MACROECONOMIC POLICY AND DOMESTIC PRIVATE INVESTMENT: THE CASE OF ZAMBIA, 1980 -2008

BY

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I, Collins Chileshe Kaputo, declare that this dissertation:

(a) Represents my own work;

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APPROVAL

This dissertation of **COLLINS CHILESHE KAPUTO** has been approved as partial fulfillment of the requirements for the award of Master of Arts Degree in Economics by the University of Zambia.

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ABSTRACT

There has been a lot of emphasis in Zambia on FDI in the last two decades culminating in a steady increase in FDI flows from about US$200 million in 1990 to about US$920 million in 2008. On the other hand, domestic private investment, as a percentage of GDP has generally been low and has shown downward trends for some periods during 1980-2008. It is clear that the government focus on attracting FDI has disadvantaged local investment as shown by the selective application of tax incentives to foreign investors while local investors are denied similar incentives. While FDI has a significant effect on economic growth and has the advantage of transferring technology to local entrepreneurs, it cannot guarantee sustainable economic development in isolation of domestic private investment.

Viewed against the background of growing evidence of a link between the growth of domestic enterprises and economic development, an inconsistent and downward trend in Zambia's domestic private investment should be a matter of concern to policy makers. Thus, this study argues for the increased mobilization of domestic resources and support to domestic entrepreneurs as the sustainability of the country's economic development and poverty reduction strategies hinge on the growth of local entrepreneurs.

Several studies in developing countries emphasize the importance of macroeconomic policy in explaining variations in domestic private investment. They particularly identify fiscal, monetary and financial policy variables that include; real interest rates, output growth, public investment, bank credit to the private sector, inflation and real exchange rate. This study adopts this approach and examines the relationship between macroeconomic policy and domestic private investment in Zambia for the period 1980 to 2008 by means of a regression analysis based on Cointegration and Error Correction Modeling (ECM) techniques.

The econometric results provide support for the hypothesis that domestic private investment in Zambia, like other developing countries, is affected by key macroeconomic policy variables. It is clear from the findings of the study that real GDP growth, real exchange rate, real interest rates, inflation, public investment and credit availability to the private sector are some of the key macroeconomic factors that influence domestic private investment decisions in Zambia. The results also indicate that macroeconomic factors affect domestic private investment, both in the short-term and in the long-term. Public investment was found to have a greater impact on domestic private investment in the short-run, while real GDP growth, the inflation rate, bank credit to the private sector, the real exchange rate and the real interest rate had a greater impact in the long-run. Econometric results of the error correction mechanism (ECM) further reveal the existence of a short-run dynamic adjustment process and a long-run equilibrium relationship between these macroeconomic variables and domestic private investment. Any disequilibrium away from the long-run steady state equilibrium of domestic private investment is corrected at the rate of 85.5 percent. In other words, the speed at which domestic private investment adjusts to changes in macroeconomic policy variables of real interest rates, real exchange rate, inflation, public investment, bank credit flows to the private sector and the real GDP growth in an effort to achieve long-run static equilibrium is 85.5 percent. Thus, as results show, policies relating to GDP growth, public investment, bank credit availability, lending interest rates, exchange rate and inflation are expected to significantly influence domestic private investment decisions in Zambia, the magnitude of which depends on the vigor of policy implementation.

To my mother Margaret F. Chileshe

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Lastly, I would like to say thank you to my family, in particular, my beloved wife and children for their love, support and understanding during my studies. Above all, I wish to thank the almighty GOD for making everything possible.

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LIST OF ABBREVIATIONS AND ACRONYMS

ADF	Augmented Dickey Fuller
AR	Autoregressive
BoZ	Bank of Zambia
CEEC	Citizens Economic Empowerment Commission
CSO	Central Statistical Office
DF	Dickey Fuller
ECM	Error Correction Model
ECT	Error Correction Term
FDI	Foreign Direct Investment
GDI	Gross Domestic Investment
GDP	Gross Domestic Product
IMF	International Monetary Fund
LuSE	Lusaka Stock Exchange
LR	Log likelihood Ratio
MMD	Movement for Multiparty Democracy
OLS	Ordinary Least Squares
PP	Phillips-Perron
SMEs	Small and Medium Enterprises
UNDP	United Nations Development Programme
UNIP	United National Independence Party
VAR	Vector Autoregressive
WB	World Bank
ZDA	Zambia Development Agency
ZPA	Zambia Privatisation Agency

CHAPTER ONE
INTRODUCTION

1. 0 Introduction

This chapter presents the background to the study, the problem statement, objectives of the study and discusses the hypotheses on which the study is based. It also provides justification for the study and presents the scope of the study and its organization.

1.1 Background to the Study

Economic theory identifies macroeconomic policy as a factor of major importance for economic growth. This proposition is centered on the view that a correct macroeconomic policy framework promotes both foreign direct investment and domestic private investment. The importance of investment to the growth and development strategy of developing countries can hardly be over emphasized. The need for more investment into the economy to tap the yet unexploited natural resources that countries are endowed with is one of the topical issues in the development literature. Indeed, there is growing evidence to suggest that investment is one of the most important determinants of the long-run rate of economic growth (Patnaik and Joshi, 1998). This is so because investment has a dual role of affecting not only income generation, but also increases the productive capacity of the economy. This is particularly critical for most Sub-Saharan African countries whose underdevelopment and poverty are acute. It is important to note, however, that investment is at two levels- in the public sector and the private sector. While public sector investment on infrastructure (roads, telecommunication, and energy) and non-infrastructure (health, education, security) sectors of the economy is critical in terms of creating the necessary conditions for economic growth, harnessing the inherent potential of the private sector as the driver of economic growth is especially important. This is so because most

governments face huge challenges in mobilizing sufficient public resources to make meaningful investments that would ensure increased economic growth. Moreover, public investment is sometimes made for political expedience, thus lacking economic rationality. The private sector, on the other hand, has the capacity to mobilize resources and make prudent investment decisions that enhance the efficiency and productive capacity of the economy. It is therefore necessary, as Reinhart and Khan (1990) point out, to distinguish between private and public sector investment in the analysis of investment in developing countries. They emphasize that private sector investment plays a greater role than public sector investment in determining economic growth and employment creation. This was confirmed by Reinhart and Khan (1990) in a study involving 24 developing countries where private sector investment was found to have a larger direct effect on growth than public sector investment.

As far back as the early 1980s, there was a realization that private sector driven development was more sustainable than the one driven by the public sector. Consequently, most developing countries began to implement economic reforms that were aimed at strengthening the participative capacity of the private sector in economic development (Pfefferman and Madarassy, 1990). This line of thought is supported by Chhibber and Dailami (1990) who stress the need for the revival and promotion of private sector investment as the means for the recovery and enhancement of economic growth in developing countries.

Indeed, the desirability of increasing the private sector's share in total capital formation by relying more on incentives is widely acknowledged. It is also now accepted that the expansion of private sector investment should be the main impetus for economic growth, and that public sector investment resources should gradually focus on the social sector such as upgrading of social capital and services. Ndikumana and Verick (2008) also point out that domestic private

investment attracts foreign direct investment into the economy in that high domestic private investment acts as a signal for high returns to capital. Another plausible argument is that local investors have access to more accurate information about the local business climate than foreign investors, and therefore, the robustness of domestic private investment acts as a signal about the state of the economy to foreign investors. Thus, improving domestic private investment through incentives pays off by among other things making the economy more attractive in the eyes of foreign investors.

According to Martin and Wasow (1992), most developing countries could not maintain their investment rates and therefore economic growth in the 1980s because of the failure to adjust to the adverse changes in the external environment. They further argue that the implementation of adjustment policies influences domestic private investment by affecting its key determinants which include fiscal, monetary and financial policy variables. Moreover, the hypothesis that a stable macroeconomic environment is conducive to investment and therefore economic growth underlies the IMF/World Bank stabilization and structural adjustment programs. This hypothesis is shared by Patnaik and Joshi (1998) who argue that sustainable government policies are more likely to attract private sector investment, both foreign and domestic. Recent cross-country studies also suggest that long-term growth requires macroeconomic stability. Low inflation, realistic exchange rates and appropriate real interest rates are among the indicators of a stable macroeconomic environment.

Domestic private investment in Zambia has been quite low and declining during the period 1980-2008. Gross domestic private investment as a share of GDP declined from 14.2 percent in 1980 to 7.2 percent in 2000 before increasing to 14.4 percent in 2008. Even at 14.4 percent of GDP in 2008, gross domestic private investment is quite low compared to other Sub-

Saharan African countries such as Lesotho and South Africa whose gross domestic private investment have been higher over the same period. For instance, Lesotho recorded gross domestic private investment (% of GDP) of 25.7 percent in 1980, 36.9 percent in 2000 and 31.7 percent in 2008 while South Africa had 25.9 percent in 1980, 13.8 percent in 2000 and 21.5 percent in 2008 (World Bank, 2007).

Viewed against the background of the growing evidence of a link between investment and economic growth, Zambia's low domestic private investment is a matter of serious concern. It is critical for Zambia, especially given the high levels of poverty and unemployment to harness the potential of the private sector and ensure increased levels of investment and economic growth by creating conditions that enhance domestic private investment. The question of what influences domestic private investment behaviour in Zambia is therefore of critical importance.

It is often argued that Zambia's poor economic performance began with the decline in the price of copper on the international market and the subsequent increases in the price of crude oil in the 1970s. While these shocks undoubtedly exerted tremendous pressure on the economy, government's failure, however, to restructure its fiscal policy and diversify the economy in the face of continued decline in export earnings and increasing import costs is largely to blame for the economic down-turn of the 1970s and late 1980s. Despite being well-endowed with natural resources such as minerals, arable land and abundant water, the country continued to experience economic decline in the decades following independence largely because of failure to diversify the economy away from mining. In order to redress the negative economic growth trends, the World Bank and IMF urged the Zambian government to undertake macroeconomic policy reforms (White, 1997). Government in this regard, made multiple aborted attempts to undertake macroeconomic policy reforms beginning in 1985. However, a more consistent and

comprehensive package of macroeconomic policy reforms aimed at creating an improved business environment was only implemented in 1992. The macroeconomic policy reforms were supported with the policy of privatization of parastatal companies. The aim was to promote private sector development. This however, did not result in significant investment as earlier envisioned. This was because macroeconomic policy reforms brought about profound changes in the economy which the country was ill structured to accommodate. For instance, complete trade liberalization introduced competition which state enterprises as well as newly privatized companies were unprepared to meet. Further, the open economic environment, when combined with extremely high borrowing rates proved in practice to be biased against Zambian producers whose cost of doing business was much higher than their counterparts in the neighbouring countries, especially those from South Africa, Botswana and Zimbabwe. The new economic environment was further compounded by uncertainties in the business environment arising from unstable macroeconomic conditions. High prices for utilities such as electricity and fuel further exacerbated the difficulties faced by domestic producers (UNDP, 2006). Under these difficulties, coupled with the lack of capacity of new owners of the privatized companies, most of the newly privatized parastatal companies collapsed. The end result was continued negative economic growth, increased levels of unemployment and poverty.

The study aims at examining the dynamic relationship between macroeconomic policy and domestic private investment by means of cointegration and error correction modeling techniques, addressing the question of the extent to which macroeconomic policy reforms implemented by the government over the last two decades have influenced domestic private investment decisions in Zambia. The methodology of cointegration and error correction modeling is chosen on the basis that it takes into account the problems associated with time

series data and also enables us to determine the short-term and long-term effects of macroeconomic policy simultaneously. In this study, domestic private investment includes investment in manufacturing, agriculture, infrastructure, construction and services. The study is based on the annual time series data covering the period 1980 to 2008. The choice of the sample period is based on the view that for Zambia, this period combines two sets of macroeconomic policy regimes – the free market and the controlled market systems. The combination of the two economic systems enables us to have a holistic approach in the analysis of the impact of macroeconomic policy on domestic private investment given the continued low and cyclical domestic private investment trends particularly in the 1980s and 1990s.

1.2 Statement of the Problem

The poor economic performance largely characterized by economic decline and macroeconomic instability points to the fact that neither strong public intervention and ownership, nor radically market oriented policy frameworks have achieved the economic diversification and equity necessary for sustainable growth in Zambia. This is exemplified by the fact that even after almost two decades of speedy implementation of the most comprehensive macroeconomic policy reforms aimed at improving the overall economic environment, domestic private investment in Zambia, later alone economic growth is yet to show a robust improvement. Zambia still confronts significant challenges in improving the overall environment for private sector-led growth.

Domestic private investment, as a percentage of GDP has generally been low compared to other Sub-Saharan African countries. It has also shown downward trends during the period 1980-2008. For instance, Sub-Saharan African countries average gross domestic private investment (% of GDP) for the period 1980-2008 was 13 percent compared to 5 percent for

Zambia. At a country level, the average gross domestic private investment (% of GDP) for the same period was 19 percent for Botswana, 32 percent for Lesotho, 18.2 percent for South Africa, 14.4 percent for Swaziland and 14.5 percent for Zimbabwe (World Bank, 2007). This clearly indicates that overall, Zambia has recorded comparatively lower domestic private investment ratios. This investment performance is worrying in that it is not reflective of the country's natural resource endowment and the pace of macroeconomic policy reform implementation of the 1990s.

Consistently low levels of domestic private investment are a problem. Firstly because domestic private investment plays a critical role in the growth of an economy and employment creation, and secondly because low levels of domestic private investment increases the vulnerability of the economy, especially with regards to external shocks.

Given the high poverty levels and the low domestic private investment, and the fact that very little is known as to what extent the macroeconomic policy reforms implemented over the last two decades have influenced domestic private investment, it is necessary to evaluate how these reforms have impacted on domestic private investment. It will also enable us learn lessons in order to draw appropriate policy conclusions and implications for Zambia.

