FOREIGN DIRECT INVESTMENT (FDI) AND AGRICULTURAL GROWTH IN ZIMBABWE

BY

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CERTIFICATE OF DISSERTATION

The undersigned certify that they have read and recommended for submission to the Department of Agricultural Economics and Development, in partial fulfillment of the requirements of the Bachelor of Science Degree in Agricultural Economics and Development, a research by Zingwena Taurai entitled:

FOREIGN DIRECT INVESTMENT (FDI) AND AGRICULTURAL GROWTH IN ZIMBABWE.

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DEDICATION

To my family and friends.

ABSTRACT

Low levels of government spending in the agricultural sector over the past years together with poor attraction of external capital are among the major determinants of low agricultural growth in Zimbabwe. The purpose of this research was to examine the impact of (FDI) on agricultural growth in Zimbabwe and to analyze other macroeconomic variables which affect growth in the long run. The exploration of the impact of FDI on agricultural growth was grounded on the growth framework. Secondary data was used for the study and time series data was collected for the period 1980 to 2012 and the study established the determinants of agricultural growth and estimate the impact posed by FDI on growth. The Stock-Watson Dynamic Ordinary Least Squares (DOLS) method was used to analyze the long run elasticities. The study revealed that there exist a positive relationship between FDI and agricultural growth in the long run with an elasticity of 0.07 although it is inelastic. All other macroeconomic variables included in the model have expected signs statistically significant. The study contributed in adding more literature on the relationship between agricultural growth and foreign direct investment. The government should foster policies which create conjusive environments for FDI inflows and should address policies which attract more inflows of FDI.

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ACRNOYMS

ADF	Augmented Dickey Fuller
AfDB	African Development Bank
ARCH LM	Autoregressive Conditional Heteroscedasticity Lagrange Multiplier
CUSUM	Cumulative Sum of recursive Residual
CUSUMSQ	Cumulative Sum of Squares of Recursive Residual
DOLS	Dynamic Ordinary Least Squares
ESAP	Economic Structural Adjustment Program
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GLS	Generalized Least Squares
GMM	Generalized Methods of Moments
GoZ	Government of Zimbabwe
HAC	Heteroscedasticity and Autocorrelation
MNEs	Multinational Enterprises
MoAMID	Ministry of Agricultural Mechanization and Irrigation Development
MoF	Ministry of Finance
ML	Maximum Likelihood
OLI	Ownership, Location and Internalization
OLS	Ordinary Least Squares
RBZ	Reserve Bank of Zimbabwe
TFP	Total Factor Productivity
WDI	World Development Indicators
ZIA	Zimbabwe Investment Authority
ZIMPREST	Zimbabwe Program for Economic and Structural Transformation
ZIMSTATS	Zimbabwe Statistics Agency

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Zimbabwe agricultural sector has been the mainstay to economic stability and growth but due to disastrous economic policies, political instability, illiquidity problems and deterioration in infrastructure the sector is underperforming living many people food insufficient (Moyo, 2013). Agricultural productivity is remaining very low which is related to low levels of capital spending which reduces the uptake of productive farm technologies and efficiency. The low levels of production output for the past decade has made Zimbabwe the net food importer in the region and most of its population relying on food aid and emergence relief (Saruchera, Kapuya, Jongwe, Mucheri, Mujeyi, Ndobongo and Meyer, 2010).

Rukuni (2006) noted that agricultural growth was impacted by factors like land reform program, control of producer and food prices and lack of security of tenure among other macroeconomic dispensations which adversely impacted investment in the agricultural sector. The National budget also highlighted that the contraction of the agricultural sector is mainly due to liquidity problems from poor government spending, fiscal revenue underperformance and capacity utilization (Government of Zimbabwe, 2013; 2014). The sector's present state of technologies, infrastructure and a poor research and development technologies and limited access to borrowed capital are also significantly affecting the sector.

Zimbabwe has good agro-ecological regions for agricultural activities, good agricultural climate, high levels of skilled labour and vast opportunities for foreign investment in value addition in the tobacco, cotton processing and agricultural infrastructure. Despite all these factors, the real agricultural growth rate is still remaining low and production during the past decade was low in nominal and real terms (African Development Bank Report, AfDB, 2011)

Government policies in the agricultural sector supported by political instability and poor environment for investment in the country have affected the inflows of foreign direct investment (FDI) in the sector (Chingarande et al, 2012). Agricultural growth fell from 22 % in 2001 to

about 10 % in 2008 which also corresponds to low levels of FDI during the same period. Low levels of investment *visa-vis* low government spending in the sector failed to sufficiently sustain the existing capital stock to increase agricultural production for the last decade.

Total FDI inflows averaged 14-20 % of gross domestic product (GDP) since 1980 have declined to 1.1% of GDP by 2012 placing Zimbabwe among the least attractive investment destination in Southern Africa (Zimbabwe Investment Authority, 2012). Agricultural FDI inflows and stocks since the dollarization era increased from 0.4 % in 2009 to 2.3 % in 2012 with China, South Africa and Spain being the highest investors respectively and real agricultural growth for the period dropped from 21 % to 5.1% (GoZ, 2013). Figure 1.1 shows the relationship between FDI inflows and agriculture growth in Zimbabwe since 1980 in natural logarithms.

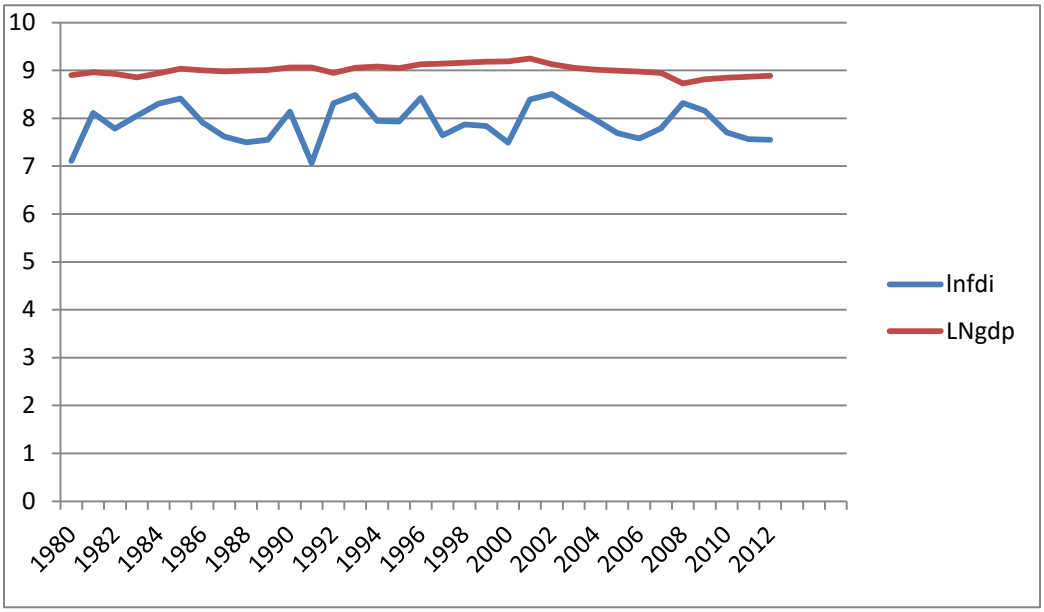

Figure 1.1: Trend between agriculture output and FDI inflows (1980-2012)

Source: World Bank Development Indicators, 2013

The Economic Structural Adjustment Program (ESAP) and Zimbabwe Program for Economic and Social Transformation (ZIMPREST) were formed in order to support agricultural policies implemented by the government to promote food self-sufficiency in food and raw-materials. These programs were targeting the removal of export incentives and import licensing regime by calling for export increasing and import substitution until 1998 where there was policy reversal in the framework of liberalization. As a result of trade openness foreign investment increased

during the period 1994 to 1999 and started to decline after the collapse of ZIMPREST and the early stages of land reform (Chingarande et al, 2012)

The agricultural sector is important in Zimbabwe because of its contribution to exports base, provision of livelihoods especially the rural population and has strong linkages with other production sector as a source of raw materials. Recent studies in Ghana, Nigeria, Tanzania and Egypt showed that low agricultural performance was due to capital constraints therefore FDI was the only source of capital to counter the constraints. Msuya (2007) said that inflows of FDI increased agricultural output since it corrected government failure to support and finance farmers in the rural areas of Tanzania with agricultural inputs.

Agricultural growth is accelerated by additional quantities of factors of production and allocation efficiency (Ajuwon and Ogwumike, 2013). They further stressed out that many developing nations are labour abundant and scarce in capital which is a result of low per capita income which leads to shortages in domestic savings. The past domestic savings will result in new capital formations which lead to investment which means that by affecting capital formations, FDI ought to be capable of influencing agricultural growth and production output.

In most developing countries agriculture is the major employer and economic growth is mirrored by the performance of the agricultural sector. Massoud (2008) reiterated that FDI may benefit the host country in employment generation, enhances domestic investment through increased tax revenue and new technology, skills and knowledge. These factors contribute to higher economic and employment growth which are the effective tools for poverty reduction. However some studies highlighted that FDI contributes to growth only when there is sufficient absorptive capacity in the host country.

1.2. PROBLEM STATEMENT

Zimbabwe experienced serious economic stagnation from the year 2000-2008 with serious economic hardships hitting the country. High levels of political instability, liquidity crunch, sectoral targeting policies and a risky business environment reduced the barometer of investment inflows during this period (GoZ, 2014). The country has a lot of arable land, good weather conditions for agricultural activities and backward linkages with other industries among its

strengths. A lot of opportunities exist in the sector especially value addition business of crops like tobacco and cotton which are exported in raw form

Despite having these strengths and opportunities and given the importance of the agricultural sector in Zimbabwe, growth in the agricultural sector and its productivity still remaining low despite the stability of some of its macroeconomic variables. Recent studies in many developing countries established that there is a complementary relationship between FDI and agricultural growth therefore it remains important to examine whether inflows of FDI also stimulate agricultural growth in Zimbabwe since most macroeconomic variables are now stable.

