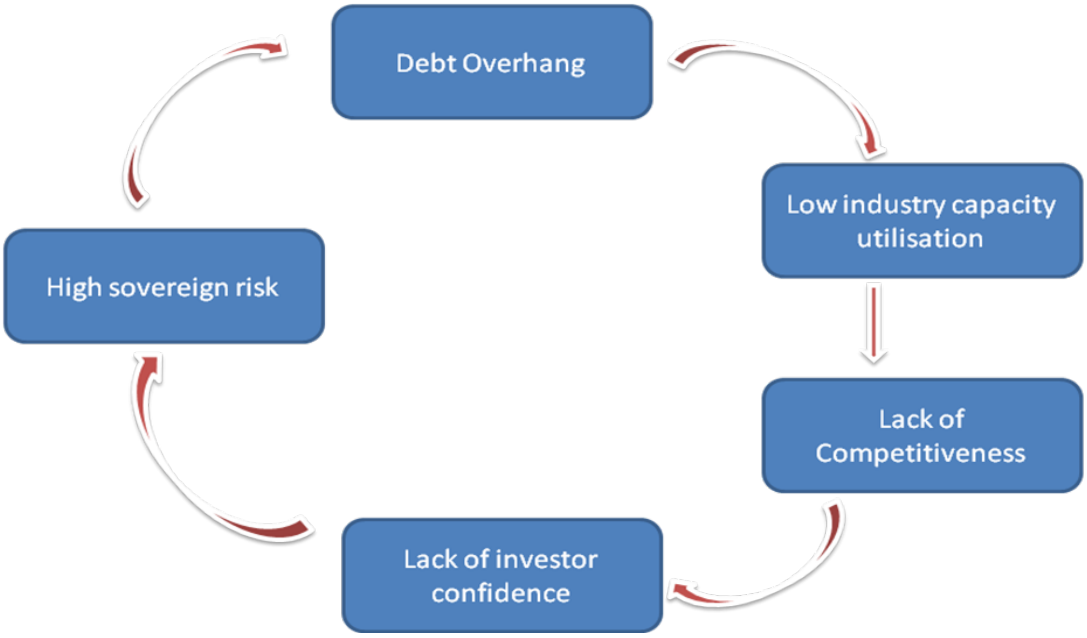
This resulted in the central bank proposing a risk-based approach to supervise all financial institutions. RBZ also laid a foundation for the implementation of the Basel II framework and ordered the training of all directors of the financial institutions regarding their roles and responsibilities (Gono Monetary Policy Statement, 2009).

In 2008, the gold deliveries declined by more than 50% from 6 798 kg to 3 072 kg due to foreign currency shortages that resulted in power cuts, shortages of cyanide, spare parts and equipment. The manufacturing sector was not spared from those constraints. Overall, this resulted in a skills flight from Zimbabwe leading to the reduction in capacity utilisation to less than 20% (Gono Monetary Policy Statement, 2009, p. 65).

According to IMF (2010, p. 9), South Africa was a crucial safety valve concerning the mitigation of humanitarian and social costs of Zimbabwe's economic decline. About 10% of the working population had migrated to South Africa by 2007. Most of these people were illegal immigrants; hence, this forced the South African government to remove the visa requirements on Zimbabwe in April 2009. This was clearly illustrated under the labour mobility assessment by the IMF regarding OCA (Kramarenko et al., 2010, p. 9). The RBZ expressed concern on the decline of tourists' arrival that had dropped by 58% from 1 262 898 tourists (first half of 2007) to 531 357 tourists (in 2008, same period) (Gono Monetary Policy Statement, 2009, p. 66–71).

In 2015, the new governor, JPM, illustrated the Zimbabwe economic challenges in the form of a diagram (Figure 5), which he described as the debt burden vicious cycle that needed to be broken, even when the country was fully dollarised (Mangudya Arrears Clearance Report, 2015).

Figure 5: Debt Burden Vicious Cycle



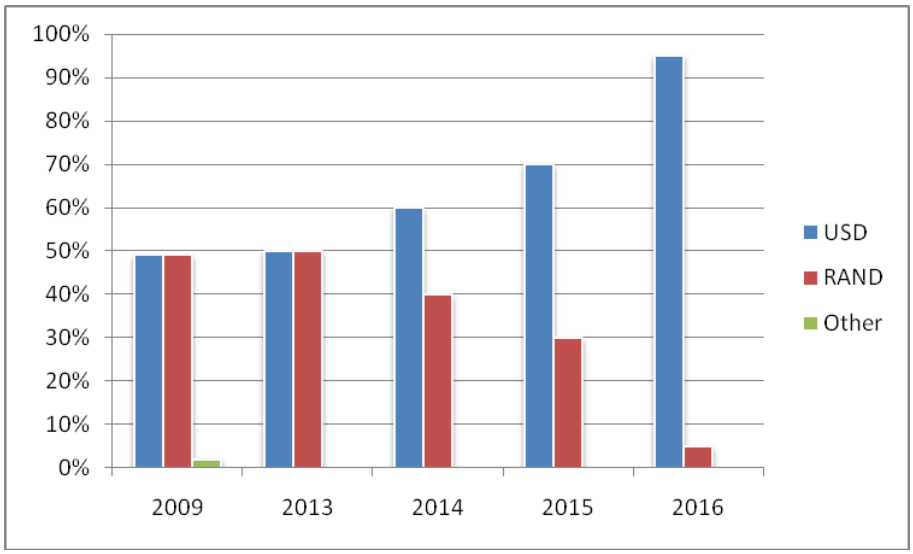
Source: Adopted and modified from Mangudya Arrears Clearance Report *(2015)*

In 2016, the economy was facing serious challenges such as capital flight and fiscal indiscipline that resulted in cash shortages, resulting in long queues in both banks and at automated teller machines (Mangudya Press Statement, 2016, p. 2). In JPM's 2016 press statement, he highlighted that the US dollar was too strong, making Zimbabwe a high-cost producing country and extremely expensive tourist destination, discouraging FDI (Mangudya Press Statement, 2016, p. 2). The RBZ also believed that the strength of the US dollar made the multicurrency system dysfunctional because the US dollar was being treated like a commodity or an asset rather than a medium of exchange (Mangudya Press Statement, 2016, p. 2).

Around 70% of tourists to Zimbabwe come through South Africa, 40% of exports from Zimbabwe are consumed by South Africa, and Zimbabwe imports 60% of its imports from South Africa as compared to the 4% exports and 3% imports from the USA. These results are not supported by the currency utilisation level provided by the RBZ, which clearly illustrates that the US dollar was gaining popularity every year since 2009, as shown in Figure 6 (Kramarenko et al., 2010; Mangudya Press Statement, 2016, p. 4). The trend shown below

might be attributed to the continuous announcement by the government of Zimbabwe in both their fiscal and monetary policy statements that the USD is their currency of reference (Kramarenko et al., 2010).

Figure 6: Currency Usage (2009–2016)



Source: Adopted and modified from Mangudya Press Statement (2016;4)

The country has a high government wage bill and expensive agricultural programme known as command agriculture programme (CAP). Zimbabwe still has a solid human capital and infrastructure base (IMF, 2017, p. 1–4). Dollarisation eliminated price distortions, instilling confidence in the market. After dollarising the economy, both the RBZ and the financial sector faced serious capital constraints (IMF, 2017, p. 4). In 2015/16 Zimbabwe experienced a drought, which forced the government to import maize (Zimbabwe's staple food) for USD$ 200 million.

The need to import was because of the depressed production of maize in prior years due to capital constraints experienced by new farmers. In response to the drought, the government introduced loans in exchange for produce. Under this arrangement, the government issued loans to farmers. In return, they would get produce that will be delivered by the farmer to the grain marketing board (GMB). GMB was buying maize at USD$ 390 per tonne, which was twice the world's prevailing price at that time. Millers were getting the same product from GMB below the cost.

The government was heavily subsidising the product since they are the owners of GMB (IMF, 2017, p. 13) to ensure food security and poverty alleviation, achieving a goals number 1 and 2 of the SDGs. The government argues that it is the main reason they created CAP that was fully financed by the state. The rationale behind this was to reduce future imports and create more export revenue through tobacco exports. IMF encouraged the government to leave the financing of CAP to the private sector and instead concentrate on sectors such infrastructure, irrigation and education because they believed that the costs for CAP were outrageous (IMF, 2017, p. 14).

These programmes were financed by the creation of money through RTGS electronic balances, treasury bills (TBs) and bond notes that were introduced by the government in 2016 (IMF, 2017). Bond notes are local currency with a fixed exchange rate of 1:1 with the USD, which is subject to manipulation; hence, this worsened fiscal indiscipline. Foreign-owned banks have no interest in TBs since they were denominated in bond notes; hence, the only takers are domestic banks who use them as a source of revenue that increases their profitability, boosting their capital requirements.

Although dollarising the economy in 2009 reduced the inflation rate from 79.6 billion% in 2008 to 3,2% in 2010, in 2016, inflation signs were beginning to emerge because of the over-valuation of the real exchange rate by the government that insists that the bond note is at par with the US Dollar. This has created a parallel market that has discounted the value of the RTGS, TBs and bond notes (IMF, 2017, p. 15–16).

The creation of money (fiscal indiscipline) has eroded most of the benefits of dollarisation because the RTGS, TBs and bond notes have brought back the exchange rate risk, resulting in capital flight. The domestic banks were classified as high credit risks in 2016, and they broke ties with about 50 corresponding international banks. The high tax burden and the currency premium resulted in most companies failing to meet their loan obligations. To save those entities from collapsing, the government expanded the role of the Zimbabwe Asset Management Company (ZAMCO), which was an existing entity wholly owned by the state to take over all the non-performing loans from the banks (IMF, 2017, p. 42).

The government created a priority list of foreign currency requirements that would be allocated by RBZ. Statutory instrument 64 (SI64) was introduced to reduce the demand for

foreign currency by restricting the importation of certain goods and services (IMF, 2017, p. 9). It is also important to note that this created a demand for local products that were prohibited under SI64. Both the governor of the RBZ and the IMF concurred that individuals and companies used the USD to store value (IMF, 2017, p. 10). The bond notes were trading at a discount between 5% and 10% to the USD, while the electronic balances were trading between 15% to 20% discount to the USD (IMF, 2017, p. 10).

In November 2018, the new finance minister, during the 2019 budget presentation, acknowledged that the country was experiencing financial distress with deficits of both fiscal and current account (Ncube Budget Statement, 2018, p. 7). The government still continued to issue TBs to fund CAP, which was condemned by the IMF (Ncube Budget Statement, 2018, p. 14). By October 2018, inflation had reached 20.85%, which was attributed to food and non-food items like transport costs (Ncube Budget Statement, 2018, p. 16). In this budget, the minister admitted the existence of ghost workers in government, which he planned to eliminate using the biometric registration and skills audit for all civil servants. The government wage bill consumes 90% of the budget, hindering development (Ncube Budget Statement, 2018, p. 31). He also maintained the multicurrency system and further reiterated that the US dollar is the anchor currency (Ncube Budget Statement, 2018, p. 37).

The government also tried to deal with issues of property rights by allocating USD 53 million to compensate former white farmers for their land that was expropriated. By doing this, the government acknowledged the importance of property rights and ROL in an economy (Ncube Budget Statement, 2018, 8–49). The other key development finance issue in this budget was the fiscal devolution. The government allocated money to individual councils, which reduces bureaucracy and increases efficiency (Ncube Budget Statement, 2018, p. 52).

The minister of finance is moving back to full dollarisation because he has introduced the payment of customs duties on vehicles and other selected products in foreign currency (forex). Entities have been allowed to sell their products in forex provided they pay all their taxes in forex (Ncube Budget Statement, 2018, p. 80–81).

On the political front, Zimbabwe went for harmonised elections on 30 July 2018. The harmonised elections are a combination of presidential, parliamentary and local government elections (European Union Election Observation Mission , 2018, p. 1). These elections were

the first since the removal of former president Robert G Mugabe, who has been president for 37 years. Based on the new people-driven constitution of 22 May 2013, the Zimbabwe Elections Commission (ZEC) was established for the administration of the July 30 elections.

Most opposition parties complained that the ZEC was partisan, lacked transparency and inclusiveness (European Union Election Observation Mission, 2018, p. 1). After polling and counting votes at individual polling stations, the ZEC published the results outside each polling station using V11 forms. It is alleged that the results announced by the ZEC differed from the ones that were displayed outside the various polling stations. The results also lacked verifiability, transparency and traceability, which could have easily been achieved (European Union Election Observation Mission , 2018, p. 2). The EU also highlighted the existence of "smart intimidation" of voters by the ruling party.

Prior to the ZECs announcement of the results, the MDC-Alliance team claimed victory of the presidential poll based on the respective V11 forms of different polling stations but alleged that Zanu PF was in the process of rigging the results because the ZEC was delaying the announcement of the results. On 1 August 2018, protesters gathered around the ZEC offices in town and violence erupted. This resulted in the deployment of soldiers on civilians. The deployment led to the shooting of protesters and innocent civilians, which left six people dead and 14 injured (European Union Election Observation Mission , 2018, p. 2). The opposition members who were involved in the data collection from different polling stations were arrested (European Union Election Observation Mission , 2018, p. 2).

The ZEC announced the results and the ruling party candidate was the winner. The opposition candidate made a constitutional application to the constitutional court for the annulment of the presidential results because the total number of presidential votes announced by the ZEC exceeded the number of registered voters at the respective polling stations. This resulted in discrepancies that did not tally with the V11s. The EU report pointed out that constitutional amendment no 1 of 2017 gave the president the powers to appoint the chief justice, deputy chief justice and the judge president of the high court in the consultation with the judiciary service commission (JSC), affects judiciary independence (European Union Election Observation Mission , 2018).

2.6.2 Aims of Dollarisation from the Zimbabwean Perspective

The aims and objectives of dollarisation were:

- to ease pressure on the payment systems to facilitate the normal flow of transactions (RBZ, 2009);
- to fight inflation (Gono Monetary Policy Statement, 2008; RBZ, 2008);
- to address the budget deficit (Biti Budget Statement, 2009);
- to halt quasi-fiscal activities that were being done outside the provisions of the constitution of Zimbabwe by eliminating the printing of money (Biti Budget Statement, 2009); and
- to ensure fiscal discipline within the government (Biti Budget Statement, 2009).

2.6.3 Benefits of dollarisation from the Zimbabwean Perspective

The benefits of dollarisation were that:

- it halted inflation, as the inflation rate was reduced from 79.6 billion % in 2008 to 3.2% by the end of 2010 (IMF, 2017); and
- it boosted economic growth from a decline of 15% in 2008 to an increase of 15.4% in 2010 (IMF, 2017), which helped restore investor confidence that has long been dented.

2.6.4 Empirical Evidence for Zimbabwe

Pasara (2015) investigated the effects of dollarisation on economic growth in Zimbabwe from 2000 to 2014 using quarterly data. The author used the Auto-Regressive Distributive Lag (ARDL) model to analyse the effect of dollarisation on economic growth. Gross domestic product per capita (GDP) was modelled as the dependent variable with interest rates (lending), trade openness, gross domestic investment and dollarisation the chosen independent variables. Dollarisation was measured using a dummy variable (0 for the quarters with no dollarisation, and 1 for the quarters with dollarisation) (Pasara, 2015).

The results of the study showed that dollarisation, interest rates, lagged GDP and trade openness were significant at the 1% level of significance while gross domestic investment was found weakly significant. Dollarisation and trade openness positively influenced economic growth for the period under consideration. Gross domestic investment was found

weak and positively correlated with economic growth. Interest rates were found to negatively affect economic growth.

Buigut (2015) investigated the effects of Zimbabwe's multicurrency arrangement on bilateral trade using a gravity model that accounts for endogeneity. In the regressions, bilateral trade was used as the dependent variable while the independent variables included contiguity, official common language, common coloniser after 1945, colonial relationships after 1945, distance, the product of the GDPs and dollarisation. As per Pasara (2015), dollarisation was measured using a dummy variable equal to 1 to capture the multicurrency arrangement introduced in 2009 and zero in the preceding years. The study covered the period from 2004 to 2012 using in total 50 potential trading partners from Africa, Asia, Western Europe, Eastern Europe, North and South America. The results suggest that the multicurrency arrangement has reduced Zimbabwe's bilateral trade by 15%.

Le Roux and Kavila (2016) analysed the movement of inflation in Zimbabwe under dollarisation. They used an ARDL model with monthly data for the period of 2009–2012, including the Rand USD exchange rate, international oil prices, lagged values of Zimbabwean inflation and South African inflation. To test for stationarity and the order of integration of the dependent and independent variables, the ADF and Philips Peron tests were used. The variables showed an integration of order 1. The Wald coefficient test was then applied to test for cointegration (Le Roux & Kavila, 2016). The empirical findings show that the South African inflation has the most significant impact on inflation in the dollarised Zimbabwean economy, with a 1% increase in the South African inflation increasing inflation by 0.3% in Zimbabwe. Their study only focused on the dynamics of inflation under a dollarised environment and not on the effects of dollarisation on the economy and other economic indicators such as the NFPIs. The study does not incorporate data from 1990 to 2008, which makes it shallow.