1.3 General Objective

The study's overall objective is to assess the impact of macroeconomic policy on domestic private investment in Zambia

1.3.1 Specific Objectives

1) To determine the macroeconomic policy variables that influence changes in domestic private investment in Zambia;

2) To estimate the short and long-term effects of the macroeconomic policy variables on domestic private investment in Zambia.

1.4 Hypotheses

The hypotheses to be tested in this study are that macroeconomic factors influence the level of domestic private investment. Specifically, we hypothesize that the rate of inflation, real interest rate, bank credit to the private sector, real exchange rate, public investment and real GDP growth have a significant impact on domestic private investment.

It is expected that:

1) Domestic credit to the private sector, public sector investment, real GDP growth and real exchange rate would most likely impact positively on domestic private investment.
2) Inflation and real interest rate would have a negative effect on domestic private investment.
3) The macroeconomic policy variables have both short-term and long-term effects on domestic private investment.

1.5 Justification and Significance of the Study

According to Bigsten (1999), domestic private investment performance is influenced to a very large extent by macroeconomic policy variables such as fiscal, monetary and exchange rate policies. This study is influenced and seeks to add to this body of knowledge by empirically analyzing domestic private investment and its response to macroeconomic policies in Zambia. The significance of private investment to the growth of the economy has been widely acknowledged both in the developed and developing countries. Several studies have been conducted on what determines private investment in other countries such as Kenya (Martin and Wasow, 1992); Senegal (Ouattara, 2004), and Fiji (Seruvatu and Jayaraman, 2001) among

others. Further, Ghura and Goodwin (2000) and Mlambo and Oshikoya (2001) carried out similar studies for groups of African countries. However, no study has yet been conducted that focuses on how macroeconomic policy influences domestic private investment in Zambia. This study is therefore, an attempt to fill this gap by evaluating the impact of macroeconomic policy on domestic private investment in Zambia and identifying its key macroeconomic determinants. We believe that the results of this study shall be a useful contribution to knowledge and in the formulation of policies related to the promotion of domestic private investment.

1.6 Scope of the Study

The study covers the Zambian economy for the period 1980 to 2008. This period was chosen because it sufficiently captures both the pre-macroeconomic reform period (1980-1991) and the post-macroeconomic reform period (1992-2008). The combination of the two different macroeconomic policy regimes- free market policies and controlled market policies allows for a holistic approach in the analysis of the impact of macroeconomic policy on domestic private investment in Zambia.

1.7 Organization of the Study

This study is organized into six chapters. Chapter 1 discusses the background to the study. Chapter two provides some economic background information, investment trends and macroeconomic policy reforms in Zambia. Chapter three reviews the relevant literature on investment. Data sources, estimation model and estimation techniques are discussed in chapter 4. Empirical analysis and presentation of results are dealt with in chapter 5, and the conclusion and policy recommendations follow in chapter 6.

CHAPTER TWO

MACROECONOMIC BACKGROUND ON ZAMBIA

2. 0 Introduction

This chapter provides some insights into the macroeconomic background of Zambia with regards to the macroeconomic policy reforms that have been undertaken to improve the investment environment, and reviews the investment trends.

2.1 The Macroeconomic Background

Zambia's economic policy in the years after independence followed much the same course as that taken by other governments pursuing an African socialist path to development. Public revenues were used to rapidly expand social sector service provision and public service employment (White, 1997). The first few years after independence saw a commitment to an economic set up that was largely market oriented and with a favourable attitude towards foreign investment. During this period, real output grew at an annual average rate of 4 percent and the economy experienced high levels of domestic capital formation sustained largely by high copper prices on the international market (World Bank, 2007). However, by mid-1970s, the country switched to an economy characterized by state controls following the Mulungushi Declaration in 1968 and the Matero Reforms of 1969 which greatly expanded the role of the state in the economy. Government assumed a majority share holding in existing enterprises and created new ones. By the end of the 1970s, an all-embracing system of state controls on economic activities had been constructed, with price controls for major commodities, government intervention in credit allocation, import controls and an overvalued exchange rate with an elaborate foreign exchange rationing system. These policies led to economic instability and precipitated increased levels of capital flight. Starting after 1976, the country experienced two decades of almost

continuous decline in income per capita. During the 1980s, as the price of copper continued to fall on the international market, capital stock declined, and the economy continued to contract (Adam, 1999). The cause of the country's rapid economic decline after the 1970s can be explained by Zambia's economic over-dependence on the production and export of copper, and a flawed macroeconomic response to the decline in world copper prices in the 1970s (Gulhati, 1989). In the mid-1970s, there was an urgent need to adjust to the change in the new external environment. The Zambian government failed to make any such adjustment. Consequently, by the early 1990's, on the eve of major political and economic reforms, real per capita income was less than half its value in the early 1970s (Gulhati, 1989). The government borrowed heavily in the second half of the 1970s from both domestic and foreign sources to bridge its fiscal financing gap and shortfalls in foreign exchange. These funds were used to maintain high consumption levels whilst investment was allowed to decline. The policy of not adjusting in consumption patterns was followed on the assumption that the depression in copper prices was a temporary phenomenon, and therefore borrowings were made against the prospect of future copper earnings. But this optimism was misplaced as the price of copper continued to fall on the world market and the economy continued on a steep downward trend. Real GDP per capita fell by over one fifth between 1970 and 1983. The initial gains in social indicators that were made immediately after independence began to decline. For example, the infant mortality rate rose from 90 per 1,000 live births in 1980 to 101 in 1990, child malnutrition increased over the same period from 6 to 14 per cent, and continued to worsen reaching 23 per cent in 1991. A marked increase in poverty also began to emerge. The percentage of households below the poverty line increased from 49 percent in 1980 to 67.4 percent in 1991 (White, 1997). Despite the economic

and social decline, the control regime remained in place, with continued half-hearted reform efforts until the 1990s.

The Zambian economy was by 1990 in a parlous state, characterized by among other things a balance of payments crisis, unsustainable foreign debt burden (which grew from $0.8 billion in the early 1970s to $7.2 billion by the late 1990s), lack of re-capitalization in the parastatal companies and a general decline in investment due to resource constraints for new investments. Government initiated the IMF/World Bank supported macroeconomic policy reforms in 1985. These reforms involved the liberalization of interest rates, the reduction in subsidies and the elimination of most price controls. Most radical however, was the liberalization of the foreign exchange allocation system in preparation for the foreign exchange auction system, which was introduced in October 1985. The foreign exchange auction system proved very controversial as it was thought to have caused high inflation and consequently allowed the rich to benefit from luxury imports (White, 1997). More controversy followed at the end of 1986, as food riots flared up on the copperbelt in protest at the announced doubling of mealie meal prices following the removal of subsidies. The government was forced to back down, paving the way for the formal abandonment of the reform programme in May, 1987. In the same year (1987), the government introduced what was called the "New Economic Recovery Programme" under which Zambia suspended financial relations with the IMF which was blamed for the economic difficulties the country found itself in. However, the New Economic Recovery Programme did not help revive economic growth, as annual inflation continued to rise from 47.1 percent in 1987 to 85.7 percent in 1989 while GDP annual growth declined from 2.7 percent to -1.0 percent during the same period (World Bank, 2007). In 1989, in the face of enormous capital flight and continued macroeconomic instability, government re-adopted the macroeconomic

policy reforms prescribed by the IMF and World Bank, albeit reluctantly. The programme of macroeconomic policy reforms was embraced rather more enthusiastically by the MMD Government who in 1991 elections campaigned on the platform of economic liberalism and the idea that the economy should be private sector driven (Adam, 1999).

The new economic development strategy of the government since 1991 has been to promote economic growth through the private sector, develop an efficient financial system and provide a stable macroeconomic environment that promotes investment. To this effect, a wide range of macroeconomic policy reforms were embarked upon. As a result, economic performance has shown some improvement as indicated by various economic indicators. The GDP annual growth increased from -5.0 percent in 1990 to 5.7 percent in 2008 while annual inflation declined from 106.4 percent to 16.6 percent during the same period (World Bank, 2007).

Table 2.1: GDP Annual Growth Rate for Zambia and Selected African Countries.

Country	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2006**	**2007**	**2008**	**2009**
Zambia	3.0	1.6	- 0.5	-2.8	3.6	5.2	6.3	6.2	**5.7**	6.3
Mozambique	..	1.0	1.0	3.3	1.9	8.4	8.7	7.3	6.7	6.3
Rwanda	9.0	4.4	-2.4	35.2	6.0	7.1	7.3	7.9	11.2	5.3
DRC	2.2	0.5	-6.6	0.7	-6.9	6.5	5.1	6.3	6.2	2.7
Sierra Leone	4.8	-5.3	3.4	-8.0	3.8	7.2	7.3	6.4	5.5	4.0
Burundi	1.0	11.8	3.5	-7.9	-0.9	0.9	5.1	3.6	4.5	3.5

Source: *World Bank, African Development Indicators, 2007.* https://www.worldbank.org/data/wdi2009/index.htm

Table 2.1 shows the GDP annual growth rate for Zambia and selected African countries which have gone through conflict. The figures indicate that, on average, Zambia's economic

performance is comparable to that of the countries that have gone through conflict. This is a worrying phenomenon given that the country's relative tranquility and natural resource endowments could not be exploited to grow the economy beyond the current levels. For Zambia to reduce the current high poverty levels which stand at 64 percent of the total population according to the 2006 CSO survey report there is urgent need to grow the economy beyond the rates of growth obtaining now. On average, Zambia's population has been growing at the rate of 3.5 percent. According to the National Population Policy of Zambia of 2007, for the country to have a sustainable population growth, reduce poverty and unemployment, the economy needs to grow at a rate 3 times the rate of the population growth. This is possible, but only with increased levels of private sector investment, both foreign and domestic.

2.2 Investment Overview

Zambia's gross domestic investment has been on a declining trend since 1980. The decline has been particularly severe between 1985 and 2000. This may be attributed to the decrease in copper production and the falling copper prices on the international market. Gross domestic investment fell by 6.1 percent of GDP between 1980 and 2000. As a share of GDP, it was 17.2 percent in 2000 relative to 23.3 percent in 1980. Overall, gross domestic investment as share of GDP reached its peak in 2006 at 25.8 percent from the 1980 level of 23.3 percent. It has since declined to 20 percent in 2009.

Table 2.2 below shows a declining trend in domestic private investment from 1980 to 2000. Domestic private investment reached its lowest ratios ever in 1985. However, it showed signs of recovery in 2005 and reached its peak in 2006, after which it started to fall again. Domestic private investment fell almost by half between 1980 and 2000. It was 14.2 percent in 1980 as compared to 7.2 percent in 2000. A marked increase in domestic private investment was

recorded in 2006 at 16.1 percent, but declined to 14.9 percent in 2009. Public investment as a ratio of GDP followed almost the same pattern as that for domestic private investment. It declined from 9.1 percent in 1980 to 5.1 percent in 1995, but reached its peak in 2000 at 10 percent before declining again to 5.1 percent in 2009.

Table 2.2: Zambia's Gross Domestic Investment, Public and Private (% of GDP), 1980 - 2009.

	1980	1985	1990	1995	2000	2005	2006	2007	2008	2009
Gross domestic investment, private (% of GDP)	14.2	6.6	7.3	7.3	7.2	15.8	16.1	15.2	14.4	14.9
Gross domestic investment, public (% of GDP)	9.1	8.3	6.2	5.1	10.0	8.9	9.7	8.8	7.6	5.1

Source: *World Bank, African Development Indicators, 2007. https://www.worldbank.org/data/wdi2009/index.htm.*

Figure 1 shows gross domestic fixed investment in levels. The figure depicts declining trends in domestic total fixed investment from 1980 to 1986. Gross domestic fixed investment (private and public) were maintained below the 1980 levels from 1986 to about 2006. However, a sharp increase in domestic fixed private investment was recorded in 2007, but declined slightly in 2008. On the other hand, domestic fixed public investment remained low and only recorded marginal increments for the entire period.

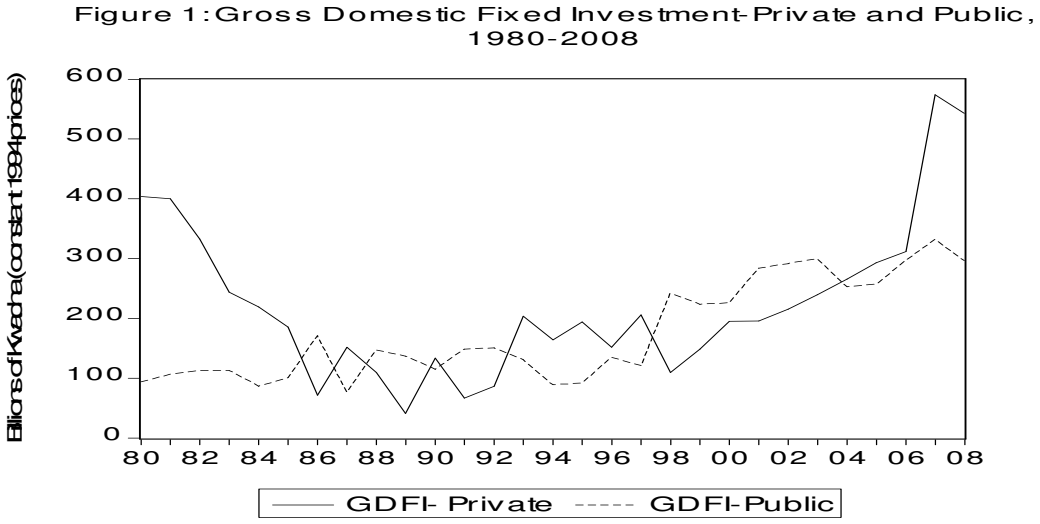


Table 2.3 below highlights Zambia's domestic investment performance relative to selected Asian, Latin-American and Sub-Saharan African countries. The statistics indicate that overall, Zambia has recorded comparatively lower domestic investment ratios to that of the leading countries in Sub-Saharan Africa, Asia and Latin-America. However, the country's domestic investment ratios compare well with that of Ecuador and Venezuela especially between 1985 and 2007. On the other hand, Botswana, Gabon, and the two emerging economies of Asia-India and China had higher domestic investment ratios than Zambia for the period 1980 to 2009.