1.3. RESEARCH OBJECTIVES

The main objective of this research project is to examine the impact of FDI on agricultural growth in Zimbabwe. The specific objective of the research is:

- To examine the contribution of FDI into the agricultural sector in Zimbabwe.
- To analyze other macroeconomic variables which affect agricultural growth in the long-run.

1.4. HYPOTHESIS

H_0: FDI does not significantly impact agricultural growth in Zimbabwe.

H_1: FDI significantly impact agricultural growth in Zimbabwe.

1.5. JUSTIFICATION OF THE STUDY

The agricultural sector of Zimbabwe plays an important role in the economy and has the potential to increase the overall growth prospectus which means that investing in the sector will foster a self-sustaining economy rather than continued reliance on exports. Since more than 70% of Zimbabweans live in rural areas with the agriculture as their mainstay for living, FDI will impose an indirect impact on growth through increased employment and income, allowing movement of capital inflows into the sector is the central role to eradicate poverty.

Many research studies on FDI in Zimbabwe were mainly focusing on the relationship between FDI and economic growth but the relationship between agriculture and FDI is less known despite

that economic growth is mirrored in agricultural growth for example research by Moyo (2013). Other researches focused on the relationship between agricultural growth and factors like policy reforms, corruption, and modeling the growth function without FDI as a factor of production. Therefore this study is relevant as the results will relatively add to the scarce literature of FDI and agricultural growth globally. The study will also help in policy formulations and policy mechanisms identifying gaps in existing policies and it will also open new gaps for other researches.

1.6. ORGANIZATION OF THE STUDY.

The research is organized into five chapters. Chapter two is the literature review. It starts with the discussion about the theoretical review why firms engage into FDI and also presents the empirical review on the relationship between FDI and agricultural growth with insights from the literature closing the chapter. Chapter three is the research methodology. It presents the model specification, justification of variables, data collection tools, sources and the estimation procedures for the data collected. Chapter four presents the data presentation and analysis and the final chapter will give the recommendations and conclusions to the research study.

CHAPTER TWO

LITERATURE REVIEW

2.0 INTRODUCTION

The issue of foreign direct investment is gaining more attention at both national and international level especially in developing nations. Many researches have tried to explain the existence of FDI considering the motives for engaging in FDI but no theory accepted to explain the existence of FDI (Vintila, 2010). The current dominant theories of FDI were developed by Coase, Dunning, Hymer and Vernon who believed that FDI is an important element for economic development in many developing nations. The first part of this chapter explores the theoretical review of the main theories why firms engage in FDI which are internalization advantages theory, monopolistic advantages theory, and eclectic theory or OLI framework. The second part outlines the theoretical framework and empirical review of the relationship between FDI and agricultural growth.

2.1. DEFINATION OF TERMS

Foreign Direct Investment

Moosa (2002: 1) defined Foreign Direct Investment as "a process whereby residents of one country (the source country) acquire ownership of assets for the purpose of controlling the production, distribution and other activities of a firm in another country (the host country)."

United Nations (UNCTAD) (2012) defined FDI is an investment involving a long term relationship and reflecting a lasting interest and control of a resident entity in one economy in an enterprise resident in an economy other than of the foreign direct investor.

Agricultural Growth

In this research agricultural growth is measured in terms of agricultural productivity or increase in agricultural output. It can also be defined as the ratio of agricultural output to agricultural input and can be measured by total factor productivity (TFP). This research defined agricultural

growth as the net output of the sector after adding up all outputs and subtracting immediate inputs.

2.2. THEORETICAL LITERATURE REVIEW

This section outlines the major theories which try to explain the motives for operating abroad, reasons for taking different forms and what enables them to survive in foreign environments. Firms can invest abroad for market seeking and efficiency seeking benefits which maybe through horizontal FDI, vertical FDI or conglomerate FDI.

2.2.1. Monopolistic Advantages Theory

The monopolistic advantages theory was developed by Hymer (1960) who tried to answer why firms invest abroad and how are they able to survive and why they want to retain control and ownership. The theory pointed out that in order to survive a foreign firm should have certain specific advantages which are not present to local firms in the host country. These specific advantages include technological knowledge, managerial skills and economies of scale which help them to monopolize and control production. Hymer (1976) argued that FDI is a firm level specific decision and not a capital market financial decision. In developing the monopolistic advantages theory of FDI, Hymer asserts that the motive to perform FDI is explained by the industrial organization and imperfect competition theories. Kindleberger (1969) and Ardiyanto (2012) also pin pointed that FDI cannot exist in a world characterized with perfect competition therefore imperfect competition is the only way for FDI to pursue.

Brainard (1997) reiterated that if markets work effectively in a perfect competitive economy with no market distortions, trade is the only way to engage in international trade rather than through FDI. For FDI to pursue, Hymer (1976) put forward that monopolistic advantages should have features like factor market imperfections which can be due to proprietary technology and access to borrowed capital. This means that the presence of those advantages will increase monopoly profits and the more the firms will engage into FDI (Kuslavan, 1998).

The theory also assumes that features of market distortions inform of tariffs or trade barriers imposed by the host country government as a way to influence monopolistic advantages also allow firms to engage in FDI. The degree of openness and the trade regime in the host country is considered as a major determinant in relation to FDI inflows. Thus the efficiency and efficacy of

FDI in promoting growth is likely to be higher in countries pursuing export promotion strategy than import substitution (Balasubramanyam, Salisu and Sapsford, 1999). The greater the openness an economy is to international trade, the more the flows of FDI funds into the nation and the more the firms engage in foreign investment (Kongruang, 2002). Caves (2006) added that, for FDI to be effective in the host country there should exist internal or external economies of scale which can be as a result of production or marketing expansion.

These economies of scale can be realized from either horizontal FDI or vertical FDI meaning that increased production through horizontal FDI results in decreases in unit costs of services while vertical FDI allows foreign firms to benefit from local advantages by maximizing economies of scale in producing a single product (Caves, 2006). Another feature which is detrimental for FDI to pursue is product differentiation and the quality of skills which may lead to imperfections in the goods market (Ardiyanto, 2012). Thus the issue of trademarks and patents play a significant role in ensuring excludability of local firms from producing the same product and this reduces competition if the FDI motive is market seeking.

The monopolistic-oligopolistic theory claimed that the existence of FDI is exclusively due to market imperfections therefore firms can supersede these market failures through direct foreign investment. When imperfections are not present in the market, FDI will not occur and international production will be undertaken through offshoring, export and import arrangements or outsourcing (Vintila, 2010).

2.2.2. Internalization Advantages Theory

The internalization theory was first developed by Coase (1937) who explain the growth of multinational companies (MNEs) and their motivation for achieving FDI. The theory was further developed by Buckley and Casson (1979, 2001, 2009) who considered FDI as an economic asset to link international markets and internalize transactions within the firm. The theory is based on the assumption that firms choose the least cost location for each activity and that firms grow by internalization up to the point where further internalizing brings in more costs than benefits (Alberta, 2006). Internalization costs include avoiding search costs, capture economies of interdependent activities and control of market outlets.

The theory further argues that firms do not need monopolistic or oligopolistic advantages when they are at the initial stages of investing but they can be internalized later. Internalization theorists argue that internalization creates contracting through a unified governance structure but it rather takes place because there is no immediate market for the product needed or the external market for the product is inefficient (Alberta, 2006). Regarding the fact that most foreign firms are profit maximizing and growth oriented, the existence of imperfections in intermediate products will internalize external market so as to increase their profits by offsetting some costs (Kuslavan, 1998).

The internalization theory holds that the available external market fails to produce an efficient environment in which firms make profit using the present state of technology and resources. Coase (1937) explained why economic activity was organized within firms by arguing that firms exist because they reduce transaction costs from human production incapabilities. When transaction costs are prohibitive thus MNEs exists as a response to market failure trying to increase allocative efficiency (Buckley and Casson, 2009). In addition to that, if the exogenous market imperfections cause MNEs to internalize markets or replace expensive transaction models then internalization increases efficiency.

Williamson (1985) extending the internalization theory also treated the firm as a governance structure and asserts that costs of using the market can be avoided by performing intra firm transactions. The transaction cost approach therefore provides the main explanation of how MNEs operate and FDI in this framework is the main instrument to internalize the transaction costs. Through internalization, global competitive advantages are developed forming international economies of scale. Thus the aspect of control should be segmented by product line and distributed among different subsidiaries depending on particular capabilities and environmental conditions.

2.2.3 Ownership, Internalization and Specific Advantages Theory (OLI framework)

Dunning (2001) encompasses all the works of Hymer and Coase into the eclectic theory or the OLI framework. The theory combines the country specific, ownership-specific and internalization factors in articulating the benefits of international production. The main hypothesis of the eclectic theory was that the firms prefer working capital investment to export if the transaction costs advantages are high and there exists favorable production conditions.

Dunning (2001) classified three set of advantages as major factors which determine the pattern, extent and the form of FDI which are ownership, location and internalization advantages.

According to Dunning (2001), ownership advantages are the income generating assets which motivates firms to undertake production abroad other than in the home country. The ownership advantages are similar to the monopolistic advantages of Hymer (1960) and these ownership advantages will be different depending on firm characteristics, production goods and markets they operate (Ardiyanto, 2012). The ownership advantages possessed by foreign firms should have the characteristics of excludability of other local firms from the product, transferability and should produce and market products through its own internal subsidiaries. Thus the ownership advantages have specific advantages which include monopoly advantages through trademarks and brands, technology and economies of large scale.