Mukoki and Mapfumo (2015) examined the effects of dollarisation on the growth of nonperforming loans (NPL) in the Zimbabwean banking system. The study employed quarterly data from March 2000 to September 2014. The following variables were used in the ARDL model for analysis: NPL, liquidity ratio, efficiency, profitability, interest rate spread and dollarisation. Dollarisation was proxied using a dummy variable (0 for period 2005–2008 and 1 for period 2009–2014). The ADF was employed to test for stationarity and order of

integration. Pesaran, Shin and Smith (2001) as cited in Mukoni and Mapfumo (2015) argued that ARDL works well with a small and finite sample size. Model diagnostics were performed using the ARCH test, Jacque-Bera normality test, Ramsey RESET test and Breusch-Godfrey serial correlation LM test. Model stability was checked using the cumulative sum (CUSUM) of the recursive residuals test. Results showed that dollarisation does not influence NPL both in the short- and long term (Mukoki & Mapfumo, 2015). The study is insightful on the suitability of ARDL for small samples. The study, however, was based on bank-specific variables and the study period was short. The study also only focused on the effects of dollarisation on FPIs.

2.7 Chapter Summary

The existing literature gives us differing effects of dollarisation on economic variables such as economic growth, inflation and economic integration. Some authors argue that dollarisation leads to economic growth, yet others argue the opposite that it leads to economic stagnation in the long term. In the case of partial dollarisation, the studies reviewed found that dollarisation creates currency mismatches that will, in turn, lead to inflation because of the dynamics in exchange rates. There seems to be no outright conclusion on the direction of the significance of dollarisation on dollarised economies; hence, the motivation of carrying out this study to possibly bridge this gap, with the focus on Zimbabwe. The next chapter presents the econometric specification and dataset used to answer the research question underpinning this study of the effects of dollarisation on the Zimbabwean economy.

Chapter 3: Methodology

3.0 Introduction

This chapter outlines the methodology that is used to analyse the effects of dollarisation on the Zimbabwean economy using annual time series data from 1990 to 2017.For this purpose, the Autoregressive Distribution Lag (ARDL) model is employed to test for long-run relationships between the variables and also examine any short-run dynamics using the error correction model. The data that is used for the analysis is described along with the expected relationships between economic growth and the various explanatory variables that are included in the model.

3.1 Research Design and Strategy

This research employs an explanatory quantitative research design. This is applied when the objectives are based on a cause and effect relationship; that is, the research studies the effects of one variable on another. This design is more suitable when the research is focused on trying to understand, explain, predict and control associations among variables which go beyond qualitative analysis (Yin, 1994).

Quantitative methods try to void human subjectivity by deriving explanations from statistical analyses. Factors can be analysed whilst holding others constant as compared to a qualitative study. Consequences from changes in levels of one factor are assessed and it is possible to intervene in the natural dynamics of the variables by manipulating observations. On the other hand it is very difficult to intervene in the natural movement of variables when using a qualitative study (Antwi&Kasim, 2015).

Further to the above, quantitative methodology is based on a positivism/ realism research paradigm, where the thrust is on measuring variables and hypotheses that are connected to general causal relationships. When there is enough theoretical support for the research problem, it is possible to develop hypotheses and test them based on a quantitative study(Antwi&Kasim, 2015).

3.2 Data

3.2.1 Sample Period

A multivariate regression approach will be used to examine the effect of dollarisation on the economy of Zimbabwe, with various other determinants included in the regression so as to ensure that a thorough and robust analysis is presented (Ajide, 2014). All regression analysis will be undertaken in the statistical software packageEViews while Microsoft Excel will also be employed for some of the graphical evidence that is analysed.

The study employs annual time series data covering a period of 28 years from 1990 to 2017While quarterly data was available for some variables (such as GDP and inflation) the same was not true for others and therefore annual data had to be relied upon. Furthermore, data on many of the variables was not available prior to 1990; thus limiting the starting point.

3.2.2 Description of the Variables

The variables used in the regression model and the sources of the data are listed in Table 3.1. The details and justification for the choice of the variables are described in detail thereafter. As explained previously, the objective of this study is to ascertain the impact of dollarisation on various areas of the Zimbabwean economy. The first measure is economic growth and thus to provide an accurate analysis of the effects of dollarisation on this measure, other factors that affect economic growth must also be considered as explanatory variables. These are drawn from other studies on the determinants of economic growth indeveloping economies while also providing a holistic overview of the economy. Beyond this, the effect of dollarisation is then examined on each of these other determinants of economic growth. All the variables are in logarithm form (Tweneboah, 2016). This log transformation is performed so that all the variables have the same magnitude or weight (Omoniyi& Olawale, 2015) while also aiding in interpretation of the model results as the coefficients represent elasticities.

Table 2: Description of Variables

Variables	Symbol	Indicator	Source
Economic Growth	GDP	Natural logarithm of Gross Domestic Product (GDP) (constant local currency units)	World Bank
Foreign Direct Investment	FDI	Natural logarithm of net inflows (constant local currency units)	World Bank
Inflation	INF	Natural logarithm of the CPI	Zimbabwe National Statistics (ZIMSTAT)
Financial Dollarisation	DOLL	A dummy variable taking the value of 0 for the pre-dollarisation period (1990-2008) and 1 for the dollarisation period (2009- 2017).	
Trade Openness	TOP	Natural logarithm of total trade (imports plus exports) (local currency units)	IMF
Rule of Law	ROL	Natural logarithm of the Rule of Law Index	World Bank

- **Economic Growth (ECG)**

In order to obtain a clear understanding of economic growth it is important to define GDP. GDP is the financial value of goods and services that are produced locally in a particular country for a given period and bought and consumed by the end user in that country. It also

includes other goods such as defense and education which are provided by the state (IMF, 2017). GDP growth in an environment with stable inflation is a clear sign of a better standard of living, although it is not a full reflection thereof (IMF, 2017:14). There are three approaches that can be used to asses GDP: (1) the production approach – this considers any value addition in different stages of production. It basically calculates the difference between total input costs and revenue (IMF, 2017:14). For economic growth to occur, productivity plays a key role, hence it is incorporated in the calculation of GDP (Kim et al., 2016); (2) the expenditure approach – this combines all the costs of procurement incurred by end users, including, for example, food, investments by companies, and government procurement of goods and services; and (3) the income approach – this is the sum of all income generated from production, dividends to shareholders, salaries to employees and rentals (IMF, 2017:14).

One of themajor disadvantages of GDP is that it does not consider depreciation of assets such as equipment and buildings. In terms of measurement, GDP is measured in the domestic currency of an individual country but for benchmarking purposes it is converted to US dollars using the prevailing exchange rate, in order to be able to compare GDP across countries (IMF, 2017: 14-15). The study is based on the US dollar which has become the proxy domestic currency of Zimbabwe and is back-dated for the entire period of the study (World Bank, 2018). The alternative option to GDP is known as gross national product (GNP) which is simply a total of all goods and services produced by a country.

Justification: According to the IMF (2017:15), GDP provides sufficient detail on the performance of the economy relative to its size such that GDP growth is a sign of economic growth. This justifies the use of GDP growth to measure economic growth in this study.

- **Dollarisation**

As highlighted previously, while dollarisation has various definitions, it refers to the use of foreign currency as legal tender either alongside or as a replacement to the domestic currency of that country. In the case of Zimbabwe, where the domestic currency was replaced by a multicurrency system such that the domestic currency no longer existed, the country was said to be fully dollarized. As mentioned in chapter 2, in countries which maintain a domestic currency alongside the foreign currency, the extent of dollarisation can be measured by various ratios such as foreign currency deposits in the banking system. However, this is not appropriate in the case of Zimbabwe where the domestic currency ceased to exist. Edwards

and Mangenzo (2003) used a dummy variable to distinguish between dollarized and non-dollarised countries (1 for the former and 0 for the latter). Drawing from this approach, dollarisation was measured in this study using a dummy variable taking the value of 0 for the pre-dollarisation period (1990-2008) and taking the value of 1 for the dollarisation period (2009- 2017).

Justification: Dollarisation is the main variable under study; hence it is important to establish its relationship with economic growth and other key FPIs and NFPIs. Use of dummy variable is justified by the fact that full dollarization is difficult to measure in Zimbabwe because of the use of the bond notes which resemble a local currency but the authorities argue that it is the USD since it is at par with the USD (Mangudya Press Statement, 2016).

- **FDI**

FDI is the long term investment by a foreign entity in a resident entity in an economy. The investment should result in at least 10% shareholding in order to gain significant influence in the day to day running of the investee entity (World Investment Report, 2007). The 10% rule is not a hard and fast rule because some direct investors have obtained less than a 10% shareholding but they have significant influence. These flows can either be direct capital injection or intra company loans or reinvested earnings.

The rules of how FDI is measured and recognized are clearly set out in the balance of payment (BOP) manual authored by the IMF. The accrual concept is used meaning all FDI movements should be recorded at their accrual value (Duce & de Espana, 2003:7). Due to the difficulty involved in the application of the accrual concept, most FDI is recorded at fair value (FV) on the date of transaction after the payment has been processed (Duce & de Espana, 2003:7). The IMF usually recommends two methods for FV measurement: (1) the market price should be the price agreed by the parties to a specific transaction on the transaction date and should not be altered due to exchange rate movements; and (2) as for shares, the market price on the transaction date is recommended (Duce& de Espana, 2003:7).

Justification: FDI is closely related to GDP as it stimulates production, because it is a source of long term capital which is needed by every developing country. According to the World Bank there is a positive relationship between FDI, economic growth, production and development (Gould et al., 2013:3).

- **Trade Openness (TOP)**

Trade openness is simply the growth of traded sectors within a country relative to its total output. Openness should be centered on the intensity of trade of a particular economy (Pigka-Balanika, 2005:5). Trade openness is closely aligned with barriers of entry created by the government hence the removal of such barriers and the introduction of free trade systems will result in greater trade openness. In this study, trade openness is measured by combining imports and exports. There is also an alternative measurement method which uses barriers of trade such as taxation on international trade and exports (Pigka-Balanika, 2005;12).

Justification: The inclusion of trade openness is to clearly separate the effect of dollarisation from the change in economic growth that is attributable to TOP. Proponents of endogenous growth theory are of the view that economic growth is stimulated by FDI and trade openness (Pigka-Balanika, 2005;7). Most economists seem to agree that trade openness is a catalyst to economic growth (Pigka-Balanika, 2005; 2).If TOP is to be excluded from the model the results will be distorted because the model would have omitted an important variable that drives economic growth.

- **Inflation**

Inflation refers to a rise in the price of goods and services over a period of time. Volatility in inflation rates and high rates of inflation deter economic growth hence all monetary policies should aim to achieve low inflation and ensure stability (Gottschalk, 2014; 2). The consumer price index (CPI) is used to calculate inflation. The base year price index of 100 is applied across the board. The index is calculated periodically on a particular basket of goods and services with fixed quantities consumed by a single household. The components of the goods and services are derived through sampling techniques using a survey and the data is updated periodically(Gottschalk, 2014:4). The components of the consumer basket vary from one country to another. ZIMSTATS uses the CPI approach. The CPI is calculated using the Laspeyres Composite Index (LCI) (Gottschalk, 2014:5). The alternative measure of inflation which is used by other countries is referred to as the GDP deflator. This indexes all the component of goods and services that are part of GDP. These include all locally produced goods and services plus local investment goods excluding all imported goods and services. This is known as the Paasche Index (Gottschalk, 2014:12).

Justification: It is important to include inflation in the econometric model of determinants of economic growth in Zimbabwe because firstly, inflation is a key performance indicator that measures movement of prices and price stability and hence affects growth; and secondly, the hyperinflation of 2008 led to the abandonment of the Zimbabwean dollar thereby eventually causing de facto dollarisation and finally the official abandonment of the Zimbabwe dollar on February 2009 resulting in official dollarisation (Kramarenko et al, 2010; 3).

- **Rule of Law (ROL)**

ROL captures the reliability of the judicial system and is inextricably linked to the concept of governance. Governance refers to the way in which power in exercised in the social and economic management of resources for economic development (Kaufman et al., 2010:2). The ROL is classified as a key performance indicator (KPI) under the Worldwide Governance Indicators (WGI) (Kaufman et al., 2010:1) and measures performance of different states in terms of how they are governed. This makes law equally important because when combined with other political and social strategies it enhances accountability and it also acts as a control mechanism, for example, by prohibiting bribery and corruption (World Bank, 2017:13). ROL considers how the government and society abides by the law, property rights and the probability of a crime being committed in a particular country. ROL also closely monitors the behaviour, effectiveness and efficiency of the police in a particular country (Kurul& Yalta, 2017:8).In addition, the ROL includes the perception of the system and the ability to enforce contracts using courts in cases of disputes along with the effectiveness and efficiency of the judiciary system. The ROL indicator should be reported in a way that the standard deviation value is between -2.5 and +2.5 with a mean of 0. The greater value indicates better ROL (Kurul& Yalta, 2017:8). The overall effect of a nation that respects the ROL is thelikely attraction of FDI.

Justification: The previous indicators such as FDI, TOP and inflation measure economic factors as determinants of economic growth and can be classified as FPIs. However, NFPIs also contribute to growth in the long run and ROL can be considered to be an important NFPI. Hence in order to present a holistic view of the determinants of economic growth in Zimbabwe, with the specific focus on dollarisation, ROL was included as an explanatory variable in the economic growth model. The model of Zimbabwe's economic growth

presented in this study is thus a combination of NFPIs and FPIs, which is the ideal model for modern regression analysis.

The table below gives the expected signs between GDP and each of the variables included in the model.

Table 3: Expected Variable Signs/Effect on GDP

Variable	**Expected Sign**	**Possible Explanation**
FDI	+	FDI contributes positively to economic growth (Gould et al. 2013)
Inflation	_	Inflation negatively impacts economic growth (Gottschalk, 2014)
Dollarisation	-	Dollarisation ensures economic growth because it fosters monetary credibility (Bannister et al., 2018)
TOP	+	Trade openness broadens economic integration hence impacting economic growth positively (Weerasinghe, 2007)
ROL	+	Respect of rule of law promotes confidence among investors and fosters economic growth (Kurul& Yalta, 2017)

The table below gives the expected signs between dollarisation and other variables.

Table 4: Expected Dollarisation Effect on Other Variables

Variable	Expected Dollarisation Effect or Sign	Possible Explanation
FDI	+	Stability due to dollarisation will attract FDI (Gould et al., 2013).
Inflation	-	Dollarisation stabilizes inflation (Bannister et al., 2018).
TOP	+	Dollarisation has a positive relationship with trade openness because trade openness is a source of foreign currency. It will also have positive effects from an import/ export perspective if the currency is stable (Raheem &Asongu, 2016)
ROL	+/-	If the government adheres to the ROL, it makes the government structures more efficient in terms of the implementation of dollarisation, thereby resulting in a positive relationship (Duma, 2011). However, Hanke (2003) argued that if a government fails to maintain the ROL by not safeguarding the value of the currency, this will result in dollarisation and hence a negative relationship exists.