The evolution of domestic investment in Zambia shows a declining trend from 1980 to 2000. It reached its peak in 2006 at 25.8 percent and slumped again to 20 percent in 2009. The worrying fact is that while Zambia's economic performance could compare favourably well with that of both India and China at independence in 1964, India and China's domestic investment have almost been double that of Zambia between 1980 and 2009.

Given the political stability and natural resource endowments, it is possible for Zambia to enhance domestic investment to the levels obtaining in India and China provided the right macroeconomic policies are implemented that encourage local investor participation in the economy and the growth of SMEs.

Table 2.3: Gross Capital Formation for Zambia and Selected Asian, Latin- American and Sub-Saharan African Countries (% of GDP): 1980 – 2009.

Country	1980	1985	1990	1995	2000	2005	2006	2007	2008	2009
Zambia	23	15	17	16	19	25	26	24	22	20
Botswana	40	30	38	26	28	26	24	26	32	24
Gabon	28	39	24	24	26	21	26	26	24	28
Ecuador	26	18	18	19	13	24	23	24	28	27
Venezuela	25	19	10	18	17	23	25	28	25	22
India	21	24	24	27	23	34	36	38	36	35
China	35	39	35	40	35	44	44	42	43	45

Source: *IMF International Financial Statistics, Year Book 2002 and 2007; World Bank, Africa Development Indicators, 2007.*

2.3 Overview of Zambia's Macroeconomic Policy Reforms

Zambia's macroeconomic policy reforms have largely centered on macroeconomic stabilization, trade and financial liberalization coupled with structural reforms with the aim of encouraging foreign direct investment into the country. To achieve this, the government has implemented measures that include, among others, removal of restrictions on foreign exchange retention and externalization, tax rebates for foreign companies willing to invest in the country, and a market determined foreign exchange rate to enhance Zambia's competitive position as a regional investment destination. Government also introduced the Bureau de change system for foreign exchange to create efficiency in the foreign exchange market. Import and export licenses were eliminated to promote international trade. Further, to enhance efficiency and competitiveness in the financial sector, government committed itself to limit net borrowing from the banking system to zero (World Bank, 2004). Other policy measures have included the conversion of most commercial banks' statutory reserve deposits to medium term government debt as a means of reducing the bank interest rate spread and thus enhance private savings and investment. Recognizing the importance of private investment in the creation of employment, economic diversification and poverty reduction, government established several institutions such as the Lusaka Stock Exchange to help in capital mobilization, and the Zambia Development Agency to promote investment, particularly in the manufacturing sector and to supervise the privatisation of parastatal companies. To promote investment in the mining sector, being Zambia's main economic backbone, government revised the Mineral Tax Act into the Mineral Royalty Tax Act, thus bringing Zambia in line with international norms. In addition, the government has set up the Citizens Economic Empowerment Commission to promote local investment through support to small and medium scale enterprises.

Despite government's efforts and commitment in attracting investment, notable policy failures have been established especially in the area of economic diversification and active participation of the citizens in the economy. The country continues to depend on the mining sector even with the volatility of the copper prices on the international market. The country's agricultural and tourism potential remains largely underdeveloped hence the high levels of unemployment and poverty. The manufacturing sector is almost non-existent largely due to the absence of vibrant small and medium scale enterprises and the underdeveloped agricultural sector. The absence of vibrant small and medium scale enterprises is largely due to government policies that are tailor made to attracting foreign direct investment as opposed to encouraging local domestic investment.

There is enough evidence to suggest that formulating policies that focus more at attracting foreign direct investment without due consideration for local participation have failed to bring about economic diversification and the equity necessary for sustained economic and social development. There is therefore, need to develop policies that support the development of local entrepreneurship if the country has to achieve sustainable social and economic development (Sikazwe, 2010). It is therefore important that the focus on attracting foreign direct investment through various incentives does not disadvantage local investment by citizens. Zambian entrepreneurs experience a lot of problems in growing their small businesses. This is due to various bottlenecks which include, among others, the undercapitalization of their businesses, the high cost of borrowing and generally the difficulty in gaining access to bank credits. They are also faced with high bureaucratic costs, the lack of entrepreneurial skills and most importantly a seemingly lack of government interest in supporting local investment by offering similar incentives as those offered to foreign investors.

There is ample evidence that economic growth in most developed and emerging economies such as those of Canada, China and India have been driven by small and medium scale enterprises. These continue to be the major source of wealth and economic growth. In Canada, small and medium size enterprises (SME) represent over 97 per cent of independent business establishments and account for roughly half of Canada's GDP. In 2005, SMEs employed over 6.7 million Canadians or 64 per cent of private sector employees (Pohlmann et al., 2006). In the European Union, SMEs comprise approximately 99% of all firms and employ between them about 65 million people. In India, according to the Wikimedia Foundation Inc publication of 2010, the SMEs sector plays a pivotal role in the development of the industrial sector of the economy. It is estimated that in terms of value, the sector accounts for about 39% of the total manufacturing output and around 33% of the total exports of the country. The publication states further that in many sectors, SMEs are also responsible for driving innovation and competition and that globally SMEs account for 99% of business numbers and 40% to 50% of GDP. The major advantage of the sector is its employment potential at low capital cost. Zambia can take a leaf from the success story of such economies, and create conditions that encourage wider participation of local entrepreneurs in the local economy. Any plan that aims at enhancing Zambia's competitiveness and productivity should have a major focus on encouraging the birth and growth of SMEs, particularly in sectors such as manufacturing, agriculture and tourism as a way of reducing urban and rural poverty. Growing small firms into larger firms, and improving productivity, are essential to building a more competitive economy that can consequently attract foreign direct investment by positioning itself as a highly desirable place to do business in, given an increasingly competitive world business environment.

CHAPTER THREE

LITERATURE REVIEW

3.0 Introduction

The main aim of this chapter is to present some theoretical and empirical arguments underlying the wider debates on domestic private sector investment. In this respect, the chapter provides theory supported by empirical evidence on macroeconomic policy variables that influence investment decisions by the private sector. In the literature, private investment functions are generally modeled on the premise of the neo-classical models, the accelerator model, Tobin's Q- model or the expected profits model. The macroeconomic policy variables frequently used in private investment models can be categorized as financial and non financial determinants. Financial variables include the rate of interest, real exchange rate, inflation, the level of financial development and bank credit. The non-financial variables include real output and public investment. The remainder of this chapter discusses the theoretical and empirical effects of these variables.

3.1 Theoretical and Empirical Review

The basic notion behind the flexible accelerator model is that the larger the gap between the existing capital stock and the desired capital stock, the greater a firm's investment (Ghura and Goodwin, 2000). The idea is that firms generally plan to close the gap between the desired capital stock K* and the actual capital stock K, in each period. The equation for the desired capital stock is of the form:

$$K^* = \alpha \frac{p}{r} Y_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

This implies that the desired capital stock (K*) depends on the real rental cost of capital and the level of output (Y_t). When these variables change, the desired capital stock also changes (Gujarati, 2007).

In the neoclassical approach, Chirinko (1993) says that the desired capital stock is proportional to output and the user cost of capital. This in turn depends on the price of capital goods, the real rate of interest, the rate of depreciation and the tax structure. Therefore, an investment equation can be postulated from the gap between the desired capital and the actual capital stock.

The Tobin's Q theory of investment says that the ratio of the market value of the existing capital stock to its replacement cost (i.e. the Q ratio) is the main force driving investment. Accordingly, Ghura and Goodwin (2000) argue that enterprises will want to invest if the increase in the market value of an additional unit exceeds the replacement cost.

The analysis of the profit and investment relationship has several variants. One of which is that investment is affected by current profits, the amount of retained profits or by other variables like output, price and sales, which reflect the profits (Chirinko, 1993). The profit theory suggests that the greater the gross profits, the greater will be the level of internally generated funds and in turn the greater will be the rate of investment.

According to Mlambo and Oshikoya (2001), the level of investment can be represented in the following form:

$$I = I(\Delta\mu, \delta, \tau, \psi) \quad \text{..... (2)}$$

where, I is investment, $\Delta\mu$ is the expectation of future market conditions, δ is the financial constraints of the firm, τ is the valuation of the firm in the stock market, and ψ is economic and political uncertainty.

It can be concluded from the foregoing that private investment depends on three broad categories of variables defined as Keynesian, neoclassical, and uncertainty variables. Variables that may be included in the Keynesian approach include GDP growth, internal funds and capacity use. The neoclassical determinants of private investment include the ratio of the market value of the existing capital stock to its replacement cost (the Q ratio), the real interest rate, the user cost of capital and public investment (Mlambo and Oshikoya, 2001). The uncertainty variables include the exchange rate and the inflation rate.

A study by Reinhart and Khan (1990) of 24 developing countries found a close connection between the level of investment and the rate of economic growth. Another study on the short run and long run determinants of private sector investment in Argentina by Acosta and Loza (2004), confirmed that the real exchange rate, growth in output and public investment affect private investment significantly. Ghura and Goodwin (2000) in a study involving 31 developing countries in Asia, Sub-Saharan Africa and Latin-America found that private investment is determined by real GDP growth, public investment, improvements in financial intermediation and reduced credit to government. A study by Blejer and Khan (1984) using data for 24 developing countries also found that changes in private sector output, public investment and the flow of credit to the private sector are key determinants of private investment. Furthermore, a multi-country panel data study on investment reports that measures of macroeconomic instability such as the variability in the real exchange rate and the rate of inflation have an adverse effect on investment (Serven and Solimano, 1992). Further, Patnaik and Joshi (1998) in a study on India observed that recent developments in the theory of investment behaviour have focused on the role of instability and uncertainty in determining investment. This view ties in with the observation by Mlambo and Oshikoya (2001) that standard

macroeconomic policy variables such as the exchange rate, fiscal and monetary policy and the overall macroeconomic uncertainty variables explain the sluggish response of investment behaviour to reforms. Mlambo and Oshikoya (2001) also conclude that Africa remains significantly vulnerable to external shocks. These have a negative impact on domestic private investment. They suggest the need to diversify the export base as a cushion, especially against the terms of trade shocks.

Ghura and Goodwin (2000), Oshikoya (1994), and Mlambo and Oshikoya (2001) argue that while investment models have been widely applied using data from developed countries, there are difficulties associated with the applicability of these models to developing countries. Noted among others are the assumptions upon which these models are based such as the existence of perfect capital markets and the perfect flow of information which are not satisfied in most developing countries. Furthermore, the inadequacy of data on capital stock in developing countries makes it difficult to observe the stock adjustment mechanism upon which investment theories are based.

The existence of data limitations in empirical models of developing economies, especially for capital stock and the appropriate measures of the return on investment has led empirical studies on the determinants of private investment in developing countries to use variants of the flexible accelerator model of private investment. This is designed to capture the distinctive institutional and structural features of those economies. They have combined the features of the flexible accelerator, the neoclassical and the structural models in an effort to emphasize the effects of resource constraints faced by private investors in developing countries. The results of these studies suggest that the expected aggregate demand, proxied typically by output; domestic credit constraints, proxied by credit availability to the private sector; and

physical infrastructure, proxied by public investment expenditure, are important determinants of domestic private investment in developing countries (Martin and Wasow, 1992). Other studies such as Fry (1998) have used variants of the flexible accelerator model. In this case, the speed of adjustment is influenced by a number of observable variables. These observable variables may include public investment, credit to the private sector, inflation, real exchange rate, GDP growth and interest rates.

3.1.1 Inflation Rate and Domestic Private Investment

A high rate of inflation tends to discourage private savings and consequently investment. On the other hand, a low rate of inflation and appropriate pricing of capital, labour and land help to maintain international competitiveness, and are therefore, a major area of concern for policy makers in enhancing private sector investment (World Bank, 1995). Beaudry et al, (2001) used the inflation rate as a reasonable proxy for the 'uncertainty' level in the economy. A multi-country panel data study by Serven and Solimano (1992) found that stable prices improved the informative content of the price system. This allowed a favourable allocation of resources. Higher expected inflation lowers the real interest rate, causing a shift in portfolio adjustments from real money balances to real capital, thereby raising real investment (Ghura and Goodwin, 2000). Empirical studies involving 23 developing countries by Greene and Villanueva (1990) found a negative relationship between a higher inflation rate and domestic private investment. Moreover, a high inflation rate is an indicator of macroeconomic instability which can have adverse effects on domestic private investment. A long run negative relationship is expected in this study.

3.1.2 Exchange Rate and Domestic Private Investment

Export competitiveness based on the appropriate real exchange rate will prevent domestic resources from being overvalued and ensure that domestic investors are discouraged from investing overseas while overseas investors are encouraged to make new commitments. According to Chhibber and Dailami (1990) devaluation affects domestic private investment through several channels. Firstly, devaluation alters the real supply price of capital goods. Secondly, it affects the real price of imported inputs which are used in conjunction with capital goods to produce output. Thirdly, devaluation produces changes in real income which affects the demand for domestically produced goods. Finally, devaluation affects nominal and real interest rates which in turn have an impact on investment. Ghura and Goodwin (2000) noted that the devaluation of the domestic currency raises the cost of imported capital goods, and since a large component of investment goods in developing countries is imported, devaluation lowers domestic private investment in the non-tradable goods sector. On the other hand, Froot and Stein (1991) argue that the devaluation of the real exchange rate, by raising the competitiveness and hence profitability of the tradable goods sector, would stimulate domestic private investment in that sector. According to Branson (1986) devaluation raises the cost of capital goods and acts like an adverse supply shock on investment, the size of which depends on the import content of investment. Thus, the devaluation of the domestic currency lowers the profitability of investment, especially in the non-tradable sector and consequently slows down the adjustment response of domestic private investment. On the other hand, devaluation can also raise investment by raising demand for domestic output relative to imported goods. Thus, the net impact of devaluation of the domestic currency on private domestic investment could go either way. This ambiguity is evident in empirical results. Most econometric studies find a negative

impact of devaluation of the domestic currency on investment in the short-run, but a positive impact in the long-run. For example, a short-run adverse effect is found by Solimano (1990) for Chile. Faini and de Melo (1991) using data for 24 developing countries confirmed the same result. Another study by Chhibber and Shefik (1990) on Indonesia established that the real exchange rate had a positive impact on exports, but had a negative short- run effect on domestic private investment through the replacement cost of capital as well as the cost of imported inputs. However all of the above find a positive impact of devaluation of the domestic currency in the long run.

