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*Investigating the effects of dollarization on economic growth in Zimbabwe (1990-2015)*

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## **ABSTRACT**

This research presents a comprehensive analysis of Zimbabwe's adoption of a basket of foreign currencies as legal tender and the resultant economic effects of this move. Upon adoption in 2009, Zimbabweans were optimistic about the future as they thought the multicurrency regime would bring a more stable economy. Eight years down the line, it is prudent to evaluate whether this optimism was justified in terms of the effect of the policy on the Zimbabwean economy. An econometric model was applied in this study to investigate how dollarization and the other macroeconomic factors impacted on economic growth. The findings of the study show that most macroeconomic indicators improved as a result of dollarization. The average economic growth rate, as measured by growth in gross domestic product, was -5.22 per cent for the period before dollarization (1990 to 2008) and 14.83 per cent for the dollarized period (2009 to 2015). The difference in average growth rate is 20.05 per cent and is statistically significant at 1 per cent. This implies that the average economic growth rate improved by 20.05 per cent after the economy was dollarized. The average GDP per capita improved during dollarization by \$278.78 and this difference is statistically significant at the 1 per cent level. Foreign direct investment inflows per capita improved from the pre-dollarization average of \$5.40 to an average of \$20.89 during the dollarized period, with this difference statistically significant at the 1 per cent level. Inflation declined substantially from over 230 million per cent to an average of less than 1 per cent during the dollarized period. However, despite a significant improvement in some macroeconomic variables, Zimbabwe's debt increased during dollarization.

The results from the regression model of economic growth on its determinants further show that dollarization improved economic growth. In the absence of a dummy variable for dollarization, economic growth is influenced by population (statistically significant at 10 per cent), literacy (statistically significant at 5 per cent) and inflation (statistically significant at 1 per cent). However, with a dollarization dummy, growth becomes a function of inflation (statistically significant at 1 per cent) and dollarization (statistically significant at 10 per cent). The findings generally indicate that dollarization has improved economic growth. They point to the policy implication that a control of inflation to reasonable levels is crucial for economic growth. The policy implications for such findings are discussed in the study

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## ACRONYMS

- ❖ Afreximbank: African Export-Import Bank
- ❖ DF: Dickey and Fuller
- ❖ ESAP: Economic Structural Adjustment Program
- ❖ FDI: Foreign Direct Investment
- ❖ GDP: Gross Domestic Product
- ❖ IMF: International Monetary Fund
- ❖ KPSS: Kwiatkowski, Phillips, Schmidt, and Shin
- ❖ OLS: Ordinary Least Squares
- ❖ RBZ: Reserve Bank of Zimbabwe
- ❖ SSA: Sub-Saharan Africa
- ❖ USA: United States of America
- ❖ US\$: United States Dollar (the official currency of the United States of America)
- ❖ ZAMCO : Zimbabwe Asset Management Company

## GLOSSARY OF TERMS

- ❖ Currency Board: a monetary authority which is required to maintain a fixed or at times floating (within specified ranges) exchange rate with a foreign currency. This policy objective requires the conventional objectives of a central bank to be subordinated to the exchange rate target. Argentina went part of the way toward dollarization through its adoption of a currency board linked to the US\$ in 1991. Currency boards that lock local currencies to the US\$ or the euro also exist in Hong Kong, Estonia, Bulgaria, and Lithuania (Alesina & Barro, 2001).
- ❖ Foreign Direct Investment (FDI): the concept of “foreign direct investment (FDI) is a category of cross-border investment made by a resident in one economy (the direct investor) with the objective of establishing a lasting interest in an enterprise (the direct investment enterprise) that is resident in an economy other than that of the direct investor.” (OECD, 2008)
- ❖ Multi-currency system: a system which allows businesses to price goods and services in a variety of foreign currencies, while continuing to receive settlement in a variety of foreign currencies and reporting in one selected foreign/reserve currency. (Reporting currency for Zimbabwe is US\$-per Reserve Bank of Zimbabwe website 2017).
- ❖ Disintermediation: the avoidance of intermediaries or middlemen. The term has been used lately in particular reference to the growing trend of investors and borrowers bypassing banks to tap capital markets (Sisodia, 2010).
- ❖ Seigniorage: profit made by a government by issuing currency, especially the difference between the face value of coins and their production costs. In other words it is the difference between the value of money and the cost to produce it, the economic cost of producing a currency within a given economy or country (OECD, 2008)
- ❖ Ordinary Least Squares: is a type of linear regression method for estimating the unknown parameters in a linear regression model under the additional assumption that the errors are normally distributed. (Alexander, 2008).
- ❖ Kwiatkowski, Phillips, Schmidt, and Shin Test (KPSS) (1992): test for testing trend and/or level stationarity ( Alexander, 2008)
- ❖ Dickey–Fuller Test tests the null hypothesis that a unit root is present in an autoregressive model (Alexander, 2008)

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# **1 INTRODUCTION**

## **1.1 Introduction and Background of the Study**

The United States Dollar (US\$) has been used either formally or informally as the reserve currency (default dollarization currency) of several countries in Africa since the end of World War I in 1918. Zimbabwe in southern Africa was one of the very few countries, which formally adopted the use of the dollar as its currency. Zimbabwe was once the breadbasket of the region, an economic powerhouse, and full of potential until the disastrous and chaotic land reform programme launched in the year 2000. The resulting macro- and microeconomic, political, and socio-economic challenges became so severe that Zimbabweans quickly faded into despair and had to fight for their survival. Between 1998 and 2008, Zimbabwe became the first country in the twenty-first century to experience hyperinflation and broke all previous hyperinflationary records.

### **1.1.1 Importance of Economic Growth**

In simple terms, ‘economic growth’ refers to an increase in the productive capacity of an economy, as a result of which the economy is capable of producing additional quantities of goods and services (Haller, 2012). Economic growth is central to all governments around the world as it creates employment, brings prosperity, and enables governments to improve the livelihoods and ultimately the standard of living of citizens. As the economy grows, the revenue base for governments increases while the demand for social services (free goods and services) decreases. Economic growth also results in an increase in domestic demand; this enables the government to increase further demand in the economy. Economic growth is central to, and synonymous with, human development. Its importance is summed up by the United Kingdom’s Department for International Development’s statement, “Economic growth is the most powerful instrument for reducing poverty and improving the quality of life in developing countries” (Organization of Economic Co-operation and Development, 2017). There are numerous methods to measure the economic growth of a country, but the most commonly used one is that of the real gross domestic product (GDP) (Leamer, 2009).

There are two main theories of economic growth:

- neoclassical theory, formalized by Solow in 1956, focuses on capital accumulation or investment as the driver of economic growth
- endogenous growth theory of the late 1980's and early 1990's places emphasis on human capital and innovation capacity as the drivers of economic growth (Arvanitidis et al., 2009).

Empirical studies have found that different factors affect economic growth:

- Arvanitidis et al. (2009) found that human capital, innovation, openness, foreign direct investment (FDI), and infrastructure promote economic growth. Such information highlights the increasing importance of political and legal factors
- Ndambiri et al. (2012) found that physical capital formation, increase in exports and floating exchange rate policies promote economic growth
- So many and varied are the results of empirical tests on the determinants of economic growth that Moral-Benito (2009) summarises them saying, "In spite of a huge amount of empirical research, the drivers of economic growth are not well understood".

### **1.1.2 The Phenomenon of Dollarization**

According to Antinolfi & Keister (2001):

- "Official dollarization is where the US\$ (or some other currency) replaces the national currency as legal tender"
- Partial dollarization, while still official, occurs when the foreign currency is made legal tender alongside the domestic currency
- Unofficial dollarization occurs when the foreign currency is used for transactions within the domestic country, although it is not formally recognised

As was seen in Chile, Colombia and Peru (Duma, 2010), dollarization can be attributed to a variety of factors, among which are:

- extended periods of economic instability/imbalance
- hyperinflation

Zimbabwe falls into this category since dollarization was mainly due to those two factors in the decade of its economic stagnation from 1998 to 2008.

Financial repression and capital controls contributed to the dollarization of Bolivia and Venezuela in South America, and Nigeria in Sub-Saharan Africa (Duma, 2010).

According to Duma (2010), “The appeal of the U.S. dollar as an anchor of macroeconomic stability resulted in adoption by Argentina and Ecuador of the US\$ as legal tender following deep economic and political crisis, respectively”.

Vetlov’s study of Lithuania (2001) found other factors that may lead to dollarization:

- high devaluation expectations
- high inflation differentials between the domestic and foreign countries
- significant interest spreads between domestic and foreign currency deposits
- current account deficits
- inadequate levels of international reserves

Dollarization has been found to have both positive and negative effects on the countries that are dollarized.

Positive effects of dollarization include:

- The use of dollarization as a monetary policy tool to help bring price stability and promote financial deepening in high inflation or hyperinflation countries (Musse & Echchabi, 2017)
- The use of dollarization’s stable currency has been found to lower risk of sovereign default, while at the same time lowering the cost of borrowing (since most loans are denominated in the reserve currency)
- Use of the reserve currency (US\$ for example) also results in deeper integration into the global market

Negative effects of dollarization include:

- The loss of effective monetary policy, with countries becoming totally dependent on the reserve currency issuing country (Berg & Borensztein, 2000)
- The central bank of the dollarized countries rendered useless
- The loss of seigniorage revenue. According to Musse & Echchabi (2017), “Dollarization resulted in Cambodia losing US\$682 million from 1992 to 2004, an equivalent of 27 per cent of its GDP in 1992”.

### 1.1.3 Dollarization Elsewhere

The US\$ is the single dominant form of currency; it is used as a unit of account, and all loans, debts and financial statements are expressed in dollars. It is also used as a store of value or savings, both formally (in banks, unit trusts etc.) and informally (hard cash held by the majority of the public who have lost faith in the banking sector). The US\$ is also used as a medium of exchange in barter. Figure 1.1 from Adam (2013) below illustrates the level of dollarization across the world as measured by the ratio of foreign currency deposits to total deposits. This shows that dollarization is a worldwide phenomenon. According to Baliño et al. (1999) (as quoted in Adam 2013), “a dollarization ratio higher than 30 per cent indicates that the economy is highly dollarized.”

Although dollarization is less common in industrialized countries and the Caribbean, it is increasing in Asia, South America, transition economies, the Middle East and Africa. Since the beginning of this century, Africa’s dollarization trend has risen to above 30 per cent.

**Figure 1.1: Average Foreign Currency Deposits to Total Deposits Across the World (as a percentage)**

Regions	No. of Countries	1996	1997	1998	1999	2000	2001
South America	8	45.8	46.1	49.4	53.2	54	55.9
Transition economies	26	37.3	38.9	43.5	44.3	46.9	47.4
Middle East	7	36.5	37.2	37.3	37.5	38.2	41.9
Africa	14	27.9	27.3	27.8	28.9	32.7	33.2
Asia	13	24.9	28	26.8	28.8	28.7	28.2
Central America and Mexico	7	20.6	20.8	22	22.1	22.5	24.7
Caribbean	10	6.3	7.6	6.8	6.7	6.1	6.2
Industrial countries	14	7.4	7.5	7.5	6.7	7	6.6
<b>Maldives</b>		<b>49.5</b>	<b>55.5</b>	<b>57.1</b>	<b>50</b>	<b>43</b>	<b>54.2</b>

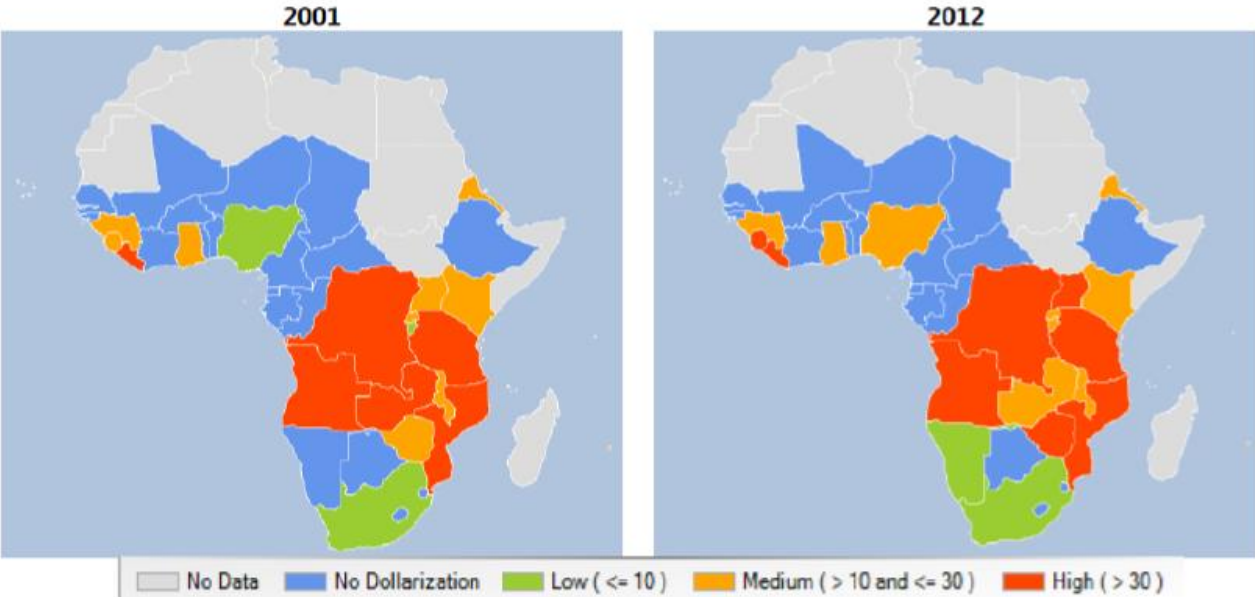
(Source: Adam, 2013)

Reinhart, Roofs & Savastano (2003), as quoted in Adam (2013), obtained similar results to Figure 1.1 above from their composite indices of dollarization constructed for a large sample of developing countries. South America was found to be the most dollarized region, followed by Africa, Central Asian countries, and the Middle East. The degree of dollarization based on the composite dollarization index for individual countries is for the period 1996–2001. It reveals that half of the countries in the very high category are from the Western hemisphere; the majority of them are South American countries. All this points to the fact that, even

though dollarization’s adoption, spread, extent, impact, and the reasons for de-dollarization vary greatly across the world, dollarization is a worldwide phenomenon.

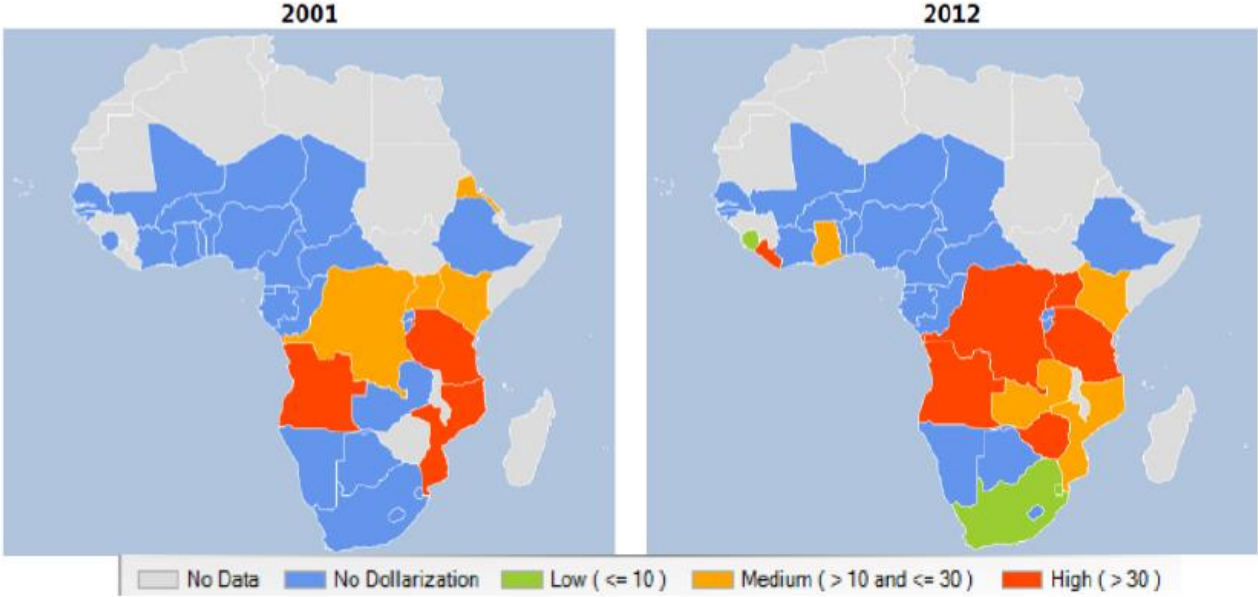
As stated by Mecagni et al. (2015), Sub-Saharan Africa (SSA), notably southern Africa, has experienced a marked improvement economically over the last three decades. On the other hand, Asongu et al. (2016) state that, “Financial dollarization in Sub-Saharan Africa is the most persistent compared to other regions of the world.” Thus, it is against this backdrop that a study on the impact of dollarization on a southern African country is a crucial addition to the literature on the impact of dollarization. This is aided by Figures 1.2 and 1.3 below, which show the rapid pace of dollarization in Africa south of the Sahara between 2001 and 2012. Hence, there is a need to understand the economic ramifications of dollarization for African countries, focusing on economic variables such as inflation, FDI, external debt, trade, and especially growth.