3.3 Estimation Methodology

3.3.1 The Theoretical Model

The theoretical models employed in this study canbe expressed as follows with the variables in their existing form:

$$GDP_t = f(DOLL_t, INFLN_t, TOP_t, FDI_t, ROL_t) \quad (1.1)$$

$$INFLN_t = f(GDP_t, DOLL_t, TOP_t, FDI_t, ROL_t) \quad (1.2)$$

$$TOP_t = f(GDP_t, DOLL_t, INFLN_t, FDI_t, ROL_t) \quad (1.3)$$

$$FDI_t = f(GDP_t, DOLL_t, INFLN_t, TOP_t, ROL_t) \quad (1.4)$$

$$ROL_t = f(GDP_t, DOLL_t, INFLN_t, TOP_t, FDI_t) \quad (1.5)$$

Following Tweneboah (2016), the multiplicative form of the above equation is given as:

$$GDP_t = \alpha DOLL_t^{\beta_1} INFLN_t^{\beta_2} TOP_t^{\beta_3} FDI_t^{\beta_4} ROL_t^{\beta_5} GDP_{t-1}^{\beta_6} \varepsilon^{\mu_t} \quad (2.1$$

$$INFLN_t = \alpha GDP_t^{\gamma_1} DOLL_t^{\gamma_2} TOP_t^{\gamma_3} FDI_t^{\gamma_4} ROL_t^{\gamma_5} INFLN_{t-1}^{\gamma_6} \varepsilon^{\mu_t} \quad (2.2)$$

$$TOP_t = \alpha GDP_t^{\pi_1} DOLL_t^{\pi_2} INFLN_t^{\pi_3} FDI_t^{\pi_4} ROL_t^{\pi_5} TOP_{t-1}^{\pi_6} \varepsilon^{\mu_t} \quad (2.3)$$

$$FDI_t = \alpha GDP_t^{\theta_1} DOLL_t^{\theta_2} INFLN_t^{\theta_3} TOP_t^{\theta_4} ROL_t^{\theta_5} FDI_{t-1}^{\theta_6} \varepsilon^{\mu_t} \quad (2.4)$$

$$ROL_t = \alpha GDP_t^{\eta_1} DOLL_t^{\eta_2} INFLN_t^{\eta_3} TOP_t^{\eta_4} FDI_t^{\eta_5} ROL_{t-1}^{\eta_6} \varepsilon^{\mu_t} \quad (2.5)$$

By taking the natural log of each variable (as explained in section 3.2.2), the multiplicative equation can be specified as follows (Tweneboah, 2016):

$$\ln GDP_t = \beta_0 + \beta_1 \ln DOLL_t + \beta_2 \ln INFLN_t + \beta_3 \ln TOP_t + \beta_4 \ln FDI_t + \beta_5 \ln ROL_t + \beta_6 \ln GDP_{t-1} + \mu_t \quad (3.1)$$

$$\ln INFLN_t = \gamma_0 + \gamma_1 \ln GDP_t + \gamma_2 \ln DOLL_t + \gamma_3 \ln TOP_t + \gamma_4 \ln FDI_t + \gamma_5 \ln ROL_t + \gamma_6 \ln INFLN_{t-1} + \mu_t \quad (3.2)$$

$$\ln TOP_t = \pi_0 + \pi_1 \ln GDP_t + \pi_2 \ln DOLL_t + \pi_3 \ln INFLN_t + \pi_4 \ln FDI_t + \pi_5 \ln ROL_t + \pi_6 \ln TOP_{t-1} + \mu_t \quad (3.3)$$

$$\ln FDI_t = \theta_0 + \theta_1 \ln GDP_t + \theta_2 \ln DOLL_t + \theta_3 \ln INFLN_t + \theta_4 \ln TOP_t + \theta_5 \ln ROL_t + \theta_6 \ln FDI_{t-1} + \mu_t \quad (3.4)$$

$$\ln ROL_t = \eta_0 + \eta_1 \ln GDP_t + \eta_2 \ln DOLL_t + \eta_3 \ln INFLN_t + \eta_4 \ln TOP_t + \eta_5 \ln FDI_t + \eta_6 \ln ROL_{t-1} + \mu_t \quad (3.5)$$

where μ_t is the white noise which is assumed to follow normal distribution with mean 0 and variance σ^2, which is constant and not correlated with regressors (Tweneboah, 2016). These equations thus represent the long-run equations for the determinants of each of the variables in Zimbabwe, with dollarisation included as an explanatory variable in each regression.

Prior to estimating the model, a correlation analysis will be conducted to check for multicollinearity among the explanatory variables. The assumption of no multicollinearity is satisfied if the correlation coefficients for each pair of explanatory variables are less than 0.8 (Tabachnick and Fidell, 2012). The existence of multicollinearity may lead to spurious results and thus incorrect conclusions regarding the effects of dollarisation on economic growth (Tabachnick and Fidell, 2012). The best way of dealing with collinear variables is to drop one with the highest variance inflation factor (VIF) (say more than 10) (Chen, 2012).

In order to determine the appropriate method to analyse these relationships, it is important to know the characteristics of the data; in particular, whether the time series data is stationary or not. Using non-stationary data in a regression can lead to spurious results– t-statistics are misleadingly high, as are R^2 values, while the Durbin-Watson statistic for the test for autocorrelation are very low. If unit roots (the data is non-stationary) are present, alternative estimation tests than the traditional Ordinary Least Squares (OLS) approach thus have to be considered. Thus, the starting point for the analysis is to test the stationarity of the data as this will then inform the choice of modelling technique.

3.3.2 Unit Root Tests

To test for stationarity, the Augmented Dickey Fulller (ADF) unit root test is used (Sjo, 2008). Two models for the ADF test are used; one with an intercept only in the test equation and one with an intercept and trend in the test equation (Nkoro&Uko, 2016). The null hypothesis that a variable contains a unit root is tested against the alternative of no unit root/ the variable is stationary.Variables which are I(0) are integrated of order zero meaning that they are stationary in levels or have no unit roots. I(1) variables, in contrast, are integrated at the first order meaning that they contain one unit root and become stationary after first order differencing once (Pasara, 2015).If the test statistic is more negative than the critical value, then the null hypothesis can be rejected and it can be concluded that the series is stationary while if the test statistic is not more negative than the critical value then the null hypothesis cannot be rejected and it can be concluded that the series is non-stationary.

If variables are I(1) further tests to determine if they are I(2) are required; that is, whether they contain two unit roots. Lag determination for ADF is based on running the ARDL model with AIC with a maximum of 4 lags because of the small sample sizes. In estimating these models, Akaike information criterion (AIC) is used to select the optimal lag lengths for the differenced variables, because it has good small sample properties compared to either the Schwarz Bayesian information criterion (SBIC) or the Hannan-Quinninformation criterion (HQIC) (Nkoro&Uko, 2016).

3.3.3 The ARDL Model

If the findings reveal that the variables used in this study contain unit roots, a cointegration testing procedure becomes necessary. Various econometric methodologies have been used to probe long run equilibrium relationships among variables including Engle and Granger (1987), Johansen (1991) and the ARDL model ofPesaran and Shin (1997) (Altaee et al., 2016). This study employs the ARDL model to examine the effect of dollarisation on economic growth in Zimbabwe alongside other variables which have been identified to be important determinants of growth, namely inflation, FDI, TOP and ROL.

This model was chosen for several reasons. Notably, the ARDL model performs better when using small samples as compared to other cointegration models (Latif et al., 2015). In contrast, the Johansen cointegration method is useful for large samples (Dizaji, 2012). Given

that this sample comprises only 28 observations, the ARDL model was considered appropriate for this study. In addition, the ARDL model is adaptable when variables are of different orders (Altaee et al., 2016). Thus it circumvents pre-testing problems related to standard cointegration tests (Pesaran et al., 2001). However, the unit root tests still have to be performed because the variables cannot be integrated of order two or higher. If the variables are I(2), then the calculated F-Statistic of the bounds tests (to be discussed in the next section) is invalid because it is based on the assumptions that variables are I(1) or I(0) (Chigwisa et al., 2011 as cited in Nkoro&Uko, 2016). Also, for the Johansen cointegration tests, it is impossible to perform analysis when different numbers of lags of each variable are required whereas the ARDL provides flexibility in this regard by incorporating different numbers of lags for each variable (Dizaj, 2012). However, the ARDL is a single-equation model meaning that it estimates the long run relationship using one equation while Johansen's cointegration estimates the long run relationship for a system of equations (Dizaji, 2012).

3.3.4 Cointegration Test – the ARDL Bounds Test

The ARDL bounds testing procedure is used to investigate the existence of a long run association between economic growth and the financial and non-financial indicators described previously (Odhiambo, 2009). The test can be applied irrespective of whether the predictors are I(0) or I(1). The cointegration approach involves estimating the conditional error correction model (CECM) of each of the equations (Tweneboah, 2016), as shown below.

$$\Delta \ln GDP_t = \beta_0 + \sum_{i=1}^{n} \beta_{11i} \Delta \ln DOLL_{t-i} + \sum_{i=1}^{n} \beta_{12i} \Delta \ln INFLN_{t-i} + \sum_{i=1}^{n} \beta_{13i} \Delta \ln TOP_{t-i} +$$
$$\sum_{i=1}^{n} \beta_{14i} \Delta \ln FDI_{t-i} + \sum_{i=1}^{n} \beta_{15i} \Delta \ln ROL_{t-i} + \sum_{i=1}^{n} \beta_{16i} \Delta \ln GDP_{t-i} + \partial_1 \ln DOLL_{t-1} +$$
$$\partial_2 \ln INFLN_{t-1} + \partial_3 \ln TOP_{t-1} + \partial_4 \ln FDI_{t-1} + \partial_5 \ln ROL_{t-1} + \partial_6 \ln GDP_{t-1} + \mu_t$$

(4.1)

$$\Delta \ln INFLN_t = \gamma_0 + \sum_{i=1}^{n} \gamma_{11i} \Delta \ln GDP_{t-i} + \sum_{i=1}^{n} \gamma_{12i} \Delta \ln DOLL_{t-i} + \sum_{i=1}^{n} \gamma_{13i} \Delta \ln TOP_{t-i} +$$
$$\sum_{i=1}^{n} \gamma_{14i} \Delta \ln FDI_{t-i} + \sum_{i=1}^{n} \gamma_{15i} \Delta \ln ROL_{t-i} + \sum_{i=1}^{n} \gamma_{16i} \Delta \ln INFLN_{t-i} + \ell_1 \ln GDP_{t-1} +$$
$$\ell_2 \ln DOLL_{t-1} + \ell_3 \ln TOP_{t-1} + \ell_4 \ln FDI_{t-1} + \ell_5 \ln ROL_{t-1} + \ell_6 \ln INFLN_{t-1} + \mu_t$$

(4.2)

$$\Delta \ln TOP_t = \pi_0 + \sum_{i=1}^{n} \pi_{11i} \Delta \ln GDP_{t-i} + \sum_{i=1}^{n} \pi_{12i} \Delta \ln DOLL_{t-i} + \sum_{i=1}^{n} \pi_{13i} \Delta \ln INFLN_{t-i} +$$
$$\sum_{i=1}^{n} \pi_{14i} \Delta \ln FDI_{t-i} + \sum_{i=1}^{n} \pi_{15i} \Delta \ln ROL_{t-i} + \sum_{i=1}^{n} \pi_{16i} \Delta \ln TOP_{t-i} + \omega_1 \ln GDP_{t-1} +$$
$$\omega_2 \ln DOLL_{t-1} + \omega_3 \ln INFLN_{t-1} + \omega_4 \ln FDI_{t-1} + \omega_5 \ln ROL_{t-1} + \omega_6 \ln TOP_{t-1} + \mu_t$$

(4.3)

$$\Delta \ln FDI_t = \theta_0 + \sum_{i=1}^{n} \theta_{11i} \Delta \ln GDP_{t-i} + \sum_{i=1}^{n} \theta_{12i} \Delta \ln DOLL_{t-i} + \sum_{i=1}^{n} \theta_{13i} \Delta \ln INFLN_{t-i} +$$
$$\sum_{i=1}^{n} \theta_{14i} \Delta \ln TOP_{t-i} + \sum_{i=1}^{n} \theta_{15i} \Delta \ln ROL_{t-i} + \sum_{i=1}^{n} \theta_{16i} \Delta \ln FDI_{t-i} + \vartheta_1 \ln GDP_{t-1} + \vartheta_2 \ln DOLL_{t-1}$$
$$+ \vartheta_3 \ln INFLN_{t-1} + \vartheta_4 \ln TOP_{t-1} + \vartheta_5 \ln ROL_{t-1} + \vartheta_6 \ln FDI_{t-1} + \mu_t$$

(4.4)

$$\Delta \ln ROL_t = \eta_0 + \sum_{i=1}^{n} \eta_{11i} \Delta \ln GDP_{t-i} + \sum_{i=1}^{n} \eta_{12i} \Delta \ln DOLL_{t-i} + \sum_{i=1}^{n} \eta_{13i} \Delta \ln INFLN_{t-i} +$$
$$\sum_{i=1}^{n} \eta_{14i} \Delta \ln TOP_{t-i} + \sum_{i=1}^{n} \eta_{15i} \Delta \ln FDI_{t-i} + \sum_{i=1}^{n} \eta_{16i} \Delta \ln ROL_{t-i} + \zeta_1 \ln GDP_{t-1} +$$
$$\zeta_2 \ln DOLL_{t-1} + \zeta_3 \ln INFLN_{t-1} + \zeta_4 \ln TOP_{t-1} + \zeta_5 \ln FDI_{t-1} + \zeta_6 \ln ROL_{t-1} + \mu_t$$

(4.5)

The bounds test then entails a Wald/ F-test on each of the equations with the restriction that the estimated long run coefficients are equal to zero. The hypotheses are specified as follows:

H_0 : There is no cointegration or long run relationship

H_1 : There is cointegration.

Two sets of critical values are generated for the bounds test at each significance level – the I(1) values/ upper bound critical values and I(0) values/ lower bound critical values (Odhiambo, 2009; Altaee et al. 2016). If the F-statistic exceedsthe upper bound critical values, then the null hypothesis can be rejected and it can be concluded that there is cointegration among the variables while if the F-statistic is below the lower bound critical values, the null hypothesis cannot be rejected and it can be concluded that there is no cointegration (Tweneboah, 2016). If the F statistic is between the I(0) and I(1) bounds, the test is inconclusive.

If the variables are found to be cointegrated then the long-run coefficients can be interpreted as they are consistent (Pesaran and Shin, 1998).

3.3.3 The Error Correction Model

If cointegration is found between the variables in any one of the equations, then the short run dynamics can be obtained by constructing theErrorCorrection Model (ECM)in the ARDL framework as follows(Tweneboah, 2016):

$$\Delta \ln GDP_t = \beta_2 + \sum_{i=1}^{n} \beta_{21i} \Delta \ln DOLL_{t-i} + \sum_{i=1}^{n} \beta_{22i} \Delta \ln INFLN_{t-i} + \sum_{i=1}^{n} \beta_{23i} \Delta \ln TOP_{t-i} + \sum_{i=1}^{n} \beta_{24i} \Delta \ln FDI_{t-i} + \sum_{i=1}^{n} \beta_{25i} \Delta \ln ROL_{t-i} + \sum_{i=1}^{n} \beta_{26i} \Delta \ln GDP_{t-i} + \rho_1 ECT_{t-1} + \mu_t \quad (5.1)$$

$$\Delta \ln INFLN_t = \gamma_2 + \sum_{i=1}^{n} \gamma_{21i} \Delta \ln GDP_{t-i} + \sum_{i=1}^{n} \gamma_{22i} \Delta \ln DOLL_{t-i} + \sum_{i=1}^{n} \gamma_{23i} \Delta \ln TOP_{t-i} + \sum_{i=1}^{n} \gamma_{24i} \Delta \ln FDI_{t-i} + \sum_{i=1}^{n} \gamma_{25i} \Delta \ln ROL_{t-i} + \sum_{i=1}^{n} \gamma_{26i} \Delta \ln INFLN_{t-i} + \rho_3 ECT_{t-1} + \mu_t \quad (5.2)$$

$$\Delta \ln TOP_t = \pi_2 + \sum_{i=1}^{n} \pi_{21i} \Delta \ln GDP_{t-i} + \sum_{i=1}^{n} \pi_{22i} \Delta \ln DOLL_{t-i} + \sum_{i=1}^{n} \pi_{23i} \Delta \ln INFLN_{t-i} + \sum_{i=1}^{n} \pi_{24i} \Delta \ln FDI_{t-i} + \sum_{i=1}^{n} \pi_{25i} \Delta \ln ROL_{t-i} + \sum_{i=1}^{n} \pi_{26i} \Delta \ln TOP_{t-i} + \rho_4 ECT_{t-1} + \mu_t \quad (5.3)$$

$$\Delta \ln FDI_t = \theta_2 + \sum_{i=1}^{n} \theta_{21i} \Delta \ln GDP_{t-i} + \sum_{i=1}^{n} \theta_{22i} \Delta \ln DOLL_{t-i} + \sum_{i=1}^{n} \theta_{23i} \Delta \ln INFLN_{t-i} + \sum_{i=1}^{n} \theta_{24i} \Delta \ln TOP_{t-i} + \sum_{i=1}^{n} \theta_{25i} \Delta \ln ROL_{t-i} + \sum_{i=1}^{n} \theta_{26i} \Delta \ln FDI_{t-i} + \rho_5 ECT_{t-1} + \mu$$

$_t$ (5.4)

$$\Delta \ln ROL_t = \eta_2 + \sum_{i=1}^{n} \eta_{21i} \Delta \ln GDP_{t-i} + \sum_{i=1}^{n} \eta_{22i} \Delta \ln DOLL_{t-i} + \sum_{i=1}^{n} \eta_{23i} \Delta \ln INFLN_{t-i} + \sum_{i=1}^{n} \eta_{24i} \Delta \ln TOP_{t-i} + \sum_{i=1}^{n} \eta_{25i} \Delta \ln FDI_{t-i} + \sum_{i=1}^{n} \eta_{26i} \Delta \ln ROL_{t-i} + \rho_6 ECT_{t-1} + \mu_t \quad (5.5)$$

where ECT_{t-1} is the error correction term, obtained by making it the subject of the formula from equations1. The coefficients in these equations explain the short run relationships between the variables. The coefficient of ECT_{t-1} captures the speed of adjustment towards long-run equilibrium; that is, that is, variations due to shocks to the system are temporal and the system moves towards a long run equilibrium state. A negative and statistically significant coefficient on the ECT term signifies the existence of a long term relationship between variables (Tweneboah, 2016).

