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Determinants of Economic Growth-The Case of Zimbabwe

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Abstract

The paper investigated the determinants of economic growth in Zimbabwe over the period 1980 to 2017 drawing from previously identified factors as discussed in international literature which had been acknowledged as important determinants. The variables included human capital, gross fixed capital formation, unemployment, inflation and government expenditure. The study employed Unit Root Tests. The Auto Regressive Distributed Lag model was used to examine the mixed variable while the Ordinary Least Squares model and the Johansen test were used to examine all stationary and non-stationary variables respectively. In the case of co-integration, the Error Correction Model and the Causality test were run. Ultimately, the results indicated that in the long-run gross fixed capital formation has a positive influence on economic growth while human capital development has a negative influence. ECM found that in the short run there is a positive relationship between lags of economic growth, government expenditure, inflation and human capital with economic growth.

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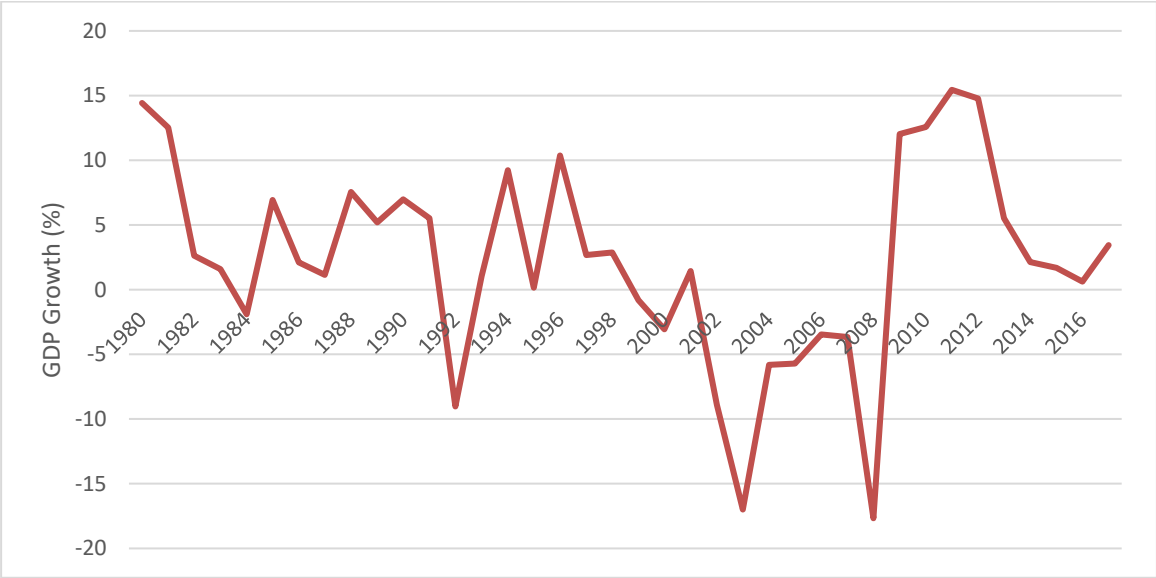
CHAPTER 1

INTRODUCTION

1.1 Background: The Zimbabwe Situation

In 1980, following independence from the United Kingdom (UK), Zimbabwe's growth rate plummeted, as evidenced in Figure 1-1 as the new Zimbabwean government inherited an economy which was focused on strategies towards import substitution. On realising that the economy had deficiencies, the government launched the Economic Structural Adjustment Policies (ESAP) which was led by International Monetary Fund (IMF). The goal was to remedy the ailing the economy. The result was a switch from being a command-based economy to becoming a market-based economy (UNDP, 2008).

Figure 1-1: Zimbabwean Economic Growth, 1980 to 2017



(Source: World Bank Development Indicators Data)

ESAP had mixed outcomes as many companies retrenched employees and shut down contributing to a rise in unemployment, the local currency was devalued in comparison with that of its major trading partners and a rise in inflation (Kawewe and Dibie, 2000). At the country's independence in 1980, the rate of inflation was between 5% and 6% per annum but around the early 1990s, there was such a surge that by the end of 1999, the inflation was reported to have reached 56.9% (Brett and Winter, 2003). The government's land reform policy introduced in 2000, or as some may call it, 'the land grab', had disastrous effects on the Zimbabwean economy. The Gross Domestic Product (GDP), which is considered a general measure of the size of a country's economy due to it being the culmination of all the

final goods and services produced within that country. For the period between 2000 and 2007, the GDP had contracted by 40%. This was coupled with hyperinflation; by the end of 2006, annual inflation had risen to 1,282.11% and it continued to on this trajectory until it reached 231 million% mark by the end of 2008 (Mbulawa, 2015). The Zimbabwean government responded to the economic chaos by introducing price controls mainly on basic commodities especially food items. This gave rise to rampant shortages of daily essentials such as food, medicine and fuel. There were huge shortages of foreign and local currency, as the value of the Zimbabwean dollar collapsed. Sovereign debt climbed to unparalleled levels, the export market tumbled, and generally, the economy came crumbling to its knees. Further exacerbating the country's problems were the economic sanctions imposed by the European Union (EU) and the United States (US) due to perceived human rights abuses, the inability of the government to service debt provided by the World Bank and IMF, and widespread corruption in the government.

By 2009, in a bid to salvage the country from its dire straits, the government introduced the multi-currency system, termed dollarisation, and use of the Zimbabwean dollar was suspended. As is shown in Figure 1-1. the adoption of the multicurrency system seemed to usher in some macroeconomic stability. While the introduction of dollarisation did support economic growth, it is evident that the fundamental and structural challenges facing the economy were not sufficiently addressed as economic growth again began to fall by 2013.

Presently, the Zimbabwean economy faces a crisis again. It is characterised by shortages in the US dollar and bond note shortages, foreign payment difficulties and industry shut down. El Nino induced drought conditions adding pressure to the import bill with the current account deficit estimated at 6% of GDP. "The persistence of low commodity prices for much of 2016, combined with adverse weather conditions, saw the Government's fiscal position remain in deficit, around 4.6% of GDP" (Kaduwo, 2017). These conditions caused the economy to register only marginal positive economic growth in 2016 as evidenced in Figure 1-1 (Kaduwo, 2017). Unemployment rates are at an all-time high and any prospects of growth and development have long been set aside.

Moreover, de-industrialisation and job losses are being witnessed as companies are rationalising operations in a bid to withstand economic doldrums, this has also contributed to the dwindling of government revenue sources. Through the issuance of treasury bills, the government has been quite active on the domestic market in terms of borrowing to fund the bloated expenditure. From March 2016 to March 2017, treasury bills in the market rose from

$1.2bn to an estimated US$2 billion in March 2017 (RBZ, 2017). It is however worth noting that of the US$2 billion, approximately US$500 million are Zimbabwe Asset Management Company (ZAMCO) issued Treasury Bills to restructure non-performing loans (NPLs) that had become a burden in the financial services sector. Excessive Government borrowing due to overrun budgets is contributing to economic instability as the private sector is crowded and thereby resulting in low economic growth.

With the current political unrest and the election of a new president in 2018, the country is at a major junction, teetering on the edge of a cliff. The president has alluded to economic growth as one of his main goals, with the slogan "Zimbabwe is open for business". The right economic decisions and the country will flourish and grow. If, however, the wrong decisions are made it will end up even worse than it is now. Economic growth is needed and thus the goal of this study is to examine some of the factors that may have contributed positively to economic development since independence so as to ensure that more attention is given to these.

1.2 Problem Statement

Achieving high and sustainable economic growth is the *sine qua non* of developing countries as it is seen as the means by which to raise living standards and reduce poverty. Various theoretical models of economic growth have been developed which identify certain determinants and hindrances to achieving greater growth. Capital, for example, is seen as a crucial ingredient in most theoretical models, not only monetary capital but also human capital. Trade is also seen as a critical means by which to stimulate an economy along with factors such as financial development and inflation.

Part of the problem is the gap in research; no research has explicitly focused on what factors have affected economic growth in Zimbabwe. The one exception to this is Tekere (2001), who studied the effects of trade liberalisation on the livelihoods of poor and vulnerable groups, human development and economic growth in Zimbabwe. He concluded that "trade liberalisation led to increased hardships and deterioration of human development". Zimbabwe has experienced volatile growth since independence with numerous recessions and contracting GDP but with the periodic glimmers of hope. To come out of the disaster the country faces, there is need for sustained, positive high growth. The government thus needs to identify what areas they should focus on to achieve this objective. Each country is unique and it is not simply possible to draw from studies of other countries and apply it to Zimbabwe, but

rather, an analysis is needed of what factors have had a positive effect on economic growth in Zimbabwe over the last 38 years so as to direct future policy. This study will focus on the effect of government expenditure, human capital, inflation, gross fixed capital formation and unemployment on GDP. Whilst this list is not exhaustive, it constitutes a diverse set of factors drawn from the literature.

Zimbabwe has been under sanctions since 2003. In studies conducted in Iraq (Alnasrawi 2001), North Korea (Lee 2016), sanctions have been found to impact income inequality and poverty gap which do not significantly affect the intended targets though GDP per capita generally decreases according to Neuenkirch and Neumeier (2016). Studies have been conducted by the OECD (2002) broadly focusing on how the pillars of the economy, structural issues, debt and macro-economic policy affect economic development. While in another study, Murisa (2010) zoned in on Social Development, they found that economic development without much focus on factor correlations and their effects will lead to inadequate policy formulation which causes inadequate crisis response this study will concentrate on key identified factors that will not only respond to history but proffer solutions for the future.

The relationship between economic growth, as measured by GDP, and various economic variables like trade liberalisation, inflation, foreign direct investment (FDI) and capital formation was concluded to inconclusive (IMF, 2008). There has been an apparent contradiction from expectations derived from our understanding of theory because a decline in capacity utilisation has been reported and exports and inflows of FDI have deteriorated. According to Bautista (1998), "trade policy reforms alone increase aggregate disposable income but the overall equity impact may be unfavourable. The outcome is different when complimentary policies like changes in government expenditure and tax policies are implemented". If anything, the Zimbabwean situation has shown that opening up the market contributes to de-industrialisation and contraction of the economy, at least in the short- run.

1.3 Research Question

The research question which is thus the focus of this study is as follows:

What factors have affected economic growth in Zimbabwe since the country gained independence?

1.4 Research Objectives

The research objectives of the study are:

- to examine the existence of a long-run relationship between economic growth and the five selected determinants namely government expenditure, human capital, inflation, gross fixed capital formation, and unemployment in Zimbabwe,
- to assess the determinants that have had an effect on economic growth in the short-run in Zimbabwe,
- to examine the existence of short-run causality from government expenditure, human capital, inflation, gross fixed capital formation, and unemployment to GDP in Zimbabwe,

1.5 Research Hypotheses

The above research objectives can be translated into the following testable hypotheses:

Hypothesis One

H_0: There is no long-run relationship between GDP and government expenditure, human capital, inflation, gross fixed capital formation and unemployment in Zimbabwe**.**

H_1: A long-term relationship exists between government expenditure, human capital, inflation, gross fixed capital formation, gross domestic product and unemployment rate in Zimbabwe.

Hypothesis Two

H_0: There is no short-run relationship between GDP and government expenditure, human capital, inflation, gross fixed capital formation and unemployment in Zimbabwe.

H_1: There is a short-run relationship between GDP and government expenditure, human capital, inflation, gross fixed capital formation and unemployment in Zimbabwe.

Hypothesis Three

H_0: There is no short-run causality from economic growth to human capital, gross fixed capital formation, unemployment, inflation and government expenditure in Zimbabwe.

H_1: There is short-run causality from economic growth to human capital, gross fixed capital formation, unemployment, inflation and government expenditure in Zimbabwe.

1.6 Justification for the Research

The topic was selected because the Zimbabwean economy has been in disarray for a while now and an all-encompassing study into possible causes and solutions could better shed light

on how to get it back on track. Few scholars have undertaken a thorough analysis to identify the factors that have had an impact on the Zimbabwean economy. Most research to date has been focused on a single determinant at a time rather than a cross analysis of multiple determinants. (Murisa, 2010, Kunofiwa and Odhiambo, 2012, Caleb et al, 2014). This research therefore seeks to provide an unbiased quantitative analysis of the determinants of economic growth in Zimbabwe. The results of this study are expected to have important implications for policymakers as the new government seeks to put the country back on to the path of economic prosperity and return Zimbabwe to the economic strength in Africa that it once was. For example, should the country be focusing on reducing inflation or should government spending be prioritised? The government has already made attracting capital to the country a priority – should these efforts be expanded or cut back? Zimbabwe has always had a well-educated population, but do the people of the country have the skills required to support growth? Is the high unemployment level hampering growth? These are just some of the questions that this study seeks to answer.