**Figure 1.2 Sub-Saharan Africa Levels of Dollarization in 2001 & 2012: Deposits**  
(Foreign currency deposits as percent of total deposits)



Source: Mecagni et al., (2015)

**Figure 1.3: Sub-Saharan Africa Levels of Dollarization in 2001 & 2012: Loans**  
*(Foreign currency loans as percent of total loans)*



*Source: Mecagni et al. (2015)*

Figure 1.1 is corroborated by recent evidence of Corrales et al. (2016) of the International Monetary Fund (IMF) in their paper Dollarization in Sub-Saharan Africa. Therein they say, “In contrast to other regions, Sub-Saharan Africa has experienced an increase in dollarization over the last 10 years, despite successful de-dollarization in Angola, Mozambique and Zambia.” Of note is the fact that, although officially the three countries alluded to above have de-dollarized, evidence on the ground says otherwise. The US dollar still dominates the economies of most southern African countries through black-market activities, except in South Africa, Namibia and Botswana (Bank of International Settlements, 2017).

Interestingly, as illustrated in the following two historical tables, Zimbabwe was not the first, and may certainly not be the last, country to dollarize.

**Table 1.1: Selected African Countries that Adopted Dollarization**

Country	Year	Country	Year
Angola	Present	Namibia	1906-1914; 1962-1993
Botswana	1950-1976	Nigeria	1891-1913
Cameron	1910-1916	Seychelles	1903-1919
Egypt	1856-1898	Sierra Leone	1898-1913
Eritrea	1900-1952; 1962-1993	Somalia	1920-1950
Gambia	1902-1913	Swaziland	1921-1974
Ghana	1896-1913	Tanzania	1893-1907; 1916-1920
Kenya	1896-1898	Togo	1904-1914
Lesotho	1921-1980	Tunisia	1973-1904
Liberia	1880s-1985	Uganda	1906-1920
Libya	1912-1943	Western Sahara	1930-Present
Madagascar	1886-1926	Zimbabwe	2009-Present
Morocco	1800s-1969	-	-

Source: Schuler (2005) and Sikwila (2013)

**Table 1.2: Selected List of Non- African Countries that Adopted Dollarization**

Asia	Europe	America
Russia	Austria	Mexico
Azerbaijan	Croatia	Nicaragua
China	Germany	Uruguay
Turkey	Greece	Ecuador
Taiwan	Hungary	El Salvador
Cambodia	Poland	Brazil
Georgia	Ukraine	Argentina
Singapore	Yugoslavia	Peru
Saudi Arabia	Kosovo	Panama
Vietnam	Cyprus	Bolivia
UAE	Hungary II	Cuba
Yemen		Honduras
Nepal	-	Puerto Rico

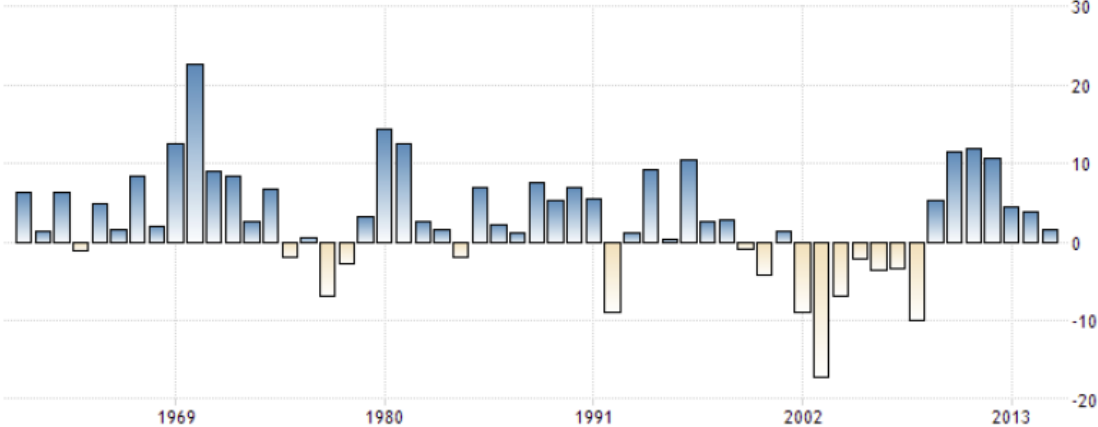
Source: Nkomazana & Niyimbanira (2014)

#### 1.1.4 Zimbabwe and its Background to Dollarization

Zimbabwe attained independence from the United Kingdom on 18 April 1980 after a war spanning almost two decades. Independence brought hope for the betterment of the lives of the majority. Sanctions that had been imposed on the country prior to independence were lifted, and the country re-joined the international community. Soon, donors began to help rebuild Zimbabwe's economy. The result, as shown in Figure 1.4 below, was that the country's GDP improved due to growth in the key sectors of the economy -- agriculture,

mining, tourism, education and health. “GDP was growing by an average of around 5.5 per cent, higher than the average for Sub-Saharan African (SSA) countries” (African Forum and Network on Debt and Development, 2015).

**Figure 1.4: Zimbabwe Annual GDP Growth Rate 1969-2013**



**Source: World Bank Economic Indicators**

After the adoption of the IMF-sponsored Economic Structural Adjustment Program in 1990 (ESAP), by 1998 Zimbabwe’s economy started slowing down. Reasons for it included:

- The opening of the economy to external competition for local companies
- The adoption of straitjacket economic policies
- The disastrous land reform policy of 2000 (African Forum and Network on Debt and Development, 2015)

Also as shown in Figure 1.5 above, between 2000 and 2007:

- Zimbabwe’s GDP growth was negative
- The national economy contracted by 40 per cent

As shown in figure 1.6 below, inflation skyrocketed over a short period. There were persistent shortages of foreign exchange, local currency, fuel, medicine, and food. Thus, the period from 1998 to 2008 was a decade of economic meltdown that resulted in:

- Soaring imports of both consumption and industrial goods
- A huge accumulation of external debts, arising from external borrowings to fund the government’s recurrent expenditures and interest on un-serviced debts

**Figure 1.6: Hyperinflation in Zimbabwe at its peak from March 2007 to November 2008**

<b>Hyperinflation in Zimbabwe, 2007–2008</b>		
	<b>Monthly Inflation</b>	<b>Annual Inflation</b>
<b>Date</b>	<b>Rate (%)</b>	<b>Rate (%)</b>
March 2007	50.54	2,200.20
April 2007	100.70	3,713.90
May 2007	55.40	4,530.00
June 2007	86.20	7,251.10
July 2007	31.60	7,634.80
August 2007	11.80	6,592.80
September 2007	38.70	7,982.10
October 2007	135.62	14,840.65
November 2007	131.42	26,470.78
December 2007	240.06	66,212.30
January 2008	120.83	100,580.16
February 2008	125.86	164,900.29
March 2008	281.29	417,823.13
April 2008	212.54	650,599.00
May 2008	433.40	2,233,713.43
June 2008	839.30	11,268,758.90
July 2008	2,600.24	231,150,888.87
August 2008	3,190.00	9,690,000,000.00
September 2008	12,400.00	471,000,000,000.00
October 2008	690,000,000.00	3,840,000,000,000,000,000.00
14 November 2008	79,600,000,000.00	89,700,000,000,000,000,000,000.00

**Source: Hanke & Kwok (2009)**

Since 2009, the government has made efforts to rebuild the economy by:

- adopting a multi-currency system which allows businesses to price goods and services in a variety of foreign currencies
- continuing to receive settlement in a variety of foreign currencies
- reporting in one selected foreign/reserve currency

According to African Forum and Network on Debt and Development (2015), “The massive accelerated de-industrialization (the reduction of industrial activity or capacity in a region or economy) and in-formalization (increase in informal businesses coupled with a related decrease in formal businesses), however, has made the rebound of the economy difficult, reflecting economic fragilities and structural challenges.”

Zimbabwe's economic turmoil is characterized by:

- Company closures
- Rising youth unemployment
- A liquidity crunch
- A negative country-risk premium arising from high levels of public debt
- Declining international capital inflows (including remittances)
- Infrastructural bottlenecks (transport, water, energy)
- Uncertainty over property rights
- Lack of coherent and consistent policy pronouncements
- Unresolved disputes arising from the land reform programme
- Lack of clarity in the indigenization policy to increase local participation in the economy, such as:
  - o where the local people take part in ownership of companies or industries in their state, or
  - o where the local residents are given part of the profits which are used to develop their area

Such disadvantages have all contributed to scare away much-needed FDI.

Although the US \$ dominates other currencies in the Zimbabwe multi-currency system, Zimbabwe still has its own monetary policies. This makes it an interesting case study. At its inception in 2009, the multicurrency regime included South African Rand, Botswana Pula, British Pound and United States Dollar. By January 2014, the multi-currency system was widened to include notably the Chinese Yuan and Australian Dollar among others.

### **1.1.5 Dollarization and its Impact on the Relationship between Economic Growth and its Determinants**

While there are many determinants of economic growth alluded to above, dollarization may have resulted in some determinants being more important than others are. According to earlier empirical studies, which primarily focused on Latin and South America (Ortiz, 1983; Cohen, 2000; Raheem & Asongu, 2016), dollarization was followed by a reduction in inflation, which resulted in economic stability and ultimately steady but not rapid growth. This immediate impact on some of the determinants of economic growth is corroborated by

Munhupedzi & Chidakwa (2017), who conclude that dollarization in Zimbabwe resulted in a decline in inflation. Overnight, dollarization eliminated hyperinflation, reduced capital flight, and had a positive effect on the economic growth of Zimbabwe (Nkomazana & Niyimbanira, 2014). Munhupedzi & Chidakwa (2017) go on to point out that inward investments (FDI), export incentives, and robust exchange controls may result in Zimbabwe reaping the full benefits of dollarization. The above shows that dollarization does make some determinants of economic growth more important than others, with inflation and FDI being prominent.

The above has policy implications for Zimbabwe, such as, should Zimbabwe de-dollarize completely if necessary to do so in the near future? Or should it focus on having the US\$ as legal tender for the foreseeable future? Should Zimbabwe consider formalising its use of the dollar with the USA government? If so, would formalization include Zimbabwe's monetary policy framework vis-à-vis the role of the Central Bank versus inflation control/targeting, money supply, and interest rates, etc.? Printing of money during the 1998-2008 hyperinflationary period contributed greatly to economic decay. Inflation has remained subdued with the introduction of dollarization. Therefore, should the Central Bank of Zimbabwe continue with its policy of not financing the Government's budget deficit? The results of this study may assist in addressing/answering some of these important issues.

## **1.2 Problem Statement**

The research problem is to investigate the relationship between dollarization and economic growth in Zimbabwe for the period from 1990 to 2015. While many countries, as shown in above, have dollarized at some point in their history, perhaps none have had their economies ravaged to the extent that dollarization became the only solution, rather than an option. Research by Edwards & Magendzo (2004; 2006) and Nkomazana & Niyimbanira, 2014) has shown that the stability or strength of the country's currency, in relation to base currencies in use at any point in time, influences that country's economic performance.

“In Peru, dollarization was caused by the high inflation experienced between 1975 and 1990, which prompted residents to turn to dollar-denominated assets as a store of value.” (Velarde, 2005). In some countries such as Ecuador and El Salvador, dollarization has been the outcome of official government policy; the domestic currency was retired from circulation

and the U.S. dollar became the official currency. The main reason why those countries dollarized was, like in Zimbabwe, **an economic necessity**.

After dollarization, Zimbabwe's economy showed some stability after record-breaking twenty-first century hyper-inflationary levels. Edwards & Magendzo (2004) found that dollarized countries have had:

- a significantly lower rate of inflation
- a statistically lower rate of GDP per capita growth
- no statistical difference in macroeconomic volatility between dollarized and non-dollarized economies

This study will seek to help unravel the link between dollarization and economic performance from an African country perspective. A theoretical framework will be hypothesized. Then relevant tools will be used to establish the relationships between economic growths as measured by annual GDP per capita, external debt, foreign direct investment (FDI), inflation, levels of literacy and trade.

The research problem is to investigate the relationship between dollarization and economic growth in Zimbabwe for the period 1990 to 2015. If a positive relationship is identified (that dollarization has contributed positively to growth), then it will signal to the government that this exchange rate policy should be continued. If the opposite is found to be true, however, then the results will signal to the government that the country needs to re-evaluate its dollarization policy.

### **1.3 Purpose and Significance of the Research**

“The experience of countries that have officially and unilaterally adopted a foreign currency remains under-researched” (Winkler et al., 2004). While some research has been done for countries in the Americas, Europe and Asia, very little research has been done about dollarized countries in Africa. Corrales et al. (2016) agree with the gap identified by Winkler et al. (2004). “The empirical literature on dollarization has mostly focused on Latin America and to some extent on transition economies. While some studies do include African economies, to our knowledge there is no study that focuses comprehensively on the issue of dollarization in the African context”. Raheem & Asongu (2016) also agree that the focus of

earlier and **most studies on dollarization have been on its causes and on regions (Latin America) other than Africa.**

The gap in research identified by Winkler et al. (2004) has not been filled in the interim. Studies by Kabote et al. (2013), Sikwila (2013), Nkomazana & Niyimbanira (2014), and Nhavira (2015), focused on some aspects of dollarization on the economy of Zimbabwe. Nkomazana & Niyimbanira (2014) examined the **economic causes and effects** of dollarization principally on the elimination of hyperinflation. Sikwila (2013) emphasized the positive impact of dollarization on the economy. Nhavira's (2015) study was on **dollarization and its impact** on tourism and poverty in Zimbabwe. Of note is the fact that both Sikwila (2013) and Nkomazana & Niyimbanira (2014) did not do any formal statistical tests. Like Nhavira (2015), Kabote et al. (2013),'s main thrust was on the impact of dollarization on tourism in Zimbabwe. Raheem & Asongu (2016) and Asongu et al. (2016) have focused their **studies on the determinants and enablers of dollarization** respectively.

Zimbabwe is by far one of the most rapidly and highly dollarized countries, as shown in Figures 1.2 and 1.3 above. Therefore it is interesting to note that several papers on dollarization in southern Africa, notably by Mecagni et al. (2015) and Corrales et al. (2016), have excluded Zimbabwe from their analysis. The reason is that, unlike most other dollarized African countries, Zimbabwe does not have its own currency (thus forcing its inhabitants to make use of foreign currency). Another reason that dollarization is **measured differently** for other countries is because they use aspects like proportion of foreign currency deposits in the domestic banking system over time. Since there has been no domestic currency in circulation in Zimbabwe since 2009, the proportion of foreign currency since then has been constant at 100 per cent. Although Zimbabwe's Central Bank promulgates economic policies, due to dollarization it does not have control over some of them. While some dollarized countries have experienced economic downturns, none have regressed as dramatically as Zimbabwe; hence, Zimbabwe has been a somewhat unusual dollarization case.

Zimbabwe's government now seeks to drive growth in its economy that was devastated previously by years of poor leadership and economic depression. In order to assess whether this policy should be maintained, policy makers must have definitive evidence of the effect of dollarization on economic growth,. If the exchange rate policy of Zimbabwe does not work

coherently with other policies that are being driven, such as attracting FDI, then other efforts may be thwarted. Zimbabweans could then see no improvement on the ground.

Since the gap in knowledge identified by Winkler et al. (2004) has remained, this case study of **the impact of dollarization on Zimbabwe** is a necessary and significant addition to the scarce literature on dollarization in Africa. It opens the door to future studies of the monetary policy frameworks of the SSA region, and offers valuable new economic policy lessons for the region.

Specifically, this study seeks to ascertain whether the economic growth of Zimbabwe changed due to dollarization. Unlike the above-mentioned previous studies, it will investigate statistically the effects of dollarization on Zimbabwe's economy in terms of inflation, FDI flows, external debt, trade openness, the literacy level and population. This study will help to inspire and motivate more research and case studies on developing countries from which other countries can learn and benefit. Thus, this study has policy implications that could reach far beyond Zimbabwe and Sub-Saharan Africa.

#### **1.4 Research Questions and Scope**

The study is guided by the following questions:

- ❖ Has dollarization affected economic growth in Zimbabwe?
- ❖ What is the nature of the relationship between dollarization and the economic growth factors of total external debt levels, inflation, FDI in a dollarized Zimbabwe?
- ❖ Besides external debt, FDI, and inflation, what other factors influence economic growth in a dollarized economy?