3.4 Granger Causality Tests

The Granger causality test (GCT) is used in conjunction with the ECM specified above (Odhiambo, 2009)to study the short-run relationships between the variables. The GCT is used to establish the direction of causality and forecasting strength of the shocks based on other variables (Tweneboah, 2016). Considering variables W_t and Z_t; if historical observations of W_t significantly contribute to predicting Z_t, W_t is said to Granger cause Z_t (Odhiambo,

2009. The converse relationship can also be established. The GCT is based on the following hypotheses (Odhiambo, 2009):

$H_0 : W_t$ does not Granger cause Z_t

$H_1 : W_t$ Granger causes Z_t

The above hypotheses are tested using the following regressions (Odhiambo, 2009):

$$Z_t = a_0 + \sum_{i=1}^{k} a_{1i} Z_{t-i} + \sum_{i=1}^{k} b_{1i} W_{t-i} + \varepsilon_t \tag{6.1}$$

$$W_t = b_0 + \sum_{i=1}^{k} a_{2i} Z_{t-i} + \sum_{i=1}^{k} b_{21i} W_{t-i} + \mu_t \tag{6.2}$$

where ε_t and μ_t are random processes and k denotes the number of lagged variables. H_0 is rejected if b_{1i} are jointly significant. The variables are in differenced form (Odhiambo, 2009).

3.5 Post-Estimation Model Tests

It is a requirement of OLS that the residuals are homoscedastic and there is no serial correlationin the model residuals.The presence of heteroscedasticity or unequal variance and autocorrelation will give false results (Pasara, 2015). This study will employ the Breusch-Godfrey (BG)test for second order autocorrelation among variables and first order autocorrelation will be checked using the Durbin-Watson (DW)test. The best way to deal with autocorrelation is to replace the variable with an alternative proxy or completely eliminating the variable (Pasara, 2015). In addition to these two tests, the cumulative sum of squares (CUSUM) test of the residuals will be employedfor model stability. For the latter, if the plot of the residuals is inside the 5% significance levels, this means the parameters were stable over the period while the opposite is true if the plot of the residuals falls outside the significance levels (Tweneboah, 2016).

Model validity tests such as the F-test, R-squared, and adjusted R-squaredwill also be analysed(Keller, 2012). R-squared is used to check goodness of fit and the higher the R-squared, the better the model. The R-squared coefficients sometimes increase with increases

in the number of explanatory variables hence the need to use the adjusted R-squared value for quality checking (Pasara, 2015).

3.6 Chapter Summary

This chapter has specified the ARDL model that will enable the research problem to be investigated; that is, to determine the effect of dollarisation on the economy of Zimbabwe in particular on economic growth, inflation, FDI, TOP and the ROL. The data and variable descriptions, pre-estimation techniques, model specification, and post estimation tests were discussed. The next chapter will present and discuss the findings from these tests.

Chapter 4: Analysis and Discussion of Results

4.1 Introduction

This chapter presents the analysis of the results on the effects of dollarisation on the economy of Zimbabwe from the empirical models specified in chapter three. As mentioned, the data analysis procedures were performed using the EViews statistical package. The first subsection discusses the descriptive statistics of the data and this is followed by the results of the correlation and VIF analysis to assess multicollinearity and the ADF unit root test results of the variables. Then after the ARDL model results are presented and discussed and finally the tests of the model adequacy are reviewed.

4.2 Descriptive Statistics

Table 5 is a presentation of the descriptive statistics for the variables used in this study over the 28-year time period from 1990 to 2017.

Table 5: Descriptive Statistics

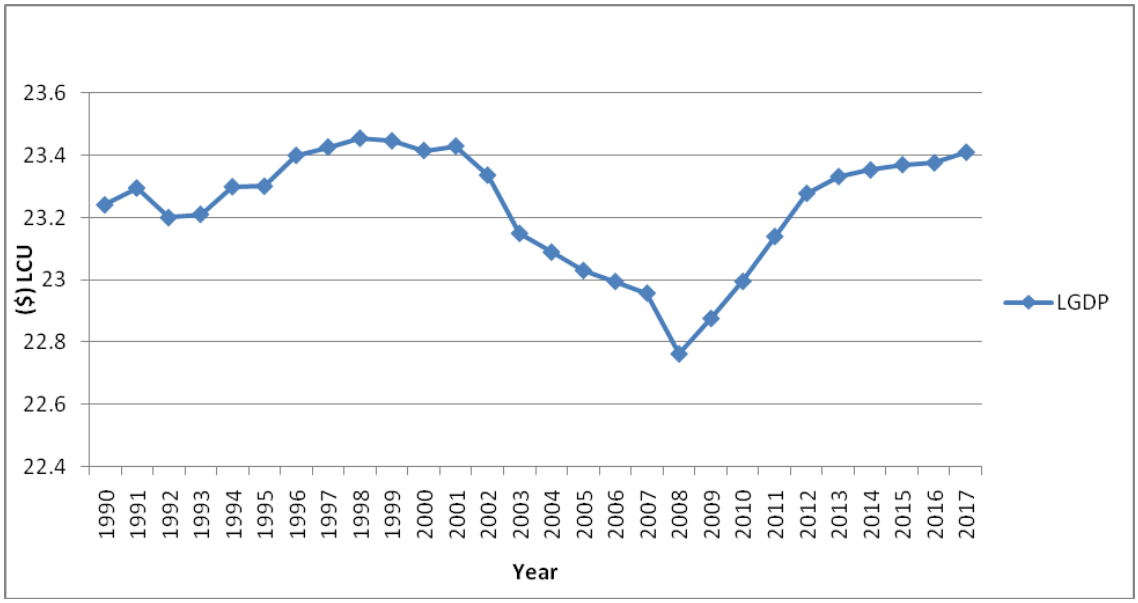
	LGDP	Doll	LTOP	ROL	LFDI	INFN
Mean	23.2	0.32	22.9	-1.29	18.4	8256356
Median	23.3	0.00	22.96	-1.38	18.6	22.97
Max	23.5	1.00	23.2	-0.43	20.8	2.31E+08
Min	22.8	0.00	22.3	-1.84	15.3	-7.5
Std.Dev	0.19	0.48	0.27	0.47	1.34	43683223
Skewness	-0.85	0.76	-0.799	0.38	-0.74	5.0037
Kurtosis	2.75	1.58	2.66	1.56	2.995	26.037
Jarque-Bera	3.43	5.07	3.12	3.07	2.44	735.995
Probability	0.18	0.079	0.21	0.22	0.29	0.00

The mean GDP is e^23.2= $13.2 billion (constant LCU). A combination of a postive mean and a negative skewness for GDP means a general decline in the movement of the variable, thereby indicating economic stagnation. This means that between 1996 and 2017 there was very little growth in the economy.The standard deviation is close to zero (0.19) which indicates very little variability in the series. This is confirmed in Figure 7 which shows a significant decline in GDP from 1996 to 2008. This was due to:

- Unplanned compensation of war veterans by the government, which resulted in the fiscal deficit.

- The expropriation of land from white farmers which resulted in a sharp decline in agricultural production and a fall in investor confidence since property rights were infringed. This resulted in targeted sanctions on Zimbabwe by the USA and most of the countries in the EU.

Figure 7: Economic Output in Zimbabwe, 1990 - 2017



From 2009 to 2013, there was a sharp increase in economic output due to the historical global political agreement (GPA) between Zanu PF and MDC-T which resulted in the formation of a government of national unity (GNU). This resulted in economic growth due to

- the introduction of a people-driven constitution which placed emphasis on the rule of law and property rights, and
- the adoptionof a multicurrency system and the lifting of foreign currency payment restrictions which attracted FDI.

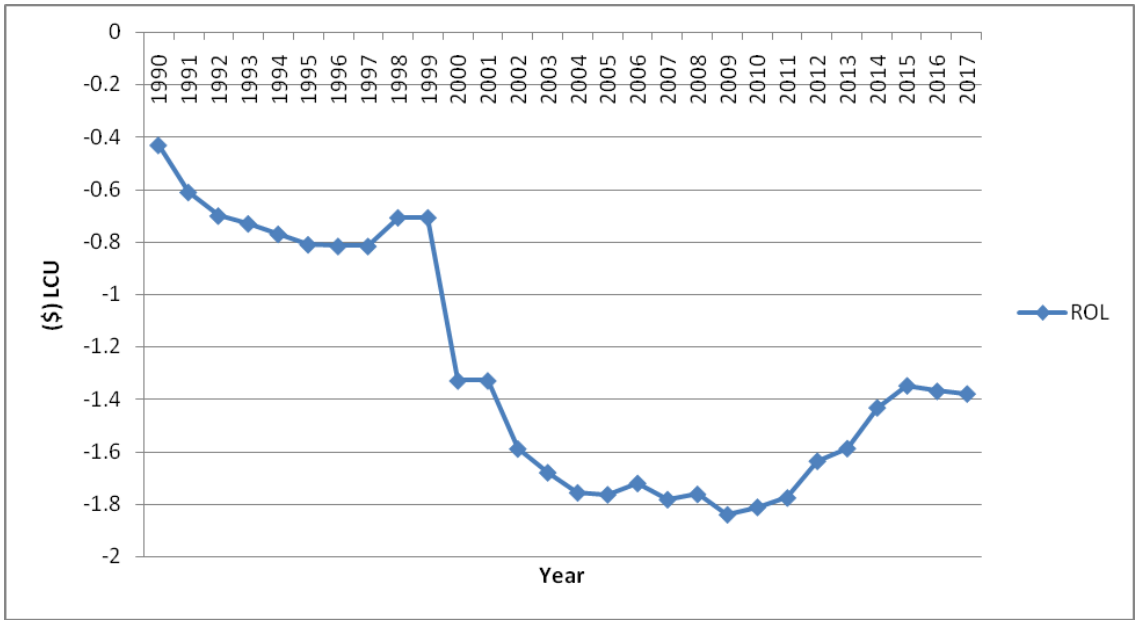
The gradual decline in GDP from 2013 to 2018 is associated with

- the 2013 disputed elections that resulted in the extension of targeted sanctions on Zimbabwe,
- the introduction of bond notes in 2016, and

- the reintroduction of exchange control restrictions which affected investor confidence and resulted in capital flight.

The ROL index exhibited a negative mean of 1.29. As explained in the preceding chapter, the ROL index ranges from -2.5 (the weakest measure) to 2.5 (the strongest measure). Hence, a value of -1.29, which is close to -2.5, indicates very poor ROL in Zimbabwe over the study period. Figure 4.2 shows the general downward trend in ROL from 1999 to 2009. This is due to the widely criticized land reform programme of 2000 and political violence against the opposition by the ruling Zanu PF party. From 2009 to 2015 the index exhibited an upward trend because of the GPA, which, as mentioned above, had a people-driven constitution that focused on ROL. However, from December 2015 to 2018 there was a decline again in the ROL; the reason being the disputed elections of 2013 and 2018. The killing of protesters on August 1 2018 by security forces in full view of the world also affected the ROL index.

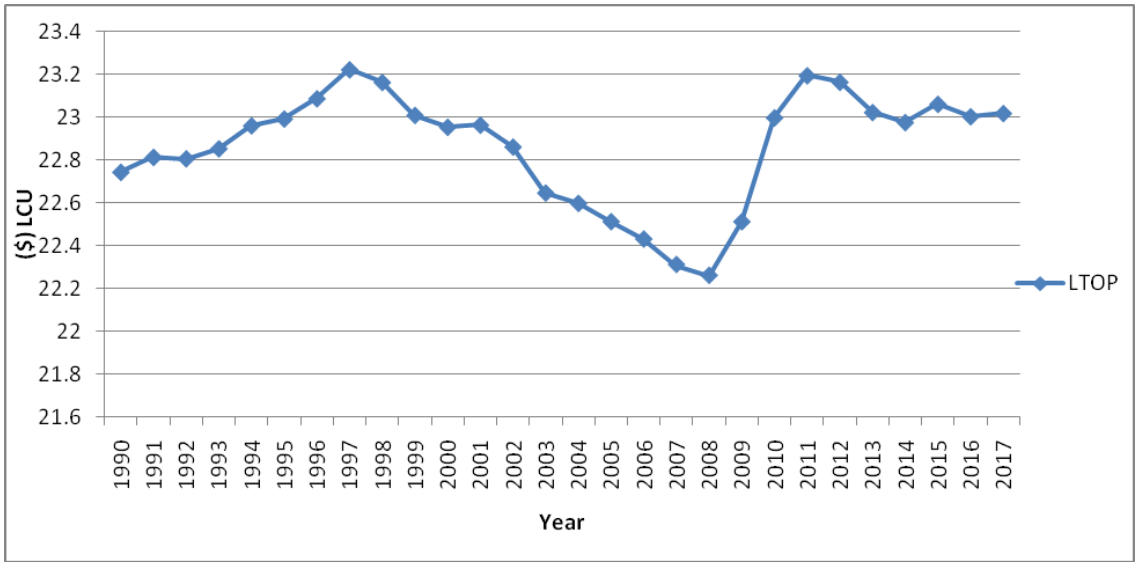
Figure 8: ROL in Zimbabwe, 1990 - 2017



On average TOP was e^22.9 = $8.8 billion (constant LCU). A combination of a positive mean and a negative skewness indicate a downward movement on average in TOP. Figure 9 shows that there was a sharp decrease in TOP from 1997 to 2008, which could be explained by economic sanctions and the land reform program. The historical hyperinflation also contributed to low productivity and lower exports. In addition, the acute shortage of foreign currency during that period resulted in less imports thereby affecting the trade openness measure. From 2009 to 2012 there was a notable rise in trade openness which may be

attributable to the adoption of the multicurrency system. However, from 2013 to 2017, there was a continuous decline in TOP, as Figure 9 demonstrates, which could be a result of political instability, the shortage of foreign currency and the introduction of bond notes and the introduction of SI 63 which resulted in the banning of the importation of many products.

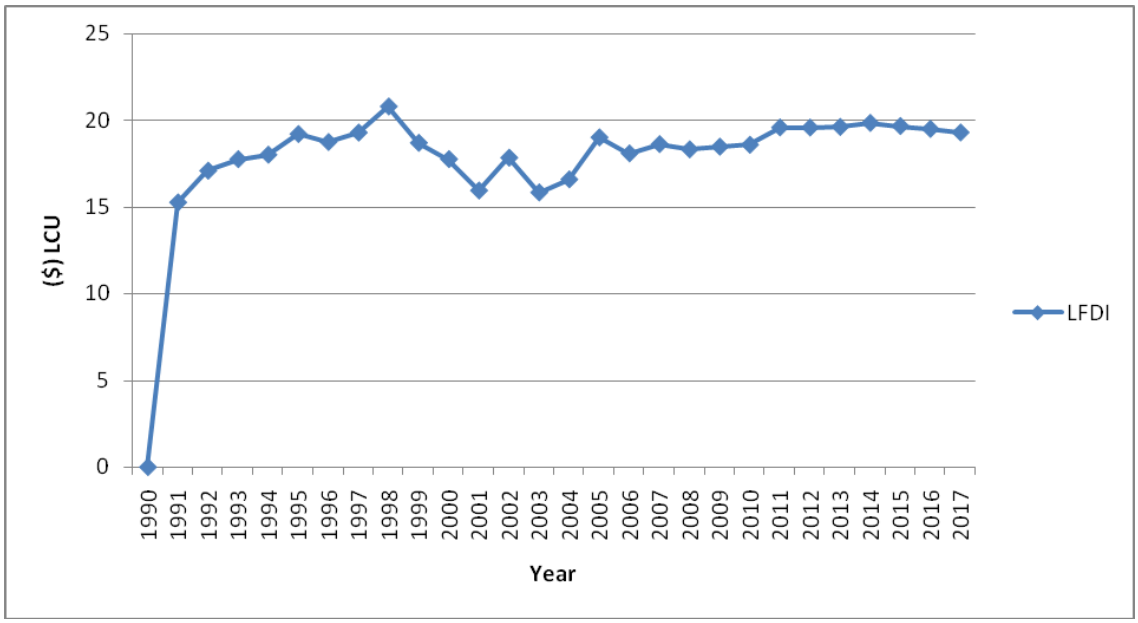
Figure 9: TOP in Zimbabwe



FDI was approximately e^18.4 = $98 million (constant LCU) on average in Zimbabwe over the period 1990- 2017. Figure 4.4 shows a sharp increase in FDI from 1990 to 1997 but this reversed noticably. The trend shows a sharp decline in FDI from 1998 to 2001 which was due to a combination of circumstances. Firstly there was a general decline in capital flows to developing countries due to a reduction in bank lending and bonds and an increase in risk aversion due to uncertainty in the late 1990s (Mohan et al., 2013). This can also be explained by the establishment of the war victims' compensation fund which resulted in the collapse of the Zimbabwean dollar exchange rate in 1997 - foreign investors are not interested in investing in countries with exchange rate volatility. The introduction of the land reform program in 2000 contributed to the continuous downward trend of FDI because of the lack of respect for property rights. There was a sharp increase in FDI from 2003 to 2005, which might be attributed to resource seeking FDI. This was followed by relative stagnation from 2006 to 2009 possibly arising due to the global economic crisis and the drying up of funds. There was a gradual increase from 2010 to 2013 which may be attributed to GNU. Between

2014 and 2017, FDI gradually fellwith worsening economic conditions and political uncertainty the likely contributing factors.