3.1.3 Public Investment and Domestic Private Investment

Domestic private investment flourishes in a supportive environment where the cost of doing business is significantly minimal through cost reductions in energy, transport and communications. These are often provided through public sector investment. Empirical studies by Blejer and Khan (1984) on 24 developing countries, and Greene and Villanueva (1990) using cross- country data on 23 developing countries have shown that public investment, especially in physical infrastructure such as power, communication and roads is complementary to domestic private investment. To the extent that public investment expenditure results in the provision of public services which reduce the cost of production of the private sector, public investment is found to have a positive effect on private sector profitability and investment. However, Ghura and Goodwin (2000) made an observation that increases in public investment may also crowd out domestic private investment if the additional government borrowing raises interest rates and the tax burden. In this sense therefore, public investment tends to have a negative effect on domestic private investment. Chhibber and Dailami (1990) point out that most developing countries have restricted access to foreign financing, so there is direct competition between the

public sector and private sector for limited financial resources. Higher aggregate public investment expenditures can raise demand and increase capacity utilization in the private sector. On the other hand, public investment expenditure can also crowd out the private sector in input and product markets, or in financial markets. Given the relatively high dependence of firms in developing countries on debt capital, particularly bank loans to finance their investment and growth, financial crowding out is a likely possibility.

3.1.4 Bank Credit to the Private Sector and Domestic Private Investment

The effect of credit to the private sector on domestic private investment is expected to be positive. Private firms in developing countries rely heavily on bank credit as a source of financing. When the hire cost of capital is increased by raising the cost of bank credit or by increasing the cost of retained earnings, which is the main source of financing investment, there is a decline in investment. Studies by Wai and Wong (1982), and Greene and Villanueva (1990) using cross- country data for a number of developing countries have also confirmed the direct effect of credit availability on domestic private investment. Additionally, Oshikoya (1994) finds support for this relationship and argues that changes in the volume of bank credit to the private sector have a positive effect on investment decisions in developing countries irrespective of the cost of capital. A study by Chhibber and Van Wijnbergen (1988) on Turkey revealed that both the quantity of credit to the private sector and the level of the real lending rates had a significant effect on domestic private investment.

3.1.5 Interest Rate and Domestic Private Investment

Economic theory suggests a negative relationship between investment and the rate of interest. Fry (1998) suggests that increases in real interest rates in financially repressed economies may stimulate an increase in the flow of deposits that would enable increased

investment. On the other hand, a higher real interest rate may raise the hire cost of capital and therefore reduce investment. In the case of Mexico, Van Wijnbergen (1989) using time series data, found a significant negative relationship between the real lending rates and domestic private investment. Green and Villanueva (1990) in a study involving 23 developing countries also found a significant negative effect of real interest rate on domestic private investment.

3.1.6 GDP Growth and Domestic Private Investment

Investment theory suggests that domestic private investment is positively related to the growth of real GDP. The increase in output or incomes of the people will through the multiplier effect cause a significant increase in aggregate demand for goods produced by the private sector. This will raise the profit expectations of business firms, consequently encouraging domestic private investment. It has also been hypothesized that domestic private investment is affected positively by income level, as countries with higher income level would tend to dedicate more of their wealth to domestic savings which would then be used to finance investment (Greene and Villanueva, 1990).

CHAPTER FOUR

METHODOLOGY

4.0 Introduction

This chapter provides details of the methodology employed in the study and justification for selecting the preferred methodology. It also presents the conceptual framework upon which the macroeconomic determinants of domestic private investment will be evaluated and outlines the investment model that will be estimated. Finally, data sources, sample period and variables used in the study are discussed.

4.1 Theoretical Framework

Blejer and Khan (1984) point out that there is a gap between the theory of investment and the models that have been specified for "developing countries" such as the simple accelerator model, the liquidity theory and the neoclassical flexible accelerator theory. This gap is due to the institutional and structural features of developing countries. The absence of well developed financial markets, the greater role of the government in investment, the lack of reliable data on capital stock and other market imperfections characterize the economies of developing countries which hinder the application of theories of investment. Martin and Wasow (1992), in recognition of these limitations, applied a variant of the flexible accelerator model in the study of Kenya which ascribed greater importance to macroeconomic policy variables in explaining investment behaviour.

The empirical framework employed in the study involves the regression of domestic private investment on selected explanatory variables. The study draws on the approaches adopted in previous studies (Martin and Wasow, 1992), (Kabir, 1992), (Elhiraika, 2001), and (Ekpan, Offem et al, 2006) where ordinary least squares and error correction modeling were used to

evaluate the influence of macroeconomic policy variables on private investment. This study, however, combines the techniques of cointegration and error correction modeling as it provides the tools to simultaneously quantify both the long-run relationship and the short-run deviations from equilibrium. In this approach, a domestic private investment function is developed and estimated on lagged and differenced terms to determine the long-run and short-run behavior. The adjustment mechanism by which short-run dynamics adjust towards equilibrium is also estimated. The error correction term is used to combine both short run and long run dynamics of the model.

4.1.1 Vector Error Correction and Cointegration Theory

The findings that many macroeconomic time series data may contain a unit root, thus presenting a problem of spurious regression results, has led to the development of the theory of non-stationary time series analysis. Cointegration analysis is a technique used in the estimation of the long-run equilibrium parameters in a relationship with non-stationary variables. It is used for the construction of the dynamic error-correction models. Engle and Granger (1987) point out that a linear combination of two or more non-stationary series may be stationary. If such a stationary or I(0) linear combination exists, the non-stationary (with a unit root) time series are said to be cointegrated. The stationary linear combination is called the cointegrating equation and may be interpreted as a long-run equilibrium relationship between the variables.

A vector error correction (VEC) model, or simply put, an error correction model is a restricted VAR that has cointegration restrictions built into the specification, so that it is designed for use with non-stationary series that are known to be cointegrated. Engle and Granger (1987) say that any system of cointegrated variables can best be represented by an error correction mechanism in which the lagged residuals that are obtained from the underlying

cointegrating relationships are added to the original vector of cointegrating stationary variables. According to Elhiraika (2001), the coefficient of the lagged residuals or the error correction mechanism represents the process by which the dependent variable adjusts to its long-run equilibrium position. The cointegration term is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments. The ECM specification restricts the long-run behaviour of the endogenous variables to converge to their cointegrating relationships while allowing a wide range of short-run dynamics. Thus, the approach enables the long-run equilibrium relationship and the short-run dynamics to be estimated simultaneously (Gujarati, 2007).

The ECM procedure allows the distinction between short-run and long-run relationships, and is therefore, more relevant from the policy perspective. The separation between short-run dynamics and long-run relationships is particularly important in the context of the present study because of the macroeconomic policy changes that have taken place in the country, and also because of the emphasis this study has placed on macroeconomic variables as the determinants of domestic private investment.

Harris (2000) summarizes the three desirable features of ECM as follows: (i) it avoids the possibility of spurious correlation among strongly trended variables; (ii) the long-run relationships that may be lost by expressing the data in differences to achieve stationarity are captured through the inclusion of lagged levels of the variables on the right-hand side; (iii) the specification attempts to distinguish between short-run (first-differences) and long-run (lagged-levels) effects.

4.2 Model Specification.

The model specification of the domestic private investment function for Zambia draws on the approaches employed in previous studies (Martin and Wasow, 1992); (Elhiraika, 2001), (Kabir, 1992) and (Ekpan, Offem et al, 2006).

According to the investment literature, in the long-run steady state, the private sector's desired capital stock (K_t^*) is assumed to be proportional to expected output (Y_t^*):

$$K_t^* = \delta (Y_t^*) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

There are two ways of deriving an investment function from the above equation (Blejer and Khan, 1989) and (Martin and Wasow, 1992). The first one specifies the coefficient "δ" as a function of different variables. Gradual adjustment of actual to desired capital stock is obtained by using a local quadratic approximation to adjustment costs and the gradual change in actual capital stock is the investment function (Gujarati, 2007).

The alternative method used by Martin and Wasow (1992) and adopted in this study keeps the coefficient "δ" constant, but assumes that the parameters of the quadratic adjustment cost function are a function of different variables. This formulation starts with a partial adjustment function as follows:

$$\Delta I_t = \gamma (I_t^* - I_{t-1}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where, ΔI_t is the change in investment at time t, I_{t-1} is the level of investment lagged by one period, γ is the coefficient of adjustment and I_t^* is the desired level of investment in the steady state which is given by;

$$I_t^* = [1 - (1 - \sigma) L] K_t^* \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where, L is the lag operator, σ is the proportional rate of depreciation and K_t^* is the desired capital stock. The response of investment to the gap between desired and actual investment, as measured by the coefficient γ, is assumed to vary systematically with economic factors that influence the ability of private investors to achieve the desired level of investment. These are: the availability of credit to the private sector, the real lending interest rate, the real exchange rate, public investment expenditure, and the annual rate of inflation.

The coefficient of adjustment (γ) in equation (4) can be expressed as a linear function as follows:

$$\gamma_t = \alpha_0 + \frac{1}{(I_t^* - I_{t-1})}(\beta_1 BC_t + \beta_2 RER_t + \beta_3 GI_t + \beta_4 LR_t + \beta_5 INF_t) \quad \text{.... (6)}$$

Where,

BC = real flow of bank credit to the private sector

RER = real exchange rate

GI = real public sector investment expenditure

LR = real lending interest rate

INF = annual rate of inflation, defined as the change in the consumer price index

Equation (6) states that the response of investment to the size of the gap between the desired and actual investment depends on the magnitude of these five factors. The signs of the parameters in this equation are expected to be:

$$\beta_1 > 0, \quad \beta_2 > 0, \quad \beta_3 > 0, \quad \beta_4 < 0, \quad \beta_5 < 0$$

Substituting equation (6) into equation (4) yields;

$$\Delta I_t = \alpha_0 (I_t^* - I_{t-1}) + \beta_1 BC_t + \beta_2 RER_t + \beta_3 GI_t + \beta_4 LR_t + \beta_5 INF \quad \text{..... (7)}$$

Alternatively, we can rewrite equation (7) (Martin and Wasow, 1992) as;

$$\Delta I_t = \alpha_0 (I_t^*) + \beta_1 BC_t + \beta_2 RER_t + \beta_3 GI_t + \beta_4 LR_t + \beta_5 INF_t + (1 - \alpha_0) I_{t-1} \ldots (8)$$

Substituting K_t^* in equation (5) with δY_t^* in equation (3), we have;

$$I_t^* = [1 - (1 - \sigma) L] K_t^* = [1 - (1 - \sigma) L] \delta Y_t^* \ldots\ldots\ldots\ldots\ldots (9)$$

From which we can obtain the dynamic reduced-form equation for the gross domestic private investment function that includes expected output, real bank credit to the private sector, real exchange rate, real public investment expenditure, inflation, and real lending interest rate as the explanatory variables by substituting equation (9) into (8) as follows;

$$\Delta DPI_t = \alpha_0 [1 - (1 - \sigma) L] \delta Y_t^* + \beta_1 BC_t + \beta_2 RER_t + \beta_3 GI_t + \beta_4 LR_t$$

$$+ \beta_5 INF_t + (1 - \alpha_0) DPI_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

Where Δ is the first difference operator, DPI_t is domestic private investment at time t; DPI_{t-1} is domestic private investment lagged by one period; σ is the proportional rate of depreciation; L is the lag operator; Y_t^* is expected output (real GDP), BC_t is the real flow of bank credit to the private sector; RER_t is the real exchange rate; GI_t is the real public sector investment expenditure; LR_t is the real lending interest rates; INF_t is the annual inflation rate and ε_t is the error term.

4.3 Data Sources and Sample

The study employed annual time series data for the period 1980 to 2008. This period was chosen for the reason that it is the period for which comprehensive data was available for the selected variables. The data was largely collected from the World Bank and International Monetary Fund publications and complemented by economic reports from the Bank of Zambia and Ministry of Finance and National Planning. The data covered a wide range of

macroeconomic variables that included bank credit to the private sector, GDP growth, inflation, exchange rates, interest rates and public investment.

4.4 Variable Description

To control for the effects of price changes, real variables were used as opposed to nominal variables except for the annual rate of inflation. This is because real variables measure quantities in terms of real goods and services, and therefore are typically of more interest than nominal variables in investment decision making. All real variables are expressed in constant 1994 prices except real interest rate and the real exchange rate. The following variables were used in the investment model as regressors; real interest rates, real GDP, real exchange rate, real credit to the private sector, real public investment and the annual rate of inflation. Domestic private investment was used as the regressand. All regressors are in natural logarithmic form except for the rate of inflation.

CHAPTER FIVE

EMPIRICAL ANALYSIS AND RESULTS

5.0 Introduction

This chapter presents and analyzes the empirical results of the impact of macroeconomic policy reforms on domestic private investment in Zambia for the period 1980 to 2008. The chapter is divided into two sections. Section 5.1 outlines the estimation method for the analysis of the study, and section 5.2 presents the empirical results and discussion.