1.7 Structure of the Study

Chapter 2 presents the theoretical framework underpinning the determinants of economic growth along with a review of empirical studies in this area. In chapter 3, the methodology that was used in conducting this research is outlined and includes the research design, data collection, regression models, reliability and validity tests, and other data analysis procedures. The following chapter contains the findings of the research and provides a full discussion thereof with reference to theoretical framework and relevant studies cited in the literature review. Finally, chapter 5 details the conclusions drawn from the findings of the study. It also includes a discussion of how the findings apply to policy makers in Zimbabwe and recommendations for future research.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Economic growth is always a goal chased by governments and usually a campaign promise given by hopeful opposition government politicians. Several theories have been proposed to explain and understand the complexities of attaining economic growth and these are briefly reviewed in this chapter. From these theories numerous factors that determine economic growth have been identified including (but not limited to): the financial development of markets and institutions, inflation, education, literacy levels, the unemployment rate, life expectancy, population growth, urbanisation, government expenditure, human capital and gross fixed capital formation. The results from various empirical tests in developing and developed countries as to the importance and role of these variables in contributing to growth will be examined in detail. This chapter will thus provide the theoretical foundation so as to better understand the determinants of growth so as to achieve the research objective of empirically assessing the determinants of economic growth in Zimbabwe.

2.2 Theoretical Review

This section seeks to review the connection between variables used in this research with those already revealed by theory.

The Ricardian model is a theory that tries to underpin economic development. For years, economists like Adam Smith and David Ricardo have lended weight to the opinion that international trade is a major force in driving economic development. According to the Ricardian model, countries benefit from comparative advantage in the absence of trade barriers. This is made possible by the fact that countries face different opportunity costs in their production choices (Ahmed and Sattar, 2004). According to Ferrantino et al. (1997), in the short-term, the impact of trade openness on economic development is supported by their findings but that in the long run such a relationship ceases to exist.

The endogenous growth model further suggests that trade drives the economy towards growth using various channels but it also shows that developed nations benefit at the expense of poor countries whenever liberalisation exists. Lucas (1988), in his findings explained that the opening of a country's economy attracts the flow of capital which he considered vital for

fulfilling investment needs which increase the production potential of the economy. This has a spill over effect on the economy as industry's capacity to absorb the unemployed increases, thereby increasing the income generating capacity. As the economy opens up, the expectation is that resources are shared among countries, for example raw materials to finished goods and even human capital moves across borders.

The neoclassical growth theory argues that labour, capital and economic growth are the three driving forces towards accomplishing a steady economic growth. The theory was developed by economists such as Robert Solow and Trevor Swan in 1956, and shows the importance of physical capital accumulation and that each economy follows a steady state growth path as a result of technological progress. This idea was supported by the likes of Ferrantino, (2010) and Muhammed et al, (2010) who were of the opinion that "the generation of capital by a country creates a platform for economic development". The presence of competition in the globalised economies increases not only output but quality while reducing prices through the use of technological advancements prices thereby benefitting consumers Barriers to trade However, lead to inefficiency as lack of competition breeds complacency and monopolies with consumers being the ones to suffer the consequences.

The theories by the neoclassical economists however, fail to show the direct connection between trade openness and economic development, FDI and capital accumulation. Interestingly though, for education as an economic growth variable, Lefeber 2000, notes that the classical conception of development was focused on realism grounded in an excess supply of labour; labour which came to excess due to higher investments in human capital. Barro (1997) also confirms enhancement of economic growth through higher initial education investment.

Financial development, on the other hand, under the modified growth model focusses on the effects of three major aspects of financial development which are: the stock market, banking sector and capital flow, Tang 2006 in his study found that of the 3 aspects, only stock market development had a greater impact on economic growth.

Newgrowth models such as the works of Grossman and Helpman (1991, 1996) and Aghion and Howitt (1992) support the assertion that trade openness affects long term growth thorough they further refine that with openness there exists transmission of technological progress spill overs, technological diffusion from reduced replication of research and competition of firms in outward-oriented markets, which results not only in economic growth for the innovators but also for their trade partners.

2.21 Theoretical underpinnings for Human Capital as a driver of growth

The significance of human capital for competitiveness and economic growth has been discussed quite thoroughly over the past two decades. Initially it was Arrow (1962) and Uzawa (1965). Romer (1986) and Lucas (1988) who first put the theoretical emphasis on human capital, making the work useful within the growth frameworks. It was birthed from the endogenous growth theory primarily. Nelson and Phelps (1966) were probably the first ones who emphasized the role of human capital in technology adoption and its impact on economic growth (Cadil et al 2014).

Barro (1990) introduced the concept of human capital as a determinant of growth as an extension to his endogenous growth models. The existence of the Solow (1956) residual, from the neo-Classical growth models, motivated Barro to investigate the role of human capital in economic growth in the presence of technological development. As a means to remedy the failings of the classical theory, the new theory of economic growth was developed in the early 80s emphasising the importance of education and innovation, (both elements of human capital) in long-term economic growth. The theory of market value, however, reveals that studies have emphasised rather, the influence of intangible assets such as research and development and intellectual capital on the market value of companies and on their development, leading to overall economic growth.

Since Barro (1990) and the endogenous economic growth model, the role of human capital has been attributed as a contributor to growth through direct channels such as increased efficiency in production through enhanced skills and indirect channels such as increased efficiency in the education sector for instance. In the classical theory of economic growth, labour productivity is considered an exogenous factor, depending on the ratio between workforce and physical capital, among other factors (technical progress). The effect of education on potential growth of productivity is not taken into calculations however. The approach in endogenous growth models changed that.

2.22 Theoretical Controversies relating to Economic growth and Government Expenditures

According to Poot (2000), the government acts in five key ways that affect economic growth. These are:

- Supplying pure public goods that constitute a sizeable component of the aggregate demand;

- Owning or operating enterprises and institutions that provide quasi-public or private goods;
- Enforcing regulations and controls imposed in order to facilitate the protection of property rights and enhance allocative efficiency in the presence of externalities;
- Applying income taxes and transfer payments to affect income distribution thereby creating a more equitable society;
- Acting as facilitators in markets with asymmetric and imperfect information.

Economic schools of thought have differing perspectives on the influence of government activities on economic growth and the direction of causality between government expenditure and economic growth. Concerning influence, the major paradigm is between interventionists and non-interventionists represented by the Keynesian and Classical economists respectively. Classical economists (Solow, 1956, Swann, 1959 and Friedman, 1970) argue that market forces are responsible for bringing the economy to long-run equilibrium by making adjustments in the labour market. Keynesians (Keynes 1936, Harrod, 1938 and Domar, 1948) on the other hand claim that due to rigidities in the labour market, the assumed self-regulating mechanisms in the economy fail to lead the economy back to equilibrium.
Since Keynesians believe that government expenditure is positively related to economic growth, they prescribe expansionary fiscal policies to avoid long recessions. Non-interventionists (Classical and Neoclassicals) point out that increased government spending is ineffective on the grounds that public goods crowd out private goods in the goods market. This effect can also be felt in the market for borrowed funds where heavy government borrowing may result in higher interest rates which hamper private investment. The arguments so far are inconclusive concerning whether or not government expenditure has either a positive effect on economic growth.
Concerning causality, Wagner's (1890) rule stipulates that government expenditure grows with economic growth, suggesting that causality runs from economic growth to government expenditure. The argument has been enhanced with the introduction of new growth theories.

2.3 Empirical Review

This section reviews the relationship between economic growth and numerous variables that have been cited in the literature and included in empirical studies. Whilst the variables examined are not exhaustive (trade openness, financial development, inflation, education,

unemployment, gross fixed capital formation, government expenditure and human capital) this list includes some of the major determinants of economic growth and is used to inform the empirical approach adopted in this study to examine the factors contributing to growth in Zimbabwe since independence. Other factors that have been cited in the literature include life expectancy, population growth and urbanization.

Mansell and When (1998) defined economic development as "the increases in per capita income and the attainment of a standard of living equivalent to that of industrialised countries or a static theory that documents the state of an economy at a point in time". The Centre for the Advancement of Steady State Economy defines economic growth as "an increase in the production and consumption of goods and services", and which occurs when "there is an increase in the multiplied product of population and per capita consumption." (CASSE, 2011)

2.3.1 Economic Growth and Trade Openness

The relationship between trade openness and economic growth has been investigated by many scholars over the years, with the results largely demonstrating a positive impact of trade openness on growth but the opposite has also been found. Tan (2012) employed a cross country dataset comprising 189 countries to examine the effect of trade on growth. After adjusting for population size and price level differences between the countries, he found that trade openness was an important factor in explaining growth but other determinants were also significant including expenditure on education, technological progress and inflation. Gries and Redlin (2010) used panel co-integration and Generalised Method of Moments (GMM) to determine the dynamics of the trade-economic development relationship. The results confirmed both a long-run and a short-run relationship adjustment to equilibrium. In the long-run causality was found to be bi-directional moving from trade openness to growth and vice versa thereby indicating international integration as being beneficial to growth. In the short run however, the results showed that openness could be distressing for an economy going through short-run adjustments. Wong (2006) prioritised finding the impact of openness on manufacturing sectors, with the results ultimately proving that openness increased productivity of manufacturing firms in industries that were focused on exports.

A research conducted by Manni et al. (2012) assessed if and how liberalisation affected the economic growth of Bangladesh. They employed Ordinary Least Squares (OLS) and according to their findings, liberalisation significantly increased the growth of GDP in the country; in particular, liberalisation resulted in increased exports and subsequent higher levels of economic growth. The same was found by Capolupo and Celi (2008) who studied the

CMEA (the Council for Mutual Economic Assistance, a grouping of socialist countries in the Eastern Europe bloc and others such as Cuba) countries and concluded that trade openness leads to increased productivity and economic development for developing countries. The causality tests showed that the relationship is uni-directional from trade openness to economic development. Ali (2013) examined the impact of trade on Pakistan's economy using openness as a proxy for liberalisation and other determinants of growth including FDI, gross capital formation and inflation. Real GDP was used as the measure of economic growth. The results confirmed earlier findings in Pakistan that trade liberalisation had a significant and positive impact on economic growth in the country. Other studies conducted on developing countries by Karras (2003), Babula (2008), Signorelli (2009) and Mercan et al. (2013), found similar results.

Some evidence contrasting the positive effect of trade on growth has been documented. Simorangkir (2006) surmised that in Indonesia, trade and financial openness had a negative effect on economic development. The Impulse Response Functions (IRF) showed that openness actually led to less output. These results are supported by a study done on Mexico and the USA that used a static model by Bajona and Kehoe (2010). They concluded that there was no relationship between trade liberalisation and economic development and that if it does exist, the relationship is negative.

Yanikkaya (2003) found that in developing countries, trade barriers have a positive and significant impact on economic development. The research echoed the results found by Ulassan (2008) which "empirically determined the relationship between economic development and trade openness" by using a cross country approach that included both developed and developing countries. The study showed that openness did not have a direct relationship with growth over the long-run as was found in other studies. Instead, Ulassan (2008) found that economic institutions and macroeconomic uncertainties related to inflation and government consumption were responsible for economic development in the long-run. While economic development is never a guarantee, these studies confirm that where there are better institutions and stable demand management policies in the country, there are also higher chances for economic development. The study of Lutz and Ndikumana (2007) also seem to reach the same conclusion.

The results of studies of trade on economic growth in African countries have also yielded mixed findings. For example, Dava (2012) identified a strong positive impact for a sample of 7 SADC (Southern African Development Community) countries (South Africa, Mozambique, Zambia, Botswana, Mauritius, Tanzania and Madagascar). Asiedu (2013) confirmed that

trade liberalisation in Ghana had contributed to economic growth. Mwaba (2010) adopted a different approach to some of these other studies where he compared African protectionism policies and tariffs to those of fast-growing exporters around the globe and found that by removing trade restrictions, exports and growth seemed to increase. Yeboah et al. (2012) made use of a Cobb-Douglass production function on 38 African countries to evaluate the impact of different variables on economic development. The results confirmed the previous findings in literature that trade openness has a positive impact on GDP.

Lutz and Ndikumana (2007) studied the relationship between trade and growth in 33 African countries. After controlling for export diversification, they found, in contrast to other studies, that trade openness had limited impact on economic development. Further analysis revealed this arises because of the weakness of institutions and corruption as the growth effects of trade are enhanced by institutions.

2.3.2 Economic Growth and Financial Development

Research has shown that financial development, along with an efficient banking system, can fuel economic development (Levine, 1997, 2005; Wachtel, 2001). Levine (2005) argues that financial institutions and markets can foster economic growth through various ways including but not limited to:

- providing payment services in order to simplify the process of buying and selling,
- targeting investors for a wider capital base
- undergoing intense research and development on possible investments thereby aiding in the allocation of savings to the most productive functions,
- safeguarding investors by ensuring good corporate governance practices, and
- diversifying, increasing liquidity and reducing intertemporal risk.

As evidenced in the reform of the financial sector of Central and Eastern Europe, the banking sector pioneered the transition process.

2.3.3 Economic Growth and Inflation

Inflation is loosely defined in economics as the increase in prices. It is a quantitative measure of the rate of increase of certain goods and services over a period of time. Economic growth has been traditionally measured by GDP and defined as an increase in an economy's ability to produce goods and services over a given period of time. The relationship between inflation and economic growth has long been of interest to consumers and economists alike. Inflation

decreases GDP as a result of reduced buying power while high inflation also reduces the desirability of investments as it affects the return on the investments. The balance of payments (BOP) is affected by inflation in that exports become more expensive and therefore unattainable. The overall effect of inflation is thus to decrease though some theories have shown the opposite; an example in the South African context, Vermeulen (2017), "in the short run finds no evidence of a trade-off between inflation and unemployment rate, thus confirming the orthodox view, while there is conflicting evidence of a positive relationship between inflation and employment growth."

Fischer (1993) shows an adverse relationship between inflation and growth, while arguing specifically that not only is the relationship negative but that the accumulation of capital and productivity growth are also negatively affected by budget deficits.