#### **1.5 Research Objective**

The main objective of this study is to investigate the contribution of dollarization to economic growth in Zimbabwe for the period 1990-2015. Specifically, the study seeks to:

- ❖ investigate the impact of dollarization on economic growth in Zimbabwe
- ❖ investigate the impact of dollarization on external debt, FDI and inflation
- ❖ examine how inflation and other factors such as levels of literacy and trade influence economic growth along with dollarization

## **1.6 Organisation of the Study**

The remainder of this study is structured as follows:

Chapter 2 contains the literature review, including both theoretical and empirical literature. It examines studies done in other parts of the world, and highlights those conducted on dollarization in Zimbabwe.

Chapter 3 presents the research methodology. It includes the research approach and strategy, the data sources, and the research methods used to analyse the data.

Chapter 4 presents and analyses the research findings.

Chapter 5 describes the conclusions from the research, draws policy implications from these results, and concludes by suggesting recommendations for future research.

## 2 LITERATURE REVIEW

### 2.1 Introduction

The theoretical and empirical literature reviewed in this chapter provides a framework for this study's investigation of the effects of dollarization on economic growth for Zimbabwe. It identifies relevant issues, and enables the specification of the appropriate empirical model. The effects of dollarization on economic growth in Zimbabwe remain inconclusive, as evidenced by existing studies.

### 2.2 Definitions, Types and Measures of Dollarization

“Dollarization is the adoption of the US\$ or other major advanced country's currency as the currency of choice in a foreign country” (Edwards and Magendzo, 2006). “Whilst in general any country using foreign currency as its own can be said to be dollarized, different countries follow one of the three known dollarization formats,” according to Quispe-Agnoli, (2002); that is, unofficial dollarization, semi-official dollarization, and official dollarization.

The debate on dollarization has been surrounded by varying opinions and controversies for quite some time now. There is no consistency in the definitions of dollarization used in the literature. In the early literature, **the focus was on currency substitution** and the term ‘dollarization’ was used interchangeably to describe the same phenomenon. “Currency substitution was popularized by the work of Hausmann (1999), Edwards (2001) and Engel and Rose (2002). A recent strand of literature focuses on the dollarization of liabilities, and has thus broadened asset substitution to include liability dollarization” (Adam, 2013).

Unofficial dollarization is also known as de facto dollarization (Corrado (2008). It is when people of a country lose faith in their own currency and resort to using foreign currency as a medium of exchange and unit of account. Economic agents hold financial assets in foreign currency, even if the institutional specifications of dollarization regimes differ. This was referred to by Adam (2013) as simply, “Currency substitution (foreign currency used as a medium of exchange and unit of account) and asset substitution or financial dollarization (foreign currency used as a store of value)”. Under unofficial dollarization, the foreign currency is not official legal tender. Unofficial dollarization is the rationale behind the theory of currency substitution. The phase of unofficial dollarization was mainly experienced in

Zimbabwe between 2000 and 2008 when the official exchange rate was not adjusted for inflation rates. A black market emerged and foreign currencies were used to peg almost all prices in the informal market. The local currency was still being used as legal tender, but the majority of stakeholders were hedged against hyperinflation by holding their liquidity in foreign currency. They only converted it to local currency for transaction purposes.

Semi-official or partial dollarization is “a currency regime that is neither de facto dollarization nor de jure (official) dollarization but lies between the two. In Zimbabwe, this is the period when companies had to apply to RBZ for licenses to trade using foreign currency” (Kabote et al., 2013). The Zimbabwean economy experienced semi-official dollarization from early 2008 to when the country fully dollarized in 2009.

Full or official dollarization occurs when a country replaces its domestic currency with the foreign currency. Zimbabwe adopted full dollarization in February 2009; prices, taxes and the national budget were pegged in US\$, whilst other currencies were used for convenience purposes. Moreover, some dollarized countries still issue domestic currencies, like the recently introduced Zimbabwean bond notes, as a surrogate currency. These hedge against hyperinflation, or credit risk, or some form of financial-system instability

Castillo and Montoro (2015), distinguish among three different types of dollarization:

- transaction dollarization - the substitution of domestic currency as medium of payment
- asset dollarization - the substitution of domestic currency as reserve of value
- price dollarization - the substitution of domestic currency as the unit of account

Zimbabwe has adopted all three concepts of the dollarization since transactions, reserves/savings, and prices are all dollar denominated.

Dollarization is measured differently across the world but, per Adam (2013), “**The most common measurement of dollarization is the ratio of foreign currency deposits in the domestic banking system to total deposits (DR1).** Another related measure is the ratio of foreign currency deposits to total deposits (DR2).” However, these measures of dollarization may be grossly underestimated, as they cover only the foreign currency deposits in the banking system (Adam, 2013). This is because foreign currency in circulation in the domestic

economy (which will show the level of currency substitution), and foreign currency deposits held abroad by the country's residents, are equally important to gauge the full extent of dollarization in the country. This is not applicable to the case of Zimbabwe where the country is fully dollarized; hence both ratios would be constant at 100 per cent.

### **2.3 Theoretical Literature Review**

Early literature made a distinction between two types of dollarization: currency substitution and asset substitution. The former refers to the use of foreign currency as medium of exchange, and the latter as store of value (Levy-Yeyati, 2006 quoted in Adam 2013). The early literature focused on currency substitution and was motivated by the history of high inflation in Latin America. The key message from this initial literature is that monetary policy will be ineffective in a country where foreign currencies are seen as substitutes for the domestic currency. The implication is also that the elasticity of substitution between domestic and foreign currency is likely to increase when the perceived risk of sharp changes in the value of the domestic currency is greater, most likely in situations of floating or adjustable predetermined exchange rates. To the extent that inflation is ultimately reflected in the nominal exchange rate, expected inflation should underpin currency substitution. In such circumstances, the effectiveness of monetary policy is limited (Miles 1978; Brillembourg & Schadler 1980; Girton & Roper 1981; Ortiz 1983).

After the 1990s, the literature evolved into three categories inspired by macroeconomic developments in Latin America (Mecagni et al., 2015). The first refers to a portfolio view, which explains dollarization as the optimal portfolio choice for a given distribution of real returns in each currency. That is, if domestic currency deposits yield higher returns than dollar-denominated deposits, one should expect lower deposit dollarization (Mecagni et al., 2015). The second emphasizes a market portfolio view, which looks at dollarization as a response to market imperfections (Mecagni et al., 2015). Market portfolio view is when fundamentals in the market force risk-averse investors to construct dollarized portfolios to optimize or maximize expected return based on a given level of market risk. Finally, the last refers to an institutional view (Mecagni et al., 2015) whereby institutional weaknesses render the inability of governments to address a financial crisis leading to dollarization. These institutional weaknesses include failure of government and quasi-government institutions that can establish and enforce rules to enable market efficiency.

## 2.4 Empirical Literature Review

As propounded by Edwards & Magendzo (2003), “Surprisingly, until very recently there have been no formal empirical studies on the economic consequences of dollarization. International comparative studies on alternative exchange rate and monetary regimes have traditionally ignored dollarized countries.” This is reiterated by Schuler (2005), “The history of dollarization, though, remains little known.” Previous empirical research on the topic has been limited to research conducted around dollarization, rather than on the **economic impact** of dollarization. This is reflected in Antinolfi & Keister (2001) when they say, “a large part of the reason for dollarizing is to create a more stable economic environment that will encourage investment and growth.” They conclude that, “It is extremely difficult to make quantitative predictions about the size of this effect on the economy”.

Although dollarization may lead to the government losing the revenue generated by seigniorage, Slivinsk (2008) argues that, “the newly dollarized economy will soon find itself more integrated with international capital markets leading to economic growth.” This may have been the case for the Latin American countries that averted economic collapse through adoption of the US\$, such as Peru and Argentina (Schuler, 2005; Castillo & Montoro, 2015).

According to Antinolfi & Keister (2001), “Discussions of the optimal monetary and exchange rate arrangements for an emerging market economy have traditionally centred on fixed or flexible exchange rates or (most often) some hybrid of the two, perhaps combined with capital controls or other regulatory measures.” These views are shared by Barro (1999), Hanke (2003), Dean & Hira (2004) and Schuler (2005), who went a step further by proposing dollarization as the solution to the exchange rate problem. This was so as most of the Latin American and East Asian countries that adopted dollarization in the early 1990’s did so primarily to stem the tide of local currency depreciation with some measure of success, albeit for short periods of time. Argentina’s currency board (with a mandate to fix the exchange rate) experienced some period of success before it was disbanded, with a move to the floating exchange rates in 2001. Brazil’s economy initially had a boom but later experienced retarded growth in 1999. East Asian countries such as Bangladesh and Sri Lanka experienced some economic growth followed by financial crisis which forced abandonment of the fixed rates policy in 1997 (Palley, 2004).

For Zimbabwe, dollarization was the only alternative as it sought to combat record-breaking galloping inflation, a worthless local currency, a shrinking economy, and related socio-economic effects such as high unemployment and poor essential services (e.g. health and education). Antinolfi & Keister (2001) point out that two of the primary benefits of dollarization are straightforward: exchange rate volatility (against the dollar) and exchange rate crises would be eliminated. In most cases, the inflation rate would be lowered substantially. This appears to have been true for Zimbabwe; dollarization helped to ease/eliminate the exchange rate crisis while steadying runaway inflation, thus stabilizing the economy. However, the overall effect on the economy remains to be empirically tested.

While Antinolfi & Keister (2001) offer the view that, “dollarization implies the loss of monetary policy”, this appears to not have been the case for Zimbabwe; it maintained its monetary policies after dollarization (see RBZ Monetary Policies during dollarization below). However, their view that dollarization would limit the ability of the central bank to act as a lender of last resort appears to be true for Zimbabwe. The country is currently experiencing liquidity challenges characterized by chronic cash shortages. It has introduced a parallel local/surrogate currency (so called bond notes, see section on bond notes below) which are supposedly at parity with the US\$ officially. On the black market, the surrogate currency is trading at discounted values ranging from 80 per cent to 90 per cent to the dollar. This is a sign that the monetary authorities are clutching at straws in their fight against economic decay.

According to Schuler (2005) a dollarized economy is characterized by, “no central bank, no independent exchange rate, and more generally no independent monetary policy.” However, Zimbabwe has maintained its central bank; it has its own floating exchange rates for the basket of currencies in use; its monetary policy is independent from that of the reserve currency used more than all the others: the US Dollar. Zimbabwe also has very stringent exchange rate controls (per RBZ Monetary Policy Statement of January 2010). This is in sharp contrast to Panama, for example, which has, according to Schuler (2005), “no central bank, no locally issued paper money (people use U.S. dollars instead), and no exchange controls restricting trade in foreign currencies.”

In most cases, according to Sikwila (2013), countries that have adopted a foreign currency as an official legal tender had a background of economic, social and political disturbances that

led to instability and poor economic growth. Zimbabwe falls into this category. Mhute (2012) states that, “an immediate and noticeable effect of dollarization was price stability and reduced hyperinflation. After the dollar was introduced, inflation in Zimbabwe remained in single digit figures, and was even negative at the beginning of 2009”. Mhute (2012) is supported by Nkomazana & Niyimbanira (2014). In their conclusion they argue that, “Dollarization brought about overnight elimination of hyperinflation; there is a visible reduction in exchange rate volatility and a reduction in capital flight.”

Castillo & Montoro (2015) argue that dollarization was forced by failing economies: “A history of monetary mismanagement and episodes of hyperinflation, especially during the eighties and in some cases during the nineties, transformed the monetary systems of many emerging economies into dollarized monetary systems, for example Argentina, Bolivia, Peru, Uruguay, Turkey, and more recently Russia .“

In his study on theory and history of dollarization, Schuler (2005) concludes that, “most countries that were dollarized but now have their own currencies (after successful de-dollarization) and, in addition, maintain truly independent monetary policies, have performed worse in terms of monetary stability than they would have by remaining dollarized.” He quotes Cuba as an example. For Zimbabwe, this aspect may remain unknown unless or until Zimbabwe will have its own currency.

There is much less agreement, however, on the effects of dollarization on real economic variables such as growth, employment and volatility. According to its supporters, dollarization will positively affect growth through two channels. Firstly, dollarization will tend to result in lower interest rates, higher investment, and faster growth (Dornbusch 2001). Secondly, by eliminating currency risk, a common currency will encourage international trade. This in turn will result in faster growth. All of this implies that dollarization may have a positive effect on the determinants of economic growth, and in turn on economic growth itself. Rose et al. (2000) and Rose & van Wincoop (2000), among others, have emphasized this trade channel. Other authors, however, have been sceptical regarding the alleged benefits of dollarization. Indeed, according to a view that goes back at least to Meade (1951), countries with a hard peg -- including dollarized countries -- will have difficulties accommodating external shocks. This, in turn, will be translated into greater volatility, and may even lead to lower economic growth (Parrado & Velasco, 2002, Broda, 2001).

One of the biggest disadvantages of dollarization is that the export prices of the dollarized country become expensive. This is because the US\$, being the most traded currency, is priced at a premium. Thus, a dollarized country such as Zimbabwe, due to loss of monetary policy control, cannot devalue its currency and make its goods and services cheaper in the world market. This is supported by Cohen (2000) when he states that, “In practical terms, however, it is likely that much of the country’s monetary autonomy has already been greatly eroded. Otherwise, the country would not even be considering dollarization in the first place.”

Corrales et al. (2016) summarize the significance of studying dollarization for a developing country such as Zimbabwe when they state that, “few studies have focused on the impact of dollarization in SSA countries.” Erasmus et al. (2009), in their study on Liberia, conclude that dollarization precludes monetary policy from achieving its primary objective of price stability, and that successful and lasting de-dollarization may be difficult to achieve. Corrales et al. (2016) also quote Sikwila (2013). Sikwila studied the economic impact of dollarization on the Zimbabwean economy after the hyperinflation episode, and the unprecedented depreciation of the exchange rate between 2000 and 2008. Sikwila (2013) concluded that dollarization played a dominant role in contributing to the macroeconomic stability of the country.

Corrales et al. (2016) also quote Nor (2012). In Nor’s analysis of dollarization in Somalia, he highlights that partial dollarization has contributed to the relentless depreciation of the Somalia Shilling and subsequent economic turmoil in the country. Mengesha & Holmes (2013) examine the impact of dollarization on exchange rate volatility by focusing on the consequences of dollarization on the Eritrean exchange rate. They concluded that partial dollarization has a positive and significant impact on both official and black-market exchange rate volatility. While these articles focus on individual African countries, the unanimous assessment is that partial dollarization has negative effects for the economy, unless a move to full dollarization is undertaken to restore macroeconomic stability by providing a credible anchor (Mecagni et al., 2015). As stated by Mecagni et al. (2015), “Dollarization can pose important challenges to policymakers. It constrains the capacity of monetary authorities to act as a lender of last resort; hampers banks’ liquidity management; and weakens the stability of the financial sector, as it may amplify the impact of exchange rate movements on banks’ balance sheets, thereby increasing the risk of contractionary effects and bank failures”.

Zimbabwe has experienced fifty per cent bank failure since 2002 as per Dhliwayo (2015), “Growth in Zimbabwe’s financial sector from a mere 5 banking institutions in 1980 to 40 players in 2002 was mainly due to financial reforms of the 1990’s. Some banks have since failed and there are only 20 institutions remaining”.

While Figure 2.1 below shows that Angola and Mozambique successfully de-dollarized in 2001, current evidence (in 2017) suggests that both countries appear to have dollarized again post 2001. Despite Mecagni, et al. (2015) stating that those countries that de-dollarized generally had low or declining inflation and comparatively high growth (of the 42 countries shown in Figure 2.1 below), the question is: why have both Angola and Mozambique, for instance, dollarized again? Does this mean that dollarization is a vicious circle from which a country cannot get out once it has dollarized? Is dollarization a matter of choice, or it is imposed on countries by circumstances beyond their control? The table below shows countries that de-dollarized successfully and those that failed to do so.

**Figure 2.1: Successful and Unsuccessful De-Dollarization for the period 2001 to 2003**

Successful	Unsuccessful	
Angola	Albania	Moldova
Azerbaijan	Armenia	Mongolia
Bolivia	Belarus	Nicaragua
Georgia	Bosnia And Herzegovina	Qatar
Kazakhstan	Cambodia	Romania
Mozambique	Costa Rica	São Tomé and Príncipe
Paraguay	Croatia	Suriname
Peru	Dem. Rep. of the Congo	Serbia
Turkey	Dominican Republic	Tajikistan
Uruguay	Guatemala	Tanzania
Uzbekistan	Haiti	Uganda
	Honduras	Ukraine
	Jamaica	Vanuatu
	Liberia	Zambia
	Macedonia, F.Y.R.	Zimbabwe
	Maldives	

(Source: Mecagni et al., 2015)

Among the countries that have managed to de-dollarize, at least to some extent, two distinctive groups can be found:

1. Those which have de-dollarized unilaterally, by legal means.
2. Those which have only allowed for market forces to reduce the share of dollar deposits (Mecagni et al., 2015).