International market imperfections in the labour and capital markets cause differences in the production costs among nations. This is because in most developing countries, labour costs are low which encourages FDI inflow while higher prices of labour tend to discourage FDI (Kongruang, 2002). This clearly highlights that ownership advantages provide firms with market power and competitive advantage over domestic markets through trade markets and patents

The location specific advantages refer to the factor endowments like government policies, market structures and all environments in which FDI is undertaken. Therefore the decision on where to invest and not to invest is determined by the opportunity for acquiring more profits using the firm specific advantages. In other words, the country's social, political and economic conditions are considered detrimental/ important in attracting FDI inflows (Anyanwu, 2011). Market size, macroeconomic stability, economic growth, production costs and the stage in development phase are the macroeconomic determinants which may attract or detract direct investment in to the host nation.

If trade barriers exist in the recipient country, market factors are relevant to the possibility of allowing investment (Chorell and Nilsson, 2005). Dunning (2001) highlighted that FDI only occur when MNEs possesses both ownership and internalization advantages but when internalization advantages are absent, production is licensed to local firms in foreign market. The motives for FDI like resource seeking, efficiency seeking, market seeking and strategic seeking

also help to explain the location advantages (Zbida, 2010). Thus the greater the interest in using these ownership and internalization advantages the greater the possibility of performing FDI.

Dunning (2009) clarified that internalization advantages come as a result of benefits the firm gain from its value added activities and firms seek to avoid search costs and negotiation costs. The advantages are important in determining whether MNEs choose to use its ownership advantages between own production and licensing to external firms.

Although the theory provides a comprehensive view of explaining FDI and contribution to growth, it fails to address how MNE's ownership advantages should be developed and exploited in international production (Shenkor, 2007). The theory does not explicitly delineate the ongoing, evolving processes of international production since FDI is a dynamic process in which resource commitment, production scale and investment approaches changes over time.

2.3. THEORETICAL FRAMEWORK

The exploration of the effects of FDI on agricultural growth is grounded on the framework of new growth theory. Massoud (2008) and van Leeuwen (2007) accounted that FDI can endogenously affect growth in an economy if it results in increasing returns to scale through increased productivity. Government policies to host FDI are of greater concern for growth of production output to pursue since FDI inflows are regarded as a source of capital and technological change. The Solowian exogenous growth theory (1950) included capital (K) and labour (L) and total factor productivity or technology (A) which explain long run growth. Thus the Solow growth model represents how inputs are combined to produce output with a given technology.

$$Y = f(K, L\ A)$$

This model is based on the assumption of marginal changes in output and factor inputs which means that the equation follows a Cobb-Douglas production function of the form

$$Y = K_t^{\alpha}\ L_t^{\beta}\ (AL)^{1-\alpha-\beta} \quad \text{for } 0 \leq \alpha \leq 1 \text{ and } 0 \leq \beta \leq 1 \text{ such that } \alpha + \beta = 1$$

α and β are partial derivatives of growth rate in GDP with respect to growth rate in the factor inputs.

In the endogenous growth model or Solow growth model, only one factor of production is supplied indefinitely in order to have long run growth. In classical growth models land is supplied in limited quantity which imposes diminishing returns to capital and labour which means that labour cannot be produced indefinitely (Boreinsztein, Gregorio and Lee, 1998). Endogenous growth models substitute labour with human capital since labour exhibit diminishing returns in the long run and FDI is introduced as a source of long term growth (van Leeuwen, 2007). Thus

$$Y = f(FDI, HK, a)$$

Where FDI is Foreign Direct Investment, HK is human capital and *a* is the level of technology.

2.4. EMPIRICAL REVIEW

Empirically the study on FDI and agricultural growth in most developing countries especially in Africa reviewed that there is a positive relationship between the two variables depending on the absorptive capacity of the host country. The researchers also found that FDI determinants like trade liberalization, market imperfections are necessary for FDI to prevail in many countries. Theoretical and empirical literature outlined that inflows of FDI into the host nation brings in new knowledge and capital investments, create employment improve market competitiveness and also increases the total factor productivity (agricultural output) through the effect of effective and efficient technologies.

Adamassie and Matambalya (2002) using the Cobb-Douglas stochastic frontier production function with FDI as a source of capital accumulation and technological change, labour was proxied of percentage of secondary school enrolment, land as a proxy of market size, and available credit. Time series data on the variables from 1992 to 2005 was collected and used OLS method to estimate the model. They found out that FDI positively impacted growth in Tanzania since a unit increase in FDI inflows increases agricultural output by 13 percent especially when farmers are linked to out grower schemes.

Sattaphon (2006) in East Asian Countries examined the effects of FDI on agricultural growth using both time series and panel data from 1987 to 2003. Using the conventional neo-classical production function with real agricultural growth rate as a proxy for agricultural growth, trade openness and introduced FDI as an additional variable representing human capital stock and

technology. The ordinary least squares method was used to estimate the model and the results showed that FDI has a positive impact on agricultural growth although its contribution was relatively small. In other countries like Taiwan and Korea he found that FDI stimulate agricultural growth with land use as another major determinant for growth.

Massoud (2008) in his study on the relationship between agricultural growth and FDI in Egypt found that FDI does not exert any significant positive impact on agriculture growth in the country. The study used panel data from the two sectors of agriculture from 1974 to 2005. Massoud extended the traditional production function by introducing FDI as a source of capital accumulation and technological change and agricultural growth rate (proxy for growth) as the endogenous variable. The model also collected data on variables like human capital (proxy for secondary school enrolment), GDP per capita and inflation to capture the efficiency of economic activity and performed the OLS estimation model.

Adugna (2011) carried out a research on the impacts of FDI on agricultural growth in Ethiopia using time series data from 1993 to 2010. The research used the ordinary least squares method (OLS) (log-linear model) and a two stages least squares method (TSLS) to estimate the model. He collected data on agricultural output as a proxy for growth, availability of credit, agricultural exports, and dummy variable for political and economic instability. The results showed that a unit change in the inflows of FDI into the agricultural sector increases agricultural production by 0.2 percent. It also showed that agricultural production was also affected most by other factors like political and economic instability.

Akande and Biam (2011) examined the causal relationship between foreign direct investment in agriculture and agricultural output (proxied as growth) in Nigeria. They used time series data from 1960 to 2008 for variables like agricultural FDI and inflation. Employing the Augmented Dickey-Fuller (ADF) test, Johansen co integration procedure, error correction models, Granger causality test and impulse response for data analysis. The results showed that no long run relationship exists between FDI in agriculture and agricultural output both with and without inflation shocks. Inflation plays a negative role in the short run influence of FDI in agriculture and agricultural output.

Djokoto (2011) performed a Granger causal analysis to find the movement of agriculture growth and agriculture FDI in Ghana using time series data from 1966 to 2008. Real agriculture growth rate was proxied as agriculture growth and agriculture FDI was proxied as the ratio of inward FDI as a ratio of agriculture value added and they revealed that the movement of FDI to agricultural GDP showed spiral movements up to 1979 and was stable beyond that year. They also said that neither of the two variables granger causes each other and agricultural growth requires stimuli other than FDI since it is not impossible to create growth in the sector.

In addition to that, the same study was repeated by Ajuwon and Ogwumike (2013) analyzing uncertainty and FDI in Nigerian agriculture using time series data from 1970 to 2008. Data on FDI was measured as the ratio of net FDI into agriculture, forestry and fisheries, economic uncertainty indicators include inflation and real effective exchange rate and political freedom and trade (proxy for openness) were also incorporated in the model. They used Ordinary Least Squares method to perform the multiple regression and they found out that FDI inflows positively impacted on agriculture growth not only in the short run although it was insignificant.

Kareem and Bakare (2013) conducted a research analyzing factors influencing agricultural output in Nigeria from a macroeconomic perspective. They used time series data from 1977 to 2011 on FDI, GDP growth rate, commercial bank loans interest rates and trade exports. OLS method was used to estimate the model in semi-log form on the relationship between output and other macroeconomic determinants. The inflows of FDI were found to positively influence the rate of agricultural growth and concluded that FDI is one of the crucial macroeconomic determinants of growth in Nigeria.

Studies by Hung (2006) examined the impact of FDI on employment and economic growth using primary data obtained from firms engaged in FDI and local firms. The study found that foreign firms pay higher wages than local firms. The ultimate effect of FDI on employment exhibits in the long run because in the short run employment decline due to the shift of production to other countries. Increases in wage rates in the country will result in increases in income level and closing the inequality gap among citizens resulting in poverty alleviation and growth.

Although many studies have outlined the spillover effects of FDI inflows into the host countries, Carkovic and Levine (2002) using data from 1960- 1988 to exploit the FDI effect on growth.

They used the Generalized Methods of Moments (GMM) panel estimator. They found a negative relationship between and FDI failed to stimulate growth despite well-developed economic policies. Akande and Biam also found the same results in Nigeria when they analyzed the causal relations between FDI and agricultural output. They concluded that there is no long-run relationship between FDI and agricultural growth in Nigeria.

2.5. CONCLUSION

Empirical evidence from past researches shows that there is a positive correlation between FDI and agricultural growth in many countries. Although some studies pose unique views about the relationship and give possible assumptions for FDI to positively impact agricultural growth, they all support the theories that FDI comes in as a correction of market failure and production cost reduction strategy. The next chapter looks at the methodology of the study, possible model specification and justification of variables.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 INTRODUCTION

Several studies by neo-classical, classical and modern economists have come up with different models for growth using different procedures like the Solow growth models and endogenous growth models to explain growth. There is an array of production functions like transcendental, Spillman and Cobb-Douglas production functions which may be used to explain agricultural production. This chapter presents the conceptual framework, model specification and justification of variables which affect agricultural growth. The chapter will also present the pre-estimation tests and diagnostic tests to conclude the chapter.