According to Barro (2013) the negative implications of inflation on development in the short-term are small but are felt more severely on living standards. Barro (1995) estimates that a 10% increase in inflation per year will lower real GDP by 4% to 7% in 30 years. Kasidi (2013) suggests that inflation has a negative impact on development in the short run and there is no long run relationship. In addition, Faria et al, (2001) confirm that the effects in the short-term are negative but in the long term does not impact real output. The findings of Zhu (2005), together with Ayyoub (2011), contradict those of other studies as they argue that inflation and development are positively related and a long-run relationship exists for Organisation for Economic Co-operation and Development (OECD) member countries. When the rate of inflation surpasses 10%, it has negative effects on economic development for developing economies but no effect for developed nations (Jha and Dang, 2011).

2.3.4 Economic Growth and Unemployment

Chindamo and Uren (2010) confirm in their paper that "unemployment is counter-cyclical; it increases when economic growth slows and it decreases when growth rises". This is not always the case, however, as evidenced by Levine (2013) who view the relationship as a lagging one, where unemployment will not immediately react to an economic recovery after a decline but rather the effects become visible over some time. Banda, Ngirande and Hogwe (2016), in their study on South Africa, also find that in the long-run, given sustainable policies on economic growth and employment creation, unemployment will eventually go down as the economic growth rises. On the same issue of growth versus unemployment, authors such as Misini and Pantina (2017) add that the relationship between economic growth and unemployment cannot be easily classified as positive or negative, there are more

underlying conditions that further determine the outcome which include, political will, public investment policy, investor perception, rule of law, employment creation policy (like Banda et al., 2016) and corruption; these all play an even larger role in the determination of the relationship.

2.3.5 Economic Growth and Gross Fixed Capital Formation

Governments are known to influence economic activity by either influencing capital investment or money supply; all in a bid to elevate social, political and economic consequences. In recent years the contribution of capital formation has been recognised as a major factor that determines economic growth, as seen in the case of Nigeria (Ugochukwu & Chinyere, 2013). Capital formation is therefore an active ingredient in a country's ability to produce goods and services for domestic consumption or export which in turn affects growth. The lack of capital is considered as "the most serious constraint to sustainable economic growth" (Ugochukwu & Chinyere, 2013).

Bakare (2011) refers to gross fixed capital formation as the proportion of present income saved and invested in order to augment future output and income – generally referred to as capital goods. It is mainly categorised into 2 sub-groups that are: Gross Private Domestic Investment, which is the aggregate capital investment by the private sector and Gross Public Domestic Investment, which is the total investment by government and public enterprises. Private investment in Kenya was found to be the strongest and most significant contributor to growth according to Azam and Daubree (1997). The authors also note that the rate of private capital lags behind growth in human capital and usually is insufficient to cater for growing talent. Over time in Kenya, the efficiency of capital use declined as a result of "massive under-utilisation" of capital goods and under-utilisation of educated labour in public domestic investment.

Further evidence of a positive relationship between fixed capital formation and economic growth in developing countries has been documented by Ghura and Hadji (1996), Beddies (1999) and Kumo (2012). In the case of Nigeria after employing the Vector Error Correction Model in an effort to understand the impact of capital formation on economic growth, Ugochukwu and Chinyere (2013); Adegboyega and Odusanya (2014) have confirmed this linkage between rising economic growth rates and capital formation. They also showed positive movements on the stock market and negative impact on inflation and interest rates. For capital formation to continue sustainably, Karim et al. (2010) suggest that governments should adopt privatisation policies that will pave the way for efficiency expectations in the

areas of resource allocation, increase in overall supply, reduction of unemployment and the curbing of inflation. Overall, these benefits are poised to bring forth production excesses that can be channelled to exports as Pathunia (2013) suggests. However, Karim (2010) does not find any significant long run relationship between economic growth and net investments in Malaysia which is considered a "newly industrialised country".

But for capital formation conditions to be feasible, a clear developmental path is needed as described by Jhinghan (2003): there should be savings, sufficient and competent financial institutions should exist to manage and allocate savings efficiently, and lastly returns from the savings should be invested into capital goods. However, Pettinger (2014) argues that for developing countries, it is difficult to raise savings let alone increase the savings ratio especially when the economy is struggling to meet basic needs such as food and shelter. This notion does not seem to take into account issues of corruption, level of technological innovation and labour productivity; hence further study will clarify the interactions of capital formation and economic growth.

2.3.6 Economic Growth and Education / Human Capital

Human capital is often discussed in the context of education but it is imperative to make a clear distinction on the two. A correlation seems to exist that puts education; which is largely academic, as a basis for human capital; which refers to application of tacit knowledge in order to produce services or goods. In short, human capital is enhanced by increasing education levels.

The inclusion of human capital as a determinant of growth is recent as far as economic growth regressions are concerned. Empirical applications before endogenous growth model used the number of enrolled students at various levels of educational attainment to get an idea of the educatedness of the population. Due to empirical lack of traction, better measures had to be set up to provide more empirical traction. The building of the index and its various applications is exposed in the next section.

Lopez et al. (1998) emphasize that no country has achieved economic development without investing in education; raising the education standards of a country not only improves productivity, it increases economic growth, raises the quality of jobs in the economy and helps eradicate poverty while covering the gap for wealth disparity.

The main question that seems to take centre stage when it comes to education and development is whether high education and literacy levels translate to economic development. Pritchett (1996), having studied cross national data at the World Bank, strongly asserted that

the mere act of the labour force attaining education through an increase in educational capital had no positive impact on the growth rate of output per worker. This therefore means that negative experiences can be an indication that education is not sufficient for the development process.

Literature is rich with studies that reveal that one of the most vital factors of economic growth is human capital. Human capital stock determines the rate of economic growth, meaning that an economy with a higher human capital stock will evolve faster (Romer, 1986). Barro and Lee (1992) constructed the human capital index which combines both education and training measures to get a clearer picture of the work readiness of the concerned population. It is focused on investment in education, the use of human capital stock, the productivity of human capital and demographics and employment of human capital (Cadi et al., 2014).

Several studies explored the relationship between economic output and the accumulation of human capital. Significant contributions of human capital to economic growth have been identified as early as by (Schultz 1961).

Human capital in economic growth is widely viewed as a pillar of competitiveness though recent studies in the European Union (EU) have shown that this is a declining view and is no guarantee of stability neither is it a quick fix to recover an economy. Examples from Spain and Cyprus show high percentages of tertiary educated people in comparison to the population, but yet unemployment levels sometimes “reach critically high levels and economic growth is weak or negative” (Cadil et al., 2014). However, some in the EU still hold human capital in high regard when it comes to improving economic growth. Pelinescu (2015) highlights the EU’s 2020 strategy as it focuses on 3 main areas for growth; smart, sustainable and inclusive. The author notes that this “couldn’t be achieved without major contribution of skills, knowledge or value of people, commonly known as human capital”.

A wider body of research has revealed that amongst the most important factors of economic growth, human capital still ranks high (Lucas, 1988, Mankiw et al., 1992, Riley, 2012). Human capital is widely accepted as an important determinant of economic growth and the importance of human capital accumulation is unconditionally acknowledged in the existing exogenous and endogenous growth theories. Mankiw et al. (1992) critique the Solow growth model for understating the impact of physical capital population growth because of ignoring the correlation that human capital has with these two inputs into growth equations. After incorporating human capital into growth equations, they find higher significance of physical capital and labour in growth equations.

Benhabib and Spiegel (1994) have shown that while the introduction of human capital as a factor of production in a Cobb -Douglas type function leads to an effect on growth of GDP per capita, the effect is rather insignificant but if the influence of human capital on total factor productivity is taken into account, then effects are visible in two aspects:

- human capital influences the internal rate of innovation as evidenced by Romer (1990);
- human capital influences the rate of diffusion of technology as surmised by Nelson and Phelps (1966).

They show that an increase of 1% in the capital stock leads to a 0.13% increase in the rate of growth and the process of catching up technological development of other countries is strongly influenced by human capital stock nationwide as demonstrated by the Funke and Strulik (2000).

Mincel (1995) showed that the higher the growth of technological change in a sector, the greater the demand for an educated and well-trained workforce thereby stimulating growth in the education sectors of the economy. Jenkins (1995) discovered that during 1971-1992, a 1% share increase of highly skilled workers led to an increase of 0.42 to 0.63% of annual output in the United Kingdom. In the United States, Griliches (1997) showed that in 50 years the change in the level of education of the labour force led to a 33% increase in productivity. Aghion and Howitt (1998) stress the role of human capital as a factor promoting higher investment in technology with a positive impact on growth.

Bundell et al. (1999) by analysing the impact of human capital on economic growth believe that the growth rate of output is dependent on the rate of accumulation of human capital and innovation, the source of which being the stock of human capital, education level influence labour productivity. Englander and Gurney (1999) showed that growth in school enrolment of OECD countries from 70% in 1960 to 95% in 1985 has led to an increase of 0, 6% per year in labour productivity

By using an extension of the classical errors in variables model to correct for measurement error bias De la Fuente and Doménech (2000), constructed a set of meta-estimates of the coefficient of years of schooling in an aggregate Cobb-Douglas production function. Their results suggest that the value of this parameter is likely to be above 0.60. Funke, Strulik (2000), “using a model that incorporates aspects of the classical theory of economic growth with the new theories of economic growth, emphasize the existence of different effects of human capital in the stage of development of the country. In their view, the model provided by Uzawa-Lucas (1966,1988) may explain the development mechanisms of productivity if the

accumulating knowledge is sufficiently high, but the Grossman-Helpman (1996) model for an economy with a wide variety of products can be explained considering technological growth as an endogenous factor, which involve significant expenditure on research and development".

Bassanini and Scarpetta (2001) in a study of OECD countries for the period 1971 to 1998 discovered that increased duration of schooling by one year led to an increase in GDP per capita of 6%. More developed economies with higher capital accumulation outpace the other economies in growth however the overall growth outperformance driven by human capital improvements remains minimal. It seems that in the initial stages of development, the single most important contributor to growth income per capita is hard capital. Processes like accumulation of knowledge through continuing education and training then moves the economy to more advanced stages of development.

Riley (2012) posits that the inclusion of level effects of human capital development into growth equations accounts for unexplained variations that remain in the model with respect to the treatment of technology as an exogenous cause of economic growth.

2.3.7 Economic Growth and Government Expenditure

Government expenditure is an economic management tool as it forms part of fiscal policy, which can have economic stabilisation effects. It has been traditionally utilised to 'spend' economies out of recessions (Keynes 1936). Barro (1988) extended the endogenous growth framework to assess the impact of government expenditure on economic growth. His main observation was that government expenditure peaks when it has maximum impact on economic growth and benefits to the representative consumer, beyond which any further increases in government expenditure become detrimental the economy.

Bader et al. (2003) investigated the effect of government infrastructure spending on GDP from 1980 to 2001 for Nigeria. Using cointegration analysis, the authors found that government spending on transport and communication, education and health infrastructure had significant effects on economic growth; however, spending on agriculture and natural resources infrastructure yielded a significant inverse effect on economic growth in Nigeria.

Babatunde (2015) found a negative relationship between government expenditure and GDP for Nigeria between 1980 and 2014. This is despite the existence of asymmetries in the relationship. Pula and Elshani (2017) pit Wagner's endogenous approach against Keynes exogenous approach to the growth-public expenditure relationship. They find that for Kosovo between 2004 and 2016 Keynes' exogenous public expenditure growth nexus is supported.

Chineze (2017) disaggregated government expenditure for Nigeria into its components over the period 1990 to 2006. Contrary to *a priori* expectation the result showed that only expenditure on health has a significant and positive effect on economic growth while the other disaggregated composites show largely positive but insignificant effects on economic growth in Nigeria over the study period.

Wahab (2004) developed a new test specification for Wagner's Law of Public Expenditure using two proxies for government spending. The first defines the current state of the economy by relating to its historical mean growth rate, while the second defines government expenditure relative to a pooled time-series/cross-sectional mean growth rate. An error correction model that parameterizes the bivariate relation between government expenditure and economic growth for alternative OECD country groupings is modelled. The results suggest that government expenditure increases less than proportionately with accelerating economic growth and decreases more than proportionately with decelerating economic growth. There is only a limited support for Wagner's Law.

Wu and Tang (2010) perform a panel Granger causality test of 182 countries between 1950 and 2014 and find support for bi-directional causality between economic growth and government expenditure. The result is not sensitive to changes in definitions of both phenomena and this relationship was strong in high and middle-income countries, whereas for low income countries there was no evidence of causality. The next section will highlight the influence of inflation on economic growth in Zimbabwe. Ampah and Kotosz (2013) run an ARDL model for Burkina Faso between 1950 and 2015 and find evidence for both the Keynesian and Wagnerian relationship though results are susceptible to variable definition as seen in the theoretical review earlier.

Rana (2014) tests Keynes vs Wagner’s hypothesis for Bangladesh between 1980-2014. Using the Auto Regressive Distributed Lag (ARDL) model, he finds proof for Wagner’s hypothesis in the long run relationship between government expenditure and economic growth.