5.1 Estimation Method

Before estimating the model in equation 18, it was first tested for structural stability using the Chow breakpoint test and the Chow forecast test to see if the macroeconomic policy changes did have a structural effect on domestic private investment. The test helps to determine whether to use pooled regression or sub-period regressions. All the variables were then tested for non-stationarity using the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests. This test helps to ascertain the order of integration and the degree of differencing needed to make each time series stationary. A set of cointegrating variables was then selected using the Johansen (1988) multivariate procedure. This helps to determine long-run equilibrium relationships between variables. A necessary condition to conclude that long-term relationships exist is that the series must be cointegrated. The test statistics were applied to levels as well as first differences, with the maximum lag of 1.

5.1.1 Testing for Structural Stability of the Model

In examining the structural stability of the regression models involving time series data, the Chow breakpoint test or dummy variable approach can be used. Gujarati (2007) says that when a regression model involving time series data is used, it may happen that there is a

structural change in the relationship between the regressand (Y) and the regressors (Xs). By structural change, it means that the values of the parameters of the model do not remain the same through the entire time period. This structural change may result from either external shocks or policy changes. The possible differences, that is, structural changes may be caused by differences in the intercept, the slope coefficient or both.

In this study, the Chow breakpoint test is employed as opposed to the dummy variable approach because the need is to determine whether there is a structural change in the regression model or not, and not necessarily to pin point the cause of the structural change which is what the dummy variable approach provides.

The Chow breakpoint test is based on a comparison of the sum of squared residuals obtained by fitting a single equation to the entire sample with the sum of squared residuals obtained when separate equations are fitted to each sub-sample of the data. Structural stability (or instability) is indicated by the value of the *F*-statistic. The *F*-statistic is based on the comparison of the restricted and unrestricted sum of squared residuals, and is computed as:

$$\mathrm{F} = \frac{(RSS_r - RSS_{ur})/k}{(RSS_{ur})/(T-2k)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

Where, RSS_r is the restricted sum of squared residuals, RSS_{ur} is the sum of squared residuals from the sub-samples, T is the total number of observations, and k is number of parameters in the equation. The *F*-statistic follows the F distribution with k and $(T-2k)$ degrees of freedom in the numerator and denominator, respectively.

Alternatively, the Chow forecast test can also be used to indicate structural stability of the model. The Chow forecast test estimates the model for a sub-sample comprised of the first T_1 observations. The estimated model is then used to predict the values of the dependent variable in

the remaining T_2 data points. A large difference between the actual and predicted values casts doubt on the stability of the estimated relation over the two sub-samples. The *F*-statistic is given by:

$$F = \frac{(RSS_T - RSS_{T_1})/T_2}{RSS_{T_1}/(T_1 - 2k)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (12)$$

Where, RSS_T is the residual sum of squares when the equation is fitted to all T sample observations, RSS_{T_1} is the residual sum of squares when the equation is fitted to T_1 observations, and *k* is the number of estimated coefficients.

Pre and Post-Macroeconomic Policy Reform Period: For analytical purposes, the pre-macroeconomic policy reform period is taken to be the years before 1993, because this was the year preceding the year (1992) when actual macroeconomic policy changes were started, ushering in an era of economic liberalism replacing the controlled economic system, [see Appendix 1].

The Chow breakpoint test whose results are presented in Table 5.1 indicates no significant evidence at 5 percent and 1 percent levels of significance that there was a structural change in domestic private investment function in 1993.

Table 5.1: Chow Breakpoint Test: 1993

Test	Statistic	Probability
F-statistic	1.60	0.21
Log likelihood ratio	16.16	0.03

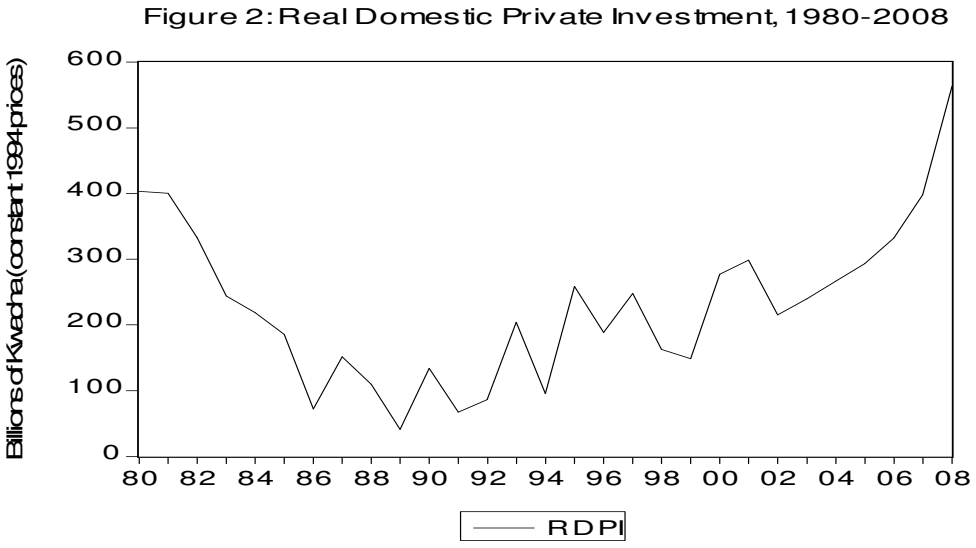
From Gujarati (2007) *F*- tables, we find that for 7 and 15 degrees of freedom, the 1 percent critical *F*-value is 4.14 and 5 percent critical *F*-value is 2.71. The computed *F*-value in table 5.1 is (1.6). The critical *F*-value at both 1 and 5 percent is much higher than the computed *F*-value. Therefore, we do not reject the null hypothesis of no structural change.

The Chow forecast test results presented in Table 5.2 further indicate no significant evidence at 1 and 5 percent levels of significance that there was a structural change.

Table 5.2: Chow Forecast Test: Forecast from 1993 to 2008

Test	Statistic	Probability
F-statistic	0.87	0.62
Log likelihood ratio	34.85	0.01

In addition, figure 2 below provides further evidence that no structural changes occurred in domestic private investment as no sudden jumps can be seen in the graph at year 1993 and beyond.



Given the stability test results obtained above which point to the fact that no structural change occurred in domestic private investment before and after 1993 following macroeconomic policy changes, the application of pooled regression is justified. The significance of the structural stability of the specified function is that the parameters of the domestic private investment function are constant and do not change over time. This makes usage of the model in policy simulations plausible.

5.1.2 Testing for stationarity

A preliminary step in the regression analysis of the investment function using time series data is to perform unit root tests to ensure that all the variables included in the analysis are stationary (Harris, 2000). Running a regression that contains some non-stationary variables may yield spurious results because the *t* and *F* distributions no longer approximate the standard distributions. A series is said to be stationary if its mean and variance are constant over time.

Three common approaches are used in testing for unit roots in macroeconomic time series data. These are the Dickey-Fuller (DF), Phillips-Perron (PP) and the Augmented Dickey-Fuller (ADF) tests. The Dickey-Fuller test is valid only if the series is an AR (1) process. If the series is correlated at higher order lags, the assumption of white noise disturbance is violated. On the other hand, the ADF and PP tests control for higher-order serial correlation in the series, but use different approaches.

For purposes of this study, the ADF and the PP tests are employed in examining the time series properties of the data. The ADF and PP tests help to ascertain the order of integration and the degree of differencing needed to make each time series stationary. The test is performed on each of the time series in logarithmic levels and difference terms. The rate of inflation is however tested for unit roots in ordinary level and difference term.

An issue which arises with the ADF and PP tests is the determination of optimal lag length in the dependent variable. The rationale for determining the appropriate lag length is to include lags sufficient enough to remove any serial correlation in the residuals.

5.1.2.1 The Augmented Dickey-Fuller Unit Root Test

The ADF test approach makes a parametric correction for higher-order correlation by assuming that the y series follows an AR(p) process, and by adding lagged difference terms of the dependent variable y to the right-hand side of the regression as follows:

$$\Delta y_t = \mu + \delta y_{t-1} + \gamma_1 \Delta y_{t-1} + \gamma_2 \Delta y_{t-2} + \ldots\ldots + \gamma_p \Delta y_{t-p} + \varepsilon_t \quad \ldots\ldots (13)$$

Where ε_t is a pure white noise error term, and where $\Delta y_{t-1} = (y_{t-1} - y_{t-2})$ and $\Delta y_{t-2} = (y_{t-2} - y_{t-3})$, etc. The number of lagged difference terms to be included is determined empirically to ensure that enough terms are included so that the error term obtained is serially uncorrelated.

The null and the alternative hypotheses in this test are that:

$$H_0: \ \gamma = 0$$

$$H_1: \ \gamma < 0$$

The null hypothesis is that $\gamma = 0$; implying that there is a unit root i.e the time series is non-stationary. The alternative hypothesis is that γ is less than zero, implying that the time series is stationary. When the null hypothesis is rejected it means that y_t is a stationary time series.

5.1.2.2 The Phillips-Perron Unit Root Test

The test regression for the PP test is the AR(1) process:

$$\Delta y_t = \alpha + \beta y_{t-1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots (14)$$

The PP test approach makes a correction to the t-statistic of the γ coefficient from the AR(1) regression to account for the serial correlation in the error term. It also takes care of the problem of heteroscedasticity and non-normality which is present in most of the time series variables. In addition, the PP test has the advantage over the ADF test in the face of structural breaks in time series data. The PP t-statistic is computed as:

$$t_{pp} = \frac{\gamma_0^{1/2} t_b}{\hat{w}} - \frac{(\hat{w}^2 - \gamma_0) T s_b}{2\hat{w} s} \quad \ldots\ldots\ldots\ldots\ldots\ldots (15)$$

Where t_b, s_b are the *t*-statistic and standard error of β and s is the standard error of the test regression. $\hat{w}^2$ and γ_j are given as follows:

$$\hat{w}^2 = \gamma_0 + 2\sum_{v=1}^{q}(1 - \frac{v}{q+1})\gamma_j \quad \ldots\ldots\ldots\ldots\ldots\ldots (16)$$

And

$$\gamma_j = \left(\sum_{l=j+1}^{T} \hat{\varepsilon}_t \hat{\varepsilon}_{t-j} \right) / T \quad \ldots\ldots\ldots\ldots\ldots\ldots (17)$$

Where, q is the truncation lag and T is the number of observations.

The ADF and PP unit root test results are presented in Table 5.3 below:

Table 5.3: Unit Root Tests with ADF and PP (Estimation period, 1980-2008)

	ADF Test		PP Test		
Variable	**Logarithmic Level**	**First Difference**	**Logarithmic level**	**First Difference**	**Order of Integration**
DPI	-1.3046	-5.6205***	-2.1470	-9.2653***	I(1)
GI	-1.4446	-5.1236***	-2.0177	-8.2932***	I(1)
LR	-2.8125*	-4.5587***	-2.6694*	-5.8085***	I(1)
RER	-2.0780	-3.2819**	-1.8499	-4.5368***	I(1)
BC	-1.6750	-2.7329*	-0.8070	-2.7675*	I(1)
GDP	2.4063	-3.0750**	2.3438	-4.3188***	I(1)
INF	-2.1076	-4.5782***	-2.2095	-5.5732***	I(1)

Notes: **** Denotes 1% level of significance, ** and *denote 5% and 10% levels of significance, respectively*

The empirical results in both tests as shown in table 5.3 indicate that all the variables, except for real lending interest rates, are non-stationary in their levels, but have simple unit roots, I(1) so that only first differencing is required to make them stationary. These include real domestic private investment, real public investment, real exchange rate, inflation rate, real bank

credit to the private sector and real GDP. It is concluded, therefore, that all the variables are stationary after first differencing.

5.1.3 Testing for Cointegration

An important ingredient in the analysis of cointegrated systems is tests for cointegration. Given a group of non-stationary series, our interest is in determining whether the series are cointegrated, and if they are, in identifying the cointegrating (long-run equilibrium) relationships. Variables that tend to move together or seem to have a long term relationship over a long period are said to be cointegrated. To establish the existence of a cointegrating relationship, one necessary condition is that all the variables must be of the same order of integration. The procedure of establishing such a relationship involves testing each series for one or more unit roots in their levels and differences. The logic behind the cointegration test is that if the linear combination of non-stationary variables is itself stationary, then the long run relationship is said to exist among the variables.

The next step after determining the order of integration is to establish whether or not the non-stationary variables are cointegrated. Engle and Granger (1987) say that although individual time series may be non-stationary, their linear combination may tend to keep such series together in the long run. If this is the case for any two or more variables, such variables are said to be cointegrated and error correction terms exist to account for short-run deviations from the long-run equilibrium relationships implied by the cointegrating relationship.

The study specifies a seven variable cointegration system, thus, the long-run domestic private investment function is of the following specification:

$$\ln DPI_t = \beta_0 + \beta_1 \ln BC_t + \beta_2 \ln RER_t + \beta_3 \ln GI_t + \beta_4 \ln LR_t + \beta_5 INF_t$$

$$+ \beta_6 \ln GDP_t + u_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. (18)$$

There are several proposed tests for cointegration among the macro economic variables. One of the most popular tests for a (single) cointegration is the two stage procedure developed by Engle and Granger (1987). The other method is the Johansen (1988) procedure. In this study, we adopt the Johansen (1988) procedure to test for cointegration as it is found to be superior to the Engle and Granger (1987) two stage procedure for the following reasons: First, the Engle and Granger method assumes that all variables are exogenous and therefore the estimation of the long-run equilibrium (cointegration) regression can be done in different ways (i.e. LHS or RHS variables). It is possible in this procedure, to find that one regression indicates that variables are cointegrated, where as reversing the order indicates otherwise. This is undesirable in that the method lacks consistency. The test for cointegration should be invariant to the choice of the variable selected for normalization. Secondly, the Engle and Granger method rules out multiple cointegration vectors between more than two variables. Third, the method suffers from a small sample bias and the step-wise procedure of testing implies the compounding of errors. On the other hand, the Johansen procedure allows for tracing more than one cointegrating vectors in the data. In this way, the Johansen procedure clearly shows whether a system consists of a unique cointegrating vector or a linear combination of several cointegrating vectors. The procedure also fully captures the underlying time series properties of the data and provides estimates of all the cointegrating vectors that exist within a set of variables. It also has better asymptotic properties which yield more robust results.