3.1. CONCEPTUAL FRAMEWORK

The theories of FDI highlighted that there are many factors which may enhance or detract the potential of FDI to promote growth in many nations. The locational variables of the eclectic theory by Dunning (2001) asserts that social, political and economic factors possessed by the host country are the main factors which allow or limit the inflows of FDI in to the host country. The research will follow a deductive approach which derives conclusions from general to particular. The study will analyze the policy and environmental framework in agriculture and the contribution of agriculture FDI in general. The push factors are the benefits to the foreign investors while pull factors are the benefits which accrue to the host country.

Investments from abroad reduce risk to investors through investment diversification and allow owners to seek out the highest rate of return. High inflows of FDI increase the total factor productivity of the sector by offsetting the investment technology gap in the host nation. Growth in the agricultural sector is considered important as it is significant in poverty reduction through creation of employment and income generation from increased investment. Agricultural sector growth allows for structural transformation and competency in global markets. Some economists observed that FDI is a source of required capital accumulation, technology and knowledge

dissemination and may also crowd out market imperfections like monopolies by introducing perfect competition (Adugna, 2011).

Linkages between FDI and growth

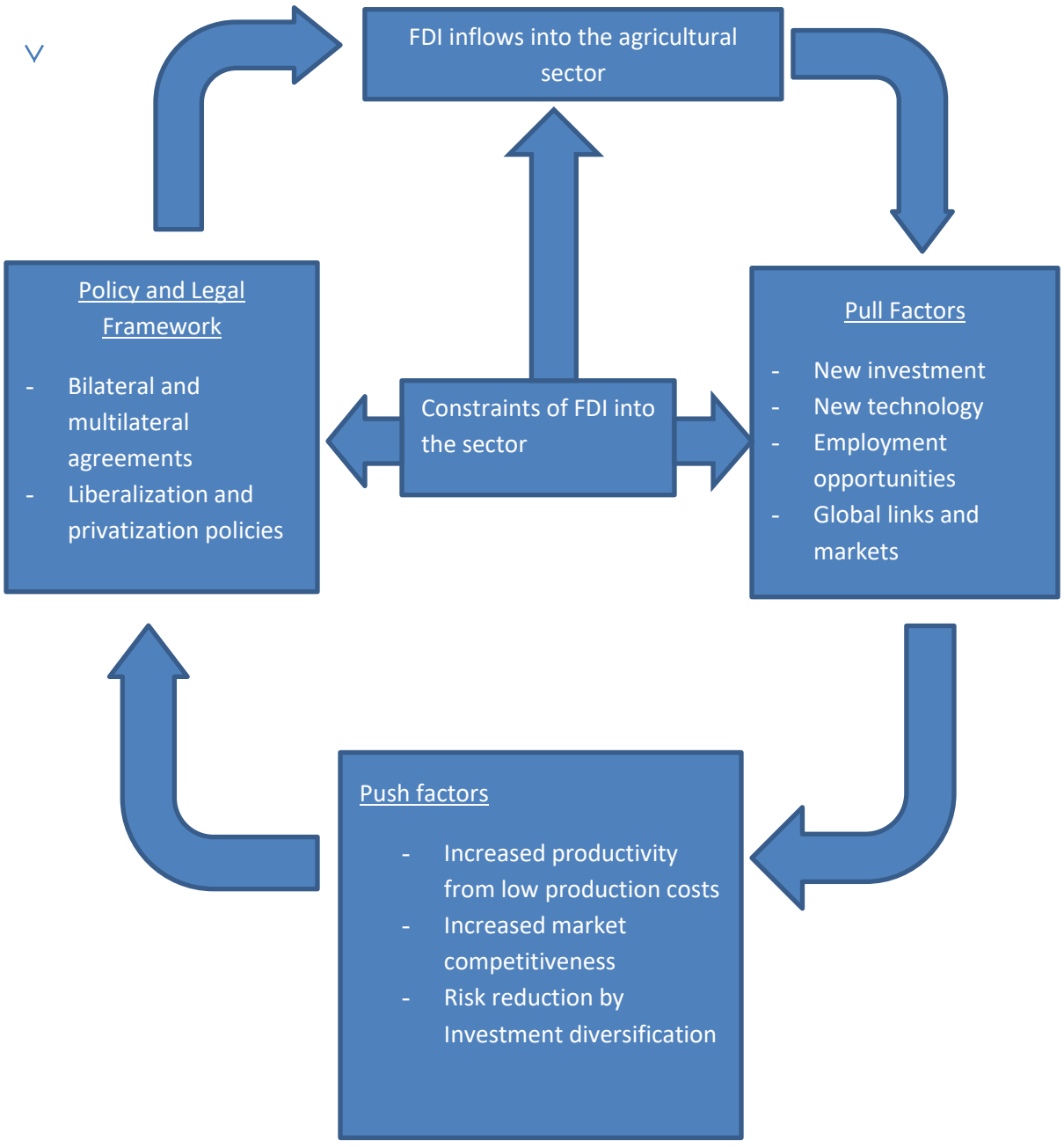

Figure 3.2: Impacts and opportunities for FDI in the agricultural sector
Source: Developed by author

3.2. MODEL SPECIFICATION

Neo-Classical and endogenous growth models assumes that FDI can stimulate growth if it brings increasing returns to production which increases production output. In these models FDI is considered as a source of human capital accumulation and technological change and is added as another factor of production.

Computing the standard growth accounting models which predicts marginal changes in output and factor inputs thus the production function is given as

$$Y_t = A_t K_t^{a} L_t^{1-a} \qquad 0 < a < 1$$

where *a* is the elasticity of output on physical capital, K is the physical capital, L is the level of human capital and A is the state of technology or total factor productivity.

To empirically find the effect of FDI on agricultural growth in Zimbabwe the study used the conventional neo-classical production function in which FDI is added as a source of capital and technological change. Additional variables like trade openness, human capital, inflation and lending rates which capture the efficiencies of economic activity. Thus a Cobb Douglas is used to estimate the model given as

$$Y = AK_t^{a} L_t^{1-a}, FDI$$

$$Y = f(FDI, INFL, GEX, HK, OPP, CRDT)$$

The model used in the analysis is given by a typical formulation postulated by economic theory for growth function in its log-log form as

$$\boldsymbol{Log\ Y_t = \beta_0 + \beta_1 log\ HK + \beta_2\ log\ FDI + \beta_3 log\ GEX + \beta_4 log\ INF + \beta_5 log\ OPP + \beta_6 log\ CRDT + \mu}$$

where:

Y_t = agricultural value added or agricultural productivity as a proxy for growth

FDI = foreign direct investment inflows into the agricultural sector

INFL = inflation rate (constant 2005= 100)

GEX = government expenditure as per budget allocation

HK = population aged between 15 to 65 years old as a proxy for human capital

OPP = trade openness taken as the total of real agricultural exports plus imports (% of GDP)

CRDT = Lending rate as a proxy for availability of credit in the sector

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are the parameters to be estimated or elasticities of growth

μ = the error term or the stochastic term

3.3.0 JUSTIFICATION OF VARIABLES

3.3.1 Foreign Direct Investment (FDI) FDI inflows in to the agricultural sector and not FDI stocks due to the limitation of data on FDI stocks. Due to the problem of currency change the study used FDI inflows from the World Bank. Empirically Massoud (2008); Borenzstein, Gregorio, Lee (1997) found that FDI are best to describe agriculture growth therefore we expect a positive relationship between FDI and agricultural growth.

3.3.2. Government Expenditure (GEXP) GExp are the budgetary funds which are allocated to the agricultural sector for its operations in the national budget. Government expenditure is the spending by the government on agricultural activities through input subsidies and is a form of domestic capital in the sector. Oyimbo, Zakan and Rekwot (2013) said that domestic capital has an impact on growth since it can substitute FDI therefore its significance is viable in determining the level of growth. A positive relationship is expected between government expenditure and agricultural growth.

3.3.3. Trade openness (OPP) Trade openness or trade liberalization is the degree to which the economy is open to trade with other countries. The level of trade openness in the host country increases the inflows of FDI which will increase the capital stock in the country which has a significant effect in deciding the level of growth (Yeboah, Naanwaab, Saleem and Akufo, 2012), (Baldwin, 2003) and (Tekere, 2001). A positive relationship between the level of growth and trade openness is expected from the study.

3.3.4. Human Capital (HK) Human capital refers to the degree of knowledge, education, skill and experience which determine the absorptive capacity of the host country. Human capital represented labour availability because it allows for increasing returns to scale. Due to data limitation, population between 25 and 65 years was used as a proxy for human capital (Massoud, 2008). Considering the human capital theory Mehdi (2011) said that human capital is crucial in determining the direction for growth. Balasubramanyam, Salisu and Sapsford (1999) also said that for growth to occur the host country should have the maximum absorptive capacity to take new technologies. Therefore we expect that human capital is positively related to agriculture growth.

3.3.5. Credit Availability (CRDT) Lending rate is the bank rate that usually meets the short- and medium-term financing needs of the private sector (Muhammad and Farzan, 2010). Higher lending rates affect agricultural growth in the sense that it reduces the borrowing rate from banks in form of loans to finance their inputs of production (Richardson, 2005). This will result in a decrease on total factor productivity. This means that lending rates have a positive correlation with agricultural growth.

3.3.6. Inflation (INFL) measures the level of macroeconomic stability in the host country. It is calculated using the consumer price index which shows the annual percentage change in the cost to the average consumer of acquiring a bundle of goods and services. During the period 2000-2008 the inflation was not stable and its variance did not reflect a stable macroeconomic environment for sustaining growth. Therefore we expect that Inflation is negatively related to agricultural growth.