Figure 10: FDI in Zimbabwe, 1990 - 2017

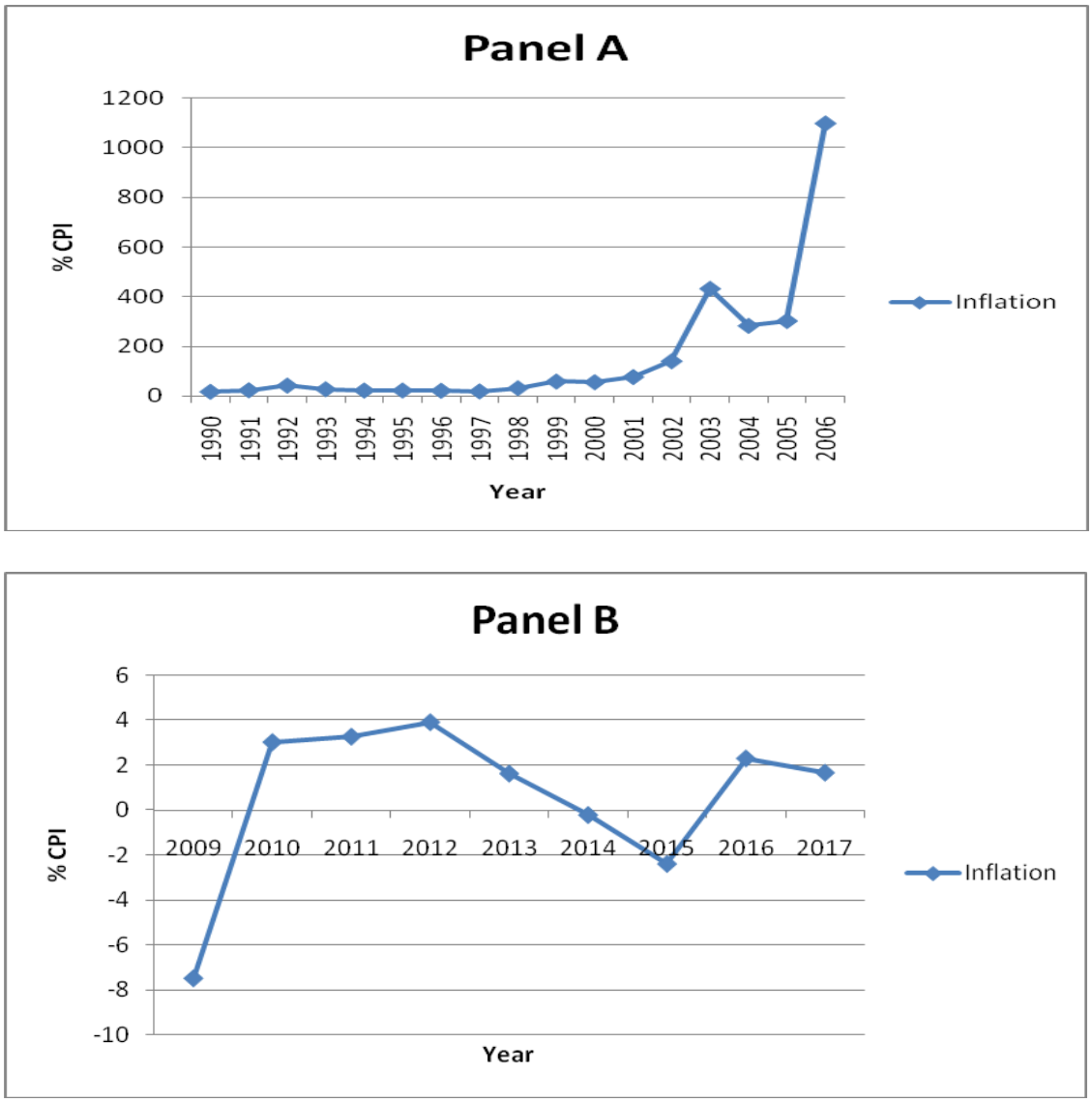


For inflation, the average of 8256356% is influenced by the presence of outlier values between 2007 and 2008, referred to by the IMF as one of the worst inflation episodes in modern history (IMF, 2017). Hyperinflation in 2008 was caused by fiscal indiscipline and RBZ quasi-fiscal activities.The standard deviation is also high confirming significant variability in the series due to these outliers. Figure 11 shows that from 2009 to 2015 there was a general decrease in inflation. A sharp decline in 2009 to negative inflation (referred to as deflation) of -7.5% was a result of dollarisation which removed price distortions and overcharging by traders. From 2010 to 2012 there was a gradual increase due to increased demand for goods and services while the opposite was true between 2014 to 2016 when there was a reduction in the demand of goods and services as an after effect of the disputed 2013 elections which resulted in the decline in inflation. The upward trend from 2016 to 2018 is associated with

- the introduction of bond notes and issuance of treasury bills to fund command agriculture and the importation of grain by the government, and

- the disputed 2018 elections and expropriation of diamond mines by the government resulted in the decline of investor confidence, thereby creating shortages in foreign currency.

Figure 11: Inflation in Zimbabwe, (Panel A: 1990 – 2006 and Panel B:2009- 2017)



***Note: 2007 and 2009 figures have been removed because of outlier effect. This resulted in splitting of inflation graph in order to establish the true trend.*

From the results presented in Table 5 for the Jarque-Bera statistic, the null hypothesiscannot be rejected for all the variables at 5% except for inflation. Thus it cannot be concluded that all

the variables are normally distributed except for inflation which is a consequence of the presence of extreme outliers. LGDP, DOLL, LTOP, LFDI and ROL have kurtosis values less than 3 signifying flat distributions with no outliers or significant peaks. This means that the movement in variables has not been significantly affected by random fluctuations. Inflation has a kurtosis value more than 3 signifying peaked distributions for the variables. This may be attributed to the presence of outliers or random fluctuations in the time series.

4.3 Pre-Estimation Tests

4.3.1 Correlation Matrix

Table 6 below shows that all absolute partial correlations are less than 0.8 (save for the correlation between TOP and GDP) and this implies there is no multicollinearity among variables (Pasara, 2015). The correlation between TOP and GDP (which is 0.81) exceeds the 0.8 yardstick which indicates the presence of multicollinearity based on the correlation matrix. According to Gujarat (2004), correlation matrix may not be sufficient to conclude the presence of multicollinearity among predictor variables. In this case we have to assess the VIFs of explanatory variables TOP and GDP and drop the variable with a VIF in excess of 10 (Gujarat, 2004; O'Brien, 2007; Nkeki & Osirike, 2013). In models where inflation, ROL and FDI are dependant variables we could not drop either TOP or GDP as their VIFs were below the threshold of 10 (See appendix 3). This means that predictor variables do not move together in systematic ways.

Table 6: Matrix of Correlates

	LGDP	DOLL	INFLN	LTOP	ROL	LFDI
LGDP	1					
DOLL	0.008	1				
INFLN	-0.49**	-0.14	1			
LTOP	0.81**	0.34	-0.45*	1		
ROL	0.62**	-0.42*	-0.2	0.46*	1	
LFDI	0.17	0.51	-0.01	0.39	-0.061	1

** and * indicate significance at the 1% and 5% levels respectively.

Table 6 indicate there is a weak positive correlation between dollarisation and GDP. The weak relationship might be as a result of a shallow financial sector that is caused by dollarisation which leaves less funds available for domestic lending since most of the money will be paid offshore. Dollarisation is negatively correlated with inflation and ROL but the magnitude of the latter is larger. According to Hanke (2009), if a government fails to preserve the value of its currency it means it's failing to comply with the ROL. Failure to comply with ROL will result in dollarisation because the domestic currency will be rejected. There is a positive relationship between dollarisation, trade and FDI. Growth is positively affected by TOP and ROL and to a lesser degree FDI. There is a negative correlation between Growth and inflation.

4.3.2 Unit Root Test Results

As explained in the previous chapter, the stationarity of the variables is tested using the ADF test, which tests for the existence of a unit root. The tests were first performed on variables in their level form and the results are presented in Table 7 below.

Table 7: Unit Root Test

Variable	Level		Fist Differences	
	Intercept	**Intercept + Trend**	**Intercept**	**Intercept + Trend**
LGDP	-1.69	-1.49	-3.24**	-3.28*
LTOP	-2.75*	-2.68	-	-3.65**
LFDI	-3.17**	-3.13	-	-6.32***
INFLN	-5.19***	-5.15***		
ROL	-1.93	-0.70	-4.58***	-4.92***

*, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.

As shown in Table 7, inflation is the only variable that is stationary at level, for both the intercept and intercept and trend models. LTOP, LFDI and Inflation are stationary in levels when an ADF is run with an intercept and the majority are not stationary when ADF is with intercept and trend. ARDL works well even if some of the variables are non stationary.

4.4 ARDL Model

4.4.1 Determination of the Optimal Number of Lags

As indicated in the previous chapter, to determine the optimal lag length for each of the five ARDL specifications, the AIC was used.

Table 8: Optimal Lag Length

		Dependant Variable				
		LGDP	INFLN	ROL	LTOP	LFDI
Predictors	LGDP	1	1	0	0	1
	INFLN	0	1	0	1	0
	ROL	0	0	2	0	0
	LTOP	0	0	0	4	1
	LFDI	0	0	1	0	1
	DOLL	0	1	0	1	1

4.4.2 ARDL Bounds Test

Table 9 below presents the results for the ARDL bounds test to determine whether cointegration exists between economic growth and the various factors. As can be seen, the F-statistics were larger than the upper bound critical values at 1%for all the regressions and therefore the null hypothesis of no cointegration was rejected. This means that a long-run relationship exists between the different variables irrespective of the identity of the dependent variable.

Table 9: ARDL Bounds Test

Dependent Variable	**F- Statistic**	
DLGDP	17.8***	
INFLN	3817.17***	
DLFDI	2.55	
DLTOP	7.5***	
DROL	2.03	
Critical Values	**Lower bound**	**Upper bound**
10%	2.26	3.35
5%	2.62	3.79
1%	3.41	*4.68*

*, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.

4.5 Long Run Dynamics

This following table presents an analysis of long run relationships.

Table 10: Long Run Estimates

	Dependant Variable			
		LGDP	LTOP	INFLN
Predictors + Respective Coefficients	LGDP		0.8630	261.66
	LFDI	0.0051	-0.0084	49.65
	DOLL	0.091	0.065	-165.71
	LTOP	0.6409		-965.08
	ROL	0.1429	0.0316	-152.07
	INFLN	-1.63E-09	-0.00017	

Table 10 shows that dollarisation positively influence GDP in the long run. GDP will increase by e^0.091= $2.48 (LCU) when there is dollarisation, confirming the findings of Benoni & Lindahl (2014), Klein (2005), Bannister et al. (2018) and Shinichi (2007). A 1% increase in FDI increases GDP by 0.0051%. A 1% increase in TOP will improve GDP by 0.6%. This result is confirmed by the findings of Weerasinghe (2007). A 1% increase in inflation reduces GDP by 1.63E-07%. For a 1 unit increase in the ROL index, GDP will increase by 14.3%.

For the model with TOP as a dependant variable; a 1% increase in GDP will improve TOP by 0.86% and a 1% increase in FDI will reduce TOP by 0.008%. A 1% increase in dollarisation improves TOP by e^0.065= $1.07 (LCU) and 1% increase in inflation lowers TOP by 0.017%. For a 1 unit increase in the ROL index, GDP will increase by 3.16%.

Inflation will be 166% lower when there is dollarisation. For a 1 unit increase in the ROL index, Inflation will decline by 152%. Increasing FDI by 1% will increase inflation by 0.496% and an increase in GDP by 1% will increase inflation by 2.62%. A 1% increase in TOP will reduce inflation by 9.65%.

4.6 Short Run Drivers

Table 11: Short Run Drivers

	Dependant Variable				
	DLGDP	DLTOP	DLFDI	DLROL	DINFLN
C	-0.32*	7.62***	10.03***	-1.79**	-2.40E+08***
D(LGDP)		1.24***	3.27	0.305	2046343***
D(LTOP)	0.32***		-0.51	-0.064	7795150***
D(LFDI)		-0.006		0.08**	15713.71
D(ROL)	0.07	-0.0096	2.68		1273632***
D(INFLN)	-8.19E-10***	2.61E-08***	3.93E-09	2.54E-10	
D(DOLL)	-0.16*	57304.13***	1.13	-0.02	-2.24E+12***
ECT(-1)	-0.000560***	-0.33***	-0.73***	-0.104**	9675.39***

*, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.

Table 11 shows that TOP, Inflation and Dollarisation significantly influence GDP. A 1% increase in TOP improves GDP by 0.32%. The result confirm findings by Weerasinghe (2007) for both short and long run dynamics. A 1% increase in inflation lowers GDP by 8.19E-08%. GDP will reduce by e^-0.16 = $0.85 (LCU) when there is dollarisation, contradicting findings by Benoni & Lindahl (2014), Klein (2005), Bannister et al. (2018) and Shinichi (2007). This may be attributed to shallow financial deepening (Bannister et al., 2018). Dollarisation results in a fragile financial sector because of the reliance on external sources of financial support by domestic financial institutions since the lender of last resort status of the central bank would have been lost (Mecgani & Maino, 2016). ROL and FDI do not significantly influence GDP and the interpretation of the signs of their coefficients is irrelevant. As mentioned in the preceding chapter, the error correction term adjusts for variations from equilibrium steadily through steps of partial short run corrections

(Tweneboah, 2016). The negative and significant coefficient for the ECT signifies the existence of a long term relationship between the explanatory variables and domestic output and it means that although there might be variations in the short term, the long term equilibrium relationship is restored (Tweneboah, 2016). Further to this, the ECT coefficient reflects the speed of correction of the dependent variable when disequilibrium occurs. For GDP, an ECT of 0.06% indicates slow speed of adjustment in reaching long run equilibrium state. The yardstick for speed of adjustment ranges between 0 and 100%. However, a coefficient of more than 100% is still acceptable (Narayan &Narayan, 2006).

In a model were TOP is the dependant variable; GDP, Inflation and dollarisation are statistically significant in influencing TOP in the short run. A 1% increase in GDP will improve TOP by 1.24% whilst a 1% increase in inflation will increase top by 2.61E-06%. It is clear that GDP and inflation significantly influence TOP both in the short and long run. The relationship is positive confirming findings by Beg &Boretzsein (2003) and Winkler et al. (2004). TOP will improve by $e^57304 (LCU), which is a significant margin, when there is dollarisation. The ECT indicates a 33% speed of adjustment to long run equilibrium state. This is within the 0- 100% recommended range (Narayan & Narayan, 2006).

In a model were FDI is the dependant variable all the explanatory variables are insignificantin the short run and commenting on their signs becomes irrelevant. Only the constant term is significant which is e^10.03= $22 697.27 (LCU). This implies that when explanatory variables are held constant, FDI will increase at a constant rate of $22 697.27 (LCU)/ year. ECT indicates 73% speed of adjustment to long run equilibrium state. This is within the 0-100% range.

In a model with ROL as the dependant variable, only FDI is statistically signioficant. A 1% increase in FDI will improve ROL by 0.0008%. Holding all explanatory variables constant ROL will be declining at a constant rate of 1.79%. The ECT indicates 10.4% speed of adjustment to long run equilibrium state.

In a model where inflation is the dependant variable; GDP, TOP, ROL and dollarisation significantly influence inflation in the short run. A 1% increase in GDP will increase inflation by 20463.43%. A 1% increase in TOP will increase inflation by 1273632%. Inflation will decrease by e^-2.24E+12% when there is dollarisation, which is a significant margin. Ic can

be noted that dollarisation is negatively related in inflation both in the short and long run. The findings have been confirmed by Gottschalk (2014), Saamoi (2011), Yagci (2011), Edwards &Magendzo (2001).

Holding all the explanatory variables constant, inflation declines at a constant rate of -2.24E+08%. The ECT indicates 9675.39% speed of adjustment to long run equilibrium state, which is outside 0- 100% range. However, a coefficient of more than 100% is still acceptable (Narayan &Narayan, 2006).

4.7 Granger Causality Test (refer appendix 2)

Below is a table for causality tests.