Within the first group, the most obvious example is Argentina. In the wake of the 2001 crisis, without previous notice, its residents had to transform their foreign currency deposits into pesos. In addition, Bolivia and Peru tried to de-dollarize by introducing serious limitations on the availability of foreign currency deposits, but after some years had to allow for dollar deposits again due to increasing capital flight (Mecagni et al., 2015). Both countries have since then remained highly dollarized. Whether Argentina in fact will be successful in maintaining the currently low dollarization without suffering from disintermediation remains to be seen.

## **2.5 Successful Case of De-Dollarization**

### **ISRAEL**

“Dollarization was precipitated by high and rising inflation throughout the 1970s, which further accelerated, reaching about 445 per cent in 1984, in the context of a broad deterioration in macroeconomic conditions. Consequently, the share of dollarized deposits peaked at 39 per cent in 1984, as depositors attempted to protect the value of their assets.” (Mecagni et al.; 2015)

### **Israel’s De-Dollarization Strategy**

Several strategies were implemented to reduce dollarization and stabilise the economy. These included cutting the budget deficit, “from 19 per cent of GDP in 1985 to about 10 per cent in the late 1990s.” (Mecagni et al.; 2015). Reduction in foreign currency was promoted through increasing interest rates on the local currency deposits while reducing interest rates on foreign currency deposits. Local banks were encouraged to issue bonds in local currencies, thereby promoting usage of the local currency. Because of the above measures among others, the decline in the share of foreign currency deposits has been large and relatively permanent since the trend started back in the 1980s. Whereas dollar deposits in Israel amounted to over 50 per cent of total deposits in the early 1980s, deposit dollarization reached only 15 per cent in 2004. (Naceur et al.; 2015) and (Mecagni, et al.; 2015).

## 2.6 Unsuccessful Case of De-Dollarization

### ANGOLA

Although Figure 2.1 above shows Angola as having successfully de-dollarized, this was only for the period 2001-2003. Dollarization in Angola was mainly due to:

- the long-lasting civil conflict
- significant uncertainty about Angola's macroeconomic conditions
- a decrease in the value of the kwanza, the local currency
- hyperinflation reaching an all-time high of 100 per cent when the civil war ended in 2002 (Staines, 2014)
- depreciation of the kwanza by 1600 per cent against the dollar between 2001 -2014
- Angola's high dependence on oil revenues
- a resulting extensive rise in the use of dollars by the oil sector to settle local suppliers
- such dollars subsequently being retained and not sold to commercial banks
- a resulting severe shortage of foreign currency in the retail market (Jover et.al: 2012 and Euro Magazine, 2015)
- higher reserve requirements on kwanza than on dollar deposits
- banks offering clients more attractive rates for dollar deposits on loans
- the dollar used as a vehicle for capital flight

Angola has tight capital controls and the kwanza is not convertible outside the country, and so much of this flight is diagnosed especially through the over-invoicing of current foreign-payment obligations. Around 2004 nearly 75 per cent of deposits and 60 per cent of credit to the private sector were in foreign currency (Jover et.al: 2012 and Euro Magazine, 2015).

Dollarization in Angola reduced the effectiveness of monetary policy and obliged the Banco Nacional de Angola (BNA) to rely on the exchange rates as the nominal anchor. Indeed, the BNA's policy rate is still a relatively weak monetary policy instrument (Jover et.al: 2012 and Euro Magazine, 2015)

As per the Euro Money Magazine (23 September 2015 Edition), Angola's de-dollarization-drive dilemma could limit foreign investment and the amelioration of the people. That is a situation that the government is finding tricky to deal with as time goes on and the gap between the rich and poor gets wider. Failure of de-dollarization in Angola is shown by Staines (2014). He notes that while Angola had no deposit dollarization in 2001, by 2012 deposit dollarization had risen to about 10 per cent.

## 2.7 Dollarization Hysteresis

A large literature has documented that financial dollarization in some emerging economies displays “hysteresis”—that is, it rises in periods of economic disarray but does not fall proportionately when the economy is stabilized (Catao & Terrones, 2016). The incidence of dollarization gives rise to an interesting fact when inflation has been tamed, whereby dollarization continues to increase in many countries (Berg & Borensztein, 2000). Only a few countries have managed to de-dollarize and generally only partially. A question that has been raised is whether dollarization exhibits a non-reversible behaviour. In fact, there are some reported cases in which the implementation of successful anti-inflation programmes was not enough to lessen sharply the demand for US dollars. This phenomenon has been identified in economies where high inflation rates persisted for long periods. Evidence of dollarization hysteresis was presented by:

- Guidotti & Rodriguez (1992) for Bolivia, Mexico, Peru and Uruguay
- Kamin & Ericsson (1993) for Argentina
- Clements & Schwartz (1993) for Bolivia
- Mueller (1994) for Lebanon
- Mongardini & Mueller (1999) for the Kyrgyz Republic
- Reding & Morales (1999) for Bolivia (as quoted by Fernandes, 1999)

Thus, dollarization experiences also demonstrate the incidence of the dollarization hysteresis. The implication is that, because of perceived lack of policy credibility, and expected volatility of the local currency, dollarization cannot easily be reversed.

The hysteresis theory in the dollarization process is probably easier to explain for asset substitution than for currency substitution. This is because foreign-currency denominated assets would still provide insurance against the probability of a return to inflation and devaluation. In the same vein, the increase of foreign-currency denominated assets in the 1990s resulted from:

1. the return of capital held by the residents abroad
2. re-monetization, thanks to the permission to hold foreign-currency deposits in the domestic banking system

However, in countries with moderate inflation rates, or in countries that exhibited short-lived high inflation rates, dollarization has been considered easier to reverse (reversibility patterns

were identified in Egypt, Yemen and Chile (Mueller, 1994), and in some transition economies (Sahay & Végh, 1996; Freitas, 2003).

## **2.8 Reserve Bank of Zimbabwe Monetary Policy during Dollarization**

Although according to Alvarez-Plata & Garcia-Herrero (2007), “A common view among economists is that dollarization makes monetary policy more complicated and less effective,” Zimbabwe’s Central Bank has maintained its monetary policy during dollarization. Since the inception of dollarization in 2009, the RBZ has continued to issue annual monetary policies. This has been restricted mainly to supervision and financial sector surveillance. As Zimbabwe moved from partial to full dollarization, issues such as money supply have not been set by domestic monetary authorities but, rather, by the behaviour of agents holding foreign denominated assets (Alvarez-Plata & García-Herrero, 2007). The fact that they cannot control money supply complicates the authorities’ ability to control inflation. The RBZ no longer functions as a Central Bank should because there are no Zimbabwe dollars. Its foreign liabilities (to the IMF, World Bank etc.) are larger than its foreign reserves; thus it has a negative net worth. (Munhupedzi & Chidhakwa: 2017).

Since May 2016, the RBZ’s monetary policies geared at promoting domestic output and productivity have included the introduction of an export incentive scheme financed through bond notes. Figure 2.8.1 below is an extract of RBZ’s monetary policy in February 2017. Of note is the fact that events on the ground indicate that other forces are in control; the RBZ’s monetary policies have been reduced to a “wish list”. For example, the Central Bank created the Zimbabwe Asset Management Company (Zamco) in 2014 to take over non-performing loans from banks and help revive the banking sector. The plan did not work; several banks, including Kingdom Bank and Allied Bank, failed and closed soon after Zamco’s establishment. (Ruwo & Makarudze: 2015)

**Figure 2.2: Extract of RBZ's 2017 Monetary Policies**

- ❖ Measures to strengthen the stability of the financial sector by extending the US\$200 million African Export-Import Bank (Afreximbank) Trade Debt-Backed Securities facility, which operates on the lines of the lender of last resort at the Bank for local banks.
- ❖ Establishment of a US\$70 million nostro stabilisation facility to deal with the delays in processing of outgoing payments by banks.
- ❖ Measures to promote exports by revamping the horticulture finance facility and enhancing the gold development facility from US\$20 million to US\$40 million.
- ❖ Putting in place facilities to cater for the requirements of bona fide cross-border trade registered with recognised cross-border associations through normal banking channels and Easylink.
- ❖ Strengthening of the parity of bond notes to the US\$ by meeting foreign exchange demand attributable to bond notes deposits.

**Source: RBZ: 2017**

## **2.9 Reserve Bank of Zimbabwe's Introduction of a Surrogate Currency**

On 28 November 2016, the RBZ introduced a surrogate currency called “bond notes” pegged 1:1 to the US\$ (RBZ 2016). The purpose was to fund export incentives of up to 5 per cent which would be paid to exporters of goods and services and diaspora remittances. The bond notes (totalling US\$200 million and backed by a loan from the Afreximbank) were released into the market through normal banking channels in small denominations of \$2 and \$5. The banking public was advised that no new accounts would be opened as the bond notes would be deposited into existing US\$ accounts. Initially the withdrawal limits of bond notes was set at a maximum of \$50 per day and a maximum of \$150 per week (RBZ 2016). Who knows, the issuing of bond notes may have been a first attempt to de-dollarize by the monetary authorities. Maybe by issuing bond notes the Zimbabwean Government may have been slowly but discreetly easing the local currency back into circulation. De-dollarization for Zimbabwe remains to be seen as the future unfolds.

The bond notes were introduced to help ease a liquidity crunch due to dollarization. As Zimbabwe does not have a formal agreement with USA, the supply of US\$ in circulation

cannot be controlled solely by the RBZ. However, in September 2017 the RBZ released another batch of bond notes totalling US\$300 million, again said to be backed by a loan. As of November 2017, the bond notes were trading at a premium of as high as 75 per cent (Zimbabwean Independent: 2017) on the black market. This was a sign that the bond notes had lost their value and had failed to stem the liquidity crunch. In fact, things have gone from bad to worse as depositors are now only getting at most \$20 a day from their banks while corporates have resorted to the black market to get US\$ (Zimbabwean Independent, 2017). The failure of the bond notes is summed up by the Zimbabwean Independent of 1 October 2017, “There is a rate for bond notes and Real-Time Gross Settlement electronic funds to the US\$. These disparities have led to a new wave of price increases or rather a differential pricing system where retailers add a premium depending on the medium of exchange used.” The bond notes crashed against the US\$ during the last week of October 2017, triggering a buying spree, hoarding, and artificial shortages of basic commodities reminiscent of the 2008, pre-dollarization, crisis. (Zimbabwean Independent: 2017).

The bond notes are still, and probably will be, in circulation for the foreseeable future. More batches are likely to be issued to perhaps help ease the liquidity/cash crunch that seemingly will not go away.

## **2.10 Conclusion**

Literature shows that there are many definitions, types and measures of dollarization. For some countries dollarization tends to have been forced by circumstances, while for others dollarization was due to economic policy. The relationship between dollarization and economic growth varies between countries and regions, but studies show that, in general, dollarization (choice of exchange rate regime) has had a positive impact on economic growth. Dollarization hysteresis may or may not follow dollarization. Studies show some countries successfully implementing anti-inflationary policies, while for others dollarization became a spiral from which they cannot extricate themselves.

## **3 RESEARCH METHODOLOGY**

### **3.1 Introduction**

This chapter presents the research methodology. It includes the research approach and strategy that were adopted. Details regarding data collection include the frequency and the choice of variables. Thereafter, the intricacies of the data analysis methods used in this research are described. They include stationarity tests and the regression models estimated. The reliability and validity of the research are examined, and the limitations of the approach used in this study are highlighted.

### **3.2 Research Approach and Strategy**

A case-study research method was adopted for this study. According to Yin (2014), “case studies can be based entirely on quantitative evidence”. Zimbabwe has been chosen because:

1. it is a developing country in Africa
2. it has broken twenty-first century hyperinflation records
3. prior research on the effects of dollarization have focused almost entirely on countries outside Africa
4. this case study adds much-needed policy implications/advice for the African perspective on the phenomenon of dollarization

Asongu et al. (2016) states that, “studies on dollarization have either been country-specific or panel-based with a focus on determinants of dollarization.” This research therefore offers a different approach by investigating the effect of dollarization on economic performance as measured by: GDP per capita, inflation, total level of external debt, FDI inflows, trade, and literacy levels. Macroeconomic variables were used to help analyse the effect of dollarization on the economic growth.

### **3.3 Data Collection, Frequency and Choice of Data**

Zimbabwe became independent in 1980. To measure economic growth in Zimbabwe, the country’s GDP was used. 1990 was selected as a starting point, because this was a time when the euphoria of independence had dissipated, and the new government’s policies were taking shape. The other variables used in the analysis are external debt, FDI inflows, inflation, trade

and the literacy rate. The secondary data for these series for Zimbabwe was collected from the World Bank's economic indicators for the period 1990 to 2015. While ideally quarterly data would have been used for the analysis, for many of the series, only annual observations were available (such as the literacy rate and external debt). In the resulting 26 observations, the inflation and the literacy rate variables are measured as percentages. The other variables used are in real terms and are measured in US\$ per capita. Growth in GDP was computed as the compound growth in each year. The deflator being used is GDP growth.

### **3.4 Data Analysis Methods**

As mentioned previously, most econometric studies on dollarization have focused on the determinants of adopting the currency of another country; those that have examined the effects have largely been qualitative in nature. Further complicating the issue is the measurement of dollarization. Adam (2013), Mecagni et al. (2015) and Corrales et al. (2016), for example, used the dollarization ratio to capture the extent of dollarization in various countries in their sample, which measures the ratio of foreign currency deposits to total deposits in the banking system. This enables a series to be generated for a country over time which can thus be used in a regression model. For example, Adam (2013) in his paper *Dollarization in a Small Open Economy – The Case of Maldives*, utilized this measure of dollarization to test for a co-integrating relationship between dollarization and its main determinants in the Maldives. The measure used for Maldives is not applicable for this study because Zimbabwe does not have a domestic currency; the dollarization ratio would not vary over time. Therefore Zimbabwe is not included in the sample of Mecagni et al. (2015) or Corrales et al. (2016) in their studies of SSA. Edwards and Magendzo (2003) focused on strictly dollarized countries in their study and created a binary measure (yes – 1, no – 0) by also including non-dollarized countries in their sample. This classification could be utilised for Zimbabwe but, given that this analysis sought to focus only on one country, this measure was again limited in its applicability.

As such, it was not possible to examine other similar studies on dollarization to determine the appropriate method, nor the way to measure dollarization, to answer the research question in this study. Instead, direction was obtained from the research conducted on the effects of exchange rate regimes on economic growth. In this field of study, the focus is on distinguishing between the effects of fixed and floating exchange rate regimes on economic

growth, typically with the use of a dummy variable (fixed – 0 and floating 1). The seminal study in this area is that of Levy-Yeyati & Sturzenegger (2003). While a number of the studies in this literature have used panel datasets (such as Levy-Yeyati & Sturzenegger, 2003; Jakob, 2016), some have also examined a single country where several changes have occurred in the country’s exchange rate regime, such as Nigeria (Obi et al., 2016). The details of the various methods used, and how they are drawn from this literature and adapted, are discussed in the sections below.

### 3.4.1 Economic Growth Pre- and During Dollarization

As a starting point for the analysis, a comparison of means was undertaken to evaluate economic growth before dollarization and after the introduction of the multi-currency regime. This is consistent with the approach adopted by Levy-Yeyati & Sturzenegger (2003) in their study on the effects of fixed versus floating exchange rate regimes on economic growth. A similar approach was also adopted in other studies such as Huang & Malhorta (2004), Bleaney & Francisco (2007) and Bakare (2011) in this field. To obtain a more comprehensive view of the effects of dollarization on Zimbabwe, in addition to economic growth, the level of external debt, inflation and FDI inflows were examined.

Effectively, this analysis entailed computing two means for each variable - one for the pre-dollarization period 1990 to 2008 and one for the dollarized period, 2009 - 2015 and comparing them. This was done with the use of a t-statistic, which took the form:

$$t = \frac{(Y_1 - Y_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} \quad (3.1)$$

where:  $Y_1$  and  $Y_2$  are the means of the variable in the pre-dollarization and dollarized periods respectively,  $\sigma_1^2$  and  $\sigma_2^2$  are the variances of the variable in the two periods, and  $n_1$  and  $n_2$  are the number of observations in each period (Alexander, 2008).  $\mu_1$  and  $\mu_2$  are the hypothesised values for the two means, with the null hypothesis in this case being  $\mu_1 - \mu_2 = 0$  against the alternative that  $\mu_1 - \mu_2 \neq 0$ . This t-statistic was compared to the critical values from the t-distribution to ascertain the statistical significance of the difference in means in each case.