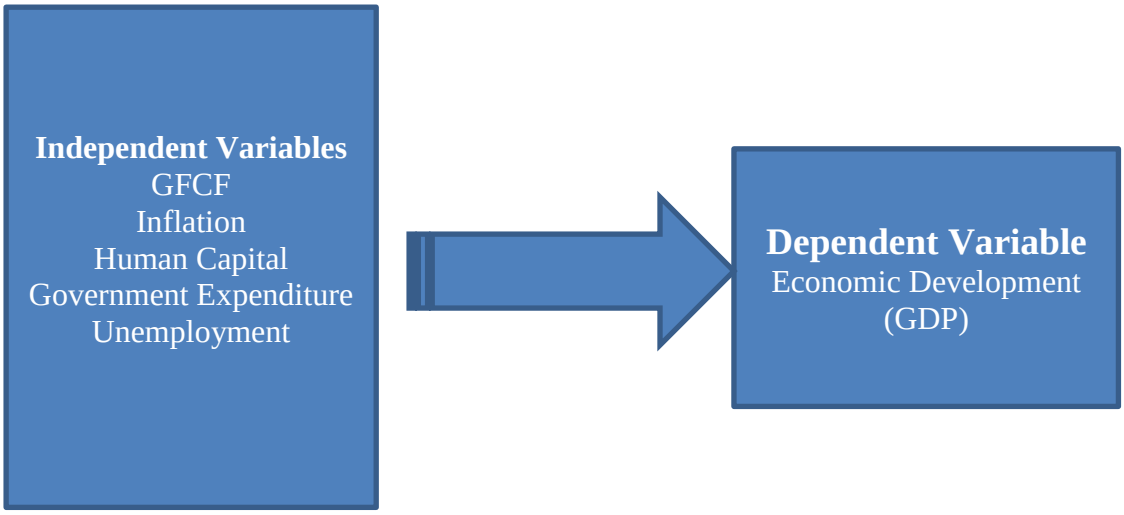
Odihambo (2015) finds that economic growth granger causes government expenditure after using the ARDL approach, with unemployment as an intervening variable, to assess the causality between economic growth and government expenditure in South Africa between 1990 and 2015.

Overall the majority of the recent evidence seems to support the view that public expenditure is a driver of economic growth contrary to the assertions of non-interventionists who claim that government should let the economy balance rather than have government intervene and spend the economy back to growth.

2.4 Conceptual Framework

Kothari (2004) (cited in Zablon et al., 2015) states that “a conceptual framework comprises of dependent and independent variables and the independent variables are inferred to have caused the changes in the dependent variables”.

Figure 2.1: Conceptual Framework



Source : Adopted from Zablon et al (2015)

Figure 2.1 is a diagrammatic representation of the existing relationship between independent variables and dependent variables in the study. The dependent variable, economic growth as measured by GDP is anticipated to be explained by human capital, gross fixed capital formation, unemployment, inflation and government expenditure. Given the wide array of variables in different literature, the researcher hypothesises all these factors have an impact on economic development whether in the short or long-run.

2.5 Chapter Summary

The chapter sought to align the theoretical and the empirical existing literature with regards to factors that may help determine economic growth. It clearly showed that there is no consensus in determinants if previous studies are anything to go by. In undertaking this chapter, it was alarmingly clear to the researcher that such studies were never satisfactorily done in Zimbabwe. The research therefore shall focus on the determinants of economic growth in Zimbabwe.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The primary objective of this study is to empirically assess the determinants of economic growth in Zimbabwe. A systematic overview of the trends in the Zimbabwean economy was presented which shed light on the economic environment prevailing in the country in prior chapters. Drawing from this and the literature discussed in the previous chapter, an econometric model is formulated to answer the research question. This chapter outlines the model specification as well as providing a description of the variables employed. Thereafter, the procedure followed to test the model is explained in detail. It is worthy to note that all economic growth measures in the study were measured in USD.

3.2 Research Design

There are two main types of research, namely, qualitative and quantitative research. Quantitative research will be used for this study. Quantitative research entails using numerical data from a group of people or using secondary data that is already available and statistical techniques to generate findings pertaining to the research topic (Kisely & Kendall 2011:364; Maree 2016:162). This current study is deductive in nature because existing theories will be tested.

3.3 Data and variables used

As the theoretical and literature review in the preceding chapter revealed, numerous factors effect economic growth. Drawing from this literature, five factors were included in the model in this study namely: gross fixed capital formation, government expenditure, inflation, employment and human capital (Deidda and Fatou, 2002, Levine 1994, Levine, 2004, Loayza and Speigel, 2001). While numerous other factors do exist, the study focused only on these variables partially due to their being topical in the Zimbabwean narrative and difficulty in obtaining data (trade openness) for some factors. Inflation is a variable that is mostly used for regulatory purposes that create favourable conditions for growth. The a priori expectations for the relationships between each of these variables and economic growth are summarised in Table 3.1.

Table 3.1: *A priori* expectations

Variable	Gross Fixed Capital Formation	Government Expenditure	Inflation	Human Capital	Unemployment
Relationship	+	+	-	+	-

Annual data used for the period 1980 to 2017 was obtained resulting in 37 observations in total. This period includes the hyperinflationary period in 2008. Table 3.2 provides the details of the variables employed in the study and the sources of the data. In this data, GDP growth, unemployment and inflation are measured as percentages, with government expenditure expressed as a percentage of GDP. Human capital is expressed as an index and is a composite measure of education and training. Gross fixed capital formation is expressed in millions of United States dollars.

Table 3.2: Variables

Variables	Description	Unit of measurement	Source
GDP	Gross Domestic Product	Millions of constant (2011) USD	World Bank
Gross Fixed Capital Formation	Capital in use in Zimbabwe	Millions of constant (2011) USD	World Bank
Government Expenditure	Comprises all expenses incurred by the government	Percentage of GDP	World Bank
Inflation	Year-on-year changes in consumer prices	Percentage	Penn World Tables 9.2
Human Capital	Human capital utilised in economic activity	Index	Penn World Tables 9.2
Unemployment	Number of unemployed people between the ages	Percentage of working age population	Penn World Tables 9.2

	of 15-60 as a percentage of the age group 15-60		

3.4 Model specification

3.4.1 Theoretical Model

The long-run relationship between GDP growth and the five factors identified can be expressed as follows:

$$GDP_t = \alpha + \beta_1 GFCF_t + \beta_2 GE_t + \beta_3 INF_t + \beta_4 HC_t + \beta_5 UE_t + \varepsilon_t \quad (3.1)$$

where GDP is the growth rate in GDP, $GFCF$ is gross fixed capital formation as a percentage of GDP, GE is government expenditure, INF is inflation, HC refers to human capital and UE refers to unemployment.

A deep understanding of the characteristics of the stationarity of a series is needed in order to determine the appropriate method needed to analyse this particular relationship. If the data is non-stationary then a regression estimated with the traditional Ordinary Least Squares (OLS) approach will result in a spurious regression meaning that the t-statistics and R^2 values will be inflated and the Durbin-Watson test for first order autocorrelation will be too low (Perron, 1989). An alternative estimation procedure has to then be determined. As such, the first step in the methodology followed in this study was to conduct unit root/ stationarity tests.

3.4.2 Unit Root Tests

Based on the statistical theorem of the weak law of large numbers all data is stationary. However, in reality macroeconomic variables such as GDP and inflation, are non-stationary (Zivot & Wang 2006:111). A stationary data series has a constant mean, variance and auto-covariance for each lag while the opposite is true for non-stationary data meaning that they exhibit high levels of persistence (Gujarati & Porter, 2008:746). A non-stationary variable needs to be differenced d times in order for it to become stationary and has d unit roots. The series,y_t, is said to be integrated of order d denoted as $I(d)$. For instance, when a variable is integrated of order one $I(1)$, this means that the variable is stationary after being differenced once. A stationary variable is denoted $I(0)$. The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests was used to test for the stationarity of the data. According to Maddala and Kim (2004), the ADF test is ideal because it has more explanatory power compared to the other unit root tests; however, the PP test is also used to ensure the robustness of the conclusions drawn from the ADF test.

3.4.2.1 Augmented Dickey-Fuller (ADF) Test

The ADF test is the most commonly employed test for a unit root. It provides an improvement on the original Dickey and Fuller (1979) test by including a parametric correction for higher-order autocorrelation assuming that the series, y_t, follows an autoregressive (AR) process with p lags (Gujarati & Porter 2008:757). This is achieved by adding p lagged differences of y_t on the right side of the test equation. For consistency purposes the optimal lag length was chosen so as to avoid spurious rejection or acceptance of estimated results. The selection of the lag length influences the outcome of a test. The omission of significant lags will not remove all the autocorrelation while a large lag length consumes degrees of freedom in the model and thus decreases the power of the test (Stock & Watson 2012:587).

According to Brooks (2008:293) there are two approaches that can assist in determining the optimal lag length. These are cross equation restrictions and information criteria. For the purpose of this research the information criteria were used. The most commonly employed are the Akaike Information Criteria (AIC), Schwarz Information Criterion (SIC), and the Hannan-Quinn Information Criterion (HQIC). For the purpose of this study the AIC test was used given that this is a small sample whereas the SIC and HQIC only select the optimal lag order in a large sample. Moreover, it is also efficient and has higher power than the other information criteria (Shahbaz, Hye, Tiwari & Leitao, 2013:114). The equation for the test is as follows:

$$AIC = \ln\left(\frac{RSS}{n}\right) + \frac{2k}{n} \tag{3.2}$$

where RSS is the residual sum of the squares, n is the sample size and k is the number of coefficients (Gujarati, 2011:44). According to Augung (2009:28), the optimal lag length is where the information criterion is minimised.

The ADF test can take three different forms as per equations 3.3 – 3.5 below. The first is a random walk with no intercept/ drift or trend, the second is a random walk with drift and the third is a random walk with both drift and a trend term.

$$\Delta y_t = \psi y_{t-1} + \sum_{i=1}^{p} \Delta y_{t-i} + \varepsilon_t \tag{3.3}$$

$$\Delta y_t = \mu + \psi y_{t-1} + \sum_{i=1}^{p} \Delta y_{t-i} + \varepsilon_t \quad (3.4)$$

$$\Delta y_t = \mu + \psi y_{t-1} + \lambda t + \sum_{i=1}^{p} \Delta y_{t-i} + \varepsilon_t \quad (3.5)$$

where: Δ is the first difference operator (Enders, 2010:206). According to Enders (2010), the choice of the specification can have a material impact on the outcome of the test. As such, to ensure the reliability of the conclusions drawn, all three forms of the test were implemented.

The null hypothesis of this test is that $\psi = 0$ meaning that the series has a unit root/ is non-stationary against the alternative hypothesis that $\psi < 0$ and the series is stationary. The test statistic is computed using the conventional t-ratio for ψ:

$$t_\psi = \frac{\hat{\psi}}{se(\hat{\psi})} \quad (3.6)$$

where: $\hat{\psi}$ is the estimate of ψ and $se(\hat{\psi})$ is the coefficient standard error (QMS 2009:384). However, this test follows a unique distribution because under the null hypothesis the series is non-stationary. The critical values of MacKinnon (1996) are used for this purpose. According to Brooks (2008:327), "if the test statistic is more negative than the critical value at the chosen significance level, then the null hypothesis is rejected in favour of the alternative hypothesis that the series is stationary. If the test statistic is not more negative than the critical value, then the null hypothesis cannot be rejected and the series is deemed to contain a unit root (non-stationary)". In this case, it becomes necessary conduct a further ADF test to determine whether the series has more than one-unit root; stated differently, to determine if the first differences are stationary. For example, the series could contain two-unit roots $I(2)$ meaning that the series has to be differenced twice to induce stationarity. This process is continued under the null hypothesis cannot be rejected (Brooks, 2008)

3.4.2.2 The Phillips-Perron (PP) test

The PP test, developed Phillips and Perron (1988), is similar to the ADF test. The major difference lies in how serial correlation is handled. The PP test uses a non-augmented Dickey-Fuller equation with a nonparametric statistical method based on the Newey-West test (1987)

to control for serial correlation. As such, no lagged differenced terms are added to the test equation. The null and alternative hypotheses are identical to the ADF test.

Given their similarity, the PP and ADF tests tend to produce similar results and are characterised by similar limitations, however, the PP test is useful for testing for a unit root in variables that may reflect structural changes in the economy (Brooks 2008:330; Gujarati & Porter 2008:758), the PP test is robust to general forms of heteroscedasticity in the error term and a lag length for the test regression does not have to specified as with the ADF test (Zivot & Wang 2006:111). However, the PP test exhibits low power against trend stationarity alternatives (DeJong, Nankervis, Savin & Whiteman 1992).