3.4. DATA SOURCES

The data on trade openness which has been used in this research was obtained from Zimbabwe Statistics agency (ZIMSTATS), foreign direct investment figures and percentages of agricultural investment to total investments were collected from Zimbabwe Investment Authority (ZIA). Reserve Bank of Zimbabwe (RBZ) provided data on inflation rates, Ministry of Finance (MoF), Ministry of Agriculture Mechanization and Irrigation Development (MoAMID) provided data for government spending in the agricultural sector, World Bank Development Indicators (WDI) also provided information on all the variables which were expressed in US$.

3.5. ESTIMATION

To estimate the model the researcher used the Stock- Watson Dynamic Ordinary Least Squares (DOLS) due to the attractive statistical properties compared to the Ordinary Least Squares (OLS) and Johansen Maximum Likelihood principle. The DOLS method is a robust method which is used particularly in small samples and it corrects for possible simultaneity bias among the regressors and also involves estimation in the long run equilibria (Stock and Watson, 1993). Although it has similar characteristics as the OLS method, the OLS method however is prone to the problem of autocorrelation since the error term is not normally distributed.

The Johansen Maximum Likelihood principle is also a full estimation technique though it is more exposed to model misspecification and is not normally used in small sample estimation. The DOLS method is a single equation approach which corrects the problem of endogeneity by including leads and lags of the first difference of the exogenous variables and for serially correlated errors by the GLS method (Masunda, 2012) and (Aj- Azzam and Hawdon, 2008). The estimation model used a sample size of 32 years from 1980 to 2012 therefore it is justified to use the DOLS method. The sample size was chosen to avoid the problem of micronumerosity which arises when the number of observations exceeds the number of parameters to be estimated. Secondary time series data was be collected for the period 1980 to 2012 for a sample size of 33 observations since time series data was readily available than panel data and model estimation was carried out using Eviews 6 statistical package.

3.6.0 DIAGNOSTIC TESTS

3.6.1. Unit Root Tests

Gujarati (2004) postulated that that unit root test is used to check for stationarity that is whether the variables are integrated of order (1) or otherwise before estimation procedure. It has been noted that if we regress a non-stationary time series on another non-stationary time series we may produce a spurious or nonsensical regression (Andren, 2007). If the variables are cointegrated of different levels, the OLS estimates of those variables may give super consistent results with the sense of collapsing the true values than if they were stationary. The Augmented Dickey-Fuller (ADF) test is used to test the existence of a relationship between current and past values of variables. The ADF test is preferred because it is robust to handle both first order and

higher autoregressive processes and it avoids spurious regression which is synonymous when estimating data with a time trend. This is tested on the null hypothesis that there is no unit root or stationarity in the variables and an alternative hypothesis that there is stationarity in the variables.

3.6.2. Multicollinearity

Maddala (1992) says that multicollinearity exists when two or more variables are highly correlated. If multicollinearity is perfect, the regression coefficients of the independent variables are indeterminate and their standard errors are infinite. The problem of multicollinearity exists when the regressors included in the model share a common trend overtime. Incorporating variables with high multicollinearity results in estimators having large variances and covariances making precise estimation difficult and because of this the confidence intervals are much wider leading to acceptance of the null hypothesis. The *t* ratios of one or more coefficients tend to be statistically insignificant which result in a very high R^2 (> 0.8) and all the estimators and their standard errors will be sensitive to small changes in the data. The research used the correlation matrix to detect multicollinearity. Multicollinearity is often a serious case especially when the coefficient of determination is greater than 0.9 with only few variables significant therefore we test for multicollinearity using the variance inflation factor.

3.6.3. Heteroscedasticity

Koutsoyianis (1977) says that heteroscedasticity is a situation where the error variance is constant. Using the OLS estimation allowing for heteroscedasticity will give unnecessary large confidence intervals as a result the *t* and F tests are likely to give inaccurate results and overestimating the standard errors. This means that persisting using the usual testing procedures despite heteroscedasticity, whatever conclusion we draw or inferences we make will be very misleading. The study employed the Breusch- Pagan-Godfrey (BPG) test to test for the presence of heteroscedasticity since it is sensitive to normality assumptions and has the advantage of detecting any linear form of heteroscedasticity. It also has the advantage that it enables the residual to be modeled as a function of its non-stochastic residuals (Gujarati, 2004). If the F-value computed is greater than the F-value from the table at the given level of confidence we fail to reject the null hypothesis of homoscedasticity and conclude that there is no heteroscedasticity

3.6.4. Autocorrelation

Andren (2007) noted that autocorrelation exist when the error terms are correlated with each other in the same sample. This means that the covariance between the two error terms should be equal to zero. The presence of autocorrelation will lead to inefficient predictions and the coefficient of determination and usual estimator of error variance will no longer be valid. If the error terms are serially correlated in dynamic models then the estimated parameters are biased and inconsistent (Qadri, 2011). The Durbin-Watson (DW) test will be conducted to test for autocorrelation due it test for first order serial correlation. More formally, the DW statistic measures the linear association between adjacent residuals from a regression model. The Breusch-Godfrey (BG) or the Lagrangian Multiplier (LM) test is also used to test for serial correlation since it allows for testing higher order moving average processes of the residuals. It allows for more than one variable to be tested at a time. The assumption of autocorrelation is tested on the null hypothesis that there is no autocorrelation among the error terms.

3.6.5. Model Specification

Maddala (1992) pointed out that a regression model should be used in the analysis of data if it is correctly specified and is coherent with economic theory. If the regression model is incorrectly specified then there is specification bias or measurement error. The Ramsey's regression specification error test was used to test whether the model has omitted variables due to its simplicity and does not specify what the alternative model is.

The presence of a structural break in the economy in the economy between 1980-2009 and 2009-2012 makes it necessary to check for the stability of the model to be estimated for this will make the regression results difficult to interpret. To test for stability of the model parameters, the research used the cumulative sum of recursive residual CUSUM test and the cumulative sum of squares of recursive residual CUSUMSQ. The decision rule is that we reject the null hypothesis that the model is unstable if the CUSUM or CUSUMSQ overlaps the 5 % level of significance boundary lines.

3.6.6 Normality Test

Normality tests are carried out to ensure that the variables used in the model are normally distributed and the Jarque-Bera test is common for normality tests. The Jarque-Bera test utilizes the mean based coefficients of Skewness and kurtosis to check for the normality of the variables.

The degree of asymmetry is measured by skewness and values between -3 and 3 while a value of 0 indicates a symmetrical distribution. Kurtosis is used to measure the heaviness of the distribution tails. Normality is tested under the null hypothesis of normality against the alternative hypothesis of no normality. If the probability value is greater than the Jarque-Bera chi-square value at 5% level of significance, we reject the null hypothesis of normality.

3.7. CONCLUSION

This chapter highlighted the basis for model selection and specification, the variables included in the model and the data collection procedures. Justification of variables highlighted what is expected in the relationship between the variable and the dependent variable from economic theory. Diagnostic tests on the variables and residuals where presented and conditions whether to reject or accept stated. The next chapter presents the results from the model estimation and tests on the estimates and residuals that were obtained using Eviews 6 statistical package.

CHAPTER FOUR

RESULTS PRESENTATION AND INTERPRETATION

4.0 INTRODUCTION

This chapter presents the estimated results and their remarkable interpretation. Eviews 6 econometric software was used for the regression process. Results on unit root tests, multicollinearity test, heteroscedasticity test, and autocorrelation test and the overall regression will be interpreted in this chapter.

4.1. DESCRIPTIVE STATISTICS

The summary below shows the descriptive statistics of all the variables included in the model. These variables include growth, FDI, inflation, government expenditure, trade openness and credit availability. The mean, standard deviation, maximum and minimum of the variables (GDP, LBR, FDI, INFL, GEX, OPP and CRDT) are summarized below. See Appendix 1 for complete table.

Table 4.1: Descriptive Statistics

	LNGDP	**LNFDI**	**LNCRDT**	**LNGEX**	**LNINFL**	**LNLBR**	**LNOPP**
Observations	33	33	33	33	33	33	33
Median	8.9994	7.91321	1.53446	7.86818	-0.6689	6.79672	1.13159
Maximum	9.24728	8.50831	5.36389	8.10543	0.63518	6.88427	1.52347
Minimum	8.72822	7.06303	0.49136	7.63213	-1.5354	6.54484	0.08827
Std. Dev.	0.11779	0.38294	1.00615	0.12462	0.5629	0.09983	0.25781
Skewness	-0.0992	-0.2408	2.29925	0.11361	0.47448	-0.7886	-1.8376
Kurtosis	2.71661	2.38121	8.3187	2.10278	2.69406	2.32742	9.93019
Jarque-Bera	0.16456	0.84543	67.9728	1.17787	1.36694	4.042	84.6111
Probability	0.92101	0.65527	0.00000	0.55492	0.50486	0.13252	0.00000

4.2 DIAGNOSTIC TEST RESULTS

4.2.1. Unit Root Tests

Time series econometric practices recognizes that classical regression properties hold only when the variables are stationary that is cointegrated I(0). If variables are integrated of order I(1) or higher therefore they do not satisfy the assumptions but if short-run and long-run relationships exists, certain combinations of I(1) are likely to be I(0) hence amenable for OLS estimation. If this holds, the variables are cointegrated and the OLS estimates of such variables are superconsistent and collapse their true value more quickly than if they have been stationary. The Augmented Dickey-Fuller test was used to test the level at which the variables are stationary, this paves way for the regression equation upon which the results of the research shall be built. This follows the equation. Table 4.2 summarizes the results from stationarity tests on all the variables.