To support the findings generated from these descriptive statistics, an Ordinary Least Squares (OLS) regression model was estimated, with a dummy variable to capture the dollarization period. *Dummy* is a dummy variable for dollarization which takes a value of 0 for the period before dollarization and 1 for the period of dollarization. The model took the following form of a population regression function:

$$E[Y_t / Dummy] = \theta_0 + \theta_1 Dummy \quad (3.2)$$

where  $Y$  is a vector of the macroeconomic variables which include GDP growth, inflation, external debt and FDI inflows. The parameters  $\theta_0$  and  $\theta_1$  are constants to be estimated. The model in equation (3.2) is equivalent to simply testing the difference between means, with the parameter  $\theta_1$  measuring the mean difference in the variable  $Y$  between the pre-dollarization and dollarization periods. To illustrate this:

$$E[Y_t / Dummy = 1] = \theta_0 + \theta_1 \quad (\text{for Dummy} = 1) \quad (3.3)$$

$$E[Y_t / Dummy = 0] = \theta_0 \quad (\text{for Dummy} = 0) \quad (3.4)$$

Subtracting equation (3.4) from equation (3.3) gives the following formula:

$$\theta_1 = E[Y_t / Dummy = 1]_{Doll} - E[Y_t / Dummy = 0]_{Pre-Doll} \quad (3.5)$$

Equation (3.5) therefore shows that  $\theta_1$  measures the mean difference in the variable  $Y$  between the pre-dollarization and dollarization periods (Brooks, 2014).

### 3.4.2 The Effects of Dollarization on Economic Growth

To supplement the descriptive statistics, a regression model examining the determinants of economic growth, including dollarization, was estimated. This follows Levy-Yeyati & Sturzenegger (2003) and Obi et al. (2016). Among others, they sought to examine the effects of the choice between a fixed and floating exchange rate regime on economic growth within the context of a broader model of economic growth. Unlike in some of the other literature on economic growth, their models have typically focused on estimating short-run relationships rather than long-run co-integrating relationships because of the use of the dummy variable and relatively short time horizons which prevent testing for structural breaks. Those considerations are also applicable to this study.

As mentioned previously, empirical studies internationally have identified numerous determinants of economic growth from macroeconomic variables such as inflation and

interest rates to trade openness, FDI, institutional quality, and levels of education and infrastructure. For the purposes of this study, external debt, FDI inflows, inflation, trade and the literacy rate were chosen as the determinants of economic growth. Investment in capital stock has been identified to be important under the Solow and endogenous growth theories, and this is captured in this study through FDI inflows. Similarly, human capital has also been found to play an important role in enhancing economic growth. This can be seen both in the availability of labour and in the quality of labour. To capture both of these elements, the estimates of the population and the level of literacy were used as proxies respectively. While not exhaustive, this list of variables covers a diverse set of measures that reflect economic conditions and government policies that have been found to play an important role in determining economic growth internationally (see for example, Arvanitidis et al., 2009; Ndambiri et al. 2012). This is consistent with Levy-Yeyati & Sturzenegger's (2003) comment that they chose "a relatively uncontroversial specification of the growth regression to which we add the exchange rate regime dummies".

The model estimated can thus be specified as follows:

$$g_t = \beta_0 + \beta_1 TO_t + \beta_2 FDI_t + \beta_3 LIT_t + \beta_4 INFL_t + \beta_5 POP_t + \beta_6 D_t + \varepsilon_t \quad (3.6)$$

where:  $g$  is the growth rate in GDP,  $TO$  refers to trade openness as measured by trade volume,  $FDI$  refers to FDI inflows,  $LIT$  refers to the level of literacy,  $INFL$  refers to inflation,  $POP$  refers to the population size, and  $D$  refers to the dollarization dummy defined previously. The natural log of external debt, FDI inflows, and trade were calculated for use in the regression models. This aids in reducing variability in the series. It also assists in interpretation of an econometric model with variables measured in different units; GDP growth, inflation, and the literacy level are measured in percentages.

Theoretically, the coefficients of investment, population, and literacy are expected to be positive; higher levels of investment, a larger population, and higher levels of literacy should contribute to greater economic growth (United Nations, 2003). The coefficient on trade could be either positive or negative. Proponents for trade liberalisation expect the coefficient to be positive. Access to new markets for goods and services, and the need to increase innovation and efficiency -- to compete with imports as a result of greater trade -- will lead to economic growth (Hasan, 2010). In contrast, protectionists expect it to be negative. They argue that

local industries are destroyed by imports, and also that they cannot compete internationally, which leads to lower economic growth (Hasan, 2010).

The coefficient of inflation can also be either positive or negative. According to the Phillips curve theory in economics, reasonable levels of inflation can promote employment and production. However, runaway inflation can be detrimental to economic growth.

In estimating this model there are several important data considerations such as stationarity, autocorrelation, and heteroscedasticity. The treatment of these issues is explored in the following sub-sections.

### 3.4.3 Stationarity Tests

As explained above, to examine the effects of dollarization on economic growth in Zimbabwe, time series data was used. Conversely, the analysis of time series variables may result in spurious relationships where variables seem to be highly related, while in fact they are not (Brooks, 2014). This problem is caused by the use of non-stationary series. A

stochastic process ( $x_t$ ) is said to be weakly stationary if the following conditions hold:

- ❖ It has a constant mean, that is,  $E(x_t) = \mu$
- ❖ It has a constant variance, that is,  $Var(x_t) = \sigma^2$
- ❖ It has constant autocovariances, meaning that the covariance between the value of the series in the current and preceding periods depends on the lag (one, two, three, etc.) and not the point in time at which it is measured, that is,  $Cov(x_t, x_{t-\tau}) = \gamma_\tau$  (Shumway & Stoffer, 2011).

If a variable  $x_t$  has a unit root, then it is a random walk process. It means that the current period value of the series is entirely determined by the previous period value and a random shock. Mathematically, this can be expressed as follows:

$$x_t = \beta x_{t-1} + v_t \tag{3.7}$$

where  $\beta = 1$  for a random walk process/ non-stationary process, and  $v_t$  is an error term assumed to be independently and identically distributed with a mean of zero and constant variance (Shumway & Stoffer, 2011; Brooks, 2014).

Dickey and Fuller (DF) devised a test for the stationarity of a series based on equation (3.7) with the hypothesis that for a non-stationary series,  $\beta = 1$  while for a stationary series,  $\beta < 1$ .

1. However, to simplify this test,  $x_{t-1}$  is subtracted from both sides of equation (3.7), yielding the following:

$$x_t - x_{t-1} = \beta x_{t-1} - x_{t-1} + v_t \Rightarrow \Delta x_t = \varphi x_{t-1} + v_t \quad (3.8)$$

where  $\varphi = \beta - 1$  (Brooks, 2014). To test the hypothesis that  $\varphi = 0$  in equation (3.8) is equivalent to testing whether  $\beta = 1$ , the equation (3.8) is estimated to obtain the coefficient  $\hat{\varphi}$

which is then used to compute the tau statistic  $\tau = \frac{\hat{\varphi}}{se(\hat{\varphi})}$ . If this statistic is less than the critical value at  $\alpha$  level of significance, then the null hypothesis of non-stationarity is rejected in favour of the alternative hypothesis that the series is stationary (Brooks, 2014). An intercept and a trend term can be added to this basic specification. The DF test is, however, augmented to account for potential autocorrelation in the series by including lags of the dependent variable as regressors, as follows:

$$\Delta x_t = \varphi x_{t-1} + \theta_1 \Delta x_{t-1} + \theta_2 \Delta x_{t-2} + \dots + \theta_q \Delta x_{t-q} + v_t \quad (3.9)$$

(Brooks 2014). This is known as the Augmented Dickey-Fuller (ADF) test and is well used in empirical studies as a test for stationarity. It was employed in this study to detect whether a given series is non-stationary/has a unit root with the test regressions including an intercept but no trend.

The ADF test, however, has low power, especially in small samples. This means that it has a tendency to fail to reject the null hypothesis when the null hypothesis is actually false (i.e. it concludes that the series is non-stationary when it is actually stationary) (Enders, 2015).

Accordingly, where discrepancies were evident, the Kwiatkowski, Phillips, Schmidt, and Shin (1992) (KPSS) test was implemented, also with an intercept, with the null hypothesis of this test being that the series is stationary.

To avoid the problem of spurious relationships in the presence of non-stationary data, this study used stationary series. Thus, if a series  $x_t$  was found to be non-stationary, it was made

stationary through generating a differenced series, that is,  $\Delta x_t = x_t - x_{t-1}$ . The process of differencing was continued until the series became stationary. The number of times which a series had to be differenced to become stationary is referred to as ‘the order of integration’ (Brooks, 2014).

#### **3.4.4 Autocorrelation and Heteroscedasticity**

The error term of the economic growth regression is assumed to exhibit no autocorrelation and to have constant variance (homoscedasticity). In the event that these two assumptions are violated, then the coefficients will not be efficient under OLS, and any hypothesis tests conducted will be unreliable (Ayyangar, 2007). To avoid this, Newey-West Adjusted Standard Errors were used.

### **3.5 Research Reliability and Validity**

A case-study-hypothesis research design was used for this study. The case study approach offers an in-depth study of a research problem such as: ‘Dollarization and its Effect on the Economic Growth of Zimbabwe.’ The focus on Zimbabwe helps to narrow down a very broad field of research (dollarization) into one easily researchable example: Zimbabwe. The case-study research design is also useful for testing whether a specific theory and model applies to phenomena in the real world. The methods are drawn from a similar branch of study in the economic/finance literature. This adds validity to the analysis, while the data is drawn from the World Bank which is a reliable source of information.

### **3.6 Limitations**

A case study has the following limitations:

1. A single case may offer little basis for establishing reliability or to generalize the findings to a wider population of people, places, or things. The question commonly raised is “How can you generalize from a single case?” (Yin, 2014).
2. Intense exposure to the study of a case may bias a researcher's interpretation of the findings.
3. The case may not be representative or typical of the larger problem being investigated (dollarization and its impact on the economy) (Yin, 2014).

4. If the criterion for selecting a case is because it represents a very unusual or unique phenomenon or problem for study, then the interpretation of the findings can only apply to that case (Tellis, 1997). This may be true for Zimbabwe.
5. The data set in this study is small; there being only seven annual periods of dollarization to date may reduce the predictive power of the results.
6. Only annual data for this study was available from the World Bank.

### **3.7 Conclusion**

This study, which aims to investigate the contribution of dollarization to economic growth in Zimbabwe for the period 1990-2015, adopted a comparative analysis of economic growth (and other variables in the pre-dollarization and dollarization periods using time series data). The study used an econometric software (i.e. e-views) for data treatment and analysis. The next chapter focuses on the analysis of the results.

## 4 RESEARCH FINDINGS, ANALYSIS

### 4.1 Introduction

This chapter presents and discusses the research findings as a basis for providing conclusions to the research problem posited in Chapter 1; that is, to assess the impact of dollarization on economic growth in Zimbabwe. In section 4.2, the characteristics of the data are examined. The first analysis is contained in section 4.3. It tests the equality of means of economic growth, external debt, FDI inflows, and inflation in the pre-dollarized and dollarized periods. The results from the stationarity tests are examined in section 4.4. The findings from the multivariate regression of the determinants of economic growth, including dollarization, are presented in section 4.5. All of these results are analysed in the context of the theory and evidence presented in Chapter 2.

### 4.2 Descriptive Statistics

Summary statistics of the variables (prior to any transformations) are provided in Table 4.1. Per capita GDP averaged \$625.2 over the study period with a minimum of \$327.2 and a maximum of \$931.2. Variation in GDP per capita was very high, as indicated by a standard deviation of \$174.1. The lowest variation is in FDI inflows per capita, whose standard deviation is only \$10.8. The largest variation is in inflation, with a standard deviation of over 45 million per cent. It reflects the hyperinflation period experienced in Zimbabwe prior to the introduction of dollarization in 2009. GDP growth averaged 0.39 per cent over the study period, with a minimum of -30.07 per cent and a maximum of 59.7 per cent. FDI inflows per capita averaged \$9.6, while external debt per capita averaged \$409.1. The distribution of the variables is normal for economic growth, GDP per capita, and external debt as indicated by the Jarque-Bera statistic, which fails to reject the null hypothesis of normality. (Jarque-Bera Test is a test for normality while Kurtosis is a measure of how much a variable's distribution deviates from the distribution of the normal curve.) However, inflation, GDP growth, and FDI inflows are not normally distributed.

**Table 4.1: Descriptive Statistics**

	INFLATION	GDP GROWTH	GDP_PC	FDI_PC	EXDEBT_PC
Mean	8891459.	0.3924	625.1904	9.5712	409.0536
Median	25.4650	-0.7623	597.4593	4.9747	387.9332
Maximum	2.31E+08	59.7068	931.2039	36.3384	594.2131
Minimum	-7.5000	-30.0722	327.2211	0.2592	289.9876
Std. Dev.	45332207	16.6826	174.1193	10.7965	83.3292
Skewness	4.8000	1.4541	0.3039	1.1828	0.6849
Kurtosis	24.0400	7.9123	2.0423	3.0298	2.5812
Jarque-Bera	579.4117	33.9468	1.3939	6.0629	2.2229
Probability	0.0000	0.0000	0.4981	0.0482	0.3291
Sum	2.31E+08	9.809148	16254.95	248.8508	10635.39
Sum Sq. Dev.	5.14E+16	6679.393	757938.1	2914.105	173594.0
Observations	26	25	26	26	26

Except for GDP growth, which is negatively skewed, the distributions for the other variables are positively skewed. “Conceptually, skewness describes which side of a distribution has a longer tail. If the long tail is on the right, then the skewness is rightward or positive; if the long tail is on the left, then the skewness is leftward or negative” (Von Hippel, 2010).

### **4.3 Effects of Dollarization on Economic Growth and Other Macroeconomic Variables in Zimbabwe**

The statistics in Table 4.1 provide some insight into the economic growth rate of Zimbabwe and the other macroeconomic variables pre-dollarization and during the dollarized period. However, the statistics require a separation of the study period in order to examine more explicitly the effects of dollarization. As explained in Chapter 3, it is necessary to establish the averages of the pre-dollarized and dollarized periods in order to enable a meaningful comparison. The question is, “Has the average economic performance changed as a result of dollarization?” Table 4.2 provides answers to this question by comparing the macroeconomic indicators of economic growth, GDP per capita, external debt, inflation and FDI inflows in the two periods.

**Table 4.2: Macroeconomic Performance, Dollarization Period versus Pre- Dollarization Period**

Macroeconomic variable	Dollarization (N=7)	Pre-dollarization (N=18)	Total (N=25)	Difference
GDP growth	14.83	-5.22	0.39	20.05***
GDP per capita	806.99	558.21	625	248.78***
External debt	522.02	376.43	409	154.59***
FDI inflows	20.89	5.40	9.6	15.49***
Inflation	0.37	12.2m	8.89m	-12.2m

\*\*\* indicate that the difference between pre-dollarized and dollarized macroeconomic performance indicator is statistically significant at 1, 5 and 10 per cent levels respectively. Differences in means were tested using *t*-tests for equality of means

The results in Table 4.2 show that most macroeconomic indicators have improved as a result of dollarization. The average economic growth was -5.22 per cent for the period before dollarization, and it is 14.83 per cent for the dollarized period. The difference in average growth rate is 20.05 per cent and is statistically significant at 1 per cent. This implies that the average economic growth rate improved by 20.05 per cent during the dollarized period. Similarly, the average GDP per capita improved during dollarization by \$278.78, and this difference is statistically significant at the 1 per cent level. The average GDP per capita for the pre-dollarization period was \$558.21, while that of the dollarization period is \$806.99. FDI inflows per capita improved from the pre-dollarization average of \$5.40 to the dollarization average of \$20.89. The difference of \$15.49 is statistically significant at 1 per cent level. Inflation significantly declined from over 12 million per cent to an average of less than 1 per cent during the dollarized period. This seemingly dramatic decline, however, is not statistically significant because the variance is so large due to the pre-dollarization period of hyperinflation. Thus with such a small sample size, the variance remains extremely large.

Despite a significant improvement in some macroeconomic variables, Zimbabwe's debt increased after the abolishment of the country's domestic currency. The massive decline in inflation has increased the country's indebtedness. This is true because a decline in inflation benefits creditors while disadvantaging borrowers. Zimbabwe is a net borrower, and any deflation is therefore detrimental to its debt stock. Generally, deflation reduces the capacity of those who are indebted to honour their debt service commitments. To put it more simply, debtors are unable to pay their debts (Bagus, 2015). A reduction in prices means less income will be received for exports. According to Munzara (2015), as at June 2015, "external debt alone amounted to US\$6.7 billion representing about 47per cent of GDP.

The findings of the estimated equation (3.2) are presented in Tables 4.3, 4.4 and Appendix A. The equations were estimated using the OLS technique. The results support the findings in Table 4.2. The coefficient of the dummy variable in the model, whose dependent variable is economic growth, is equivalent to the mean difference between the two periods as indicated in Table 4.3 with  $\theta_1 = 20.05$ . This coefficient is statistically significant at the 1 per cent level. The t-statistic of 3.17 rejects the null hypothesis that this coefficient is zero at the 1 per cent level. This is also shown by the p-value of 0.004, which is less than 1 per cent. The findings simply show that GDP growth has improved during dollarization in Zimbabwe.