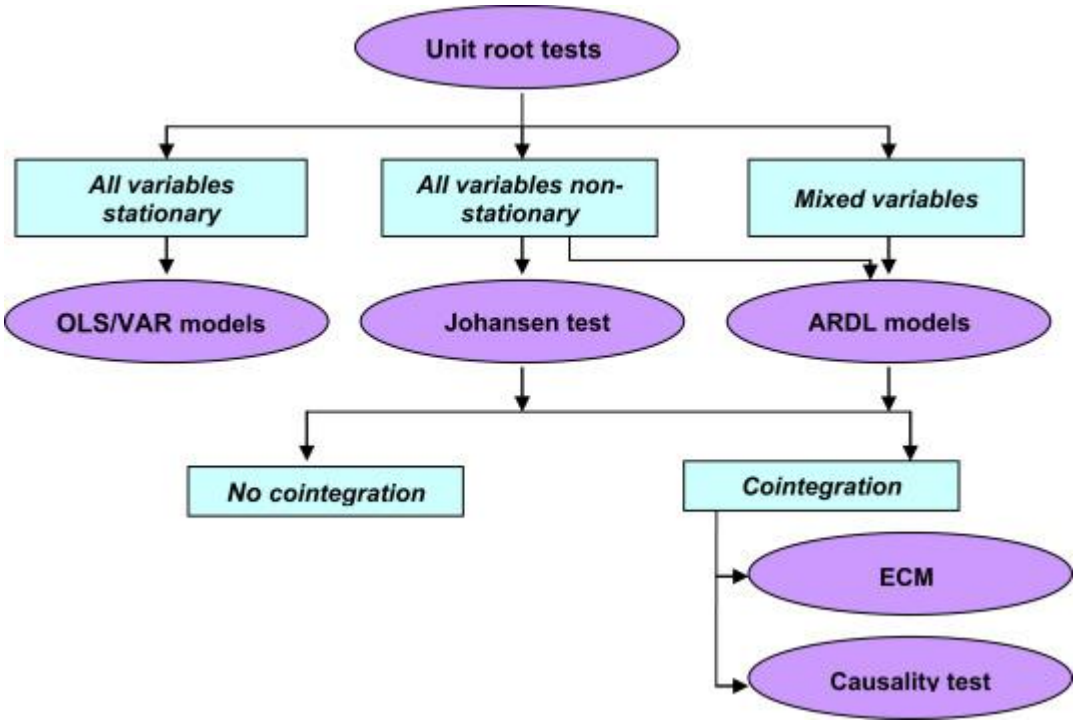
3.4.3 The Autoregressive Distributed Lag Model

Once the order of integration of the data has been determined, the appropriate modelling technique can be chosen. The outline in Figure 3.1 demonstrates the different approaches that can be taken depending on the outcomes of the tests (Rajasekar, Philominathan & Chinnathambi, 2013:5-6) research methodology. When the variables are found to be non-stationary then cointegration methods are typically used (Zivot & Wang 2006:111; Gujarati & Porter 2008:762). According to Seddighi, Lawler and Katos (2000:287) cointegration tests identify whether there is a long-run equilibrium relationship between y_t and x_t. That is, if two or more variables are $I(1)$ but a linear combination of them is $I(0)$, then the variables are said to be cointegrated (Studenmund, 2011:424).

Various cointegration methods exist such as those derived by Engle and Granger (1987), Johansen (1991) and Pesaran and Shin (1997). However, for the purposes of this study, the Autoregressive Distributed Lag (ARDL) model of Pesaran and Shin (1997) was chosen to empirically assess the determinants of economic growth in Zimbabwe because it yields efficient coefficient estimates regardless of the sample size (Goel, Payne & Ram, 2008:240). This study has a small sample of only 37 observations and thus the Engle-Granger and Johansen (1991) approaches which have poor small sample properties are not appropriate (Lui 2009:1849). Moreover, as Figure 3.1 details, the procedure can be used if the unit root tests show that some of the series are $I(0)$ and others are $I(1)$. This means that the variables of interest do not have to be the same order of integration (Pesaran, Shin & Smith, 2001:315). However, the series cannot be $I(2)$ and thus the pre-testing of the variables is still required. In addition, in cases where there are endogenous regressors, the model caters for this by

allowing for the use of different lag lengths for each regressor. This approach allows for the variables that drive economic growth to be examined in both the short and long-run. The various steps in this model are described in the following sections.

Figure 3.1: Summary of the Testing Process



Source: Rajasekar et. Al. (2013)

3.4.4 The Bounds Test for Cointegration

The long-run relationship between the variables, as shown in equation 3.1, can be depicted in an ARDL framework as follows (Ozturk and Acaravci, 2010):

$$\Delta GDP_t = \alpha + \sum_{i=1}^{I} \phi_i \Delta GFCF_{t-i} + \sum_{j=1}^{J} \theta_j \Delta GE_{t-j} + \sum_{k=1}^{K} \lambda_k \Delta INF_{t-k} + \sum_{l=1}^{L} \theta_l \Delta HC_{t-l} + \sum_{m=1}^{M} \lambda_m \Delta UE_{t-m} + \delta_1 GFCF_t + \delta_2 GE_t + \delta_3 INF_t + \delta_4 HC_t + \delta_5 UE_t + \delta_6 GDP_t + \varepsilon_t \quad (3.7)$$

The optimal lag length for each of the differenced explanatory variables is determined using the AIC as per the ADF test described previously. The bounds test creates boundaries on the estimated long-run coefficients of the variables of the model. This entails estimating an F- test

on the long-run coefficients in equation 3.7 (δ_1, δ_2 etc.) are jointly equal to zero against the alternative that at least one of the coefficients is different to zero. Under the null hypothesis, the series are not cointegrated while under the alternative hypothesis they are cointegrated. The statistic, however, does not follow the F-distribution, with Pesaran et al. (2001) deriving unique critical values for this test. Two sets of critical values are needed – the upper and lower bounds at each significance level. If the F-statistic is greater than the upper bound critical value, the null hypothesis can be rejected, which means there is a long-run relationship between the variables of interest. On the contrary, if the F-statistic is less than the lower bound critical values then the null hypothesis cannot be rejected, which means there will be no long-run relationship between the variables of interest. However, if the F-statistic is between the lower and upper bound values then the results are inconclusive (Pesaran et al., 2001). However, the critical values that will be used for the bounds test in this study are those from Narayan (2004) as they were designed for small samples (30-80 observations) whereas those Pesaran et al. (2001) developed rely on samples close to 1000 observations.

3.4.5 Error Correction Model (ECM)

In addition to estimating the long-run relationship between the variables, the short-run relationships can be examined using the Error Correction Model (ECM) while it also incorporates the rate of change in the long-run relationship (Hill, Griffiths & Lim 2012:49). The model is specified as follows:

$$\Delta GDP_t = \alpha + \sum_{i=1}^{I} \phi_i \Delta GFCF_{t-i} + \sum_{j=1}^{J} \theta_j \Delta GE_{t-j} + \sum_{k=1}^{K} \lambda_k \Delta INF_{t-k} + \sum_{l=1}^{L} \theta_l \Delta HC_{t-l} + \sum_{m=1}^{M} \lambda_m \Delta UE_{t-m} + n_1 ECT_{t-1} + \nu_t \quad (3.8)$$

Where ECT_t is the error correction term and is obtained from equation 3.1. The coefficient on the error correction term measures the adjustment to equilibrium caused by deviations in the long-run relationship between the variables in the previous (Asteriou & Hall 2007:311). It is expected that if there is cointegration among the variables, the coefficient of the error correction term shall be negative and significant.

3.4.6. Toda-Yamamoto's Granger Causality Test

The most widely known and used approach to examine the causal relationship between two variables is the Granger (1969) causality test. In 1995, Toda and Yamamoto put forward that economic series could be:

- Integrated of the different orders
- Non-cointegrated
- Both

They found that in all three of these cases, ECM could not be applied hence they developed their alternate test to be able to test for causality between integrated variable on asymptotic theory. The Toda-Yamamoto test has been known to minimise the risk of wrongly identifying the order of the integration of given variables. The test is based on the equations below:

$$X_t = \varpi + \sum_{i=1}^{m} \varphi_i X_{t-1} + \sum_{i=m+1}^{d\max} \varphi_i X_{t-1} + \sum_{i=1}^{m} \delta_i Y_{t-1} + \sum_{i=m+1}^{d\max} \delta_i Y_{t-1} + v_{1t} \quad (3.9)$$

$$Y_t = \psi + \sum_{i=1}^{m} \gamma_i Y_{t-1} + \sum_{i=m+1}^{d\max} \gamma_i Y_{t-1} + \sum_{i=1}^{m} \lambda_i X_{t-1} + \sum_{i=m+1}^{d\max} \lambda_i X_{t-1} + v_{1t} \quad (3.10)$$

Where:

- X and Y are combinations of pairs constructed by the variables of interest in different series, excluding cases, such as both X and Y are LRGDP for instance.
- The items $\varpi, \psi, \varphi, \delta, \gamma, \lambda$ are parameters of the model,
- dmax stands for the maximum order of integration of the variables in the model
- m +1 lags ; $v1t \sim N(0, \Sigma v1)$ and $v2t \sim N(0, \Sigma v2)$ are residuals, where $\Sigma v1$ and $\Sigma v2$represent covariance matrices of $v1t$ and $v2t$, respectively.

The test is performed by first testing for the unit root of X and Y, then determining the maximal order of integration. The optimal lag length will need to be determined next before setting the null and alternative hypothesis. Finally, the F statistic is calculated. This procedure will be used to check the causality between GDP and the determinants already recognised in the literature.

3.5 Diagnostic tests

Diagnostic tests will be used to test the robustness of the model. The Classical Linear Regression Model (CLRM) relies on certain assumptions about the data. If one or more of these assumptions is violated, then the coefficient estimates may be unbiased or inefficient. In particular, the model assumes that there is no serial correlation in the error terms, the variance of the error terms is constant and the error terms are normally distributed (Gujarati & Porter, 2008). Further to this, implicit assumptions of the model include that the parameters are stable and that the model is correctly specified. Tests for the violation of these assumptions are thus undertaken (Gujarati & Porter, 2008).

3.5.1 Normality test

The Jarque-Bera (JB) test is be used to identify whether the residuals are normally distributed. The null hypothesis for the JB test is that the residuals are normally distributed against the alternative hypothesis that the residuals are not normally distributed. The test statistic is computed as follows:

$$\frac{n-k+1}{6}\left(s^2 + \frac{1}{4}(c-3)^2\right) \tag{3.11}$$

Where S and K are the measures of skewness and kurtosis respectively (Vogelvang, 2005:115. The test follows the chi-squared distribution.). If the residuals are normally distributed, then $S = 0$ and $K = 3$ and as a result the JB-statistic is equal to zero. Thus, if the test statistic is smaller than the critical value, the null hypothesis of normality cannot be rejected while if the test statistic is greater than the critical value, it can be concluded that the residuals are not normally distributed.

3.5.2 Serial Correlation Test

The Breusch-Godfrey Lagrange Multiplier (LM) test is used to test for serial correlation. According to Vogelvang (2005:119), assuming the regression model takes the form of equation 3.11, then the auxiliary regression estimated for the purposes of the test is as per equation 3.12:

$$y_t = \beta_1 + \beta_2 x_t + \beta_3 z_t + \varepsilon_t \tag{3.12}$$

$$\varepsilon_t = \varphi_1 \varepsilon_{t-1} + \cdots + \varphi_p \varepsilon_{t-p} + \alpha_1 + \alpha_2 x_t + \alpha_3 z_t + v_t \quad (3.13)$$

where: p is the number of lags of the error term included in the equation. The null hypothesis for the test is that the there is no serial correlation in the error term while the alternative hypothesis is that there is serial correlation present. The LM test statistic is calculated as follows:

$$LM = (n - p) * R^2 \quad (3.14)$$

where R^2 if from the auxiliary regression (3.12). If the null hypothesis holds, then the past errors should have little ability to explain current values of the error term such that the R^2 is zero (Vogelvang 2005:120). This test statistic follows the chi-squared distribution with p degrees of freedom.

3.5.3 Heteroscedasticity test

The CLRM assumes that there the error terms are homoscedastic meaning that the variance is constant. If this assumption is violated, it is known as heteroscedasticity. Various tests can be used but for this study the Breusch-Pagan-Godfrey (BPG), Autoregressive Conditional Heteroscedasticity (ARCH) and Harvey Test for heteroscedasticity tests are used (Gujarati & Porter 2008:411). The BPG test, similarly to the BG test for autocorrelation, estimates a test regression using the residuals from the main relationship. Assuming the main relationship takes the form specified in 3.11, then the auxiliary regression that is estimated is given by:

$${\varepsilon_t}^2 = \varphi_0 + \varphi_1 x_t + \varphi_2 z_t + v_t \quad (3.15)$$

The null hypothesis of the test is the there is homoscedasticity while the alternative is that there is heteroscedasticity. This is seen by the coefficients on the explanatory variables being jointly equal to zero or at least one being different from zero (Asteriou & Hall, 2007:109). As with the LM test for the BG test, an LM statistic can be computed as per equation 3.13 where p refers to the number of explanatory variables in equation 3.14. The test follows the chi-squared distribution but with $p - 1$ degrees of freedom (Asteriou & Hall, 2007:109).

The ARCH test will also be used to detect if there is any heteroscedasticity so as to ensure that the results of the BPG test are robust. The test equation has the same dependent variable

as the BPG test but the explanatory variables are squared lags of the past error terms as shown in equation 3.15. In this way, if the one or more of the explanatory variables are significant it suggests that the variance of the residuals is not constant and the variance follows an autoregressive process (Asteriou & Hall 2007:124). Again, the LM statistic is calculated and compared to the chi-squared critical value at the chosen significance level with p degrees of freedom.

$$\varepsilon_t{}^2 = \alpha_1 + \varphi_1 \varepsilon_{t-1}{}^2 + \cdots + \varphi_p \varepsilon_{t-p}{}^2 + v_t \tag{3.16}$$

The Harvey test is used to test for a range of specifications of heteroscedasticity in an equation's residuals. It may be considered similar to the Breusch-Pagan-Godfrey test which is a multiplier test of a null hypothesis. To test for this form of heteroskedasticity, an auxiliary regression of the log of the original equation's squared residuals on $1, z_t$is performed. The LM statistic is then the explained sum of squares from the auxiliary regression divided by $\psi'(0.8)$, the derivative of the log gamma function evaluated at 0.5. This statistic is distributed as a χ^2 with degrees of freedom equal to the number of variables in z . The quoted statistics are the Obs*R-squared statistic and the redundant variable *F*-statistic.