H_0: $\beta = 0$ (there is no unit root in the variables)

H_1: $\beta \neq 0$ (there is unit root in the variables)

Table 4.2: Unit Root Test Results

variable(s)	ADF test	MacKinnon value	Order of integration	Decision
LNGDP	**-5.914979**	**-3.661661**	**I(1)**	**Stationary at 1%**
LNFDI	**-5.266479**	**-3.65373**	**I(0)**	**Stationary at 1%**
LNLBR	**-4.220238**	**-3.737853**	**I(0)**	**Stationary at 1%**
LNGEX	**-5.202478**	**-3.661661**	**I(1)**	**Stationary at 1%**
LNINFL	**-7.784855**	**-3.661661**	**I(1)**	**Stationary at 1%**
LNOPP	**-6.29549**	**-3.67017**	**I(1)**	**Stationary at 1%**
LNCRDT	**-8.536656**	**-3.711457**	**I(2)**	**Stationary at 1%**

An interpretation whether to reject or fail to reject the hypotheses on each explanatory variable is done by comparing the ADF statistic and the Mackinnon values at 1% level of significance. See Appendix 2 for detailed tables. LBR and FDI were found to be stationary in levels and other

variables GDP, GEXP, EMPL, PCI, TRDE, INFL and INTR were stationary in first and second differences respectively.

4.2.2. Multicollinearity Test Results

The test was conducted under the null hypothesis that the explanatory variables are correlated (presence of multicollinearity) against the alternative that there is zero correlation. In order to detect the presence of multicollinearity, the correlation matrix was used. The table below shows the results of the correlation matrix. A complete display of the results is shown in Appendix 3.

Table 4.3: Pair-wise Correlation Matrix

	LNGDP	**LNFDI**	**LNGEX**	**LNLBR**	**LNINF**	**LNOPP**	**LNCRDT**
LNGDP	1	0.108601	0.247909	0.168501	0.4583	-0.3256	-0.3497
LNFDI	0.10860	1	-0.057897	0.063466	0.27317	-0.0972	0.10854
LNGEX	0.24790	-0.057897	1	0.712861	0.03226	0.3351	0.2031
LNLBR	0.16850	0.063466	0.712861	1	0.32934	0.5138	0.41122
LNINFL	0.45829	0.273165	0.03226	0.329342	1	-0.0231	0.14882
LNOPP	-0.32562	-0.09722	0.335152	0.513857	-0.0231	1	0.44494
LNCRDT	-0.34966	0.108539	0.203103	0.411215	0.14882	0.4449	1

A correlation statistic of greater than 0.8 shows that there is perfect correlation between the two variables. However, in this study none of the variables are strongly correlated and all pair-wise correlation coefficients are less than 0.8 however this does not guarantee that there is no multicollinearity. The highest correlation takes the value of 0.712965 between LNLBR and LNGEX, which explains a positive relationship between the two variables.

4.2.3. Regression Results: Stock-Watson Dynamic Ordinary Least Squares (DOLS)

Given the presence of cointegration among the variables, we estimate the long run elasticities of the variables using the Stock-Watson (1993) DOLS method. The DOLS method was used since it corrects for endogeneity by inclusion of leads and lags of first difference of the regressors and for serially correlated errors by the generalized least squares procedure. The method was chosen due to its advantages relative to OLS and maximum likelihood procedures.

The model included up to $j = \pm 2$ leads and lags and insignificant lags and leads were dropped from the model. The *t*-statistics are based on the Newey-West heteroscedasticity and autocorrelation (HAC) solution. The Newey-West (1987) was used because it obtains standard errors of OLS estimators that are corrected for autocorrelation and also assumes that the correlation between the error terms is asymptotically valid.

Table 4.4: The Stock-Watson (DOLS) Empirical Results (Long-Run Results)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	12.896	2.502934	5.152352	0.0001***
LNFDI(-1)	0.091231	0.045877	1.988593	0.0653*
LNFDI	0.074532	0.033995	2.192433	0.0445**
LNLBR(-1)	-80.07105	14.77525	-5.419268	0.0001***
LNLBR	191.6682	35.81636	5.351415	0.0001***
LNLBR(1)	-112.5165	22.08944	-5.093677	0.0001***
LNGEX(-1)	-0.391165	0.216525	-1.806559	0.0909*
LNGEX	0.522618	0.212569	2.458577	0.0266**
LNINFL(-1)	-0.197389	0.106777	-1.848617	0.0843*
LNINFL	-0.051087	0.017067	-2.993365	0.0091***
LNINFL(1)	-0.034706	0.023678	-1.465791	0.1634
LNOPP(-1)	0.082187	0.030752	2.672623	0.0174**
LNOPP	0.088078	0.035909	2.452776	0.0269**
LNOPP(1)	0.084914	0.049611	1.7116	0.1076
LNCRDT	0.048969	0.029693	1.649173	0.1199
LNCRDT(1)	-0.127621	0.049772	-2.564111	0.0216**
R-squared	**0.929731**		**Akaike info criterion**	**-3.092572**
Adjusted R-squared	**0.859462**		**Schwarz criterion**	**-2.352449**
F-statistic	**13.23101**		**Hannan-Quinn criter.**	**-2.85131**
Prob(F-statistic)	**0.000005**		**Durbin-Watson stat**	**2.143822**

*** 1% level of significance, ** 5% level of significance, * 10% level of significance

4.2.4. Heteroscedasticity Test Results

The test is performed under the null hypothesis of constant variance across the regressors (homoscedasticity) while the alternative hypothesis states that there is heteroscedasticity across the regressors.

H0: $\sigma^2 = \sigma^2$ (there is homoscedasticity)

H0: $\sigma^2 \neq \sigma^2$ (there is heteroscedasticity)

The Breusch-Pagan-Godfrey test for heteroscedasticity showed the absence of heteroscedasticity in the model. The value of the F-statistic is 1.436795 and the p-value of 0.2456 therefore since the $F^* > F_{0.05}$ we reject the assumption of homoscedasticity at 95% level of confidence. The ARCH test for the model gives the F statistic of 0.429957 and the p-value of 0.5174 which is greater than significance level of 0.05. We accept the assumption of homoscedasticity in the model and conclude that there is heteroscedasticity. See Appendix 4.

4.2.5. Autocorrelation Test Results

Autocorrelation has been tested using the Durbin Watson Tests (DW test). The Durbin Watson statistic of 2.14382 indicates the absence of autocorrelation hence the model fulfills the assumption of the OLS .The DW statistic is also greater than the R squared and hence it rules out the possibility of spurious regression function. The Breusch-Godfrey serial correlation test shows an F-value of 2.480874 and p-value of 0.1242. This means that we accept the null hypothesis and conclude that there is no autocorrelation. See Appendix 5.

4.2.6 Model Specification Test Results

The Ramsey's RESET test was used to test whether there are any omitted variables in the model since it is simple to use. The F-value of 0.012803 with a p-value of 0.9115 was obtained which means that we fail reject the null hypothesis and conclude that the model is correctly specified and there are no omitted variables. The CUSM and CUSUMSQ lines did not cross the critical boundaries at 5 % level of significance which means that we do not reject the null hypothesis and conclude that there model is stable. Appendix 6 shows a detailed table.

4.2.7. Normality Test Results

The normality test was used to see if the residuals in the model are normally distributed and was carried out basing on the Jarque-Bera test. The results show a Jarque-Bera chi-squared value of 0.654579 and probability of 0.720875 which was significant at 5% level of significance. We fail to reject the null hypothesis of normality on the residuals in the model. Detailed table is presented in Appendix 6.

Since the short run is the adjustment period where the effects of leads and lags are netted out, following the DOLS rule its analysis and interpretation are not included. The variables that significantly influence the long run real agricultural growth in Zimbabwe are foreign direct investment, human capital skills, government spending in the sector, inflation levels and the level of trade openness. These variables explain 92.97% of the total variation in agricultural growth is being explained by the model and the remainder is captured by the error term. The Durbin-Watson statistic of 2.143822 rules out the assumption of autocorrelation in the model. The F-statistic of 13.23101 and a probability close to zero shows that the variables are statistically significant and have an impact on agricultural growth.

The model was chosen basing on the values of the Akaike information criterion, Schwarz criterion and the Hannan-Quinn criterion. FDI elasticity of 0.0745 shows that for a unit increase in FDI inflows will increase real agricultural growth by 0.0745% which is significant at 5 % level of significance. The results were similar to the findings of Kareem, Bakare, Ologunla, Raheem and Ademoyewa (2013), Ajuwoni and Ogwumike (2013) in Nigeria although they contradict with Akande and Biam (2011) who find a negative relationship in the same country.

Human capital elasticity is 191.66 meaning that human skills and knowledge positively impact growth since a one percent increase in human capital will increase agricultural production output by 191.66%. Qadri and Waheed (2011) found the same effect of human capital on growth in Pakistan and Zouhar (2005) also concluded that increases in human capital increases agricultural output in Morocco.

Government spending impacted positively on agricultural growth with government although it was inelastic with growth. A unit increase in government spending in the agriculture increases real agricultural output by 0.522%. Onyimbo, Zakan and Rekwot (2013) found similar results

when they analyzed the effects of agricultural budgetary allocations on agricultural growth in Nigeria. Inflation elasticity of -0.05 which is inelastic and openness elasticity of 0.08 were also statistically significant meaning they pose an impact on agricultural output in Zimbabwe agriculture.

All the variables have their expected signs in the long run and the residuals have passed various tests which include ARCH LM test, normality test, model specification test, serial correlation test and CUSM and CUSUMSQ tests.

Although the simple pair wise correlation matrix does not provide any correlation between the variables to reject the assumption of multicollinearity in the model, the variance inflation factor (VIF) = [1/ (1-R^2)] = 14.231. This clearly indicates that multicollinearity is a problem in the model since the VIF is greater than 10 due to a high R-squared value. Having identified the problem of multicollinearity in the model, the study used the do nothing approach as a remedial measure (Gujarati, 2004).

4.3 CONCLUSION

The study shows that we do not reject the null hypothesis that FDI significantly impact agricultural growth in Zimbabwe. FDI inflows are therefore an important in stimulating agricultural growth in Zimbabwe. The study found out that all the variables included in the model are significant in explaining long run growth except credit which has an expected sign but statistically insignificant in the long run. It is therefore clear that allowing for FDI inflows into the agricultural sector positively impact the output or total factor productivity through shifting the production function as a result of technological efficiency. The next chapter presents the conclusions, recommendations and suggestions for future studies.