**Table 4.3: Regression with a Dummy Variable for Economic Growth**

Dependent Variable: GDPGROWTH

Method: Least Squares

Date: 01/07/18 Time: 13:35

Sample (adjusted): 1991 2015

Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.222929	3.352253	-1.558036	0.1329
DUMMY	20.05462	6.335162	3.165606	0.0043
R-squared	0.303475	Mean dependent var.		0.392366
Adjusted R-squared	0.273191	S.D. dependent var.		16.68257
S.E. of regression	14.22240	Akaike info. criterion		8.224132
Sum squared resid.	4652.365	Schwarz criterion		8.321642
Log likelihood	-100.8017	Hannan-Quinn criter.		8.251177
F-statistic	10.02106	Durbin-Watson stat.		2.168740
Prob(F-statistic)	0.004319			

Table 4.4 summarises the estimates for the coefficient of the dummy ( $\theta_1$ ) when other macroeconomic indicators are used as dependent variables.

**Table 4.4: Estimates of the Dummy Co-efficient**

Variable	Dummy coefficient ( $\theta_1$ )	t-statistic	Dollarization effect
GDP growth	20.05	3.17***	Improved
GDP per capita	248.78	4.15***	Improved
FDI inflows	15.49	4.18***	Improved
External debt	154.59	7.56***	Debt increased
Inflation	-12.2 million	-0.60	Inflation decreased

\*\*\* indicate that the coefficient is statistically significant at 1, 5 and 10 per cent level, respectively.

In general, the findings reveal that dollarization improved several of the macroeconomic indicators examined in this study, namely GDP growth, price stability and FDI inflows. The coefficients for these variables were significant at the 1 per cent level. While inflation decreased, the difference was not found to be statistically significant. The stock of external debt increased, thereby putting more pressure on the country in interest payments.

#### **4.4 Stationarity Tests**

A summary of the stationarity results are presented in Table 4.6. The detailed stationarity tables are presented in Appendix B. The findings show that external debt per capita, FDI inflows per capita, population, and trade openness are non-stationary; that is, they are integrated in the order of  $I(1)$ . In their levels, these three variables are non-stationary. The results in Appendix B show that the ADF test statistics for external debt, population, trade, and FDI inflows are more negative than the ADF critical values at 10 per cent, 5 per cent and 1 per cent levels when tested in levels. However, when differenced once, the three variables become stationary, as indicated in Table 4.6. As a result, changes in external debt, trade, population, and FDI inflows were used in the simple regression model with a dummy variable. GDP growth, which is the change in real GDP, was found to be stationary in levels, agreeing with the findings on GDP per capita. Inflation was also stationary in levels. Thus, both GDP growth and inflation are integrated to order zero,  $I(0)$ .

For population, the ADF test in first differences only rejected the null hypothesis at the 10 per cent significance level, and not 5 per cent or higher. To ensure the robustness of the conclusion that this series is stationary in first differences, the KPSS test was used. This test confirmed that the series is  $I(1)$ , as the null hypothesis of stationarity was rejected for the test in levels but could not be rejected in first differences. For literacy, the ADF test could not be estimated because the series exhibits very little variation over time. The KPSS test, however, could be estimated, with the conclusion that the series is  $I(1)$ , i.e. it is non-stationary in levels but stationary in first differences. Thus, for all variables that were identified to be  $I(1)$ , the first differences were used in the economic growth regression; the results of which are presented and discussed in the next section.

**Table 4.5: Stationarity test results**

Variable	ADF Test			KPSS Test		
	Level	First Difference	Order of integration	Level	First Difference	Order of integration
<b>GDP growth</b>	-		I(0)			
<b>Debt</b>	4.5361***					
<b>FDI</b>	-0.7562	-3.6191***	I(1)			
<b>Inflation</b>	-2.0193	-6.7613***	I(1)			
<b>Trade</b>	-		I(0)			
<b>Population</b>	4.9995***					
<b>Literacy</b>	-1.3608	-3.6894**		0.7581**	0.1923	I(1)
	0.3650	-2.7542*		*		
				0.5784**	0.2405	I(1)

\*\*\*, \*\* and \* indicate that the ADF statistic is statistically significant at 1, 5 and 10 per cent level, respectively.

#### 4.5 Determinants of Economic Growth in Zimbabwe

This section presents the regression results of the econometric model presented in Chapter 3. The OLS results and the diagnostic tests are presented in Table 4.6 and 4.7. Care should be taken when inferring the economic relationship between variables taken in differenced form.

Firstly, a model without the dollarization dummy and with Newey-West standard errors is presented. Population, literacy and inflation have a significant effect on growth. The coefficient of population is statistically significant at 10 per cent level, literacy is significant at 5 per cent level, and inflation is statistically significant at 1 per cent level. Inflation is negatively related to economic growth, and this is theoretically expected. High price levels are detrimental to economic performance. Population is positively related to economic growth as expected, while the sign of the coefficient of literacy is unexpected. The results show that there is a negative association between economic growth and literacy. Literacy is relatively high in Zimbabwe compared to all other African countries, but the economy has been performing very badly. Hence this kind of a relationship between literacy and economic growth cannot be surprising for Zimbabwe. In other countries emphasis is on vocational and technical training, rather than education per se. The results are in Table 4.6.

**Table 4.6: A Growth Model without the Dollarization Dummy**

Dependent Variable: GDPGROWTH

Method: Least Squares

Date: 01/05/18 Time: 10:06

Sample (adjusted): 1991 2015

Included observations: 25 after adjustments

HAC standard errors &amp; covariance (Bartlett kernel, Newey-West fixed)

bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8.990193	5.052077	-1.779504	0.0920
D(LDEBT)	-11.62073	31.38705	-0.370240	0.7155
D(LFDI)	-2.519237	2.559298	-0.984347	0.3380
D(LTRADE)	26.87533	19.39577	1.385629	0.1828
D(LPOP)	796.9812	443.0870	1.798701	0.0889
D(LIT)	-5.346476	2.261727	-2.363891	0.0295
INFL	-1.07E-07	1.10E-08	-9.801077	0.0000
R-squared	0.220627	Mean dependent var.	0.392366	
Adjusted R-squared	-0.039164	S.D. dependent var.	16.68257	
S.E. of regression	17.00611	Akaike info criterion	8.736518	
Sum squared resid.	5205.739	Schwarz criterion	9.077803	
Log likelihood	-102.2065	Hannan-Quinn criter.	8.831176	
F-statistic	0.849247	Durbin-Watson stat.	2.076604	
Prob(F-statistic)	0.549173	Wald F-statistic	43.40293	
Prob(Wald F-statistic)	0.000000			

Secondly, the economic growth model with a dummy variable for dollarization as per equation (3.6) was estimated. Newey-West standard errors were also used. As shown in Table 4.7, the coefficient of the dummy variable is statistically significant at 10 per cent level but not any higher. Only the coefficient of inflation is significant of the other variables at 1 per cent. The fact that the coefficient on the dummy variable is positive denotes a positive relationship between dollarization and the economy. In fact it is significant even in the presence of inflation. This suggests that dollarization itself had an impact on economic growth, not just indirectly through inflation; the effect is direct and indirect.

**Table 4.7 A Growth Model with the Dollarization Dummy**

Dependent Variable: GDPGROWTH

Method: Least Squares

Date: 01/05/18 Time: 10:08

Sample (adjusted): 1991 2015

Included observations: 25 after adjustments

HAC standard errors &amp; covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.115395	7.116361	0.297258	0.7699
D(LDEBT)	-16.59712	24.39082	-0.680466	0.5054
D(LFDI)	-1.851482	2.319139	-0.798349	0.4357
D(LTRADE)	21.19379	26.94559	0.786540	0.4424
D(LPOP)	-370.4479	617.1948	-0.600212	0.5563
D(LIT)	-1.772365	2.768048	-0.640294	0.5305
INFL	-7.90E-08	1.86E-08	-4.254475	0.0005
DUMMY	21.06219	11.56595	1.821051	0.0862
R-squared	0.426427	Mean dependent var.	0.392366	
Adjusted R-squared	0.190249	S.D. dependent var.	16.68257	
S.E. of regression	15.01200	Akaike info criterion	8.509914	
Sum squared resid.	3831.123	Schwarz criterion	8.899955	
Log likelihood	-98.37393	Hannan-Quinn criter.	8.618095	
F-statistic	1.805535	Durbin-Watson stat.	2.214515	
Prob(F-statistic)	0.151229	Wald F-statistic	13.35282	
Prob(Wald F-statistic)	0.000009			

#### 4.6 Summary of Effects of Dollarization on Economic Growth in Zimbabwe

In summary, the above results and analysis show that dollarization has positively affected Zimbabwe's economy. This study concurs with Noko (2011), who concludes that dollarization has positively affected the Zimbabwean economy, mainly through inflation reduction. Kabote et al. (2013) also note that there is a clear indication of a positive change in the performance of the tourism industry in Zimbabwe post-dollarization, and in turn economic growth. Nhavira (2015) adds that dollarization consequently decreased poverty rates in Zimbabwe. Likewise, Kabote et.al. (2013) and Munhupedzi & Chidakwa (2017), in a study similar to this one concluded that dollarization:

- arrested hyperinflation
- resulted in an increase in GDP and growth in both the formal and informal sectors
- ultimately resulted in positive economic growth

The results of the study attest to dollarization having both a direct effect on economic growth, and an indirect effect on economic growth through inflation control.

Indeed, dollarization has helped Zimbabwe out of the pre-dollarization economic precipice. As summed by Nkomazana & Niyimbanira (2014), “There is available evidence that dollarization had a positive impact on the performance of the economy of Zimbabwe, and should be allowed to continue for the good of the people.”

The only negative impact of dollarization, albeit mostly due to the pre-dollarization hyperinflationary legacy, is an increase in external debt levels. This worsened during dollarization due to:

- deflation
- reduced output of exports as agriculture, manufacturing and mining struggled to regain lost market share
- the value of exports declining)
- interests on arrears increasing as Zimbabwe continued to default on paying almost all its external debt payments (due to inability to do so) (Department for International Development, 2017)

The results of this study therefore provide the quantitative evidence that supports previous studies of the effects of dollarization on economic growth.

Dollarization helped create a more stable economic environment that encouraged investment and growth (Antinolfi & Keister, 2001); levels of FDI for Zimbabwe increased, while the economy grew during dollarization as the country became more integrated with international capital markets (Slivinsk, 2008), (Sikwila,2013) and (World Bank, 2017).

During dollarization, the Reserve Bank of Zimbabwe’s monetary policies have been rendered ineffective (Miles 1978; Brillembourg & Schadler 1980; Girton & Roper 1981; Ortiz 1983). This was so as the central bank’s role was reduced to monitoring of financial institutions and issuing ineffective guidelines and policies.

## **4.7 Conclusion**

The analysis of the results showed mostly positive relationships between the economic variables of inflation, FDI, external debt, and trade. The next chapter concludes the study, offers policy recommendations, and suggests future studies.

## 5 CONCLUSION AND POLICY RECOMMENDATIONS

### 5.1 Conclusion

This study investigated the impact of dollarization on economic growth where economic growth was measured by GDP growth. The study was carried out for the period 1990-2015 using secondary data. Firstly, the differences between the means of several macroeconomic variables were tested for the pre-dollarization period against the dollarized period. Secondly, a regression analysis was carried out to examine the determinants of economic growth. A multivariate OLS regression model was used with a dummy to capture the effects of dollarization. The variables used in regression analysis were tested for stationarity, using both ADF and KPSS tests. This chapter provides a summary of the findings and conclusions of the study, followed by policy recommendations.

### 5.2 Summary

The results of the mean differences show that the macroeconomic environment improved after dollarization. Economic growth improved by 20.05 per cent, while inflation significantly declined by millions. Other variables such as FDI inflows significantly improved, but external debt worsened. The regression analysis results also support the findings established by the test of the differences between means. In a regression of economic growth on its determinants without the dummy variable for dollarization, population, literacy, and inflation were found to be significant determinants of economic growth in Zimbabwe. Meanwhile, in a regression with a dollarization dummy, only inflation and the dummy were found to have a significant association with economic growth.

The results showed that dollarization positively impacted economic activities in the country for the period under study. Also, the results show that since the introduction of the multicurrency system, there has been a higher increase in the country's GDP, a significant reduction in the rate of inflation, and a higher inflow of FDI. Another factor that positively influenced economic growth is population. Although there are also worrying results that the country's debt has been on the increase, from the majority of positive findings it can be concluded that Zimbabwe's economic growth is positively and significantly affected by dollarization.

The main policy conclusion of the study is that the present state of a growing economy can be explained in part by dollarization. Therefore, the continued use of the multicurrency system is highly recommended if the country is to achieve its general objective of macroeconomic stability and the realization of continued economic growth.

Zimbabwe held elections in July 2018 under a new leadership (that took office in November 2017). This new leadership and fresh elections are expected to usher in a new political dispensation, revive the economy, and hopefully map the way for the de-dollarization of Zimbabwe. The timing of de-dollarization will depend on whether the country has, among other key objectives:

- accumulated enough foreign currency reserves
- restored bi-lateral relations with the key funders such as the World Bank
- resuscitated the agro-based economy

The disputed elections have dampened investor confidence in the country, hence the future of the Zimbabwe economy is currently uncertain (as of October 2018).

While the results and analysis of this study have in general shown a positive correlation between dollarization and the economy for Zimbabwe, there have also been downsides due to dollarization. Dollarization without an official agreement with the base country (USA) has resulted in an acute liquidity crunch. The situation has forced the Zimbabwean government to introduce bond notes to alleviate the cash shortages. Bond notes have also been introduced to incentivise the export sector, help revive the economy, create jobs, and improve people's livelihood.

As explained in Chapter 4 above, Zimbabwe's debt has increased during dollarization because the authorities lost the ability to control prices, such as through increasing or decreasing the exchange rate. The local manufacturing, mining and agricultural industries have found it difficult to compete with cheaper external products. Policy makers should therefore be cognisant of the negative effects of dollarization on the economy.

According to Stryker (1999), "monetary authorities need to be equipped analytically to understand how monetary policy, exchange rate policy and debt management operate in an economy that uses foreign as well as domestic currency (Zimbabwe's bond notes)". Stryker (1999) goes on to say, "the government may also through policy formulation encourage full

dollarization including regulating the banking sector to avoid its endangerment by the process of dollarization”.

### **5.3 Suggestions for Future Research**

Latin American countries that dollarized (such as Mexico, Cuba, Uruguay, Ecuador and Panama) have a proximity to the USA. This allows for financial integration with the USA that could follow dollarization. “While dollarization may lead to the government losing the revenue generated by seigniorage, the newly dollarized economy will soon find itself more integrated with international capital markets leading to economic growth,” argues Slivinsk (2008). Future research on dollarization, and the resultant level of integration with international capital markets, as well as the level of economic growth, will add value to already existing literature. The effect of financial integration for dollarized countries like Zimbabwe and other developing countries that are far away from the base currency country, the USA, is another potential area for future research.

According to Corrales et al. (2016), “The literature on dollarization initially focused on the currency substitution angle of the phenomenon, being motivated by the history of high inflation in Latin America. The key message from this initial literature is that monetary policy will be ineffective in a country where foreign currencies are substitutes for domestic currency”. Future research can focus on the effectiveness of monetary policy in dollarized countries such as Zimbabwe that still keep their own monetary policies during the period(s) of high dollarization.

Schuler (2005) and Corrales et al. (2016) have alluded to countries that have de-dollarized not performing well after de-dollarization. The implication is that successful and lasting de-dollarization may be difficult to achieve. Experience also shows that dollarization is often difficult to reverse. Memories of macroeconomic instability and hyperinflation -- the key factors that encourage dollarization -- do not wither away easily. Averse to risking disaster again, economic agents may continue to maintain foreign-currency-denominated assets, even when macroeconomic conditions have stabilized and policy credibility has been established. Future research on whether economic performance is positive after de-dollarization, compared to pre-dollarization and dollarization periods, will be helpful, particularly for the developing countries.

As stated by Mecagni et al. (2015) “Dollarization can pose important challenges to policymakers. It constrains the capacity of monetary authorities to act as a lender of last resort; hampers banks’ liquidity management; and weakens the stability of the financial sector, as it may amplify the impact of exchange rate movements on banks’ balance sheets, thereby increasing the risk of contractionary effects and bank failures.” Zimbabwe has experienced fifty per cent bank failure (50 per cent) since 2002. Per Dhliwayo (2015), “Growth in Zimbabwe’s financial sector from a mere 5 banking institutions in 1980 to 40 players in 2002 was mainly due to financial reforms of the 1990’s. Some banks have since failed and there are only 20 institutions remaining.” The relationship between dollarization and bank failures is another area worthy of future study.

Mecagni et al. (2015) also point out that, “Indeed, dollarization can complicate the implementation of economic policies through reducing the abilities of governments to issue medium- and long-term debt in domestic currency -- known as the original sin -- further exacerbating vulnerabilities to shocks and thereby amplifying macroeconomic and output fluctuations.” It will be interesting to see whether this statement by Mecagni et al holds true for Zimbabwe. The question to be answered will be whether the Zimbabwean-government-issued debt instruments, such as treasury bills and/or bonds during the period of dollarization, to fund recurrent government expenditure and/or budget deficits, were effective.