3.5.4 Regression Specification Error Test (RESET)

The CLRM is assumed to be the appropriate 'functional form' meaning that the relationship between the dependent and explanatory variables is captured by a straight line. However, this is not always the case. Ramsey's (1969) Regression Specification Error Test (RESET) is a popular test for determining whether the model is linear or not (Brooks 2008:174). The equation for this test is as follows:

$$y_t = \beta_1 + \beta_2 x_t + \beta_3 z_t + \delta_1 y_t{}^2 + \delta_2 y_t{}^3 + \varepsilon_t \tag{3.17}$$

If δ_1 and/or δ_2 are significant then there is evidence of general misspecification and it results in the rejection of the null hypothesis that the linear specification is correct. An F-test of the joint significance of δ_1 and δ_2 is used for this purpose. If the F-statistic is greater than F critical value then the null hypothesis of correct specification is rejected while the converse is true of the F-statistic is less than the critical value (Asteriou & Hall, 2006:171).

3.5.5 Stability tests

To examine the stability of the parameters of the model, two tests will be used, namely the cumulative sum of residuals (CUSUM – Cumulative Sum control chart is a sequential analysis technique used to monitor or detect change) and the squared cumulative sum of residuals (CUSUMSQ). Firstly, the CUSUM test is constructed on the cumulative sums of scaled recursive residuals (Vogelvang 2005:133; Greene, 2000:296). The following equation is used for the CUSUM test:

$$W_t = \sum_{r=K+1}^{r=t} \frac{w_T}{\hat{\sigma}} \tag{3.18}$$

where $\hat{\sigma}^2 = \frac{\sum_{r=K+1}^{T}(w_r - \overline{w})^2}{T-K-1}$, $\overline{w} = \frac{\sum_{r=K+1}^{T} w_r}{T-K}$ and w_r is the r^{th} scaled residual.

The null hypothesis of the test is that W_t has a mean of zero and the variance ($\hat{\sigma}^2$) approximates the number of residuals that are added (Greene 2000:295). The CUSUM line and the 5% significance confidence bounds are plotted. If the results show the CUSUM line oscillating within the confidence bounds then the null hypothesis cannot be rejected and the model is said to be stable. However, if the CUSUM line escapes the boundaries, then the null hypothesis is rejected and the model is not stable (Vogelvang 2005:133).

Secondly, the CUSUM of Squares Test is derived from the squares of the recursive residuals which are given as follows (Greene, 2000:296):

$$S_t = \frac{\sum_{r=K+1}^{r=t} w_r^2}{\sum_{r=K+1}^{r=T} w_r^2} \tag{3.19}$$

The same interpretation applies as to the CUSUM line.

3.6 Research Rigour

In order to ensure reliability, the unit roots were considered to avoid any spurious regression. The results from the unit roots will validate the use of the ARDL methodology as the stationary properties are expected to be mixed. Moreover, the use of diagnostic tests will also

ensure the reliability of the results if the model is normally distributed, free from serial correlation, heteroscedasticity and miss-specification as well as parameter instability as informed by other studies using the same methodology (Odihambo and Nyasha, 2015).

The databases were obtained from the original sources of the data, namely The World Bank and Penn World Tables 9.0 which are internationally recognised databases; hence, the sources promote reliability and validity of the secondary data that will be accessed.
The selection of the proxies was based on the overall suitability of the secondary source data and the ability thereafter to address the research questions and objectives. Therefore, the suitability of the data for analysis needed to answer the research questions and to realise the research objectives was evaluated using the econometric procedures applied in the research study.

3.7 Summary

This chapter explained how the research question, to empirically test the relationship between a set of determinants and economic growth in Zimbabwe, will be done. The variables of interest were discussed namely: economic growth, gross fixed capital formation, inflation, government expenditure, human capital and unemployment. The methodology that was then used to estimate the regression model was then outlined including the initial unit root tests, the bounds test for cointegration, the ARDL model, the ECM and finally the Granger causality test. Finally, the diagnostic tests that will be performed post the estimation of the test equations to assess their validity were described. In the following chapter, the results from these tests are presented and discussed in the context of the theory and empirical evidence presented in chapter 2.

CHAPTER FOUR

EMPIRICAL RESULTS AND ANALYSIS

4.1 Introduction

The previous chapter described the data that was gathered and the tools which were employed to achieve the primary objective of this study, as outlined in Chapter one, to empirically assess the determinants of economic growth in Zimbabwe between 1980 and 2017. This chapter presents the results of the tests and interprets the findings in the context of theory and other empirical studies. Firstly, data descriptive will be shown then unit root test results are presented. Thereafter, the results from the bounds test for cointegration, the long-run coefficients and the ECM are reviewed followed by the Granger causality tests. Finally, the diagnostic tests which assess the reliability of the results are examined. E-Views 10 was used for all the empirical tests performed.

4.2 Descriptive Statistics

The descriptive statistics for the six-time series are presented in Table 4.1. GDP, human capital and unemployment display properties of a normal distribution as reflected by the Jarque-Bera test where the p-value exceeds the conventional significance level meaning that the null hypothesis that the series is normally distributed cannot be rejected. In contrast, government expenditure, gross fixed capital formation and inflation do not follow a normal distribution as the null hypothesis is rejected for each at the 1% significance level. Unemployment, inflation and government expenditure exhibit very high standard deviations which indicates that they have been volatile over the sample period. When comparing inflation, with an average of 82.46%, and unemployment, with a value of 60.02%, their values are higher than for other sub-Saharan economies which average around 14% for both (Moyo, 2016) putting Zimbabwe in a hyperinflationary situation in terms of the relationship between its inflation and unemployment in the observation period. The average GDP, government expenditure and gross fixed capital formation figures for Zimbabwe over the period were $8.83 billion, $1.72 billion and $1.26 billion respectively. Government expenditure was particularly volatile reaching a low of $90.39million in 2008.

The correlation analysis, shown in Table 4.2, shows the highest correlation exists between GDP and gross fixed capital formation while the smallest correlation exists between inflation and human capital formation. There is a strong negative correlation between inflation and unemployment over the time period. Government expenditure has a mildly positive relationship with domestic output of 0.61 while gross fixed capital formation has a negative correlation with inflation of -0.63 over the observation period. Overall the selected variables seem to have a reasonable correlation with growth to be regressors against the same in equations.

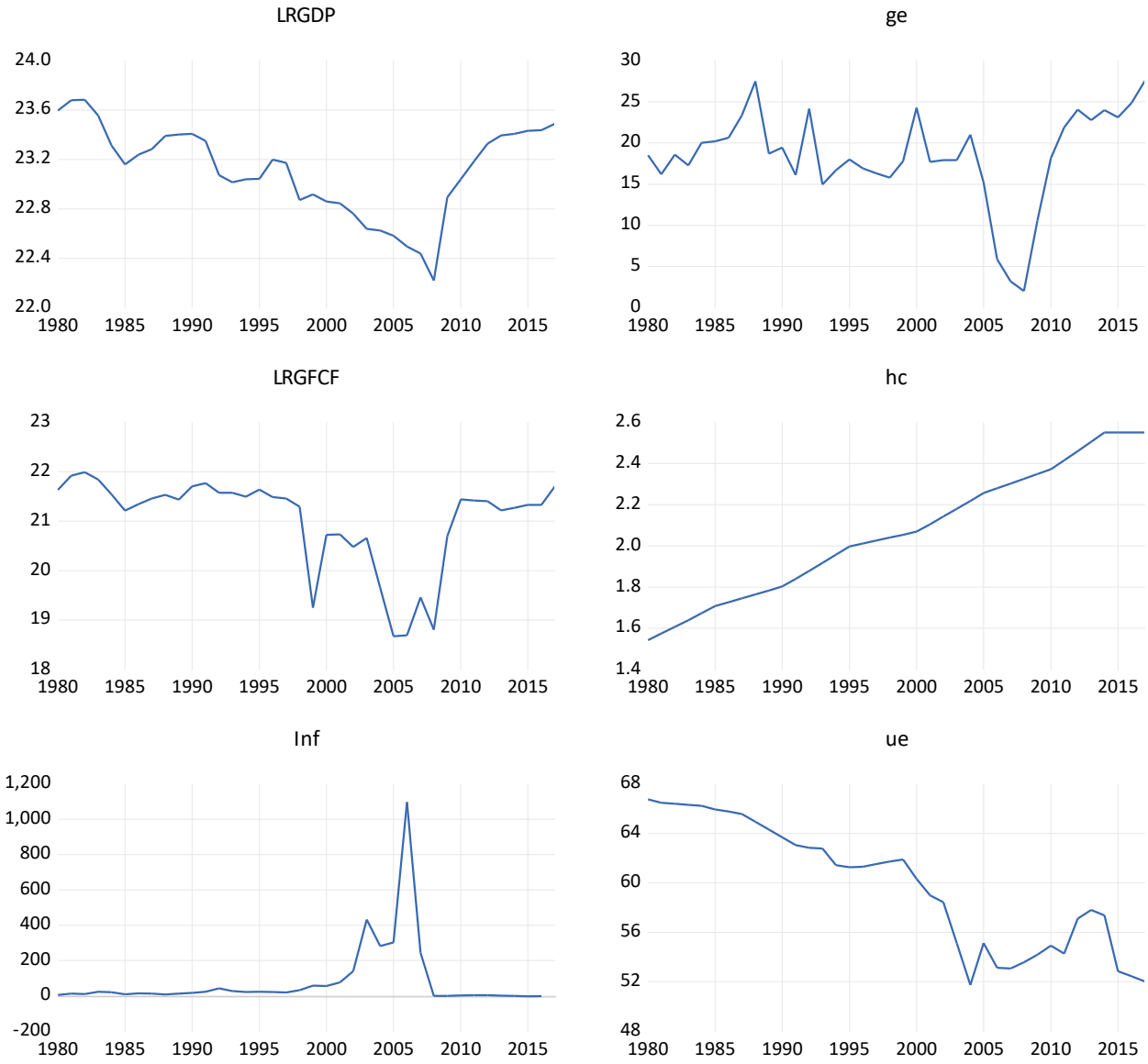
Table 4.1 Data Descriptive

	LRGDP	LRGE	LRGFCF	HC	INF	UE
Mean	23.1077	18.1574	21.0039	2.0519	82.4623	60.0169
Median	23.1732	18.1846	21.4037	2.0399	18.7361	61.3034
Maximum	23.6832	27.4871	21.9890	2.5503	1096.678	66.7548
Minimum	22.2211	2.04712	18.6718	1.5428	-2.3987	51.7384
Std. Dev.	0.36139	5.5704	0.9330	0.3060	197.7847	4.9415
Skewness	-0.5171	-1.2181	-1.4668	0.0679	3.9991	-0.2046
Kurtosis	2.5872	4.7538	3.9168	1.8484	20.1177	1.6412
Jarque-Bera	1.9119	13.8921	14.5637	2.0731	550.3498	3.1047
Probability	0.3845	0.0009	0.0007	0.3547	0.0000	0.2117
Sum	854.9863	671.8249	777.1424	75.9197	3051.106	2220.626
Sum Sq. Dev.	4.7018	1117.062	31.3369	3.3699	1408277.	879.0754
Observations	37	37	37	37	37	37

Table 4.2 Correlation Analysis

	LRGDP	LRGE	LRGFCF	HC	INF	UE
LRGDP	1.0000					
LRGE	0.6179	1.0000				
LRGFCF	0.8362	0.5756	1.0000			
HC	-0.4084	-0.0766	-0.4269	1.0000		
INF	-0.5375	-0.4254	-0.6258	0.1939	1.0000	
UE	0.6007	0.2803	0.5996	-0.9151	-0.4015	1.0000

Figure 4.1: Graphs of time series



4.3 Unit Root Test Results

The graphs in Figure 4.1 show an informal way to identify whether the variables are stationary. The variables are in levels before the unit root tests were applied. The variables are not stationary in levels; this is because the variables are not oscillating around the mean. The results for the ADF and PP tests are shown in Tables 4.1 and 4.2 respectively in levels and first differences, where appropriate, including an intercept, intercept with a trend as well as without a trend or intercept in the test regression.