CHAPTER FIVE

CONCLUSIONS AND POLICY RECOMMENDATIONS

5.0 INTRODUCTION

The main objective of this research was to examine the impact of foreign direct investment (FDI) on agricultural growth in Zimbabwe and analyze other macroeconomic factors which affect growth in the long run. The study was achieved by estimating the growth equation covering data from 1980 to 2012. Having explored relevant review on literature and presented the research findings of the empirical study, this chapter will give the recommendations and conclusions drawn from the research.

5.1. CONCLUSIONS

The main idea of this study was to test the hypothesis that FDI does not impact agricultural growth and whether FDI inflows into the agricultural sector contributed to growth. Given the evidence that Zimbabwe has enough absorptive capacity to capture new knowledge and has abundant human capital to use in the sector, additional inflows of FDI information and technology transfer and capital will positively impact the growth of the sector. Four theories explaining FDI have been outlined include internalization advantages theory, monopolistic advantages theory, eclectic theory, product life cycle theory. Using time series data from 1980 to 2012 the researcher used the Cobb-Douglas production function to estimate the impact of FDI on growth.

The results are consistent with the proposed hypothesis with all variables satisfying *apriori* expectation and the model has perfect fit. We reject the null hypothesis that FDI does not significantly impact agricultural growth in Zimbabwe accept the alternative hypothesis that FDI significantly impact to agricultural growth in Zimbabwe. This is evidently shown by an inelastic and positive relationship between FDI and growth in the long run which was significant at 5 % level of significance. Other variables like labour, government expenditure and interest rate also highlighted a positive impact on growth. This was similar to the results found by Msuya (2007) in Tanzania on FDI impact on agricultural output, Ugwuanyi (2012) in Egypt and Massoud,

(2008). This also highlights that poor performance of the agricultural sector is due to unclear linkages amongst the determinants like FDI and factors like macroeconomic stability, agricultural policies, bilateral and multilateral agreement which make firms engage in FDI.

5.2. POLICY RECOMMENDATIONS

Since economies are driven by policies, the government being the centre of policy formulation therefore saddle with responsibility of formulating policies that will positively impact on the economy. FDI in many nations has been viewed as the cutting edge of underdevelopment particularly in this globalization era. Research conducted by Blomstrom and Kokko (2003) recommended that the government should imperative formulate policies targeting attracting FDI. Focusing on this, conjusive macroeconomic policy environments is also a *sine qua non* for attracting FDI inflows into the host country.

The results shows that there is a small positive impact of FDI on growth which means that the poor levels of FDI in the country are causing a small change in growth. In other words this means that growth in the agricultural sector is attained with minimal external support. By creating a conjusive macroeconomic policy for FDI to accrue, expenditure power should be a norm by the general public for effective FDI to give desired results and this will boost investment. Therefore the government through the ministry of finance should increase internal support through increasing government spending on inputs and infrastructure.

The government should also engage in formulating favorable agricultural trade policies and regimes. Balasubramanyam et al (1999) reiterated that for FDI to be effective there should be a well functional trade regime. This is because FDI in the presence of protectionism regime immiserize growth whereas a liberal trade stimulate growth. Therefore the government should engage in export promoting strategies rather than import substitution strategies.

There should be policy revision on investment policies like indigenization and the land reform program as they are viewed as major determinants that have reduced investment in the agricultural sector. The government should also privatize some of its resource in the sector like grain reserves emphasize on Research and Development (R&D) in order to increase the adoption rate of new technologies brought in by FDI spillovers. For FDI to bring significant benefits, the

host nation should have sufficient absorptive capacity of the advanced technologies which may be through increasing R&D as well as quality human capital stock.

Since the economy is passing through a critical economic phase with a high current account deficit, food insecurity and also poor savings to stimulate investment and low government spending, the country should be much centered on increasing the spending on agricultural activities in order to stimulate output. This is because the agricultural sector is the mainstay of the economy and has linkages with all sector of the economy providing raw material. In addition to, that the government through the ministry of finance should control lending rates on borrowing from the banks so as to boost farmers' capital which increases output. This may be through putting ceiling on the interest rates which reduces the cost of capital and increases credit borrowing.

5.3 LIMITATIONS AND FURTHER STUDIES

The study was limited to data availability and there was limited information from various sub sectors in agriculture to run the regression model using panel data. The effect of FDI on agricultural growth can also be explained by examining the causal relationship using the Granger causality analysis, error correction models and impulse response models.

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APPENDICES

Appendix 1: Descriptive Statistics

	LNGDP	LNFDI	LNHK	LNGEX	LNINFL	LNOPP	LNCRDT
Mean	9.005197	7.907945	6.760584	7.871597	-0.619735	1.151569	1.761189
Median	8.999396	7.913209	6.796721	7.868177	-0.668899	1.131594	1.534460
Maximum	9.247284	8.508308	6.884273	8.105425	0.635182	1.523469	5.363894
Minimum	8.728224	7.063029	6.544842	7.632128	-1.535388	0.088268	0.491362
Std. Dev.	0.117791	0.382942	0.099827	0.124622	0.562903	0.257809	1.006152
Skewness	-0.099213	-0.240812	-0.788556	0.113605	0.474483	-1.837648	2.299248
Kurtosis	2.716611	2.381213	2.327424	2.102777	2.694061	9.930192	8.318700
Jarque-Bera	0.164562	0.845432	4.042003	1.177873	1.366937	84.61113	67.97278
Probability	0.921013	0.655265	0.132523	0.554917	0.504863	0.000000	0.000000
Sum	297.1715	260.9622	223.0993	259.7627	-20.45127	38.00178	58.11924
Sum Sq. Dev.	0.443989	4.692616	0.318891	0.496978	10.13952	2.126898	32.39497
Observations	33	33	33	33	33	33	33

Appendix 2: Stationarity Test Results

Augmented Dickey-Fuller test on D(LNGDP)

Null Hypothesis: D(LNGDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.914979	0.0000
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Augmented Dickey-Fuller test on FDI

Null Hypothesis: LNFDI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.266479	0.0001
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	
	10% level	-2.617434	

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

Augmented Dickey-Fuller test on LNHK

Null Hypothesis: LNHK has a unit root
Exogenous: Constant
Lag Length: 8 (Automatic based on SIC, MAXLAG=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.220238	0.0033
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

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

Augmented Dickey-Fuller test on D(LNGEX)

Null Hypothesis: D(LNGEX) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.202478	0.0002
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Augmented Dickey-Fuller test on D(LNINFL)

Null Hypothesis: D(LNINFL) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.784855	0.0000
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Augmented Dickey-Fuller test on D(LNOPP)

Null Hypothesis: D(LNOPP) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic based on SIC, MAXLAG=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.295490	0.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

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

Augmented Dickey-Fuller test on D(LNCRDT)

Null Hypothesis: D(LNCRDT,2) has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic based on SIC, MAXLAG=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.536656	0.0000
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

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

Appendix 3. Pair wise Correlation Matrix

	LNGDP	LNFDI	LNGEX	LNHK	LNINFL	LNOPP	LNCRDT
LNGDP	1.000000	0.108601	0.247909	0.168501	0.458296	-0.325628	-0.349666
LNFDI	0.108601	1.000000	-0.057897	0.063466	0.273165	-0.097222	0.108539
LNGEX	0.247909	-0.057897	1.000000	0.712861	0.032260	0.335152	0.203103
LNHK	0.168501	0.063466	0.712861	1.000000	0.329342	0.513857	0.411215
LNINFL	0.458296	0.273165	0.032260	0.329342	1.000000	-0.023080	0.148820
LNOPP	-0.325628	-0.097222	0.335152	0.513857	-0.023080	1.000000	0.444938
LNCRDT	-0.349666	0.108539	0.203103	0.411215	0.148820	0.444938	1.000000

Appendix 4: Regression Results: Stock-Watson Dynamic Ordinary Least Squares

Dependent Variable: LNGDP
Method: Least Squares
Date: 04/16/14 Time: 21:28
Sample (adjusted): 1981 2011
Included observations: 31 after adjustments
Newey-West HAC Standard Errors & Covariance (lag truncation=3)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	12.89600	2.502934	5.152352	0.0001
LNFDI(-1)	0.091231	0.045877	1.988593	0.0653
LNFDI	0.074532	0.033995	2.192433	0.0445
LNHK(-1)	-80.07105	14.77525	-5.419268	0.0001
LNHK	191.6682	35.81636	5.351415	0.0001
LNHK(1)	-112.5165	22.08944	-5.093677	0.0001
LNGEX(-1)	-0.391165	0.216525	-1.806559	0.0909
LNGEX	0.522618	0.212569	2.458577	0.0266
LNINFL(-1)	-0.197389	0.106777	-1.848617	0.0843
LNINFL	-0.051087	0.017067	-2.993365	0.0091
LNINFL(1)	-0.034706	0.023678	-1.465791	0.1634
LNOPP(-1)	0.082187	0.030752	2.672623	0.0174
LNOPP	0.088078	0.035909	2.452776	0.0269
LNOPP(1)	0.084914	0.049611	1.711600	0.1076
LNCRDT	0.048969	0.029693	1.649173	0.1199
LNCRDT(1)	-0.127621	0.049772	-2.564111	0.0216

R-squared	0.929731	Mean dependent var	9.012364
Adjusted R-squared	0.859462	S.D. dependent var	0.117979
S.E. of regression	0.044229	Akaike info criterion	-3.092572
Sum squared resid	0.029342	Schwarz criterion	-2.352449
Log likelihood	63.93486	Hannan-Quinn criter.	-2.851310
F-statistic	13.23101	Durbin-Watson stat	2.143822
Prob(F-statistic)	0.000005		