“It is noteworthy that the most dollarized countries in the Sub-Saharan region include some important natural resource-dependent economies: (Democratic Republic of the Congo, Liberia, São Tomé and Príncipe, Angola, Mozambique, and Zambia)” (Mecagni et al., 2015). Although not included above, Zimbabwe is both a natural resource- and agro-based economy. Future analysis of whether natural resource-dependent countries are more prone to dollarization, viewed in comparison to dollarized non-resource dependent countries such as the Maldives, would be an interesting addition to the current body of literature on dollarization. Another area for future study could be an analysis of the impact of a surrogate currency (bond notes introduced in Zimbabwe in 2016 to curb hard-cash shortages) on a dollarized economy.

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## APPENDICES

### APPENDIX A: DUMMY REGRESSIONS

#### Regression of GDP per capita on a dollarization dummy

Dependent Variable: GDP\_PC

Method: Least Squares

Date: 07/30/17 Time: 14:56

Sample: 1990 2015

Included observations: 26

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	558.2102	31.10996	17.94313	0.0000
D01	248.7836	59.95661	4.149393	0.0004
R-squared	0.417723	Mean dependent var.	625.1904	
Adjusted R-squared	0.393461	S.D. dependent var.	174.1193	
S.E. of regression	135.6052	Akaike info criterion	12.73118	
Sum squared resid.	441330.3	Schwarz criterion	12.82795	
Log likelihood	-163.5053	Hannan-Quinn criter.	12.75904	
F-statistic	17.21746	Durbin-Watson stat.	0.277751	
Prob(F-statistic)	0.000361			

#### Regression of FDI per capita on a dollarization dummy

Dependent Variable: FDI\_PC

Method: Least Squares

Date: 07/30/17 Time: 15:00

Sample: 1990 2015

Included observations: 26

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.400930	1.923308	2.808147	0.0097
D01	15.48952	3.706691	4.178800	0.0003
R-squared	0.421162	Mean dependent var.	9.571185	
Adjusted R-squared	0.397044	S.D. dependent var.	10.79649	
S.E. of regression	8.383503	Akaike info criterion	7.164212	
Sum squared resid.	1686.795	Schwarz criterion	7.260989	
Log likelihood	-91.13476	Hannan-Quinn criter.	7.192080	
F-statistic	17.46237	Durbin-Watson stat.	1.334697	
Prob(F-statistic)	0.000335			

**Regression of external debt per capita on a dollarization dummy**

Dependent Variable: EXDEBT\_PC

Method: Least Squares

Date: 07/30/17 Time: 15:04

Sample: 1990 2015

Included observations: 26

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	367.4335	10.61157	34.62576	0.0000
D01	154.5888	20.45112	7.558939	0.0000
R-squared	0.704206	Mean dependent var.	409.0536	
Adjusted R-squared	0.691881	S.D. dependent var.	83.32922	
S.E. of regression	46.25475	Akaike info criterion	10.58001	
Sum squared resid.	51348.05	Schwarz criterion	10.67679	
Log likelihood	-135.5401	Hannan-Quinn criter.	10.60788	
F-statistic	57.13756	Durbin-Watson stat.	0.977807	
Prob(F-statistic)	0.000000			

**Regression of inflation on a dollarization dummy**

Dependent Variable: INFLATION

Method: Least Squares

Date: 07/30/17 Time: 15:07

Sample: 1990 2015

Included observations: 26

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	12167260	10535855	1.154843	0.2595
D01	-12167259	20305208	-0.599219	0.5546
R-squared	0.014740	Mean dependent var.	8891459.	
Adjusted R-squared	-0.026312	S.D. dependent var.	45332207	
S.E. of regression	45924727	Akaike info criterion	38.19671	
Sum squared resid.	5.06E+16	Schwarz criterion	38.29349	
Log likelihood	-494.5572	Hannan-Quinn criter.	38.22458	
F-statistic	0.359063	Durbin-Watson stat.	2.002715	
Prob(F-statistic)	0.554642			

## APPENDIX B: STATIONARITY TESTS

GDP Growth

Null Hypothesis: GDPGROWTH has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=5)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.536057	0.0016
Test critical values: 1per cent level	-3.737853	
5per cent level	-2.991878	
10per cent level	-2.635542	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(GDPGROWTH)

Method: Least Squares

Date: 01/05/18 Time: 10:03

Sample (adjusted): 1992 2015

Included observations: 24 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPGROWTH(-1)	-0.964962	0.212731	-4.536057	0.0002
C	0.570812	3.549775	0.160802	0.8737
R-squared	0.483275	Mean dependent var.		0.145766
Adjusted R-squared	0.459787	S.D. dependent var.		23.65226
S.E. of regression	17.38422	Akaike info criterion		8.628658
Sum squared resid.	6648.641	Schwarz criterion		8.726829
Log likelihood	-101.5439	Hannan-Quinn criter.		8.654702
F-statistic	20.57581	Durbin-Watson stat.		1.928839
Prob(F-statistic)	0.000163			

LDEBT

Null Hypothesis: LDEBT has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=5)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.756185	0.8141
Test critical values: 1per cent level	-3.724070	
5per cent level	-2.986225	
10per cent level	-2.632604	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LDEBT)

Method: Least Squares

Date: 01/04/18 Time: 20:35

Sample (adjusted): 1991 2015

Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LDEBT(-1)	-0.069232	0.091554	-0.756185	0.4572
C	0.437404	0.547895	0.798335	0.4328
R-squared	0.024258	Mean dependent var.	0.023291	
Adjusted R-squared	-0.018165	S.D. dependent var.	0.083838	
S.E. of regression	0.084596	Akaike info criterion	-2.025248	
Sum squared resid.	0.164598	Schwarz criterion	-1.927738	
Log likelihood	27.31560	Hannan-Quinn criter.	-1.998203	
F-statistic	0.571816	Durbin-Watson stat.	1.469133	
Prob(F-statistic)	0.457214			

Null Hypothesis: D(LDEBT) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=5)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.691850	0.0111
Test critical values: 1per cent level	-3.737853	
10per cent level	-2.635542	

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

Augmented Dickey-Fuller Test Equation  
 Dependent Variable: D(LDEBT,2)  
 Method: Least Squares  
 Date: 01/04/18 Time: 20:35  
 Sample (adjusted): 1992 2015  
 Included observations: 24 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LDEBT(-1))	-0.769114	0.208328	-3.691850	0.0013
C	0.017936	0.017972	0.997978	0.3291
R-squared	0.382539	Mean dependent var.	0.001208	
Adjusted R-squared	0.354472	S.D. dependent var.	0.106046	
S.E. of regression	0.085202	Akaike info criterion	-2.007926	
Sum squared resid.	0.159707	Schwarz criterion	-1.909754	
Log likelihood	26.09511	Hannan-Quinn criter.	-1.981881	
F-statistic	13.62976	Durbin-Watson stat.	1.782738	
Prob(F-statistic)	0.001275			

LFDI

Null Hypothesis: LFDI has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=5)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.019302	0.2772
Test critical values: 1per cent level	-3.724070	
5per cent level	-2.986225	
10per cent level	-2.632604	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LFDI)

Method: Least Squares

Date: 01/04/18 Time: 20:37

Sample (adjusted): 1991 2015

Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFDI(-1)	-0.315190	0.156089	-2.019302	0.0553
C	0.562903	0.311299	1.808241	0.0837
R-squared	0.150589	Mean dependent var.	0.123601	
Adjusted R-squared	0.113658	S.D. dependent var.	1.182539	
S.E. of regression	1.113310	Akaike info criterion	3.129170	
Sum squared resid.	28.50755	Schwarz criterion	3.226680	
Log likelihood	-37.11463	Hannan-Quinn criter.	3.156215	
F-statistic	4.077583	Durbin-Watson stat.	2.136523	
Prob(F-statistic)	0.055258			

Null Hypothesis: D(LFDI) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=5)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.761317	0.0000
Test critical values: 1per cent level	-3.737853	
5per cent level	-2.991878	
10per cent level	-2.635542	

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

Augmented Dickey-Fuller Test Equation  
 Dependent Variable: D(LFDI,2)  
 Method: Least Squares  
 Date: 01/04/18 Time: 20:37  
 Sample (adjusted): 1992 2015  
 Included observations: 24 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LFDI(-1))	-1.309411	0.193662	-6.761317	0.0000
C	0.233647	0.230187	1.015031	0.3211
R-squared	0.675111	Mean dependent var.	0.054564	
Adjusted R-squared	0.660343	S.D. dependent var.	1.922080	
S.E. of regression	1.120190	Akaike info criterion	3.144529	
Sum squared resid.	27.60616	Schwarz criterion	3.242700	
Log likelihood	-35.73435	Hannan-Quinn criter.	3.170574	
F-statistic	45.71541	Durbin-Watson stat.	1.876290	
Prob(F-statistic)	0.000001			

LTRADE

Null Hypothesis: LTRADE has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=5)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.360816	0.5847
Test critical values: 1per cent level	-3.724070	
5per cent level	-2.986225	
10per cent level	-2.632604	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LTRADE)

Method: Least Squares

Date: 01/05/18 Time: 05:42

Sample (adjusted): 1991 2015

Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LTRADE(-1)	-0.163135	0.119880	-1.360816	0.1868
C	1.004093	0.727457	1.380279	0.1808
R-squared	0.074514	Mean dependent var.	0.014988	
Adjusted R-squared	0.034276	S.D. dependent var.	0.151522	
S.E. of regression	0.148902	Akaike info criterion	-0.894436	
Sum squared resid.	0.509953	Schwarz criterion	-0.796926	
Log likelihood	13.18045	Hannan-Quinn criter.	-0.867391	
F-statistic	1.851820	Durbin-Watson stat.	1.405919	
Prob(F-statistic)	0.186758			

Null Hypothesis: D(LTRADE) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=5)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.689446	0.0112
Test critical values: 1per cent level	-3.737853	
5per cent level	-2.991878	
10per cent level	-2.635542	

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

Augmented Dickey-Fuller Test Equation  
 Dependent Variable: D(LTRADE,2)  
 Method: Least Squares  
 Date: 01/05/18 Time: 05:42  
 Sample (adjusted): 1992 2015  
 Included observations: 24 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LTRADE(-1))	-0.766612	0.207785	-3.689446	0.0013
C	0.008493	0.031549	0.269210	0.7903
R-squared	0.382231	Mean dependent var.	-0.005318	
Adjusted R-squared	0.354151	S.D. dependent var.	0.190964	
S.E. of regression	0.153467	Akaike info criterion	-0.831001	
Sum squared resid.	0.518150	Schwarz criterion	-0.732830	
Log likelihood	11.97201	Hannan-Quinn criter.	-0.804956	
F-statistic	13.61201	Durbin-Watson stat.	1.867754	
Prob(F-statistic)	0.001282			

LPOP \*\* For population, the ADF test in first differences only rejected the null hypothesis at the 10per cent significance level and not the 5per cent or higher. To ensure the robustness of the conclusion that LPOP is I(1), the KPSS test was estimated. This test confirmed that the series is I(1) as the null hypothesis of stationarity was rejected for the test in levels but could not be rejected in first differences.

Null Hypothesis: LPOP has a unit root

Exogenous: Constant

Lag Length: 4 (Automatic - based on SIC, maxlag=5)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	0.364970	0.9761
Test critical values: level		
1per cent	-3.788030	
5per cent	-3.012363	
10per cent	-2.646119	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LPOP)

Method: Least Squares

Date: 01/05/18 Time: 05:43

Sample (adjusted): 1995 2015

Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LPOP(-1)	0.000412	0.001128	0.364970	0.7202
D(LPOP(-1))	3.040649	0.195678	15.53906	0.0000
D(LPOP(-2))	-3.750950	0.532638	-7.042208	0.0000
D(LPOP(-3))	2.261155	0.542628	4.167048	0.0008
D(LPOP(-4))	-0.578507	0.204754	-2.825372	0.0128
C	-0.006296	0.018485	-0.340616	0.7381
R-squared	0.999221	Mean dependent var.		0.014625
Adjusted R-squared	0.998961	S.D. dependent var.		0.005519
S.E. of regression	0.000178	Akaike info criterion		-14.19631
Sum squared resid.	4.74E-07	Schwarz criterion		-13.89787
Log likelihood	155.0612	Hannan-Quinn criter.		-14.13154
F-statistic	3848.671	Durbin-Watson stat.		1.995522
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LPOP) has a unit root  
 Exogenous: Constant  
 Lag Length: 3 (Automatic - based on SIC, maxlag=5)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.754275	0.0820
Test critical values: 1per cent level	-3.788030	
5per cent level	-3.012363	
10per cent level	-2.646119	

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

Augmented Dickey-Fuller Test Equation  
 Dependent Variable: D(LPOP,2)  
 Method: Least Squares  
 Date: 01/05/18 Time: 05:43  
 Sample (adjusted): 1995 2015  
 Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LPOP(-1))	-0.027314	0.009917	-2.754275	0.0141
D(LPOP(-1),2)	2.090615	0.176380	11.85289	0.0000
D(LPOP(-2),2)	-1.729692	0.313597	-5.515652	0.0000
D(LPOP(-3),2)	0.620331	0.165021	3.759097	0.0017
C	0.000450	0.000157	2.858527	0.0114
R-squared	0.989752	Mean dependent var.	0.000179	
Adjusted R-squared	0.987190	S.D. dependent var.	0.001528	
S.E. of regression	0.000173	Akaike info criterion	-14.28271	
Sum squared resid.	4.79E-07	Schwarz criterion	-14.03401	
Log likelihood	154.9684	Hannan-Quinn criter.	-14.22873	
F-statistic	386.3118	Durbin-Watson stat.	2.019551	
Prob(F-statistic)	0.000000			

Null Hypothesis: LPOP is stationary  
 Exogenous: Constant  
 Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	LM-Stat.	
Kwiatkowski-Phillips-Schmidt-Shin test statistic	0.758066	
Asymptotic critical values*:	1per cent level	0.739000
	5per cent level	0.463000
	10per cent level	0.347000

\*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Residual variance (no correction)	0.010805
HAC corrected variance (Bartlett kernel)	0.035249

KPSS Test Equation  
 Dependent Variable: LPOP  
 Method: Least Squares  
 Date: 01/05/18 Time: 05:45  
 Sample: 1990 2015  
 Included observations: 26

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.36263	0.020789	787.0706	0.0000
R-squared	0.000000	Mean dependent var.	16.36263	
Adjusted R-squared	0.000000	S.D. dependent var.	0.106005	
S.E. of regression	0.106005	Akaike info criterion	-1.612960	
Sum squared resid.	0.280926	Schwarz criterion	-1.564572	
Log likelihood	21.96848	Hannan-Quinn criter.	-1.599026	
Durbin-Watson stat.	0.025522			

Null Hypothesis: D(LPOP) is stationary  
 Exogenous: Constant  
 Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	LM-Stat.	
Kwiatkowski-Phillips-Schmidt-Shin test statistic	0.192315	
Asymptotic critical values*:	1per cent level	0.739000
	5per cent level	0.463000
	10per cent level	0.347000
*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)		
Residual variance (no correction)	3.40E-05	
HAC corrected variance (Bartlett kernel)	0.000111	

KPSS Test Equation  
 Dependent Variable: D(LPOP)  
 Method: Least Squares  
 Date: 01/05/18 Time: 05:44  
 Sample (adjusted): 1991 2015  
 Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.015901	0.001189	13.36786	0.0000
R-squared	0.000000	Mean dependent var.	0.015901	
Adjusted R-squared	0.000000	S.D. dependent var.	0.005947	
S.E. of regression	0.005947	Akaike info criterion	-7.372531	
Sum squared resid.	0.000849	Schwarz criterion	-7.323775	
Log likelihood	93.15663	Hannan-Quinn criter.	-7.359008	
Durbin-Watson stat.	0.074365			

LIT \*\*problem here is that it says “near singular matrix” when trying to run the ADF test. This issue arises because the series exhibits very little variation over time. The KPSS test, however, could be estimated and it says that the series is I(1) i.e. it is non-stationary in levels but stationary in first differences.