Before applying the Johansen (1988) cointegration test, each individual variable was first tested for unit roots using the Augmented Dick-Fuller and the Phillips-Perron tests. All the variables included in the cointegration regression were found to have the same order of integration [i.e I(1)]. A set of cointegrating variables was then selected using the Johansen (1988)

multivariate procedure. Johansen's method tests the restrictions imposed by cointegration on the unrestricted autoregressive (VAR) involving the series. The Johansen procedure estimates a vector of autoregressive system. A vector autoregressive model of the order p takes the form:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \ldots\ldots\ldots + A_p y_{t-p} + Bx_t + \varepsilon_t \ldots\ldots\ldots \quad (19)$$

Where y_t is a k-vector of non-stationary, I(1) variables, x_t is a d-vector of deterministic variables, $A_1, \ldots, A_p$ and B are matrices of coefficients to be estimated, and ε_t is the error term. We can rewrite the VAR as:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-1} + B x_t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (20)$$

Where,

$$\Pi = \left(\sum_{i=1}^{p} A_i \right) - I \qquad \Gamma_i = - \sum_{j=i+1}^{p} A_j \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (21)$$

Granger's representation theorem asserts that if the coefficient matrix Π has a reduced rank $\tau < k$, then there exists $k \times \tau$ matrices α and β each with rank r such that $\Pi = \alpha\beta'$ and $\beta' y_t$ is stationary, r is the number of cointegrating relations (the cointegrating rank) and each column of β is the cointegrating vector. The elements of α are known as the adjustment parameters in the vector error correction model. Johansen's method on the other hand, is to estimate the Π matrix in an unrestricted form, then test whether we can reject the restrictions implied by the reduced rank of Π.

The results from the Johansen cointegration tests are presented in table 5.4. All the variables included in the test have the same order of integration. The likelihood ratio is used to determine whether there are no cointegrating vectors or not. The LR larger than the critical value

rejects the null hypothesis that there are no cointegrating vectors. The results indicate the existence of 3 cointegrating vectors at both 5 percent and 1 percent level of significance.

Table 5.4: Johansen Cointegration Test Results (Estimation period 1980 – 2008)

Included observations: 27
Test assumption: Linear deterministic trend in the data
Series: LNRDPI INF LNRBC LNRGDP LNRGI LNRER LNRLR
Lag interval: 1 to 1

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.950173	216.0764	124.24	133.57	None**
0.861054	135.0979	94.15	103.18	At most 1**
0.735838	81.80878	68.52	76.07	At most 2**
0.557340	45.86654	47.21	54.46	At most 3
0.460529	23.86279	29.68	35.65	At most 4
0.233884	7.199282	15.41	20.04	At most 5
0.000219	0.005913	3.76	6.65	At most 6

Note*: a). *(**) denotes rejection of the hypothesis at 5% (1%) significance level*
b). L.R. test indicates 3 cointegrating equations at 5% significance level
c). The econometric package (EViews) used displays the critical values for the trace statistic reported by Osterwald-Lenum (1992) and not those tabulated in Johansen and Juselius (1990)

The normalized cointegrating vectors for domestic private investment are presented in table 5.5 below. Real GDP and real bank credit to the private sector show the expected positive signs of the coefficient indicating a positive long run relationship with domestic private investment. Unexpectedly however, real public investment shows a negative sign of the coefficient indicating a negative long run relationship with domestic private investment which points to the possibility of crowding out effect of domestic private investment. Real exchange rate, real interest rate and inflation rate all have the expected negative signs of the coefficients implying a long-run negative relationship with domestic private investment.

Table 5.5: Normalized Cointegrating Vectors for Investment

Variable	Equation 1	Equation 2	Equation 3
Constant	-13.68	-6.53	43.47
Real (GDP)	2.006	0.372	7.139
	(0.22)	(0.29)	(4.01)
Real government investment (GI)	-0.036	-0.234	-0.928
	(0.04)	(0.06)	(0.51)
Inflation rate (INF)	-0.007	-	-
	(0.001)		
Real bank credit (BC)	1.253	0.619	-
	(0.07)	(0.09)	
Real exchange rate (RER)	-0.217	-0.144	-0.094
	(0.01)	(0.01)	(0.11)
Real lending interest rate (LR)	- 0.472	-0.484	-0.621
	(0.03)	(0.03)	(0.09)
Log likelihood	-18.56	8.09	26.06

Note: *The numbers in the parentheses are the asymptotic standard errors. The econometric package used does not provide standard errors associated with the constant term.*

5.1.4 Error Correction Model

The cointegration regression deals with long-run properties of the model, but does not consider the short-run dynamics of the model. For policy purposes, it is necessary that time series modeling describes both short-run dynamics and the long-run equilibrium state simultaneously. For this purpose, we now develop an Error Correction Model. We define the error correction term as;

$$\varepsilon_t = DPI_t - \beta_0 - \sum_{j=1}^{k} \beta_j \Delta X_{jt} \quad \text{.....} \quad (22)$$

Where, β_j is a cointegrating coefficient, Δ is the first difference operator, $X_t = (x_1, x_2 \ldots .x_k)$, and ε_t is the error term from a regression of DPI_t on X_t.

The Error Correction Model is therefore specified as:

$$\Delta DPI_t = \alpha_0 + \alpha_1 \varepsilon_{t-1} + \sum_{i=1}^{n} \lambda_j \Delta DPI_{t-i} + \sum_{i=1}^{n} \lambda_j \Delta GDP_{t-i} + \sum_{i=1}^{n} \lambda_j \Delta GI_{t-i} +$$

$$\sum_{i=1}^{n} \lambda_j \Delta RER_{t-i} + \sum_{i=1}^{n} \lambda_j \Delta BC_{t-i} + \sum_{i=1}^{n} \lambda_j \Delta LR_{t-i} + \sum_{i=1}^{n} \lambda_j \Delta INF_{t-i} + u_t \text{ ..... (23)}$$

Where, $\varepsilon_{t-1} = (DPI_t - \beta_0 - \sum_{j=1}^{k} \beta_j \Delta X_{jt})_{t-1}$ is the one-period lagged value of the error correction term and u_t is a white noise.

The ECM equation (23) implies that ΔDPI_t can be explained by the lagged first difference of the explanatory variables, the lagged differenced value of the dependent variable, the error correction term and the equilibrium error term. Lags rather than contemporaneous values are added to avoid a possibility of simultaneity bias (Ndikumana, 2000). The error correction term, ε_{t-1} is the residual from the cointegration regression (18). It reflects the deviation of domestic private investment from the long-run level in the previous period. If the error correction term (ε_{t-1}) is non-zero, the model is out of equilibrium and vice versa. β_j is the long-run parameter, and α_1 and λ_j are the short-run parameters. Thus the ECM has both long-run and short-run properties built in it. The long-run properties are contained in the error correction term, ε_{t-1} and the short-run behaviour is captured by the error correction coefficient (α_1). The principle behind the ECM model is that there often exists a long-run equilibrium relationship between two economic variables. In the short-run, there may be disequilibrium. A proportion of the disequilibrium is corrected in the next period through the error correction mechanism. The error correction process is thus a means to reconcile short-run and long-run behaviour. The value of the error correction coefficient, α_1 determines how quickly the equilibrium is restored. The results of ECM model (23) are presented in table 5.6 below.

Table 5.6: Error Correction Model Estimates, Sample: 1980-2008, Dependent Variable: Domestic Private Investment

Variable	Equation 1	Equation 2	Equation 3
Constant	-0.009	0.029	-0.025
	(0.07)	(0.24)	(0.21)
Real (GDP_t)	2.006	0.372	7.139
	(9.07)***	(1.25)	(1.78)
Real government investment (GI_t)	-0.036	-0.234	-0.927
	(0.83)	(3.75)***	(1.83)*
Real exchange rate (RER_t)	-0.217	-0.144	-0.094
	(21.34)***	(11.48)***	(0.83)
Real lending interest rate (LR_t)	-0.472	-0.484	-0.621
	(23.55)***	(16.87)***	(6.99)***
Real bank credit to the private sector (BC_t)	1.253	0.619	-
	(17.31)***	(6.99)***	
Inflation rate (INF_t)	-0.007	-	-
	(12.89)***		
Lagged domestic private investment (ΔDPI_{t-1})	-0.365	-0.516	-0.689
	(1.79)	(2.44)**	(3.18)***
Real output (ΔGDP_{t-1})	2.332	1.921	2.489
	(0.87)	(0.76)	(1.04)
Real government investment (ΔGI_{t-1})	-0.687	-0.845	-1.219
	(2.41)**	(2.96)**	(3.69)***
Real exchange rate (ΔRER_{t-1})	-0.054	-0.154	0.026
	(0.17)	(0.49)	(0.08)
Real bank credit to the private sector (ΔBC_{t-1})	0.568	0.744	1.137
	(1.26)	(1.69)	(2.48)**
Real lending interest rate (ΔLR_{t-1})	0.064	0.097	-0.015
	(0.35)	(0.57)	(0.09)
Inflation rate (ΔINF_{t-1})	0.002	-0.0003	0.002
	(0.55)	(0.08)	(0.53)
ECM_{t-1}	-0.855	-0.504	-0.20
	(2.19)**	(1.20)	(0.47)
$\overline{R}^2$	0.61	0.65	0.69
S.E of the regression	0.34	0.33	0.30
F-statistic	6.15	6.42	7.02
N= 29			

Notes: **** Denotes 1% level of significance, ** and *denote 5% and 10% level of significance, respectively*
Figures in parentheses are the t-statistics.

In general, the econometric estimates indicate that the variables used to explain domestic private investment in Zambia are significant either in the short-run, the long-run or both and the diagnostic tests are good. This can be seen from the value of the *F*-statistic which ranged between 6.15 and 7.02, and is significant at 1 percent level of significance. A higher value of the *F*-statistic indicates goodness of fit of the model. Similarly, the reasonably high values of the adjusted R^2 show the explanatory power of the model. Similar evidence is given by the value of the standard error of the regression which ranged between 0.30 and 0.34. A model with lower values of the standard error of the regression indicates that the model is well estimated and that the residuals are distributed as white noise. Thus, the estimated coefficients are valid and therefore suitable for policy discussions.

It can be seen from the results that the error correction term (ECM_{t-1}) coefficient has the expected negative sign (i.e. it should be negative for equilibrium to be restored) and is significant at 5 percent level of significance. The significance of the error correction term supports the hypothesis that the system is cointegrated (Harris, 2000). Thus, it implies long-run steady state disequilibrium between domestic private investment and the explanatory variables. The speed of the adjustment implied by the ECM is -0.855 per annum. It therefore indicates a feedback of about 85.5 percent over the previous year's disequilibrium from long-run stead state. In other words, the coefficient of the error correction term indicates the speed at which domestic private investment adjusts to changes in real national income, real public investment, real interest rate, real exchange rate, the real flow of bank credit to the private sector and inflationary pressures to achieve long-run equilibrium.

The coefficient of the real exchange rate is negative and significant in the long-run, but insignificant in the short-run. From a policy perspective, the negative relationship between the

real exchange rate and domestic private investment may be explained in terms of the over valuation of the local currency (i.e. not backed by the productive capacity of the economy) that existed during the 1980s, and the instability of the exchange rate that was experienced during the early part of the 1990s, which may have negatively affected foreign exchange earnings needed for re-investment due to the deterioration in external competitiveness. This result is consistent with similar findings by Mlambo and Oshikoya, (2001).

On the other hand, the strong relationship between real GDP growth and domestic private investment suggests that growth in real GDP has a significant effect on domestic private investment in the long-run. This perhaps can be explained by the acceleration principle described in the theories of trade cycles and economic growth. According to this principle, when income, and therefore consumption of the people increases, the greater amount of the commodities will have to be produced. This requires extra capital, if the already given stock of capital is fully used. Since in this case, investment is induced by changes in income or consumption, it is referred to in literature as induced investment. The net induced investment is positive if national income or output increases (Ahuja, 2008). The positive relationship between GDP growth and domestic private investment is therefore theoretically and empirically consistent with similar findings by Wai and Wong (1982), and Green and Villanueva (1990) for developing countries. Thus, policies targeted at increasing GDP growth can significantly lead to increased domestic private investment.

Interestingly, and contrary to theoretical expectations, public investment had a significant negative relationship with domestic private investment both in the short-run and the long-run. This is despite the fact that much of public investment in the country is concentrated on infrastructure development i.e roads, education and other projects that are supposed to stimulate

domestic private investment. This result is, perhaps, reflective of the mode of financing fiscal deficits. Credit to the private sector is residually determined after accommodating the financing needs of government. Banks and other financial institutions give preference to government when it comes to credit. The implication being that government borrowing from the local financial market puts pressure on the already meager investment resources available to local investors. This makes the investment environment less competitive to local investors and consequently leads to the crowding out of potential domestic private investment. In other words, the negative relationship suggests competition for resources between the public sector and private sector.

Real lending interest rate seems not to have a significant effect on domestic private investment in the short-run, but has a significant negative effect in the long-run. This is so because interest rates do not change much (i.e. they tend to be sticky) in the short-run, and therefore the effects are more predictable and smaller compared to the long-run period. The coefficient of this variable ranged between -0.47 and -0.62, and was consistently statistically significant in the long-run. This is perhaps not surprising, but theoretically plausible given that the country has consistently maintained high interest rates which made borrowing for investment expensive. The high cost of investment capital discourages investment by local firms.