Appendix 5: Heteroscedasticity Test Results

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.436795	Prob. F(15,15)	0.2456
Obs*R-squared	18.27837	Prob. Chi-Square(15)	0.2483
Scaled explained SS	4.635885	Prob. Chi-Square(15)	0.9948

Arch LM test

Heteroskedasticity Test: ARCH

F-statistic	0.429957	Prob. F(1,28)	0.5174
Obs*R-squared	0.453702	Prob. Chi-Square(1)	0.5006

Appendix 6: Autocorrelation Test Results

Breusch-Godfrey Serial Correlation LM Test:

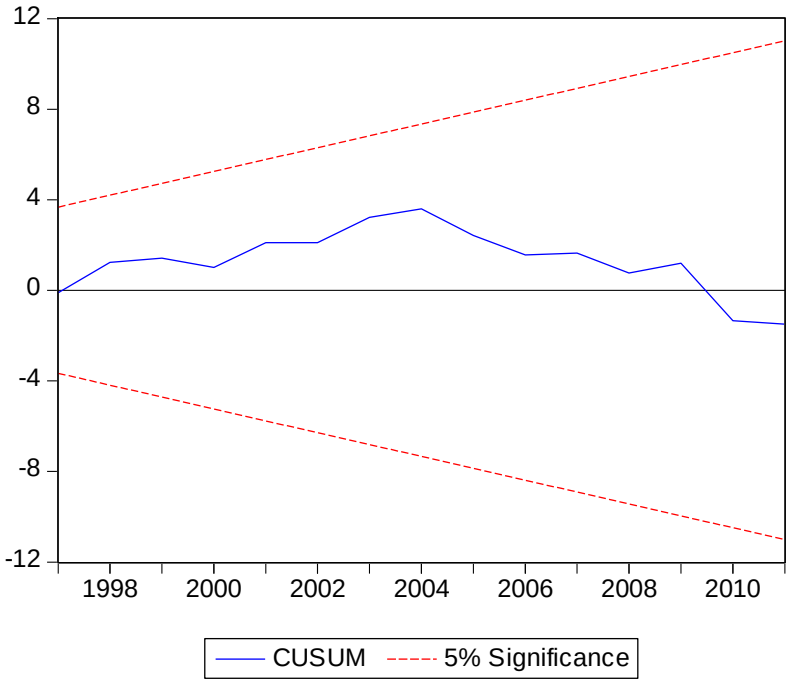
F-statistic	2.480874	Prob. F(8,7)	0.1242
Obs*R-squared	22.91716	Prob. Chi-Square(8)	0.0035

Appendix 7: Model Specification Test Results

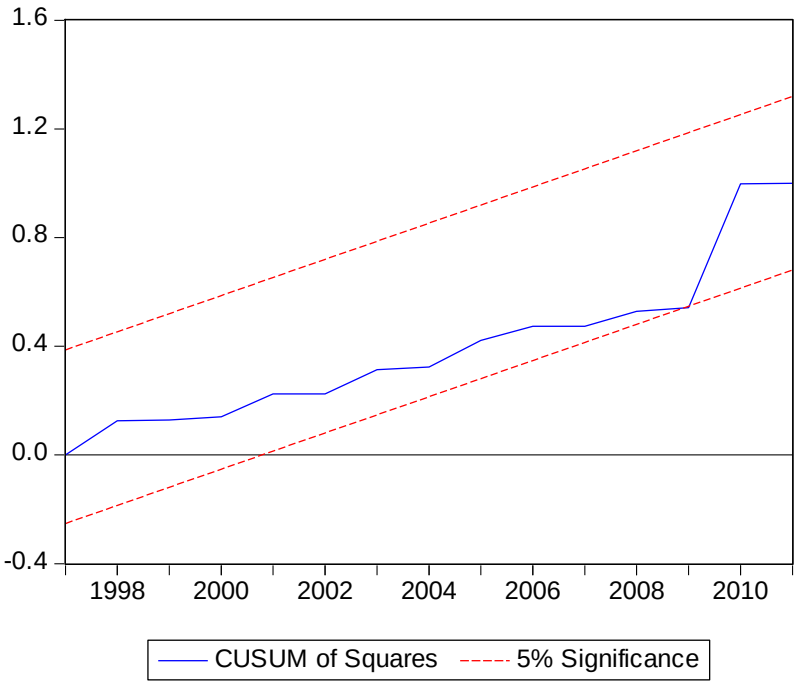
Ramsey RESET Test:

F-statistic	0.012803	Prob. F(1,14)	0.9115
Log likelihood ratio	0.028336	Prob. Chi-Square(1)	0.8663

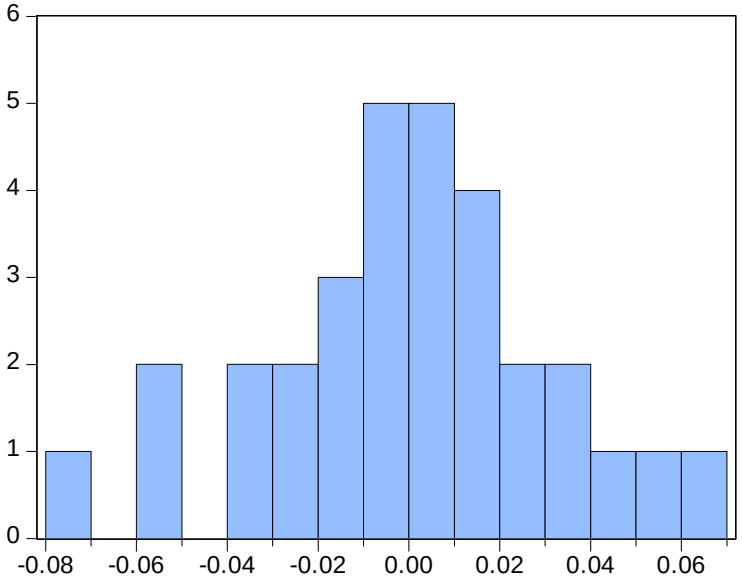
Stability Test Results: Cumulative sum of recursive Residual (CUSUM test)



Stability Test Results: Cumulative sum of squares Residual (CUSUMSQ)



Normality Test Results



Series: Residuals	
Sample 1981 2011	
Observations 31	
Mean	-1.23e-13
Median	0.001050
Maximum	0.062736
Minimum	-0.075143
Std. Dev.	0.031274
Skewness	-0.346062
Kurtosis	3.166537
Jarque-Bera	0.654579
Probability	0.720875

Appendix 8: Regression Data

YEARS	LNGDP	LNHK	LNINFL	LNFDI	LNOPP	LNGEX	LNCRDT
1980	8.90266	6.54484	-1.267458	7.10678	1.05527	7.67194	1.24403
1981	8.96029	6.56212	-0.881074	8.11258	1.11141	7.63213	1.30523
1982	8.92791	6.58054	-0.973269	7.78524	1.01691	7.73448	1.36173
1983	8.85379	6.59968	-0.636023	8.04969	0.98006	7.74131	1.3633
1984	8.94396	6.61908	-0.695695	8.30758	1.03535	7.73295	1.36173
1985	9.03666	6.63833	-1.071011	8.41323	0.98928	7.7621	1.23469
1986	8.9994	6.65742	-0.843731	7.91321	1.01851	7.76377	1.11394
1987	8.98041	6.67623	-0.904163	7.61388	1.0164	7.76577	1.11394
1988	8.99406	6.69432	-1.129459	7.49921	1.02624	7.80882	1.11394
1989	9.00882	6.71118	-0.890013	7.55288	0.9768	7.84441	1.11394
1990	9.05856	6.72657	-0.760382	8.14134	0.08827	7.87598	1.0685
1991	9.06303	6.7403	-0.631868	7.06303	1.03176	7.93518	1.19033
1992	8.94844	6.75257	-0.376082	8.31393	1.18014	7.91334	1.29603
1993	9.05266	6.76385	-0.559274	8.48563	1.10886	7.86818	1.56028
1994	9.08331	6.77476	-0.652396	7.94664	1.13597	7.91391	1.54234
1995	9.04905	6.78565	-0.64601	7.92987	1.17787	7.92585	1.54073
1996	9.12756	6.79672	-0.668899	8.42423	1.27954	7.9745	1.53446
1997	9.14129	6.8077	-0.727322	7.64644	1.23942	8.02146	1.51251
1998	9.16282	6.81793	-0.497305	7.87039	1.12662	8.00974	1.62383
1999	9.18178	6.82657	-0.232698	7.83499	1.19428	7.95888	1.7434
2000	9.19038	6.83312	-0.252849	7.49141	1.13246	7.95353	1.83384
2001	9.24728	6.83765	-0.115163	8.39341	1.0184	7.95184	1.58002
2002	9.1281	6.84057	0.1463141	8.50831	1.13159	7.93877	1.56205
2003	9.05752	6.84219	0.6351819	8.23361	1.24911	7.8605	1.98808
2004	9.01656	6.84293	0.4508343	7.9708	1.34086	7.82672	2.44547
2005	8.99428	6.84326	0.4801752	7.69325	1.08628	7.79727	2.37231
2006	8.97655	6.84302	N/A	7.57861	1.41239	7.78392	2.34104
2007	8.94504	6.84253	-0.934871	7.79013	1.43097	7.76043	2.37621
2008	8.72822	6.84326	-1.480701	8.31929	1.39366	7.73086	3.10755
2009	8.81462	6.84708	N/A	8.15704	1.49106	8.03574	4.82094
2010	8.84489	6.85516	-1.492548	7.70223	1.48826	8.07608	5.36389
2011	8.86608	6.86786	-1.308121	7.56505	1.51431	8.08692	0.89763
2012	8.88558	6.88427	-1.535388	7.54833	1.52347	8.10543	0.49136