Table 4.3: Augmented Dickey-Fuller (ADF) Unit Root Test Results

Variable	Order	Intercept (τ_μ)	Trend and Intercept (τ_T)	Without a trend and intercept (τ)	Decision
LRGDP	0	-1.4891	-0.9180	-0.1320	I(1)
	1	-5.1264	-5.4903	-5.1961	
LRGE	0	-2.1428	-2.0714	-0.2646	I(1)
	1	-6.1993	-6.1488	-6.2590	
LRGFCF	0	-2.0166	-2.0116	-0.0704	I(1)
	1	-6.7908	-6.7992	-6.8888	
INF	0	-3.5728**	-3.5718**	-3.2402***	I(0)
	1	-6.4749	-6.4063	-6.5785	
HC	0	0.5134	-4.8134**	1.4586	I(0)
	1	-5.9638	-5.8901	-0.4715	
UE	0	-0.6983	-2.3448	-1.7747*	I(1)
	1	-6.017	-5.9321	-5.6497	

**LRGDP = GDP

P< 0.10*, P<0.05** and P<0.01***

As explained in the preceding chapter, then the test statistic is more negative than the critical value, then the null hypothesis that the variable contains a unit root can be rejected while if the test statistic is not more negative than the critical value, then the null hypothesis cannot be rejected. The results with at intercept, trend and intercept and no trend and intercept indicate that the variables Human Capital Formation and Inflation are stationary at levels as the null hypothesis can be rejected at the 5% significance level or higher. The test statistics for the log of real GDP, gross fixed capital formation and Government expenditure indicate that the null hypothesis cannot be rejected at level terms for all specifications meaning that the series have at least one-unit root. Unemployment is found to also have a unit root. The combination of I (1) and I(0) variables makes it possible to proceed with the ARDL model Estimation

Turning to the Phillips-Perron test results, the findings largely confirm the conclusions from the ADF tests as both LRGDP,LRGE,LRGFCF and UE are identified to be non-stationary at level l(1).Inflation is stationary in levels however though human capital was I(0) in the ADF

tests it is now exhibiting I(1) characteristics. The difference is with regards to HC where the PP test suggests that the series contains more than one-unit root but ADF says it is stationary. We can conclude by pooling the evidence together and thereby cannot reject that human capital has a unit root.

Table 4.4: Phillips-Perron (PP) unit root test results

Variable	Order	Intercept (τ_μ)	Trend and Intercept (τ_T)	Without a trend and intercept (τ)	Decision
LRGDP	0	-1.6429	-0.9180	-0.1267	I(1)
	1	-5.1241	-5.4853	-5.1942	
LRGE	0	-2.3445	-2.2721	0.0092	I(1)
	1	-6.4245	-6.4419	-6.3864	
LRGFCF	0	-2.1487	-2.1007	-0.0616	I(1)
	1	-6.7953	-6.7992	-6.8941	
INF	0	-3.6081**	-3.6195**	-3.2512***	I(0)
	1	-8.5998	-8.5948	-8.7466	
HC	0	-0.9267	-1.6821	9.0318	I(1)
	1	-2.4057	-2.4199	-1.3659	
UE	0	-0.6983	-2.4630	-1.7994*	I(1)
	1	-6.0170	-5.9321	-5.6515	

P< 0.10*, P<0.05** and P<0.01***

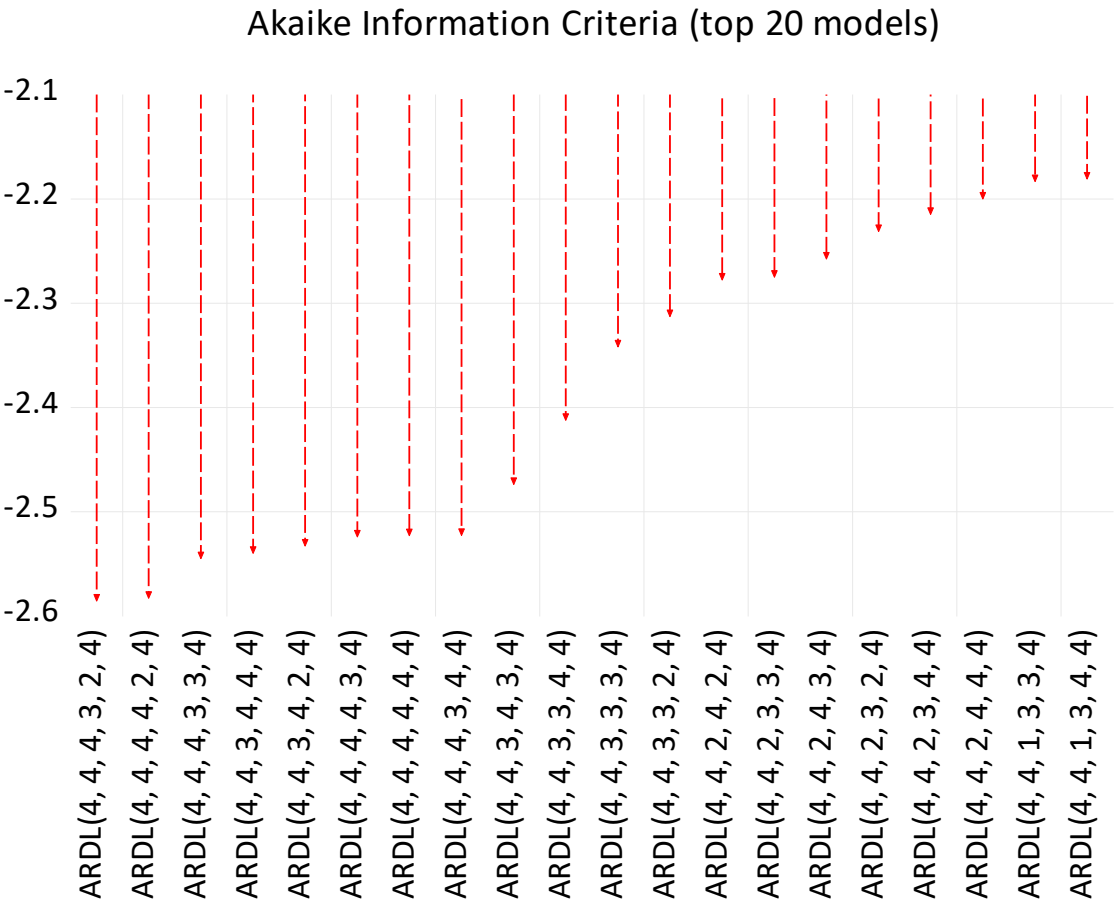
The findings from the two unit root tests that were applied indicated that the dependent variable was I(1) while the independent variables were either I(1) or I(0) when examined with or without a trend and intercept. These conclusions thus make it suitable for the analysis to proceed using the ARDL method.

4.4 ARDL Model Results

4.4.1 Model Selection Criteria

As mentioned in the methodology chapter, the first step in estimating the ARDL model is the determination of the optimal lag length. Figure 4.2 shows the results for this test using the AIC. The results show that ARDL (4,4,4,3,2,4) is the appropriate model to use for this study. This is the combination that minimises the Akaike information criterion a Box Jenkins approach to estimation models with lags.

Figure 4.2: AIC for the ARDL Model



4.4.2 ARDL Bounds Test for Cointegration

Co-integration exists when there is a long-run equilibrium relationship among the variables. The results for the bounds test are shown in Table 4.3. As can be seen, the F-statistic of 11.4252 is greater than the 1% upper bound critical value and thus the null hypothesis can be

rejected at the 1% significance level proving there is a steady-state long-run relationship between economic growth and the selected determinants.

Table 4.5 F-Bounds Test for co-integration results

ARDL F-Bounds Test		
Critical Value	Lower Bound Value l(0)	Upper Bound Value l(1)
10%	2.08	3.00
5%	2.39	3.38
1%	3.06	4.15
F-Statistic	11.4252	

4.4.3 Long-Run Coefficients

The tabulated results in Table 4.7 show the long-run relationships between each of the explanatory variables and economic growth.

Table 4.6: Dependent Variable: GDP Growth ARDL Long-run coefficients

Variable	Coefficient	Probability
LRGE	0.0682***	0.0004
LRGFCF	-0.1504	0.1392
INF	-0.0024***	0.0034
HC	-2.918***	0.0013
UE	-0.1707***	0.0055

P< 0.10*, P<0.05** and P<0.01***

A percentage increase in government expenditure will result in 0.068% increase in GDP. A one-unit increase in the human capital index will result in a 291 % drop in GDP. This is inconsistent with theoretical predictions and may indicate an accumulation of human capital at the expense of other resources necessary for production in Zimbabwe.

Gross fixed capital formation represents physical capital that is actually used in the production of other goods; hence the finding that a 1% increase in gross fixed capital formation results in a 0.15% decrease in GDP is a surprising finding. Inflation has a negative impact on growth as rising prices reduce certainty and disrupt the normal flow of consumption. A 1% increase inflation results in a 0.24% drop in GDP. Unemployment which shows the utilisation of labour should have an inverse impact on GDP; a result which was identified for Zimbabwe as a 1% increase in unemployment reduced GDP by 17.07%. Rampant inflation and rising unemployment could have formed the conditions that resulted in poor economic performance especially at the latter part of the observation period.

Table 4.7: ARDL Long-run coefficients

Variable	Coefficient
LRGE	0.0682
LRGFCF	-0.1504
INF	-0.0024
HC	-2.918
UE	-0.1707

4.4.4 The ECM Results

Given that economic growth and the five determinants were found to be cointegrated, an ECM was estimated so as to observe the short-run relationship between each of the determinants and economic growth and the speed of adjustment in economic growth to any disequilibrium in the preceding period. Table 4.8 shows the results thereof.

The significant coefficients in the short run include the first, second and third lags of economic growth (GDP); thus, past values of economic growth are a significant determinant of economic growth in the short-run. Changes in Government expenditure have a significant contemporaneous effect on economic growth as well as a delayed effect as the first, second and third lags are also significant. Changes in Gross fixed capital formation affect growth with a one year and a three-year lag on growth while inflation affects growth one year later. Changes in Human capital affect growth with a lag of I=one and two years and unemployment also have a delayed effect on growth in the short-run, over one to three years.

The p-value for the F-statistic is 0.0000 which indicates the model is significant. The error correction term is significant and has a negative sign indicating that equilibrium is restored following deviations from the long-run relationship. The value of -1.3680% suggests that 1.36% of disequilibrium is corrected per year. (Odihambo 2014)

Table 4.8 ECM Results

Variable	Coefficient	T- Statistic	Probability
D(LRGDP(-1))	0.2090	0.0926	0.0648
D(LRGDP(-2))	0.7049	0.0962	0.0003
D(LRGDP(-3))	0.8289	0.1113	0.0003
D(LRGE)	0.0156	0.0038	0.0062
D(LRGE(-1))	-0.0687	0.0082	0.0002
D(LRGE(-2))	-0.0471	0.0064	0.0003
D(LRGE(-3))	-0.0254	0.0053	0.0031
D(LRGFCF)	0.0305	0.0196	0.1708
D(LRGFCF(-1))	0.0982	0.0219	0.0041
D(LRGFCF(-2))	-0.0355	0.0265	0.2277
D(LRGFCF(-3))	-0.0883	0.0251	0.0126
D(HC)	-1.1425	1.4495	0.4606
D(HC(-1))	-6.0766	1.7838	0.0144
D(HC(-2))	21.3858	1.9035	0.0000
D(INF)	-0.0002	0.0001	0.0622
D(INF(-1))	0.0015	0.0002	0.0004
D(UE)	0.0149	0.0107	0.2116
D(UE(-1))	0.1888	0.0176	0.0000
D(UE(-2))	0.1949	0.0231	0.0002
D(UE(-3))	0.1837	0.0346	0.0018
CointEq(-1)*	-1.3680	0.1082	0.0000

P< 0.10*, P<0.05** and P<0.01***

4.5 The Granger Causality Test Results

As explained in the preceding chapter, to further analyse the short-run relationship between the selected determinants and economic growth, the Toda Yamamoto Granger causality test was used, with the focus on causality from the determinants to economic growth (i.e. only a unidirectional relationship). The results are presented in Table 4.9 and present the results for the χ^2 test. In the Toda Yamamoto Granger Causality tests the variables are tested for Granger Causality in levels being wary to adjust for the highest level of integration of variables in the model.

Table 4.9 Toda-Yamamoto Granger Causality Results

Dependent Variable	Statistic	Probability	No. of lags used
LRGE causes LRGDP	2.9527	0.2285	2
DLRGFCF causes LRGDP	0.7245	0.6961	2
HC causes DLRGDP	6.7619	0.5625	8
INF causes LRGDP	31.673	0.0000	4
UE causes LRGDP	55.4919	0.0000	9

P< 0.10*, P<0.05** and P<0.01***

The results indicate that the null hypothesis of no causal relationship between each determinant and economic growth was rejected at the 5% significance level for government expenditure, Gross fixed capital formation and human capital, suggesting that these variables do cause economic growth in the short-run. Inflation and unemployment do Granger cause growth in the short run. Unemployment and inflation have significant coefficients in the error correction model and their results are in line with Odihambi and Nyasha (2015)

4.6 Diagnostic Test Results

Several diagnostic tests were employed to assess the extent to which the ARDL model satisfied the assumptions of the CLRM. For this purpose, the JB test for the normality of the residuals,

the BG test for autocorrelation, the BPG and ARCH tests for heteroscedasticity, Ramsey's Reset test for the correct functional form, and the CUSUM and CUSUM of squares tests for parameter stability were implemented. Table 4.10 summarises these results with the exception of the tests for parameter stability which are depicted in Figures 4.3 and 4.4.

Table 4.10: Diagnostic Test Results

Test	Null Hypothesis (H_0)	Test Statistic	P-Value	Conclusion
JB test	Residuals are normally distributed.	2.3094	0.3151	The residuals are normally distributed.
BG test	No autocorrelation in the error term.	3.0247	0.1584	There is no serial correlation.
BPG test	The residuals are homoscedastic.	0.64429	0.7990	The residuals are homoscedastic.
ARCH test	The residuals are homoscedastic.	3.6270	0.0397	The residuals are Heteroscedastic.
Harvey Test	The residuals are homoscedastic.	1.3993	0.3589	The residuals are homoscedastic.
Ramsey's reset	The linear functional form model is correct.	2.0459	0.2120	The linear functional form is correct.