Null Hypothesis: LIT is stationary  
 Exogenous: Constant  
 Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

	LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic	0.578424
Asymptotic critical values*:	
1per cent level	0.739000
5per cent level	0.463000
10per cent level	0.347000

\*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Residual variance (no correction)	2.419201
HAC corrected variance (Bartlett kernel)	3.654507

KPSS Test Equation  
 Dependent Variable: LIT  
 Method: Least Squares  
 Date: 01/05/18 Time: 05:36  
 Sample: 1990 2015  
 Included observations: 26

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	83.48856	0.311076	268.3867	0.0000
R-squared	0.000000	Mean dependent var.	83.48856	
Adjusted R-squared	0.000000	S.D. dependent var.	1.586181	
S.E. of regression	1.586181	Akaike info criterion	3.798238	
Sum squared resid.	62.89923	Schwarz criterion	3.846626	
Log likelihood	-48.37709	Hannan-Quinn criter.	3.812172	
Durbin-Watson stat.	0.482307			

Null Hypothesis: D(LIT) is stationary  
 Exogenous: Constant  
 Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

	LM-Stat.	
Kwiatkowski-Phillips-Schmidt-Shin test statistic	0.240454	
Asymptotic critical values*:	1per cent level	0.739000
	5per cent level	0.463000
	10per cent level	0.347000

\*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Residual variance (no correction)	1.056653
HAC corrected variance (Bartlett kernel)	1.366782

#### KPSS Test Equation

Dependent Variable: D(LIT)

Method: Least Squares

Date: 01/05/18 Time: 05:39

Sample (adjusted): 1991 2015

Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.396000	0.209827	1.887272	0.0713
R-squared	0.000000	Mean dependent var.	0.396000	
Adjusted R-squared	0.000000	S.D. dependent var.	1.049133	
S.E. of regression	1.049133	Akaike info criterion	2.972984	
Sum squared resid.	26.41633	Schwarz criterion	3.021739	
Log likelihood	-36.16230	Hannan-Quinn criter.	2.986506	
Durbin-Watson stat.	0.578022			

INFL

Null Hypothesis: INFL has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=5)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.999500	0.0005
Test critical values: 1per cent level	-3.724070	
5per cent level	-2.986225	
10per cent level	-2.632604	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INFL)

Method: Least Squares

Date: 01/05/18 Time: 05:30

Sample (adjusted): 1991 2015

Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFL(-1)	-1.041567	0.208334	-4.999500	0.0000
C	9631490.	9631327.	1.000017	0.3277
R-squared	0.520783	Mean dependent var.	-0.756920	
Adjusted R-squared	0.499948	S.D. dependent var.	66723992	
S.E. of regression	47183444	Akaike info criterion	38.25360	
Sum squared resid.	5.12E+16	Schwarz criterion	38.35111	
Log likelihood	-476.1700	Hannan-Quinn criter.	38.28065	
F-statistic	24.99500	Durbin-Watson stat.	2.003614	
Prob(F-statistic)	0.000047			

## APPENDIX C: OLS REGRESSION OF ECONOMIC PERFORMANCE

Dependent Variable: GDPPC

Method: Least Squares

Date: 12/24/17 Time: 11:02

Sample (adjusted): 1991 2015

Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-638.3469	2438.273	-0.261803	0.7964
GDPPC(-1)	0.655697	0.153343	4.276014	0.0005
FDIPC	-3.636379	2.219259	-1.638555	0.1187
EDUCATION	314.8698	3190.148	0.098701	0.9225
IFLATION	-5.96E-07	3.16E-07	-1.883189	0.0759
TRADEPC	0.562157	0.202717	2.773109	0.0125
POPULATION	2.92E-05	2.25E-05	1.298708	0.2104
R-squared	0.883355	Mean dependent var.	616.6865	
Adjusted R-squared	0.844473	S.D. dependent var.	172.1110	
S.E. of regression	67.87519	Akaike info criterion	11.50471	
Sum squared resid.	82926.75	Schwarz criterion	11.84600	
Log likelihood	-136.8089	Hannan-Quinn criter.	11.59937	
F-statistic	22.71908	Durbin-Watson stat.	2.002778	
Prob(F-statistic)	0.000000			

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.772396	Prob. F(2,16)	0.4784
Obs*R-squared	2.201211	Prob. Chi-Square(2)	0.3327

Test Equation:  
 Dependent Variable: RESID  
 Method: Least Squares  
 Date: 12/24/17 Time: 11:14  
 Sample: 1991 2015  
 Included observations: 25  
 Pre-sample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-206.3377	2488.632	-0.082912	0.9349
GDPPC(-1)	-0.020898	0.158760	-0.131634	0.8969
FDIPC	0.407772	2.431332	0.167715	0.8689
EDUCATION	340.0809	3253.503	0.104528	0.9180
IFLATION	-7.15E-08	3.26E-07	-0.218945	0.8295
TRADEPC	0.142264	0.238597	0.596251	0.5593
POPULATION	-1.04E-05	2.42E-05	-0.427213	0.6749
RESID(-1)	-0.163293	0.287237	-0.568494	0.5776
RESID(-2)	-0.393728	0.323062	-1.218740	0.2406
R-squared	0.088048	Mean dependent var.	2.35E-13	
Adjusted R-squared	-0.367927	S.D. dependent var.	58.78164	
S.E. of regression	68.75008	Akaike info criterion	11.57255	
Sum squared resid.	75625.17	Schwarz criterion	12.01134	
Log likelihood	-135.6568	Hannan-Quinn criter.	11.69425	
F-statistic	0.193099	Durbin-Watson stat.	1.926260	
Prob(F-statistic)	0.988044			

Heteroskedasticity Test: Glejser

F-statistic	0.904921	Prob. F(6,18)	0.5130
Obs*R-squared	5.793466	Prob. Chi-Square(6)	0.4467
Scaled explained SS	4.977042	Prob. Chi-Square(6)	0.5468

Test Equation:  
 Dependent Variable: ARESID  
 Method: Least Squares  
 Date: 12/24/17 Time: 11:17  
 Sample: 1991 2015  
 Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2119.924	1407.238	1.506443	0.1493
GDPPC(-1)	-0.004808	0.088501	-0.054326	0.9573
FDIPC	0.691312	1.280835	0.539736	0.5960
EDUCATION	-2598.803	1841.180	-1.411488	0.1752
IFLATION	-2.69E-07	1.83E-07	-1.474444	0.1576
TRADEPC	-0.076519	0.116997	-0.654025	0.5214
POPULATION	1.03E-05	1.30E-05	0.793045	0.4381
R-squared	0.231739	Mean dependent var.	43.34605	
Adjusted R-squared	-0.024348	S.D. dependent var.	38.70548	
S.E. of regression	39.17386	Akaike info criterion	10.40539	
Sum squared resid.	27622.64	Schwarz criterion	10.74668	
Log likelihood	-123.0674	Hannan-Quinn criter.	10.50005	
F-statistic	0.904921	Durbin-Watson stat.	1.967311	
Prob(F-statistic)	0.513007			

Ramsey RESET Test  
 Equation: UNTITLED  
 Specification: GDPPC C GDPPC(-1) IFLATION  
 LOG(POPULATION) FDIPC  
 EDUCATION  
 Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.418172	18	0.1732
F-statistic	2.011211	(1, 18)	0.1732
Likelihood ratio	2.648023	1	0.1037

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	12154.57	1	12154.57
Restricted SSR	120936.0	19	6365.051
Unrestricted SSR	108781.4	18	6043.410
Unrestricted SSR	108781.4	18	6043.410

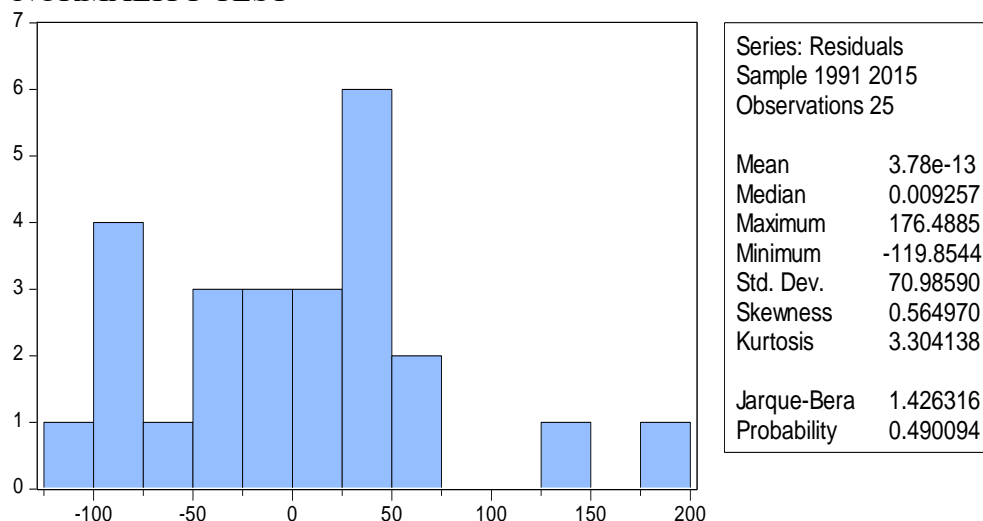
LR test summary:

	Value	df
Restricted LogL	-141.5252	19
Unrestricted LogL	-140.2012	18

Unrestricted Test Equation:  
 Dependent Variable: GDPPC  
 Method: Least Squares  
 Date: 12/24/17 Time: 11:21  
 Sample: 1991 2015  
 Included observations: 25

Variable	Coefficien			
	t	Std. Error	t-Statistic	Prob.
C	16802.62	18541.07	0.906238	0.3768
GDPPC(-1)	-1.189714	1.491830	-0.797486	0.4356
IFLATION	2.11E-07	7.03E-07	0.300705	0.7671
LOG(POPULATION )	-1069.976	1296.562	-0.825241	0.4200
FDIPC	2.309783	3.525952	0.655081	0.5207
EDUCATION	1578.596	4703.635	0.335612	0.7410
FITTED^2	0.001765	0.001244	1.418172	0.1732
R-squared	0.846988	Mean dependent var.	616.6865	
Adjusted R-squared	0.795984	S.D. dependent var.	172.1110	
S.E. of regression	77.73937	Akaike info criterion	11.77610	
Sum squared resid.	108781.4	Schwarz criterion	12.11738	
Log likelihood	-140.2012	Hannan-Quinn criter.	11.87075	
F-statistic	16.60629	Durbin-Watson stat.	1.141684	
Prob(F-statistic)	0.000002			

## NORMALITY TEST



### First regression model

Without the dollarization dummy and with Newey-West standard errors. Population, literacy and inflation have a significant effect on growth. I did not include the past value of the growth rate as I was concerned that we would have too many explanatory variables.

Dependent Variable: GDPGROWTH

Method: Least Squares

Date: 01/05/18 Time: 10:06

Sample (adjusted): 1991 2015

Included observations: 25 after adjustments

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed

bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8.990193	5.052077	-1.779504	0.0920
D(LDEBT)	-11.62073	31.38705	-0.370240	0.7155
D(LFDI)	-2.519237	2.559298	-0.984347	0.3380
D(LTRADE)	26.87533	19.39577	1.385629	0.1828
D(LPOP)	796.9812	443.0870	1.798701	0.0889
D(LIT)	-5.346476	2.261727	-2.363891	0.0295
INFL	-1.07E-07	1.10E-08	-9.801077	0.0000
R-squared	0.220627	Mean dependent var.	0.392366	
Adjusted R-squared	-0.039164	S.D. dependent var.	16.68257	
S.E. of regression	17.00611	Akaike info criterion	8.736518	
Sum squared resid.	5205.739	Schwarz criterion	9.077803	
Log likelihood	-102.2065	Hannan-Quinn criter.	8.831176	
F-statistic	0.849247	Durbin-Watson stat.	2.076604	
Prob(F-statistic)	0.549173	Wald F-statistic	43.40293	
Prob(Wald F-statistic)	0.000000			

## Second regression model

Included the dummy variable for dollarization and also based on Newey-West standard errors. Dummy is significant at 10 per cent but not any higher. Of the other variables, only inflation is significant.

Dependent Variable: GDPGROWTH

Method: Least Squares

Date: 01/05/18 Time: 10:08

Sample (adjusted): 1991 2015

Included observations: 25 after adjustments

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed

bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.115395	7.116361	0.297258	0.7699
D(LDEBT)	-16.59712	24.39082	-0.680466	0.5054
D(LFDI)	-1.851482	2.319139	-0.798349	0.4357
D(LTRADE)	21.19379	26.94559	0.786540	0.4424
D(LPOP)	-370.4479	617.1948	-0.600212	0.5563
D(LIT)	-1.772365	2.768048	-0.640294	0.5305
INFL	-7.90E-08	1.86E-08	-4.254475	0.0005
DUMMY	21.06219	11.56595	1.821051	0.0862
R-squared	0.426427	Mean dependent var.	0.392366	
Adjusted R-squared	0.190249	S.D. dependent var.	16.68257	
S.E. of regression	15.01200	Akaike info criterion	8.509914	
Sum squared resid.	3831.123	Schwarz criterion	8.899955	
Log likelihood	-98.37393	Hannan-Quinn criter.	8.618095	
F-statistic	1.805535	Durbin-Watson stat.	2.214515	
Prob(F-statistic)	0.151229	Wald F-statistic	13.35282	
Prob(Wald F-statistic)	0.000009			

Ramsey RESET Test  
Equation: MODEL1  
Specification: GDPGROWTH C GDPGROWTH(-1) D(LDEBT)  
D(LFDI)  
D(LTRADE) D(LPOP) D(LIT) INFL  
Omitted Variables: Squares of fitted values

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	Value	df	Probability
t-statistic	1.010308	15	0.3284
F-statistic	1.020723	(1, 15)	0.3284
Likelihood ratio	1.579988	1	0.2088

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F-test summary:

	Sum of		Mean
	Sq.	df	Squares
Test SSR	302.5699	1	302.5699
Restricted SSR	4748.977	16	296.8111
Unrestricted SSR	4446.407	15	296.4271

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LR test summary:

	Value	df
Restricted LogL	-97.50609	16
Unrestricted LogL	-96.71610	15

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Unrestricted Test Equation:

Dependent Variable: GDPGROWTH

Method: Least Squares

Date: 01/05/18 Time: 13:13

Sample: 1992 2015

Included observations: 24

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed

bandwidth = 3.0000)

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Variable	Coefficien		t-Statistic	Prob.
	t	Std. Error		
C	-15.46096	8.763619	-1.764221	0.0980
GDPGROWTH(-1)	-0.332561	0.447982	-0.742355	0.4693
D(LDEBT)	4.520569	39.19518	0.115335	0.9097
D(LFDI)	-0.438504	3.019322	-0.145233	0.8865
D(LTRADE)	46.70589	47.41594	0.985025	0.3402
D(LPOP)	1612.407	1026.337	1.571030	0.1370
D(LIT)	-17.21378	14.39796	-1.195571	0.2504
INFL	-2.16E-08	8.87E-08	-0.243089	0.8112
FITTED^2	-0.070697	0.073836	-0.957477	0.3535

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R-squared	0.332054	Mean dependent var.	0.586245
Adjusted R-squared	-0.024183	S.D. dependent var.	17.01258
S.E. of regression	17.21706	Akaike info criterion	8.809675
Sum squared resid.	4446.407	Schwarz criterion	9.251445
Log likelihood	-96.71610	Hannan-Quinn criter.	8.926877
F-statistic	0.932114	Durbin-Watson stat.	1.681423
Prob(F-statistic)	0.518756	Wald F-statistic	78.10910
Prob(Wald F-statistic)	0.000000		

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Ramsey's RESET test on model 2

Ramsey RESET Test

Equation: MODEL2

Specification: GDPGROWTH C D(LDEBT) D(LFDI)

D(LTRADE) D(LIT)

INFL DUMMY

Omitted Variables: Squares of fitted values

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	Value	df	Probability
t-statistic	1.467936	17	0.1604
F-statistic	2.154835	(1, 17)	0.1604
Likelihood ratio	2.983545	1	0.0841

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F-test summary:

	Sum of		Mean
	Sq.	df	Squares
Test SSR	436.2343	1	436.2343
Restricted SSR	3877.790	18	215.4328
Unrestricted SSR	3441.555	17	202.4444

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LR test summary:

	Value	df
Restricted LogL	-98.52527	18
Unrestricted LogL	-97.03350	17

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Unrestricted Test Equation:  
 Dependent Variable: GDPGROWTH  
 Method: Least Squares  
 Date: 01/05/18 Time: 13:14  
 Sample: 1991 2015  
 Included observations: 25  
 HAC standard errors & covariance (Bartlett kernel, Newey-West  
 fixed  
 bandwidth = 3.0000)

Variable	Coefficien		t-Statistic	Prob.
	t	Std. Error		
C	-0.694636	1.084107	-0.640745	0.5302
D(LDEBT)	-16.29659	18.31412	-0.889838	0.3860
D(LFDI)	-1.170760	1.949973	-0.600398	0.5562
D(LTRADE)	47.15539	17.63191	2.674435	0.0160
D(LIT)	-1.344730	2.383492	-0.564185	0.5800
INFL	4.51E-11	3.52E-08	0.001280	0.9990
DUMMY	28.38766	12.82716	2.213090	0.0409
FITTED^2	-0.058029	0.023081	-2.514200	0.0223
R-squared	0.484750	Mean dependent var.	0.392366	
Adjusted R-squared	0.272589	S.D. dependent var.	16.68257	
S.E. of regression	14.22830	Akaike info criterion	8.402680	
Sum squared resid.	3441.555	Schwarz criterion	8.792720	
Log likelihood	-97.03350	Hannan-Quinn criter.	8.510861	
F-statistic	2.284816	Durbin-Watson stat.	1.961989	
Prob(F-statistic)	0.077772	Wald F-statistic	59.78716	
Prob(Wald F-statistic)	0.000000			