Table 12: Granger Causality Test

Null Hypothesis	F Statistic	Prob	Decision
DDOLL does not granger Cause DLGDP	1.73	0.2012	Cannot Reject the Null Hypothesis
DLGDP does not granger Cause DDOLL	3.498	0.0498**	Reject Null Hypothesis
DLFDI does not granger Cause DLGDP	0.98	0.39	Cannot Reject the Null Hypothesis
DLGDP does not granger Cause DLFDI	1.07	0.36	Cannot Reject the Null Hypothesis
DLTOP does not granger Cause DLGDP	3.78	0.04**	Reject Null Hypothesis
DLGDP does not granger Cause DLTOP	0.41	0.67	Cannot Reject the Null Hypothesis
DINFLN does not granger Cause DLGDP	0.94	0.41	Cannot Reject the Null Hypothesis
DLGDP does not granger Cause DINFLN	0.24	0.79	Cannot Reject the Null Hypothesis
DROL does not granger Cause	0.144	0.87	Cannot Reject the Null

DLGDP			Hypothesis
DLGDP does not granger Cause DROL	0.56	0.58	Cannot Reject the Null Hypothesis
DLFDI does not granger Cause DDOLL	0.07	0.93	Cannot Reject the Null Hypothesis
DDOLL does not granger Cause DLFDI	0.34	0.71	Cannot Reject the Null Hypothesis
DLTOPdoes not granger Cause DDOLL	0.39	0.68	Cannot Reject the Null Hypothesis
DDOLL does not granger Cause DLTOP	4.19	0.03**	Reject Null Hypothesis
DROL does not granger Cause DDOLL	0.07	0.93	Cannot Reject the Null Hypothesis
DDOLL does not granger Cause DROL	0.15	0.86	Cannot Reject the Null Hypothesis
DLTOP does not granger Cause DLFDI	2.29	0.13	Cannot Reject the Null Hypothesis
DLFDI does not granger Cause DTOP	0.84	0.45	Cannot Reject the Null Hypothesis

DINFLN does not granger Cause DLFDI	0.21	0.81	Cannot Reject the Null Hypothesis
DLFDI does not granger Cause DINFLN	0.28	0.76	Cannot Reject the Null Hypothesis
DROL does not granger Cause DLFDI	4.95	0.0186**	Reject Null Hypothesis
DLFDI does not granger Cause DROL	3.74	0.0426**	Reject Null Hypothesis
DINFLN does not granger Cause DLFDI	4.34	0.0271**	Reject Null Hypothesis
DLFDI does not granger Cause INFLN	3.2	0.062*	Reject Null Hypothesis
DROL does not granger Cause DLTOP	0.23	0.799	Cannot Reject the Null Hypothesis
DLTOP does not granger Cause DROL	1.21	0.32	Cannot Reject the Null Hypothesis
DROL does not granger Cause DINFLN	0.148	0.864	Cannot Reject the Null Hypothesis
DINFLN does not granger Cause DROL	0.153	0.858	Cannot Reject the Null Hypothesis

*, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.

The Granger causality test is employed to test the causal relationship between pairs of variables. The test is used to compliment the analysis of short run dynamics by determining the direction of causality. As can be seen from the table above, the null hypotheses that GDP does not Granger cause changes in dollarisation is rejected. This means that GDP affects dollarisation in the short term and the causal strength is significant at 5% level. The relationship, however, is not converse and this does not concur with findings from short run dynamics. The null hypothesis that changes in TOP do not Granger cause changes in GDP is rejected at the 5% level while the opposite is not be true suggesting a unidirectional relationship exists between economic output and trade openness. The unidirectional results support those from the ECM and related literature.

Dollarisation Granger cause changes in TOP at 5% level of significance, which supports results from the ECM and related literature. The converse is not true. Dollarisation also Granger causes changes in TOP at the 10% level of significance. Dollarisation has a positive relationship with trade openness because trade openness is a source of foreign currency. It will also have positive effects from an import/ export perspective if the currency is stable (Raheem &Asongu, 2016) The null hypothesis that changes in ROL do not Granger cause changes in FDI is rejected at the 5% level. The relationship is converse and is supported by the findings in the short run dynamics. Finally, the null hypothesis that changes in inflation do not Granger cause changes in FDI is rejected at 5% and 10% and the relationship is bidirectional. The causal relationship does not support the results from the ECM and related literature findings.

4.8 Model Diagnostics

Below is a table that summarise the results for the tests of model adequacy for each of the model. The results from model diagnostics indicate that the empirical results from the ARDL regressions can be considered valid and robust.

Table 13: Short Run Model Diagnostics

Statistic	**Meaning**
Adjusted R^2	The R squares and adjusted R squared values are more than 50% meaning to say the models' quality is good (Only FDI has an adjusted R squared value lower than 50%) (Refer Appendix 6)
F- Statistic	The F statistics are highly significant, indicating statistically significant models (Save for FDI). (Refer Appendix 6)
Durbin Watson (DW)	A value of 2 or close to 2 indicates no autocorrelation in the residuals of the regression models. From the critical values table dL=0.832 and dU=1.618. If the DW statistic is greater than dU, we fail to reject the null hypothesis of no autocorrelation in model residuals otherwise reject the null hypothesis. From the ECM results the DW statistics are all greater than dU=1.618 implying the null hypothesis of non-autocorrelated errors cannot be rejected. (Refer Appendix 6)
Breusch-Godfrey Serial Correlation LM best	The Prob. Chi- Square(2) of all the models are not statistically significant meaning the null hypothesis of no serial correlation cannot be rejected (Refer Appendix 1).
CUSUM recursive plots	The plots show that the models' variables are within the 5% bounds indicating that the models are stable and do not suffer from structural breaks. This means that the models are stable and the coefficient estimates did not change over the period of the study. Thus long run relationships cannot be explained by instability in the model parameters over time (Refer Appendix 1).

4.10 Chapter Conclusion

It can be concluded that most of the results from the regression analysis are in support of the existing literature by other authors. Only a few contradict the findings from other authors like the relationship between GDP and dollarisation in the short run.

Major findings and discussion of results were outlined in this chapter. The following chapter draws conclusions from major findings and prescribes policy recommendations for use by the government of Zimbabwe.

Chapter 5: Research Conclusions and Policy Recommendations

5.1 Introduction

The penultimate chapter was an analysis and discussion of the study's results. This chapter contains conclusions and recommendations to the policymakers based on the results and literature obtained during the study. It also contains recommendations on future studies that will be discussed in detail.

5.2 Study Summary and Conclusion

This study aimed to establish the effects of dollarisation on the Zimbabwean economy. The study incorporated FPIs and NFPIs that are both important in the sustainability of any country. The study employed the ARDL model to establish the effects dollarisation on FPIs and NFPIs over a 28-year period from 1990 to 2017. NFPIs are important in ensuring the success of the country while FPIs measure the success of a country (ACCA P5, 2015–2016). In the long run dollarisation positively influences gross domestic product and trade openness and negatively influences inflation. In the short run dollarisation is significantly related to gross domestic product, trade openness and inflation. Short run results indicate that dollarisation is negatively related to gross domestic product and inflation and positively related to trade openness. However, the use of a dummy variable to measure dollarisation is subjective and may not measure the exact effect of dollarisation on FPIs and NFPIs.

5.3 Policy Recommendations

In February 2009, Zimbabwe adopted the multicurrency system, which is classified under the fixed exchange rate regime (IMF, 2017). This resulted in the official dollarisation of the economy until 2016 when the government introduced using bond notes, which resulted in partial dollarisation (IMF, 2017). In this whole process comprising of different forms of dollarisation, the USD has always been the anchor currency (IMF, 2017). In this section, it is recommended that Zimbabwe should change its anchor currency from the USD to the South African Rand. This can only be achieved by joining the CMA, as the CMA has met the OCA criteria (Chlond, 2018). Hence, it is important to justify how Zimbabwe meets the OCA criteria.

Regarding the official dollarisation, if Zimbabwe chooses the Rand as an anchor currency, the OCA criteria are easily met, which will result in the full realisation of the benefits of joining the CMA (Kramarenko et al., 2010). Concerning labour mobility, Zimbabweans are allowed to work in South Africa after they were issued with work permits in April 2009 and there are no cultural barriers between Zimbabwe and South Africa (Kramarenko et al., 2010; World Bank, 2016).

South Africa lacks skills in certain areas and Zimbabwe has a large skilled population. About 3 million Zimbabweans are currently working in South Africa (World Bank, 2016). Labour mobility controls the cost of loss of monetary independence because of employment opportunities to the unemployed in a country experiencing a recession (Kramarenko et al., 2010). When the above is benchmarked against immigration rates and entry barriers to the USA, it is clear that the Zimbabwean government is making a wrong choice of the anchor currency by continuously choosing the USD (Kramarenko et al., 2010). Regarding trading, South Africa is Zimbabwe's biggest trading partner with at least 40% of Zimbabwe's imports from South Africa and 25% of exports to South Africa as compared to 3% and 4% respectively for the USA (Kramarenko et al., 2010; World Bank, 2016).

If Zimbabwe Joins the CMA, the country will be cushioned from symmetric shocks due to the synchronisation effect (Kramarenko et al., 2010). Concerning fiscal transfers, the CMA does not include fiscal transfers, but this will be offset by seigniorage compensation (Chlond, 2018). From the above explanations, it is clear that Zimbabwe meets most of the OCA criteria except the Maaschrit criteria of 1992 (Chlond, 2018).

Zimbabwe is experiencing rising inflation rates and a high debt GDP ratio (World Bank, 2016). Zimbabwe is in debt distress, which includes both domestic and external debt (IMF, 2017). OCA requires any prospective country to have foreign reserves, but it is important to note that as of 2016, Zimbabwe had external debts worth about USD9.35 billion (IMF, 2017). This clearly illustrates that Zimbabwe does not have any foreign currency reserves, thereby failing the key requirement for joining the CMA (Chlond, 2018). Despite having failed the test to join the CMA, it is recommended that Zimbabwe should consider moving to full dollarisation and adopt the Rand as its anchor currency and then work towards clearing its debts. Zimbabwe should establish proper policies and systems to accumulate enough foreign reserves that will enable the country to join the CMA.

Zimbabwe is strongly discouraged from de-dollarisation because de-dollarisation is a long-term strategy that requires sound governance structures and policies to be put in place that make the domestic currency more attractive in terms of economic transactions (Kokenyne et al., 2010). The other reason Zimbabwe should move back to full dollarisation is that the introduction of the bond notes has resulted in serious fiscal indiscipline through the issuance of TBs to fund expensive programmes and procurement of overvalued commodities such as the CAP (IMF, 2017). The unofficial dollarisation is not working for Zimbabwe because the fixed official rate of 1:1 between the bond and the USD is not sustainable; hence, it has already created a parallel market (IMF, 2017). The USD is being driven out of circulation by the bond note with only USD600 to 800 million left in circulation in 2016 (IMF, 2017).

Regarding ROL, Zimbabwe does not comply with many laws. The elections have been disputed since 2000; hence, the country should invest in an auditable system and implement all the promised reforms such as good governance, respect of ROL and human rights (ZIDERA, 2018). The government of Zimbabwe should measure performance on NFPIs such as ROL and others such as corruption because "what gets measured gets done". It is an important phrase in terms of performance measurement (ACCA, 2015). Governance issues such as ROL and corruption should be measured because they affect the overall performance of the country. These NFPIs affect the country's risk, thereby affecting FDI. A perfect example regarding not respecting the ROL arises from what is referred to by the World Bank as the disorderly land reform programme, which resulted in the expropriation of land from white farmers without compensation. It is recommended that the white farmers should be compensated at fair value and the compensation should be made public because expropriation has no place in this world.

An illustration of performance measurement concerning corruption is using the number of convictions on corruption cases as a KPI, and the government should record such cases and make them public. The government should publicise judgments on expropriation to regain investor confidence because property rights are of critical importance to any investor.

5.4 Areas of Further Studies

Similar studies of effects of dollarisation should focus more on NFPIs. Governance indicators should be identified and be part of econometric models to establish their effect on economic

growth and dollarisation. A perfect example would be the inclusion of a political stability index and corruption index. It is also recommended that future studies should focus on the conditions necessary for a successful de-dollarisation of the Zimbabwean economy.

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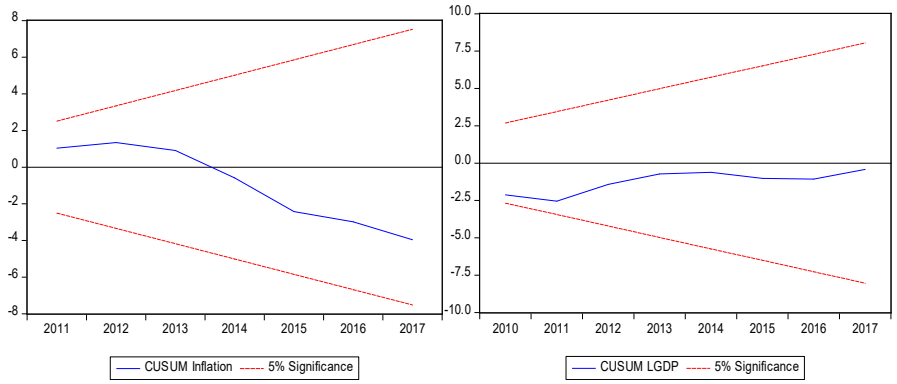
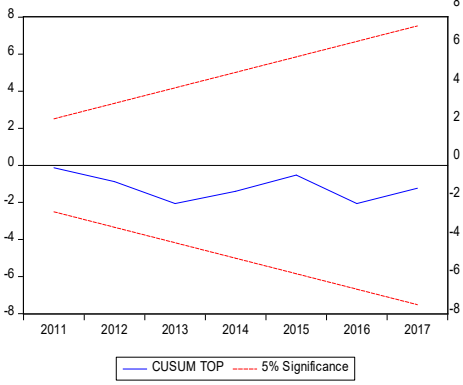
Appendix 1 Further Diagnostics for ARDL and ECM

Table 14: Breusch-Godfrey Serial Correlation LM test

D(LGDP)	F statistic: 0.24	Prob F(2,11): 0.79	Obs R^2: 0.71	Prob. Chi- Square(2): 0.70
D(LTOP)	F- statistic: 0.13	Prob F(2,11): 0.88	Obs R^2: 0.58	Prob. Chi- Square(2): 0.75
DROL	F statistic: 1.24	Prob F(2,11): 0.32	Obs R^2: 3.69	Prob. Chi- Square(2): 0.16
D(LFDI)	F statistic: 1.36	Prob F(2,11): 0.29	Obs R^2: 4.23	Prob. Chi- Square(2): 0.12
D(INFLN)	F statistic: 0.57	Prob F(2,11): 0.58	Obs R^2: 1.83	Prob. Chi- Square(2): 0.40

Figure 12: CUSUM Recursive Plots




8
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2011
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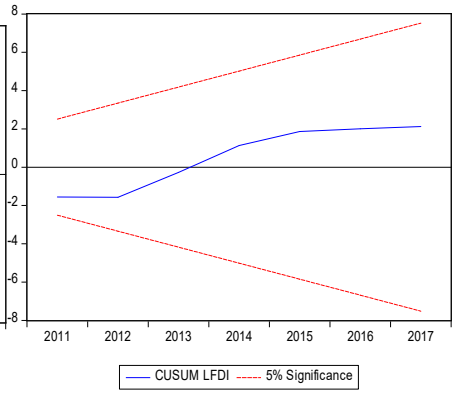
CUSUM TOP
5% Significance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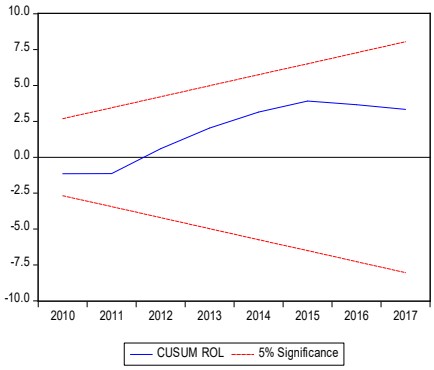
CUSUM LFDI
5% Significance


10.0
7.5
5.0
2.5
0.0
-2.5
-5.0
-7.5
-10.0
2010
2011
2012
2013
2014
2015
2016
2017
CUSUM ROL
5% Significance

Appendix 2: Granger Causality test

Table 15: Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
D(DOLL) does not Granger Cause DLGDP	25	1.73922	0.2012
DLGDP does not Granger Cause D(DOLL)		3.49782	0.0498
DLFDI does not Granger Cause DLGDP	24	0.98193	0.3928
DLGDP does not Granger Cause DLFDI		1.06990	0.3628
DLTOP does not Granger Cause DLGDP	25	3.78084	0.0405
DLGDP does not Granger Cause DLTOP		0.41097	0.6685
D(INFLN) does not Granger Cause DLGDP	25	0.93724	0.4082
DLGDP does not Granger Cause D(INFLN)		0.24156	0.7877
D(ROL) does not Granger Cause DLGDP	25	0.14436	0.8665
DLGDP does not Granger Cause D(ROL)		0.55675	0.5817
DLFDI does not Granger Cause D(DOLL)	24	0.07088	0.9318
D(DOLL) does not Granger Cause DLFDI		0.34511	0.7125
DLTOP does not Granger Cause D(DOLL)	25	0.39182	0.6809
D(DOLL) does not Granger Cause DLTOP		4.18518	0.0303
D(INFLN) does not Granger Cause D(DOLL)	25	NA	NA
D(DOLL) does not Granger Cause D(INFLN)		NA	NA
D(ROL) does not Granger Cause D(DOLL)	25	0.06765	0.9348
D(DOLL) does not Granger Cause D(ROL)		0.14920	0.8623
DLTOP does not Granger Cause DLFDI	24	2.29148	0.1284
DLFDI does not Granger Cause DLTOP		0.84375	0.4456
D(INFLN) does not Granger Cause DLFDI	24	0.21049	0.8121
DLFDI does not Granger Cause D(INFLN)		0.27788	0.7604
D(ROL) does not Granger Cause DLFDI	24	4.95059	0.0186
DLFDI does not Granger Cause D(ROL)		3.74177	0.0426
D(INFLN) does not Granger Cause DLTOP	25	4.34316	0.0271
DLTOP does not Granger Cause D(INFLN)		3.19947	0.0623
D(ROL) does not Granger Cause DLTOP	25	0.22667	0.7992
DLTOP does not Granger Cause D(ROL)		1.21195	0.3186
D(ROL) does not Granger Cause D(INFLN)	25	0.14777	0.8636
D(INFLN) does not Granger Cause D(ROL)		0.15381	0.8584