The p-value for the JB test exceeds the conventional significance levels of 1%, 5% and 10% and therefore the null hypothesis that the residuals are normally distributed cannot be rejected. The assumption therefore of the CLRM that the residuals are normally distributed is upheld in the model estimated in this study.

The serial correlation test yielded a p-value of 0.1584 meaning that the null hypothesis of no serial correlation in the error term of the model could not be rejected. A similar conclusion was reached for Breusch Pagan Godfrey and Harvey heteroscedasticity tests that were performed as the null hypothesis of homoscedasticity could not be rejected. The Ramsey rest test with p-value of 0.2120 confirms that the model does not suffer from model misspecification issues. It can therefore be concluded that the linear form adopted is correct.

Lastly, the structural stability of the model was assessed using the CUSUM and CUSUM of squares tests. As reflected in Figures 4.3 and 4.4, both tests revealed that the model was stable as the CUSUM lines were within the 5% critical lines. Overall, therefore, it can be concluded that the results of the empirical analysis can be considered robust given the findings of the diagnostic tests.

Figure 4.3: CUSUM Stability Test

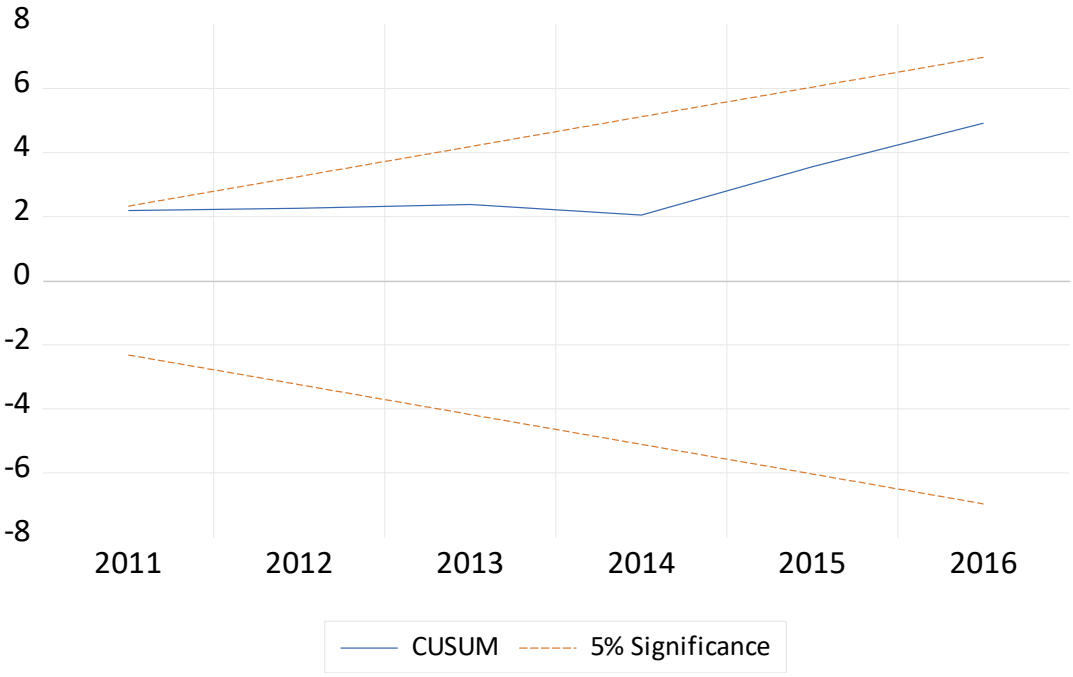
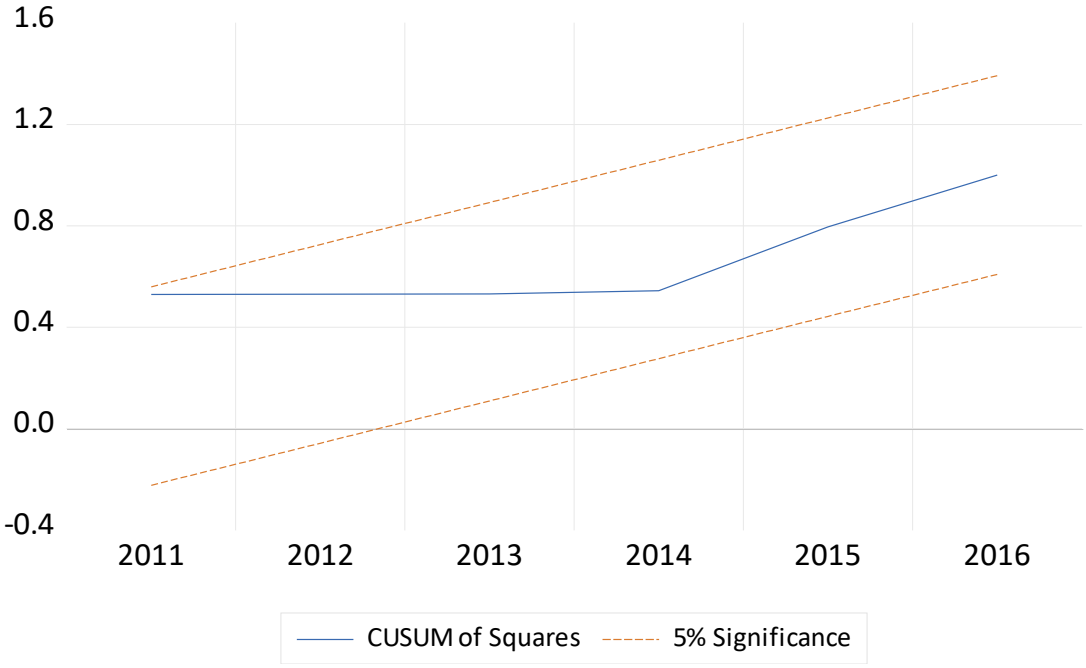


Figure 4.4: CUSUM of Squares Stability Test



4.7 Summary

This chapter presented the results for the analysis of the role of inflation, government expenditure, gross fixed capital formation, human capital and unemployment in determining economic growth in Zimbabwe over the period 1980 to 2017. The ARDL bounds test showed the presence of co-integration between the selected determinants and economic growth. In the long-run gross fixed capital formation positively affects economic growth while human capital negatively does so. The ECM found that in the short run there is a positive relationship between lags of economic growth, government expenditure, inflation and human capital and economic growth. The diagnostic tests confirmed that the explicit and implicit assumptions of the CLRM held and hence the results can be considered reliable. The following chapter summarises the study, provides policy recommendations and suggestions for future research.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In the previous chapter the statistical tests were presented and the findings discussed. This chapter provides the conclusion to the study, policy recommendations and suggestions for future research.

5.2 Summary of Research Objectives

In Chapter One the focus of this study was explained as to empirically assess the influence a select set of macroeconomic variables has on economic growth in Zimbabwe. This objective was achieved in Chapter Four, when the Auto Regressive Distributed Lag (ARDL) and the Error Correction Model (ECM) were employed. The findings showed that there is a relationship between a select set of macroeconomic variables and economic growth.

There were four secondary objectives; firstly, to provide an overview of the Zimbabwean economy and how the chosen variables come to play in comparison to other nations, developed and developing. This was shown in Chapter Two, the industry is still growing, and the progress is anecdotal considering the economic situation in the country. Secondly, to provide an overview of trends in economic growth in Zimbabwe, this was also explained in Chapter Two.

An empirical investigation was conducted to test the hypothesised relationships among the selected variables. Chapter Four tested the variables of interest using the Stationarity Tests, ARDL Bounds Test, ECM and Wald Tests. There existed co-integrating, short run and causal relationship between a select set of macroeconomic variables and economic growth.

Lastly, this chapter puts forward recommendations to the stakeholders in the Zimbabwean economy regarding the empirical results from the study. The recommendations will be explained at the end of this chapter.

5.3 Summary of Literature Review

In chapter 2, the literature showed how different variables interact with economic growth, from financial development to unemployment effects, the chapter scrutinised theoretical and empirical evidence. The study also noted that a healthy financial system and fluid capital formation facilitated from both public and private sources is a key ingredient in economic growth. The role of financial development is to provide a thriving environment for financial institutions who ultimately are responsible for allocating financial resources from unproductive markets to those that are more productive which in turn fosters economic growth.

The empirical literature showed that a select set of macroeconomic variables can reduce poverty, improve lifestyles as well as having a strong relationship with economic growth in some countries. The systematic overview of the study revealed that the economic crisis that occurred in Zimbabwe was influenced by many factors, namely, weak macro-economic policies, governance problems, weakened economic performance as well as a lack of investor confidence amongst others.

The hyperinflation that was experienced in the country caused macroeconomic instability which made it more difficult for businesses to survive. The participation in the Democratic Republic of the Congo war, government deficits, quasi fiscal activities and land reforms are some of the factors that exacerbated the situation. A total of eight policies were put in place to stabilise the economy from 1996 to 2008 which did not achieve their intended purpose. The Short-Term Emergency Recovery Programme that was implemented in 2009 to stabilise the economy was more successful as inflation was reduced and there was positive economic growth.

In Zimbabwe, the main challenges that the economy faces stem from lack of political will that ought to be exhibited by government. Issues of corruption, sound policy, sustainable policy, government expenditure discipline, matters of the rule of law, its selective application and gross disobedience to human rights, mar the path to economic recovery for Zimbabwe. It is the view of this research that even though the study was not mainly focused on these misgivings, they constitute a greater deal in the overall discussion – quantitatively these are difficult to measure but qualitatively, they stick out at every turn in the development path.

5.4 Summary of the Research and Methodology

Chapter Three explained how the methodology was applied in this research. The model used the following variables economic growth, gross fixed capital formation, inflation, government expenditure and unemployment. The procedure firstly determined the stationarity properties of the variables, subsequently; the Wald test was used to identify whether there is any co-integration amongst the variables. Thereafter, the Auto Regressive Distributed Lag (ARDL) Model and Error Correction Model (ECM) were employed to test the short and long run coefficients. Lastly, the diagnostic tests were used to shed light on the distribution, heteroscedasticity, serial correlation misspecification and stability of the series.

5.5 Summary of the Empirical Results and Analysis

In Chapter Four, various tests were undertaken in order to determine the relationships between the variables of interest. The stationarity tests showed that the variables had mixed stationarity properties, whereby the dependent variable was I(1) and the independent variables were I(1) and I(0). Subsequently, the ARDL Bounds test revealed that among the selected variables gross fixed capital formation and human capital development are significant determinants of economic growth. The ARDL model indicated that in the long-run gross fixed capital formation has a positive influence on economic growth while human capital development has a negative influence.

Moreover, in the short run, the ECM showed that past lags of growth, gross fixed capital formation, inflation and unemployment had a positive influence on economic growth. Human capital development and government expenditure had a negative relationship in the short run. The Wald test revealed that there was a causal relationship between the variables. Furthermore, the diagnostic tests indicated that there was no serial correlation, heteroscedasticity and misspecification. Moreover, it showed that there was normal distribution as well as stability in the model.

These findings lend credence to previous studies as documented by Ghura and Hadji (1996), Beddies (1999) and Kumo (2012). In the case of Nigeria after employing the Vector Error Correction Model in an effort to understand the impact of capital formation. They also showed positive movements on the stock market and negative impact on inflation and interest rates.

5.6 Recommendations and Policy Implications

In order for the Government of Zimbabwe to change the trajectory of economic growth, promoting gross fixed capital formation and re-contextualising the human capital development drive would be a lasting way to do so. This study has provided robust evidence indicating that gross fixed capital formation in the long run has a positive effect on economic growth in Zimbabwe. Increasing funding for projects such as, the Zimbabwe Infrastructure Fund and the Infrastructure Development Bank of Zimbabwe will affect the economy in a period of one to three years. In addition, the findings of this study can also justify development institutions in Zimbabwe to prioritise funding for infrastructure.

5.7 Limitations of the Study

The unavailability of some of the quarterly data was eased by using the Chow-Lin match last data interpolation method. Some years the data had to be calculated and assumptions had to be made based on the percentages reported by the Reserve Bank of Zimbabwe as was explained in section 3.3.

There are also some considerable setbacks and constraints the researcher encountered when carrying out the study and these had an impact on the results. The constraints included some of the following:

- Data was not readily available, for instance data for some years in the study period was missing.
- Reliability and integrity of data was compromised due to different sources having varying values of similar data periods.

5.8 Further Research

This study was a base for further studies that determine the drivers of economic growth in Zimbabwe; using more economic indicators in the study. In addition, possible studies could identify the thresholds at which key variables like inflation begin to deter growth especially through the hyperinflationary environment. Furthermore, a study on the impact of enhancing cross border trade using on economic growth in Zimbabwe could be of benefit.

5.9 Conclusion

The findings showed that gross fixed capital formation positively influences economic growth in Zimbabwe; however, gross fixed capital formation is not a silver bullet or a panacea for the

lack of economic growth in an economy, there is need for collective action by citizens, industry, politics and civic societies. Furthermore, there is need for political stability, visible application of the rule of law and respect for human rights. The results also provide justification for the pursuit of the Sustainable Development Goal's by capitalising on infrastructure development through enhancing gross fixed capital formation.

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