The elasticity of domestic private investment with respect to credit availability to the private sector is positive and statistically robust both in the short-run and long-run. The findings are consistent with similar findings by Elhiraika (2001) in the study of Swaziland. The positive relationship between the bank credit to the private sector and domestic private investment suggests that credit plays a significant role in boosting domestic private investment.

Our empirical results indicate that the inflation rate coefficient has the expected negative sign and is statistically significant in the long-run. The significance of the coefficient of the

inflation rate confirms that inflation is detrimental to domestic private investment. On the other hand, the effect of inflation on domestic private investment relative to other explanatory variables is quite minimal. This is perhaps not surprising given that prices were administratively controlled in the country during the early part of the period.

The coefficient of the lagged endogenous variable ranged between -0.52 and -0.69 and is statistically significant. The value of the coefficient implies that if the previous year's domestic private investment increased by 1 percent, the current year's domestic private investment will decline on average by 0.6 percent. This is rather surprising as one would expect the previous year's investment to positively influence the current year's investment. The possible explanation perhaps is the one given by Ahuja (2008). According to Ahuja (2008), when profit expectations of investors are good, large investment is undertaken which causes aggregate demand to rise bringing about conditions of boom in the economy. But, when this profit expectation falls, the rate of investment also falls causing a decline in aggregate demand. This explanation may be consistent with cyclical national income growth trends which tended to be negative in some cases during the study period.

CHAPTER SIX

CONCLUSION AND POLICY RECOMMENDATIONS

6.0 Introduction

This chapter provides conclusions and policy recommendations. It also discusses the limitations of the study and possible areas of future research in the area of domestic private investment in the country.

6.1 Conclusions and Policy Recommendations

This study examined domestic private investment in Zambia from 1980 to 2008 using cointegration and error correction model techniques. The specific objectives of the study were to determine the macroeconomic factors that influence domestic private investment in Zambia, and to estimate their short and long term effects.

The determinants of private investment in developing countries have been investigated by several studies. This study, however, focused on macroeconomic factors that influence domestic private investment in the country, and used a methodology that combines cointegration and error correction modeling techniques. These simultaneously determine both the short-run and long-run effects. The results of this study provide support for the hypothesis that domestic private investment in Zambia, like other developing countries, is affected by key macroeconomic policy variables. It is clear from the findings of the study that real GDP growth, real exchange rates, real interest rates, inflation, public investment and credit availability to the private sector are some of the key factors that influence domestic private investment decisions in Zambia. The results show that macroeconomic factors affect domestic private investment, both in the short-term and in the long-term. Thus, policies relating to GDP growth, public investment, bank credit

to the private sector, lending interest rates, exchange rates and inflation are expected to influence domestic private investment decisions.

This study confirms, in particular that real output growth is a significant determinant of domestic private investment in Zambia in the long-term. Thus, domestic private investment is expected to be boosted significantly by implementing policies that address sustained national income growth and equitable distribution in order to boost household incomes and savings. Further, given that investment is itself a key factor contributing to real GDP growth, the country can benefit from the vicious cycle that links increased domestic private investment and real GDP growth.

The large and robust credit availability coefficient points to the importance of credit to domestic private investment. Credit constraints stifle the rate of investment. The empirical evidence provided in this study suggests that domestic private investment would decline by about 12.5 percent in the long-run and 11.4 percent in the short-run with a 10 percent reduction in credit availability. The importance of credit implies a need for a well functioning financial sector that can effectively transfer resources from savers to investors. In view of the findings of this study, we wish to emphasize the need for increased mobilization of domestic resources in order to widen accessibility to financial resources for investment, particularly in rural areas where poverty and unemployment are acute.

The empirical results indicate that public investment has had a negative effect on domestic private investment both in the short-run and long-run. This suggests that public investment crowds-out private sector investment by competing for the same pool of resources with the private sector. Normally, credit to the private sector is residually determined after accommodating the financing needs of government in a situation where both government and the

private sector are targeting the same pool of resources. In order to ensure that public investment in infrastructure does not undermine domestic private sector investment, government needs to re-commit itself to the idea of limiting net government borrowing from the banking system to zero as indicated in the policy pronouncements of January, 1992 (World Bank, 2004). The resultant increase in levels of liquidity by the commercial banks can then be mobilized towards strengthening the growth of local enterprises. On the other hand, government should consider financing infrastructure developments through increased tax revenue collection by effectively and efficiently widening the tax base (i.e. bring on board the informal sector) and ensuring tax compliance.

Our empirical results further indicate that both inflation and lending interest rates have negative effects on domestic private investment. Accordingly, macroeconomic policy need not only give paramount attention to the control of inflation, but also ensure that lending interest rates are drastically reduced to sustainable levels that would encourage engagement of the local investors with the commercial banks. The prevailing base lending interest rates in the country of between 29 to 33 percent against a paltry deposit interest rate of between 2 to 6 percent are a disincentive to active participation in the banking system. The high interest rate margin due to the large difference between deposit interest rate and lending interest rate boosts bank profits at the expense of borrowers and savers, thereby discouraging their participation in the banking sector. Arguably, policies that address this discrepancy will boost domestic financial mobilization, make borrowing less costly and directly impact positively on domestic private investment.

There has been a lot of emphasis in Zambia on FDI at the expense of domestic private investment. While FDI in the country has increased significantly from about US$200 million in

1990 to about US$920 million in 2009, and has the advantage of transferring technology to local entrepreneurs, it cannot guarantee sustainable economic development in isolation of domestic private investment. Thus, the sustainability of any country's economic development hinges on the growth of local entrepreneurs. It would be prudent for government to focus more on mobilizing local investment by pursuing policies that address hindrances to increased domestic savings and accessibility to investment capital by the local investors. Domestic private investment guarantees sustainable economic development as earnings are re-invested locally in plant and machinery. The effect of which is enhanced productive capacity of the economy for accelerated growth and poverty reduction.

6.2 Limitations of the Study and Further Research

The study focuses on the macroeconomic policy variables that determine domestic private investment. There are however, other equally important factors that would influence domestic private investment. Some of these are skills and the political environment. It would be interesting to undertake a comprehensive study that takes into account both macroeconomic and non-macroeconomic policy variables. This can improve our understanding on the factors that affect domestic private investment in the country.

In this study, aggregated annual time series data were used. It would be interesting to analyze the factors that affect domestic private investment using disaggregated and sector specific data.

The sample size was limited in scope due to problems of data quality and availability. Therefore, estimates obtained in other studies may be different depending on the sample size and source of the data.

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APPENDICES

Appendix 1: Chronology of Economic Reforms in the 1990s

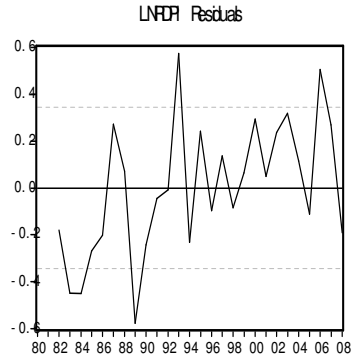
Year	Main Economic Reform
1991	**November** • Comprehensive set of Zambia's external debt data produced. **December** • Priority program to rehabilitate infrastructure commenced. • Government gives the responsibility for the privatization process to the Ministry of Commerce, Trade and Industry from ZIMCO. • Substantial reductions of maize meal and fertilizer subsidies announced.
1992	**January** • Non-traditional exporters allowed 100 percent foreign exchange retention. • Official exchange rate devalued by 30 percent (155 percent through 1992). • Subsidies on mealie meal (breakfast) removed. • Commitment to limiting net borrowing by Government from the banking system to zero announced. • Subsidies, loans and loan guarantees eliminated for all parastatals except Zambia Airways and ZCCM. • Import preferences (except for PTA) revoked. • Debt Management Task Force created within the Ministry of Finance to coordinate all issues related to external debt. • Zambia's arrears to the World Bank cleared. **February** • An agreement reached between the Zambian government, IMF and the World Bank on a Policy Framework Paper 1992 – 1994, focusing on subsidy removals, privatization of the parastatal enterprises and liberalization of markets. **March** • Controls on exports of petroleum eliminated.

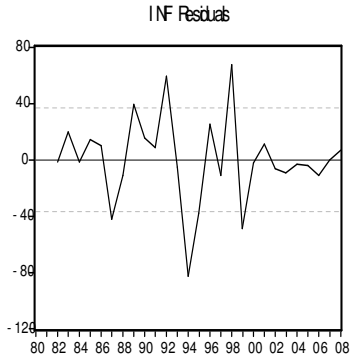
	June • Subsidies on mealie meal (roller meal) removed. • Controls on all prices eased, most eliminated. • Fertilizer market opened up for full competition. • Pan- territorial pricing for maize eliminated, pricing to reflect differential transport costs. **July** • Privatization Bill passed in parliament. Zambia Privatization Agency (ZPA) established. • Investment Act amended to make incentives automatic and transparent. • The IMF approves a restructured Rights Accumulation Program (RAP) enabling a clearance of Zambia's arrears to the IMF. **August** • Agreement with Paris Club on rescheduling of bilateral debt on enhanced Toronto terms. • Rescheduling and debt cancellation reduces Zambia's external debt burden by USD 1.5 billion. **September** • First phase of government redundancy program. 12000 contract daily employees within civil service are made redundant. **October** • Bureaux de change system for foreign exchange introduced. • Open General License System changed from a positive to a negative list. **December** • Joint MOF/BOZ Data Monitoring Committee established. • Exchange rates unified (with ZCCM selling at the market exchange rate). • First tranche of 19 state companies offered for sale.
1993	**January** • Cash budget introduced. • Weekly Treasury bill tender commenced.

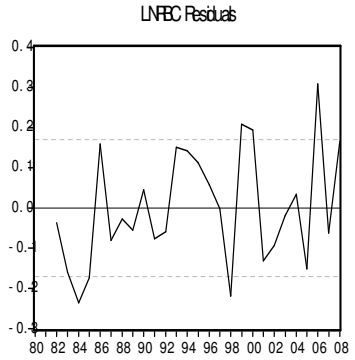
	• General reduction in tariffs and excises, shift to Harmonized Code for trade classification. • Reduction in Corporate Tax Rate, modification of personal income rates and bands. • Budget Heads established for defense and security forces. • Elimination of import and export licenses announced, import license levy abolished. • Company tax reduced from 40 to 35 percent. • Special fund set up to accelerate road rehabilitation **March** • All bilateral (Paris Club) agreements finalized. Negotiations on interest rate reductions and additional debt write- off produce savings of $100 million. **June** • Import and export licenses eliminated. • Establishment of Zambia Revenue Authority (ZRA). **July** • Formal establishment of the Lusaka Stock Exchange (LuSE). • Markets for maize opened to full competition. **November** • Commencement of Public Sector Reform Programme (PRSP).
1994	**January** • Exchange controls removed. • Manufacturing- in- bond permitted. • Duty drawback extended to include third party exporters. • Property transfer tax reduced from 7.5 percent to 2.5 percent. • Provision for countervailing duties if unfair trade practices can be proved. **April** • Zambia Revenue Authority commence operations • Privatization Fund account established.

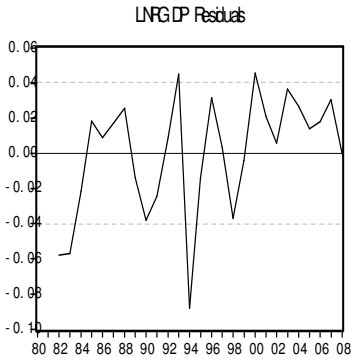
	August • Mineral Tax Act revoked and replaced by Mineral Royalty Tax Act (bringing Zambia into line with international norms) **September** • Commercial debt buy- back operation (on-going since 1992) completed. Approximately $652 million in debt eradicated. **December** • Zambia Airways and United Bus Company (UBZ) put into receivership.
1995	**January** • Conversion of most commercial banks' statutory reserve deposits to medium term government debt as a means of reducing the interest rate spread. • Adjustment of personal income tax limits to overcome "bracket creep". **March** • ZIMCO put into voluntary liquidation. **May** • Sale by public floatation of shares of Chilanga Cement to the general public. • Meridian Bank and African Commercial Bank put into receivership. **July** • Value- added tax (VAT) introduced, sales tax repealed. • Revised Land Act passed by parliament, enabling unused land to be purchased by investors (Land Act 1995). **September** • Cash budget moved from daily observance to monthly observance. **December** • Zambia qualifies for the Enhanced Structural Adjustment Facility (ESAF). • Customs duty exemptions, including government purchases, eliminated. Customs duty tariffs reduced on most goods by 15 percent.