Appendix 4- ADF tests

Null Hypothesis: LGDP has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.685403	0.4266
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LGDP)
Method: Least Squares
Date: 02/09/19 Time: 18:26
Sample (adjusted): 1992 2017
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGDP(-1)	-0.142554	0.084582	-1.685403	0.1054
D(LGDP(-1))	0.475307	0.185882	2.557031	0.0176
C	3.313123	1.964435	1.686552	0.1052

R-squared	0.250470	Mean dependent var	0.004408
Adjusted R-squared	0.185294	S.D. dependent var	0.087407
S.E. of regression	0.078895	Akaike info criterion	-2.133235
Sum squared resid	0.143161	Schwarz criterion	-1.988070
Log likelihood	30.73206	Hannan-Quinn criter.	-2.091433
F-statistic	3.842955	Durbin-Watson stat	2.058848
Prob(F-statistic)	0.036314		

Null Hypothesis: LGDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.490270	0.8069
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LGDP)
Method: Least Squares
Date: 02/09/19 Time: 18:28
Sample (adjusted): 1992 2017
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGDP(-1)	-0.135112	0.090662	-1.490270	0.1504
D(LGDP(-1))	0.464423	0.194011	2.393797	0.0256
C	3.131609	2.115707	1.480172	0.1530
@TREND("1990")	0.000600	0.002230	0.269084	0.7904

R-squared	0.252929	Mean dependent var	0.004408
Adjusted R-squared	0.151056	S.D. dependent var	0.087407
S.E. of regression	0.080536	Akaike info criterion	-2.059598
Sum squared resid	0.142691	Schwarz criterion	-1.866045
Log likelihood	30.77478	Hannan-Quinn criter.	-2.003862
F-statistic	2.482781	Durbin-Watson stat	2.052162
Prob(F-statistic)	0.087532		

Null Hypothesis: D(LGDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.238937	0.0290
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LGDP,2)
Method: Least Squares
Date: 02/09/19 Time: 18:29
Sample (adjusted): 1992 2017
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGDP(-1))	-0.604245	0.186557	-3.238937	0.0035
C	0.002360	0.016084	0.146702	0.8846

R-squared	0.304160	Mean dependent var	-0.000767
Adjusted R-squared	0.275167	S.D. dependent var	0.096156
S.E. of regression	0.081864	Akaike info criterion	-2.093706
Sum squared resid	0.160842	Schwarz criterion	-1.996930
Log likelihood	29.21818	Hannan-Quinn criter.	-2.065838
F-statistic	10.49071	Durbin-Watson stat	1.918248
Prob(F-statistic)	0.003495		

Null Hypothesis: D(LGDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.276950	0.0923
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LGDP,2)
Method: Least Squares
Date: 02/09/19 Time: 18:29
Sample (adjusted): 1992 2017
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGDP(-1))	-0.622347	0.189917	-3.276950	0.0033
C	-0.020947	0.035414	-0.591492	0.5600
@TREND("1990")	0.001614	0.002179	0.740549	0.4665

R-squared	0.320366	Mean dependent var	-0.000767
Adjusted R-squared	0.261267	S.D. dependent var	0.096156
S.E. of regression	0.082645	Akaike info criterion	-2.040348
Sum squared resid	0.157096	Schwarz criterion	-1.895183
Log likelihood	29.52452	Hannan-Quinn criter.	-1.998545
F-statistic	5.420864	Durbin-Watson stat	1.922434
Prob(F-statistic)	0.011781		

Null Hypothesis: LTOP has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.753400	0.0790
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LTOP)
Method: Least Squares
Date: 02/09/19 Time: 18:32
Sample (adjusted): 1992 2017
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LTOP(-1)	-0.232004	0.084261	-2.753400	0.0113
D(LTOP(-1))	0.656721	0.157546	4.168442	0.0004
C	5.304838	1.925864	2.754525	0.0113

R-squared	0.467707	Mean dependent var	0.007905
Adjusted R-squared	0.421421	S.D. dependent var	0.146105
S.E. of regression	0.111134	Akaike info criterion	-1.447999
Sum squared resid	0.284066	Schwarz criterion	-1.302834
Log likelihood	21.82399	Hannan-Quinn criter.	-1.406197
F-statistic	10.10465	Durbin-Watson stat	1.595964
Prob(F-statistic)	0.000709		

Null Hypothesis: LTOP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.682694	0.2509
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LTOP)
Method: Least Squares
Date: 02/09/19 Time: 18:32
Sample (adjusted): 1992 2017
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LTOP(-1)	-0.231602	0.086332	-2.682694	0.0136
D(LTOP(-1))	0.656339	0.161159	4.072618	0.0005
C	5.292600	1.976506	2.677756	0.0137
@TREND("1990")	0.000211	0.002978	0.070756	0.9442

R-squared	0.467828	Mean dependent var	0.007905
Adjusted R-squared	0.395259	S.D. dependent var	0.146105
S.E. of regression	0.113618	Akaike info criterion	-1.371304
Sum squared resid	0.284001	Schwarz criterion	-1.177750
Log likelihood	21.82695	Hannan-Quinn criter.	-1.315567
F-statistic	6.446681	Durbin-Watson stat	1.596362
Prob(F-statistic)	0.002682		

Null Hypothesis: D(LTOP) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.724615	0.0100
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LTOP,2)
Method: Least Squares
Date: 02/09/19 Time: 18:33
Sample (adjusted): 1993 2017
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LTOP(-1))	-0.669971	0.179876	-3.724615	0.0012
D(LTOP(-1),2)	0.469047	0.188444	2.489047	0.0209
C	0.008357	0.023166	0.360732	0.7217

R-squared	0.397620	Mean dependent var	0.000851
Adjusted R-squared	0.342858	S.D. dependent var	0.142346
S.E. of regression	0.115392	Akaike info criterion	-1.368802
Sum squared resid	0.292935	Schwarz criterion	-1.222537
Log likelihood	20.11002	Hannan-Quinn criter.	-1.328234
F-statistic	7.260894	Durbin-Watson stat	1.763766
Prob(F-statistic)	0.003789		

Null Hypothesis: D(LTOP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.646422	0.0459
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LTOP,2)
Method: Least Squares
Date: 02/09/19 Time: 18:34
Sample (adjusted): 1993 2017
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LTOP(-1))	-0.671841	0.184247	-3.646422	0.0015
D(LTOP(-1),2)	0.470114	0.192814	2.438179	0.0237
C	-0.000621	0.054486	-0.011398	0.9910
@TREND("1990")	0.000600	0.003278	0.182980	0.8566

R-squared	0.398579	Mean dependent var	0.000851
Adjusted R-squared	0.312661	S.D. dependent var	0.142346
S.E. of regression	0.118013	Akaike info criterion	-1.290395
Sum squared resid	0.292469	Schwarz criterion	-1.095375
Log likelihood	20.12993	Hannan-Quinn criter.	-1.236304
F-statistic	4.639097	Durbin-Watson stat	1.764524
Prob(F-statistic)	0.012188		

Null Hypothesis: LFDI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.173194	0.0334
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LFDI)
Method: Least Squares
Date: 02/09/19 Time: 18:35
Sample (adjusted): 1992 2017
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFDI(-1)	-0.457578	0.144201	-3.173194	0.0041
C	8.559721	2.655550	3.223333	0.0036

R-squared	0.295551	Mean dependent var	0.155041
Adjusted R-squared	0.266198	S.D. dependent var	1.138711
S.E. of regression	0.975445	Akaike info criterion	2.861957
Sum squared resid	22.83582	Schwarz criterion	2.958734
Log likelihood	-35.20544	Hannan-Quinn criter.	2.889825
F-statistic	10.06916	Durbin-Watson stat	2.080127
Prob(F-statistic)	0.004098		

Null Hypothesis: LFDI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.126501	0.1213
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LFDI)
Method: Least Squares
Date: 02/09/19 Time: 18:36
Sample (adjusted): 1992 2017
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFDI(-1)	-0.514550	0.164577	-3.126501	0.0047
C	9.292950	2.857080	3.252604	0.0035
@TREND("1990")	0.021601	0.029111	0.742038	0.4656

R-squared	0.312021	Mean dependent var	0.155041
Adjusted R-squared	0.252196	S.D. dependent var	1.138711
S.E. of regression	0.984707	Akaike info criterion	2.915222
Sum squared resid	22.30191	Schwarz criterion	3.060387
Log likelihood	-34.89789	Hannan-Quinn criter.	2.957024
F-statistic	5.215621	Durbin-Watson stat	2.005363
Prob(F-statistic)	0.013556		

Null Hypothesis: D(LFDI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.447622	0.0000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LFDI,2)
Method: Least Squares
Date: 02/09/19 Time: 18:37
Sample (adjusted): 1993 2017
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LFDI(-1))	-1.242941	0.192775	-6.447622	0.0000
C	0.129195	0.221477	0.583335	0.5653

R-squared	0.643808	Mean dependent var	-0.081520
Adjusted R-squared	0.628321	S.D. dependent var	1.796529
S.E. of regression	1.095263	Akaike info criterion	3.096484
Sum squared resid	27.59080	Schwarz criterion	3.193994
Log likelihood	-36.70605	Hannan-Quinn criter.	3.123529
F-statistic	41.57183	Durbin-Watson stat	2.090249
Prob(F-statistic)	0.000001		

Null Hypothesis: D(LFDI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.322968	0.0001
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LFDI,2)
Method: Least Squares
Date: 02/09/19 Time: 18:38
Sample (adjusted): 1993 2017
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LFDI(-1))	-1.252303	0.198056	-6.322968	0.0000
C	0.306506	0.523533	0.585458	0.5642
@TREND("1990")	-0.011715	0.031209	-0.375367	0.7110

R-squared	0.646074	Mean dependent var	-0.081520
Adjusted R-squared	0.613899	S.D. dependent var	1.796529
S.E. of regression	1.116309	Akaike info criterion	3.170100
Sum squared resid	27.41522	Schwarz criterion	3.316365
Log likelihood	-36.62625	Hannan-Quinn criter.	3.210667
F-statistic	20.07997	Durbin-Watson stat	2.083131
Prob(F-statistic)	0.000011		

Null Hypothesis: INFLN has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.195631	0.0002
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLN)
Method: Least Squares
Date: 02/09/19 Time: 18:40
Sample (adjusted): 1991 2017
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLN(-1)	-1.038361	0.199853	-5.195631	0.0000
C	8890601.	8890453.	1.000017	0.3269

R-squared	0.519181	Mean dependent var	-0.580978
Adjusted R-squared	0.499948	S.D. dependent var	64106338
S.E. of regression	45332390	Akaike info criterion	38.16813
Sum squared resid	5.14E+16	Schwarz criterion	38.26412
Log likelihood	-513.2697	Hannan-Quinn criter.	38.19667
F-statistic	26.99458	Durbin-Watson stat	2.003069
Prob(F-statistic)	0.000022		

Null Hypothesis: INFLN has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.145075	0.0016
Test critical values:	1% level	-4.339330	
	5% level	-3.587527	
	10% level	-3.229230	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLN)
Method: Least Squares
Date: 02/09/19 Time: 18:42
Sample (adjusted): 1991 2017
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLN(-1)	-1.051865	0.204441	-5.145075	0.0000
C	590630.5	18212611	0.032430	0.9744
@TREND("1990")	601113.9	1145803.	0.524622	0.6047

R-squared	0.524632	Mean dependent var	-0.580978
Adjusted R-squared	0.485018	S.D. dependent var	64106338
S.E. of regression	46004144	Akaike info criterion	38.23080
Sum squared resid	5.08E+16	Schwarz criterion	38.37478
Log likelihood	-513.1158	Hannan-Quinn criter.	38.27361
F-statistic	13.24361	Durbin-Watson stat	2.000383
Prob(F-statistic)	0.000133		

Null Hypothesis: ROL has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.933796	0.3127
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ROL)
Method: Least Squares
Date: 02/09/19 Time: 18:44
Sample (adjusted): 1991 2017
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROL(-1)	-0.111368	0.057590	-1.933796	0.0645
C	-0.178034	0.078618	-2.264554	0.0325

R-squared	0.130119	Mean dependent var	-0.035185
Adjusted R-squared	0.095324	S.D. dependent var	0.146998
S.E. of regression	0.139816	Akaike info criterion	-1.025792
Sum squared resid	0.488713	Schwarz criterion	-0.929804
Log likelihood	15.84819	Hannan-Quinn criter.	-0.997250
F-statistic	3.739567	Durbin-Watson stat	1.833513
Prob(F-statistic)	0.064536		

Null Hypothesis: ROL has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.704712	0.9624
Test critical values:	1% level	-4.339330	
	5% level	-3.587527	
	10% level	-3.229230	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ROL)
Method: Least Squares
Date: 02/09/19 Time: 18:45
Sample (adjusted): 1991 2017
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROL(-1)	-0.067990	0.096479	-0.704712	0.4878
C	-0.168156	0.081607	-2.060557	0.0503
@TREND("1990")	0.003269	0.005787	0.564786	0.5775

R-squared	0.141529	Mean dependent var	-0.035185
Adjusted R-squared	0.069990	S.D. dependent var	0.146998
S.E. of regression	0.141760	Akaike info criterion	-0.964921
Sum squared resid	0.482303	Schwarz criterion	-0.820939
Log likelihood	16.02644	Hannan-Quinn criter.	-0.922108
F-statistic	1.978341	Durbin-Watson stat	1.940633
Prob(F-statistic)	0.160217		

Null Hypothesis: D(ROL) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.575117	0.0013
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ROL,2)
Method: Least Squares
Date: 02/09/19 Time: 18:45
Sample (adjusted): 1992 2017
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ROL(-1))	-0.912498	0.199448	-4.575117	0.0001
C	-0.026452	0.030175	-0.876603	0.3894

R-squared	0.465856	Mean dependent var	0.006538
Adjusted R-squared	0.443600	S.D. dependent var	0.200299
S.E. of regression	0.149407	Akaike info criterion	-0.890477
Sum squared resid	0.535741	Schwarz criterion	-0.793700
Log likelihood	13.57620	Hannan-Quinn criter.	-0.862609
F-statistic	20.93170	Durbin-Watson stat	2.062178
Prob(F-statistic)	0.000122		

Null Hypothesis: D(ROL) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.920490	0.0028
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ROL,2)
Method: Least Squares
Date: 02/09/19 Time: 18:46
Sample (adjusted): 1992 2017
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ROL(-1))	-1.025570	0.208428	-4.920490	0.0001
C	-0.119586	0.068548	-1.744559	0.0944
@TREND("1990")	0.006141	0.004083	1.504165	0.1461

R-squared	0.513694	Mean dependent var	0.006538
Adjusted R-squared	0.471406	S.D. dependent var	0.200299
S.E. of regression	0.145626	Akaike info criterion	-0.907381
Sum squared resid	0.487760	Schwarz criterion	-0.762216
Log likelihood	14.79596	Hannan-Quinn criter.	-0.865579
F-statistic	12.14766	Durbin-Watson stat	1.982580
Prob(F-statistic)	0.000251		

Appendix 5- ARDL Bounds Tests and Long Run Estimates

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LGDP)
Selected Model: ARDL(1, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 02/09/19 Time: 19:04
Sample: 1990 2017
Included observations: 27

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.020022	1.311288	2.303097	0.0321
LGDP(-1)*	-0.348360	0.058325	-5.972695	0.0000
DOLL**	0.031798	0.026556	1.197404	0.2451
INFLN**	-5.67E-10	1.97E-10	-2.877219	0.0093
LTOP**	0.223267	0.053990	4.135380	0.0005
LFDI**	0.001776	0.007066	0.251367	0.8041
ROL**	0.049781	0.027063	1.839480	0.0807

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DOLL	0.091278	0.082780	1.102658	0.2833
INFLN	-1.63E-09	6.19E-10	-2.631349	0.0160
LTOP	0.640910	0.138264	4.635402	0.0002
LFDI	0.005099	0.020357	0.250463	0.8048
ROL	0.142901	0.079333	1.801289	0.0868

EC = LGDP - (0.0913*DOLL -0.0000*INFLN + 0.6409*LTOP + 0.0051*LFDI + 0.1429*ROL)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	17.81292	10%	2.26	3.35
k	5	5%	2.62	3.79
		2.5%	2.96	4.18
		1%	3.41	4.68
Actual Sample Size	27	Finite Sample: n=35		
		10%	2.508	3.763
		5%	3.037	4.443
		1%	4.257	6.04
		Finite Sample: n=30		
		10%	2.578	3.858
		5%	3.125	4.608
		1%	4.537	6.37

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-5.972695	10%	-2.57	-3.86
		5%	-2.86	-4.19
		2.5%	-3.13	-4.46
		1%	-3.43	-4.79

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LFDI)
Selected Model: ARDL(1, 1, 1, 1, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 02/09/19 Time: 19:18
Sample: 1990 2017
Included observations: 26

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	56.14934	47.60713	1.179431	0.2555
LFDI(-1)*	-0.730781	0.220002	-3.321700	0.0043
DOLL(-1)	0.952204	0.774778	1.229002	0.2368
LGDP(-1)	-3.025528	3.371330	-0.897429	0.3828
LTOP(-1)	1.256964	2.541043	0.494664	0.6276
ROL**	1.008986	0.829492	1.216390	0.2415
INFLN**	2.94E-09	6.82E-09	0.430915	0.6723
D(DOLL)	0.307875	1.344771	0.228942	0.8218
D(LGDP)	2.110931	6.868804	0.307322	0.7626
D(LTOP)	-1.616361	2.650995	-0.609719	0.5506

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DOLL	1.302995	0.989132	1.317311	0.2063
LGDP	-4.140130	5.081225	-0.814790	0.4272
LTOP	1.720028	3.597375	0.478134	0.6390
ROL	1.380695	1.181690	1.168407	0.2598
INFLN	4.02E-09	8.80E-09	0.457082	0.6538

EC = LFDI - (1.3030*DOLL -4.1401*LGDP + 1.7200*LTOP + 1.3807*ROL + 0.0000*INFLN)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	2.553572	10%	2.26	3.35
k	5	5%	2.62	3.79
		2.5%	2.96	4.18
		1%	3.41	4.68
Actual Sample Size	26	Finite Sample: n=35		
		10%	2.508	3.763
		5%	3.037	4.443
		1%	4.257	6.04
		Finite Sample: n=30		
		10%	2.578	3.858
		5%	3.125	4.608
		1%	4.537	6.37

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-3.321700	10%	-2.57	-3.86
		5%	-2.86	-4.19
		2.5%	-3.13	-4.46
		1%	-3.43	-4.79

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LTOP)
Selected Model: ARDL(4, 1, 0, 0, 1, 0)
Case 3: Unrestricted Constant and No Trend
Date: 02/09/19 Time: 19:26
Sample: 1990 2017
Included observations: 24

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.968717	4.398111	0.902369	0.3846
LTOP(-1)*	-1.318211	0.265617	-4.962826	0.0003
DOLL(-1)	0.085747	0.058319	1.470300	0.1672
LGDP**	1.137713	0.370852	3.067835	0.0098
LFDI**	-0.011134	0.018337	-0.607182	0.5550
INFLN(-1)	-0.000227	9.81E-05	-2.315198	0.0391
ROL**	0.041701	0.087345	0.477426	0.6416
D(LTOP(-1))	0.889611	0.150928	5.894259	0.0001
D(LTOP(-2))	0.011669	0.183768	0.063500	0.9504
D(LTOP(-3))	0.367658	0.135384	2.715661	0.0188
D(DOLL)	52525.60	22687.23	2.315206	0.0391
D(INFLN)	2.36E-08	1.01E-08	2.337753	0.0375

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DOLL	0.065033	0.050617	1.284800	0.2231
LGDP	0.863057	0.149075	5.789409	0.0001
LFDI	-0.008442	0.014628	-0.577135	0.5745
INFLN	-0.000172	7.12E-05	-2.420561	0.0323
ROL	0.031621	0.069755	0.453310	0.6584

EC = LTOP - (0.0650*DOLL + 0.8631*LGDP -0.0084*LFDI -0.0002*INFLN + 0.0316*ROL)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	7.501140	10%	2.26	3.35
k	5	5%	2.62	3.79
		2.5%	2.96	4.18
		1%	3.41	4.68
Actual Sample Size	24	Finite Sample: n=35		
		10%	2.508	3.763
		5%	3.037	4.443
		1%	4.257	6.04
		Finite Sample: n=30		
		10%	2.578	3.858
		5%	3.125	4.608
		1%	4.537	6.37

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-4.962826	10%	-2.57	-3.86
		5%	-2.86	-4.19
		2.5%	-3.13	-4.46
		1%	-3.43	-4.79

ARDL Long Run Form and Bounds Test
Dependent Variable: D(ROL)
Selected Model: ARDL(2, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 02/09/19 Time: 19:40
Sample: 1990 2017
Included observations: 26

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.665248	5.273946	-0.126139	0.9010
ROL(-1)*	-0.085043	0.109119	-0.779364	0.4459
LTOP**	0.070545	0.229172	0.307826	0.7617
DOLL**	0.002805	0.100840	0.027819	0.9781
LGDP**	-0.122948	0.289255	-0.425049	0.6758
LFDI**	0.094356	0.039774	2.372275	0.0290
INFLN**	1.27E-11	7.06E-10	0.017978	0.9859
D(ROL(-1))	-0.499380	0.291102	-1.715480	0.1034

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LTOP	0.829524	2.520107	0.329162	0.7458
DOLL	0.032986	1.215259	0.027143	0.9786
LGDP	-1.445709	4.295436	-0.336569	0.7403
LFDI	1.109507	1.563722	0.709529	0.4871
INFLN	1.49E-10	8.29E-09	0.018006	0.9858

EC = ROL - (0.8295*LTOP + 0.0330*DOLL -1.4457*LGDP + 1.1095*LFDI + 0.0000*INFLN)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	2.029741	10%	2.26	3.35
k	5	5%	2.62	3.79
		2.5%	2.96	4.18
		1%	3.41	4.68
Actual Sample Size	26	Finite Sample: n=35		
		10%	2.508	3.763
		5%	3.037	4.443
		1%	4.257	6.04
		Finite Sample: n=30		
		10%	2.578	3.858
		5%	3.125	4.608
		1%	4.537	6.37

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-0.779364	10%	-2.57	-3.86
		5%	-2.86	-4.19
		2.5%	-3.13	-4.46
		1%	-3.43	-4.79

Appendix 6- Short Run Results

+ Error Correction Models

Model 1:

Dependent Variable: LGDP
Method: ARDL
Date: 02/10/19 Time: 11:39
Sample (adjusted): 1991 2017
Included observations: 27 after adjustments
Dependent lags: 1 (Fixed)
Dynamic regressors (0 lag, fixed): LFDI
Fixed regressors: D(LTOP) D(INFLN) D(DOLL) D(ROL) C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LGDP(-1)	1.000560	0.079677	12.55764	0.0000
LFDI	0.017279	0.009190	1.880307	0.0747
D(LTOP)	0.324907	0.088217	3.683041	0.0015
D(INFLN)	-8.19E-10	2.64E-10	-3.099622	0.0056
D(DOLL)	-0.164099	0.098674	-1.663040	0.1119
D(ROL)	0.073307	0.086612	0.846390	0.4073
C	-0.319382	1.832485	-0.174289	0.8634

R-squared	0.938308	Mean dependent var	23.23424
Adjusted R-squared	0.919800	S.D. dependent var	0.192333
S.E. of regression	0.054468	Akaike info criterion	-2.763991
Sum squared resid	0.059335	Schwarz criterion	-2.428033
Log likelihood	44.31387	Hannan-Quinn criter.	-2.664093
F-statistic	50.69824	Durbin-Watson stat	1.718282
Prob(F-statistic)	0.000000		

ARDL Error Correction Regression
Dependent Variable: D(LGDP)
Selected Model: ARDL(1, 0)
Case 3: Unrestricted Constant and No Trend
Date: 02/10/19 Time: 11:35
Sample: 1990 2017
Included observations: 27

ECM Regression
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.319382	0.171066	-1.867007	0.0766
D(LTOP)	0.324907	0.078088	4.160752	0.0005
D(INFLN)	-8.19E-10	2.36E-10	-3.464216	0.0024
D(DOLL)	-0.164099	0.079571	-2.062290	0.0524
D(ROL)	0.073307	0.081362	0.901003	0.3783
CointEq(-1)*	0.000560	0.000286	1.954229	0.0648

Model 2

Dependent Variable: LTOP
Method: ARDL
Date: 02/10/19 Time: 12:01
Sample (adjusted): 1993 2017
Included observations: 25 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): INFLN
Fixed regressors: D(DOLL) D(LFDI) D(ROL) D(LGDP) C
Number of models evalulated: 8
Selected Model: ARDL(3, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LTOP(-1)	1.021228	0.210072	4.861323	0.0002
LTOP(-2)	-0.690676	0.257174	-2.685641	0.0169
LTOP(-3)	0.337182	0.155532	2.167932	0.0467
INFLN	2.61E-08	9.71E-09	2.692767	0.0167
INFLN(-1)	-0.000248	9.46E-05	-2.621422	0.0193
D(DOLL)	57301.00	21858.76	2.621421	0.0193
D(LFDI)	-0.006282	0.014466	-0.434228	0.6703
D(ROL)	-0.095647	0.105669	-0.905162	0.3797
D(LGDP)	1.236533	0.293383	4.214734	0.0008
C	7.626173	2.506246	3.042867	0.0082

R-squared	0.961737	Mean dependent var	22.87000
Adjusted R-squared	0.938779	S.D. dependent var	0.281019
S.E. of regression	0.069532	Akaike info criterion	-2.204887
Sum squared resid	0.072520	Schwarz criterion	-1.717336
Log likelihood	37.56108	Hannan-Quinn criter.	-2.069661
F-statistic	41.89162	Durbin-Watson stat	2.108482
Prob(F-statistic)	0.000000		

ARDL Error Correction Regression
Dependent Variable: D(LTOP)
Selected Model: ARDL(3, 1)
Case 3: Unrestricted Constant and No Trend
Date: 02/10/19 Time: 12:02
Sample: 1990 2017
Included observations: 25

ECM Regression
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.626590	2.359559	3.232210	0.0056
D(LTOP(-1))	0.353486	0.148287	2.383793	0.0308
D(LTOP(-2))	-0.337168	0.147382	-2.287718	0.0371
D(INFLN)	2.61E-08	7.77E-09	3.363789	0.0043
D(DOLL)	57304.13	17701.37	3.237271	0.0055
D(LFDI)	-0.006281	0.013775	-0.455987	0.6549
D(ROL)	-0.095648	0.101994	-0.937781	0.3632
D(LGDP)	1.236526	0.281456	4.393320	0.0005
CointEq(-1)*	-0.332284	0.102644	-3.237254	0.0055

Model 3

Dependent Variable: LFDI
Method: ARDL
Date: 02/10/19 Time: 11:42
Sample (adjusted): 1992 2017
Included observations: 26 after adjustments
Dependent lags: 1 (Fixed)
Dynamic regressors (1 lag, fixed): LGDP DOLL LTOP
Fixed regressors: D(INFLN) D(ROL) C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LFDI(-1)	0.264492	0.228608	1.156970	0.2643
LGDP	3.266149	6.986485	0.467495	0.6464
LGDP(-1)	-4.627917	5.345174	-0.865812	0.3994
DOLL	1.125380	2.223177	0.506203	0.6196
DOLL(-1)	-0.807962	2.159657	-0.374116	0.7132
LTOP	-0.514958	2.607487	-0.197492	0.8459
LTOP(-1)	2.052605	2.641099	0.777178	0.4484
D(INFLN)	3.93E-09	6.96E-09	0.564233	0.5804
D(ROL)	1.152956	1.681960	0.685484	0.5029
C	10.02803	37.27750	0.269010	0.7914

R-squared	0.530325	Mean dependent var	18.52281
Adjusted R-squared	0.266132	S.D. dependent var	1.204971
S.E. of regression	1.032252	Akaike info criterion	3.185085
Sum squared resid	17.04869	Schwarz criterion	3.668968
Log likelihood	-31.40610	Hannan-Quinn criter.	3.324426
F-statistic	2.007343	Durbin-Watson stat	2.413759
Prob(F-statistic)	0.107334		

ARDL Error Correction Regression
Dependent Variable: D(LFDI)
Selected Model: ARDL(1, 1, 1, 1)
Case 3: Unrestricted Constant and No Trend
Date: 02/10/19 Time: 11:43
Sample: 1990 2017
Included observations: 26

ECM Regression
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.02803	2.518652	3.981509	0.0011
D(LGDP)	3.266149	3.971175	0.822464	0.4229
D(DOLL)	1.125380	1.652749	0.680914	0.5057
D(LTOP)	-0.514958	1.954412	-0.263485	0.7955
D(INFLN)	3.93E-09	5.61E-09	0.699246	0.4944
D(ROL)	1.152956	1.442351	0.799359	0.4358
CointEq(-1)*	-0.735508	0.188261	-3.906854	0.0013

Model 4

Dependent Variable: INFLN
Method: ARDL
Date: 02/10/19 Time: 11:51
Sample (adjusted): 1992 2017
Included observations: 26 after adjustments
Dependent lags: 1 (Fixed)
Dynamic regressors (1 lag, fixed): LGDP DOLL
Fixed regressors: D(LFDI) D(ROL) D(LTOP) C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
INFLN(-1)	9676.394	97.44322	99.30290	0.0000
LGDP	2046348.	7108926.	0.287856	0.7769
LGDP(-1)	8197741.	7611378.	1.077038	0.2965
DOLL	-2.24E+12	2.25E+10	-99.30374	0.0000
DOLL(-1)	2.24E+12	2.25E+10	99.30400	0.0000
D(LFDI)	15713.77	315606.8	0.049789	0.9609
D(ROL)	1273631.	2753130.	0.462612	0.6495
D(LTOP)	7795149.	3553814.	2.193460	0.0425
C	-2.40E+08	59554247	-4.024749	0.0009

R-squared	0.999029	Mean dependent var	8891459.
Adjusted R-squared	0.998572	S.D. dependent var	45332207
S.E. of regression	1713164.	Akaike info criterion	31.81301
Sum squared resid	4.99E+13	Schwarz criterion	32.24850
Log likelihood	-404.5691	Hannan-Quinn criter.	31.93841
F-statistic	2185.969	Durbin-Watson stat	2.083215
Prob(F-statistic)	0.000000		

ARDL Error Correction Regression
Dependent Variable: D(INFLN)
Selected Model: ARDL(1, 1, 1)
Case 3: Unrestricted Constant and No Trend
Date: 02/10/19 Time: 11:53
Sample: 1990 2017
Included observations: 26

ECM Regression
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.40E+08	2291428.	0.000000	0.0000
D(LGDP)	2046362.	6285820.	0.000000	0.0000
D(DOLL)	-2.24E+12	2.01E+10	0.000000	0.0000
D(LFDI)	15713.92	292277.4	0.053764	0.9578
D(ROL)	1273628.	2466554.	0.000000	0.0000
D(LTOP)	7795145.	3164366.	0.000000	0.0000
CointEq(-1)*	9675.395	86.96188	111.2602	0.0000

Model 5

Dependent Variable: ROL
Method: ARDL
Date: 02/10/19 Time: 11:45
Sample (adjusted): 1992 2017
Included observations: 26 after adjustments
Dependent lags: 2 (Fixed)
Dynamic regressors (1 lag, fixed): LFDI
Fixed regressors: D(INFLN) D(LGDP) D(DOLL) D(LTOP) C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
ROL(-1)	0.432012	0.287768	1.501253	0.1516
ROL(-2)	0.464111	0.279358	1.661349	0.1150
LFDI	0.078210	0.041818	1.870266	0.0788
LFDI(-1)	0.008744	0.027941	0.312939	0.7581
D(INFLN)	2.56E-10	8.24E-10	0.310299	0.7601
D(LGDP)	0.305483	0.665803	0.458819	0.6522
D(DOLL)	-0.023785	0.238635	-0.099669	0.9218
D(LTOP)	-0.064160	0.292079	-0.219667	0.8287
C	-1.792235	0.839433	-2.135054	0.0476

R-squared	0.933006	Mean dependent var	-1.345084
Adjusted R-squared	0.901480	S.D. dependent var	0.430011
S.E. of regression	0.134971	Akaike info criterion	-0.900082
Sum squared resid	0.309694	Schwarz criterion	-0.464587
Log likelihood	20.70107	Hannan-Quinn criter.	-0.774675
F-statistic	29.59443	Durbin-Watson stat	2.036614
Prob(F-statistic)	0.000000		

ARDL Error Correction Regression
Dependent Variable: D(ROL)
Selected Model: ARDL(2, 1)
Case 3: Unrestricted Constant and No Trend
Date: 02/10/19 Time: 11:47
Sample: 1990 2017
Included observations: 26

ECM Regression
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.792235	0.669755	-2.675957	0.0160
D(ROL(-1))	-0.464111	0.245683	-1.889064	0.0761
D(LFDI)	0.078210	0.034961	2.237076	0.0390
D(INFLN)	2.56E-10	7.95E-10	0.321569	0.7517
D(LGDP)	0.305483	0.603042	0.506570	0.6190
D(DOLL)	-0.023785	0.230931	-0.102994	0.9192
D(LTOP)	-0.064160	0.279699	-0.229389	0.8213
CointEq(-1)*	-0.103877	0.039771	-2.611875	0.0182