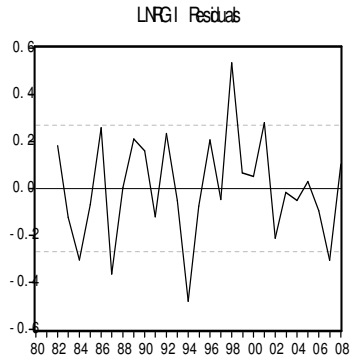
Appendix 2: Vector Error Correction Model Residuals

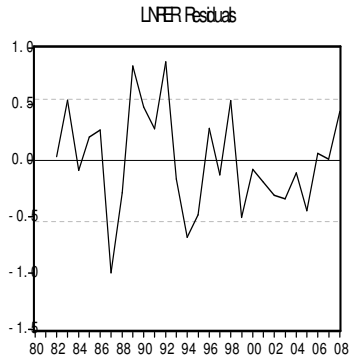


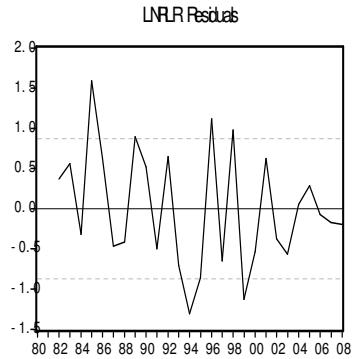












Appendix 3: Johansen Cointegration Test

Date: 11/04/10 Time: 15:40
Sample: 1980 2008
Included observations: 27
Test assumption:
Linear deterministic trend in the data
Series: LNRDPI INF LNRBC LNRGDP LNRGI LNRER LNRLR
Lags interval: 1 to 1

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.950173	216.0764	124.24	133.57	None **
0.861054	135.0979	94.15	103.18	At most 1 **
0.735838	81.80878	68.52	76.07	At most 2 **
0.557340	45.86654	47.21	54.46	At most 3
0.460529	23.86279	29.68	35.65	At most 4
0.233884	7.199282	15.41	20.04	At most 5
0.000219	0.005913	3.76	6.65	At most 6

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 3 cointegrating equation(s) at 5% significance level

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

LNRDPI	INF	LNRBC	LNRGDP	LNRGI	LNRER	LNRLR	C
1.000000	-0.007203	1.252859	2.005693	-0.036238	-0.216925	- 0.471926	-13.677
	(0.00056)	(0.07239)	(0.22118)	(0.04391)	(0.01016)	(0.02004)	
Log likelihood	-18.55723						

Normalized Cointegrating Coefficients: 2 Cointegrating Equation(s)

LNRDPI	INF	LNRBC	LNRGDP	LNRGI	LNRER	LNRLR	C
1.000000	0.000000	0.619076	0.371619	-0.233802	-0.144423	-0.484496	-6.5311
		(0.08853)	(0.29652)	(0.06235)	(0.01258)	(0.02872)	
0.000000	1.000000	87.99186	-226.8679	37.49125	10.06581	1.745284	992.112
		(11.5956)	(38.8369)	(8.16657)	(1.64820)	(3.76114)	
Log likelihood	8.087332						

Normalized Cointegrating Coefficients: 3 Cointegrating Equation(s)

LNRDPI	INF	LNRBC	LNRGDP	LNRGI	LNRER	LNRLR	C
1.000000	0.000000	0.000000	7.138865	- 0.927501	- 0.094339	-0.620668	43.4701
			(4.00775)	(0.50750)	(0.11400)	(0.08881)	
0.000000	1.000000	0.000000	840.6291	-61.10706	-23.87058	-17.60939	-6114.7
			(523.820)	(66.3307)	(14.8995)	(11.6075)	
0.000000	0.000000	1.000000	-12.13177	1.120539	0.385676	0.219960	80.7675
			(6.17968)	(0.78252)	(0.17577)	(0.13694)	
Log likelihood	26.05845						

Appendix 4: Vector Error Correction Estimates (Normalised Cointegrating Coefficients: 1 Cointegrating Equation)

Date: 10/27/10 Time: 17:43
Sample(adjusted): 1982 2008
Included observations: 27 after adjusting endpoints
Standard errors & t-statistics in parentheses

Cointegrating Eq:	CointEq1
LNRDPI(-1)	1.000000
INF(-1)	-0.007203 (0.00056) (-12.8968)
LNRBC(-1)	1.252859 (0.07239) (17.3082)
LNRGDP(-1)	2.005693 (0.22118) (9.06828)
LNRGI(-1)	-0.036238 (0.04391) (-0.82529)
LNRER(-1)	-0.216925 (0.01016) (-21.3415)
LNRLR(-1)	-0.471926 (0.02004) (-23.5536)
C	-13.67708

Error Correction:	D(LNRDPI)	D(INF)	D(LNRBC)	D(LNRGDP)	D(LNRGI)	D(LNRER)	D(LNRLR)
CointEq1	-0.854929 (0.39076) (-2.18784)	17.70576 (41.8045) (0.42354)	0.604577 (0.19370) (3.12126)	-0.007257 (0.04572) (-0.15872)	0.025208 (0.30517) (0.08260)	-0.224345 (0.61510) (-0.36473)	-0.081347 (0.99065) (-0.08211)
D(LNRDPI(-1))	-0.364639 (0.20327) (-1.79388)	-26.44055 (21.7459) (-1.21589)	-0.157727 (0.10076) (-1.56542)	0.015828 (0.02378) (0.66550)	0.240544 (0.15874) (1.51531)	-0.135454 (0.31996) (-0.42335)	0.154438 (0.51532) (0.29969)
D(INF(-1))	0.002211 (0.00405) (0.54601)	-0.336535 (0.43330) (-0.77668)	0.000358 (0.00201) (0.17835)	0.000512 (0.00047) (1.08136)	-0.001293 (0.00316) (-0.40867)	-0.005841 (0.00638) (-0.91615)	-0.009799 (0.01027) (-0.95433)
D(LNRBC(-1))	0.568279 (0.45028) (1.26206)	-15.45502 (48.1715) (-0.32083)	0.828614 (0.22320) (3.71248)	0.045337 (0.05269) (0.86052)	-0.526960 (0.35165) (-1.49855)	-1.304441 (0.70878) (-1.84041)	-0.615812 (1.14153) (-0.53946)
D(LNRGDP(-1))	2.332468 (2.66974) (0.87367)	131.5331 (285.613) (0.46053)	-1.795112 (1.32335) (-1.35649)	-0.034260 (0.31237) (-0.10967)	-2.145882 (2.08494) (-1.02923)	1.385075 (4.20239) (0.32959)	1.392927 (6.76824) (0.20580)

D(LNRGI(-1))	-0.686592	-22.13406	0.014522	-0.017190	-0.210937	-0.143370	0.153277
	(0.28506)	(30.4958)	(0.14130)	(0.03335)	(0.22262)	(0.44870)	(0.72267)
	(-2.40861)	(-0.72581)	(0.10277)	(-0.51539)	(-0.94754)	(-0.31952)	(0.21210)
D(LNRER(-1))	-0.054051	14.91342	0.178533	-0.033130	-0.283166	0.135657	-0.015300
	(0.32515)	(34.7846)	(0.16117)	(0.03804)	(0.25392)	(0.51181)	(0.82430)
	(-0.16623)	(0.42874)	(1.10773)	(-0.87083)	(-1.11516)	(0.26505)	(-0.01856)
D(LNRLR(-1))	0.063952	4.688936	-0.203728	0.014880	0.179345	0.021286	0.148914
	(0.18351)	(19.6319)	(0.09096)	(0.02147)	(0.14331)	(0.28886)	(0.46522)
	(0.34850)	(0.23884)	(-2.23970)	(0.69301)	(1.25144)	(0.07369)	(0.32009)
C	-0.009216	-6.645199	0.001097	0.029526	0.149399	0.267105	0.023561
	(0.12808)	(13.7027)	(0.06349)	(0.01499)	(0.10003)	(0.20162)	(0.32472)
	(-0.07196)	(-0.48496)	(0.01729)	(1.97016)	(1.49358)	(1.32482)	(0.07256)
R-squared	0.732127	0.170981	0.622869	0.250253	0.518783	0.297935	0.105070
Adj. R-squared	0.613073	-0.197473	0.455255	-0.082968	0.304909	-0.014094	-0.292677
Sum sq. resids	2.137008	24458.15	0.525073	0.029256	1.303332	5.294956	13.73473
S.E. equation	0.344562	36.86172	0.170794	0.040316	0.269086	0.542369	0.873522
F-statistic	6.149514	0.464050	3.716093	0.751012	2.425648	0.954832	0.264162
Log likelihood	-4.069533	-130.2312	14.87939	53.85983	2.605987	-16.31873	-29.18657
Akaike AIC	0.968114	10.31343	-0.435511	-3.322951	0.473631	1.875462	2.828635
Schwarz SC	1.400059	10.74537	-0.003565	-2.891005	0.905576	2.307407	3.260580
Mean dependent	0.012645	0.348148	0.015634	0.019403	0.021610	0.324331	0.055527
S.D. dependent	0.553927	33.68548	0.231407	0.038741	0.322753	0.538587	0.768296
Determinant Residual Covariance		9.33E-09					
Log Likelihood		-18.55723					
Akaike Information Criteria		6.559795					
Schwarz Criteria		9.919372					

Appendix 5: Vector Error Correction Estimates (Normalised Cointegrating Coefficients: 2 Cointegrating Equations)

Date: 10/27/10 Time: 17:58
Sample(adjusted): 1982 2008
Included observations: 27 after adjusting endpoints
Standard errors & t-statistics in parentheses

Cointegrating Eq:	CointEq1	CointEq2
LNRDPI(-1)	1.000000	0.000000
INF(-1)	0.000000	1.000000
LNRBC(-1)	0.619076	87.99186
	(0.08853)	(11.5956)
	(6.99254)	(7.58838)
LNRGDP(-1)	0.371619	-226.8679
	(0.29652)	(38.8369)
	(1.25325)	(-5.84156)
LNRGI(-1)	-0.233802	37.49125
	(0.06235)	(8.16657)
	(-3.74967)	(4.59082)
LNRER(-1)	-0.144423	10.06581
	(0.01258)	(1.64820)
	(-11.4766)	(6.10715)
LNRLR(-1)	-0.484496	1.745284
	(0.02872)	(3.76114)
	(-16.8716)	(0.46403)
C	-6.531138	992.1124

Error Correction:	D(LNRDPI)	D(INF)	D(LNRBC)	D(LNRGDP)	D(LNRGI)	D(LNRER)	D(LNRLR)
CointEq1	-0.504095	-46.65319	0.750085	-0.028196	-0.366862	-0.997398	-2.136007
	(0.42172)	(36.4902)	(0.21455)	(0.05250)	(0.29700)	(0.60439)	(0.50948)
	(-1.19534)	(-1.27851)	(3.49603)	(-0.53712)	(-1.23522)	(-1.65025)	(-4.19251)
CointEq2	0.010080	-0.847020	-0.002728	-0.000182	-0.004565	-0.007026	-0.022384
	(0.00349)	(0.30218)	(0.00178)	(0.00043)	(0.00246)	(0.00501)	(0.00422)
	(2.88635)	(-2.80304)	(-1.53537)	(-0.41825)	(-1.85592)	(-1.40385)	(-5.30540)
D(LNRDPI(-1))	-0.516089	1.342304	-0.220540	0.024867	0.409795	0.198262	1.041406
	(0.21143)	(18.2942)	(0.10757)	(0.02632)	(0.14890)	(0.30301)	(0.25543)
	(-2.44099)	(0.07337)	(-2.05029)	(0.94486)	(2.75213)	(0.65431)	(4.07713)
D(INF(-1))	-0.000346	0.132709	-0.000703	0.000665	0.001566	-0.000204	0.005182
	(0.00411)	(0.35573)	(0.00209)	(0.00051)	(0.00290)	(0.00589)	(0.00497)
	(-0.08428)	(0.37306)	(-0.33603)	(1.29970)	(0.54085)	(-0.03470)	(1.04327)
D(LNRBC(-1))	0.743963	-47.68355	0.901478	0.034851	-0.723293	-1.691556	-1.644709
	(0.43862)	(37.9530)	(0.22315)	(0.05460)	(0.30891)	(0.62862)	(0.52991)
	(1.69613)	(-1.25638)	(4.03970)	(0.63830)	(-2.34145)	(-2.69089)	(-3.10378)

D(LNRGDP(-1))	1.920911	207.0316	-1.965804	-0.009696	-1.685951	2.291931	3.803217
	(2.54186)	(219.942)	(1.29320)	(0.31641)	(1.79016)	(3.64294)	(3.07086)
	(0.75571)	(0.94130)	(-1.52010)	(-0.03064)	(-0.94179)	(0.62914)	(1.23849)
D(LNRGI(-1))	-0.844646	6.860312	-0.051031	-0.007756	-0.034306	0.204898	1.078923
	(0.28507)	(24.6668)	(0.14504)	(0.03549)	(0.20077)	(0.40856)	(0.34440)
	(-2.96290)	(0.27812)	(-0.35185)	(-0.21857)	(-0.17087)	(0.50151)	(3.13274)
D(LNRER(-1))	-0.153582	33.17198	0.137253	-0.027189	-0.171936	0.354971	0.567604
	(0.31349)	(27.1255)	(0.15949)	(0.03902)	(0.22078)	(0.44929)	(0.37873)
	(-0.48991)	(1.22291)	(0.86056)	(-0.69674)	(-0.77876)	(0.79008)	(1.49870)
D(LNRLR(-1))	0.097478	-1.461310	-0.189823	0.012879	0.141878	-0.052588	-0.047432
	(0.17502)	(15.1444)	(0.08905)	(0.02179)	(0.12326)	(0.25084)	(0.21145)
	(0.55694)	(-0.09649)	(-2.13175)	(0.59113)	(1.15101)	(-0.20965)	(-0.22432)
C	0.029569	-13.76029	0.017184	0.027211	0.106055	0.181642	-0.203588
	(0.12345)	(10.6817)	(0.06281)	(0.01537)	(0.08694)	(0.17692)	(0.14914)
	(0.23953)	(-1.28821)	(0.27360)	(1.77076)	(1.21984)	(1.02667)	(-1.36508)
R-squared	0.772648	0.539714	0.662808	0.279764	0.667845	0.506042	0.827511
Adj. R-squared	0.652285	0.296033	0.484294	-0.101538	0.491998	0.244535	0.736194
Sum sq. resids	1.813745	13579.59	0.469467	0.028105	0.899612	3.725417	2.647230
S.E. equation	0.326636	28.26304	0.166180	0.040660	0.230040	0.468126	0.394613
F-statistic	6.419329	2.214839	3.712924	0.733707	3.797879	1.935100	9.061908
Log likelihood	-1.855361	-122.2879	16.39058	54.40195	7.610651	-11.57246	-6.959976
Akaike AIC	0.878175	9.799104	-0.473376	-3.289033	0.176989	1.597960	1.256295
Schwarz SC	1.358114	10.27904	0.006564	-2.809094	0.656928	2.077899	1.736234
Mean dependent	0.012645	0.348148	0.015634	0.019403	0.021610	0.324331	0.055527
S.D. dependent	0.553927	33.68548	0.231407	0.038741	0.322753	0.538587	0.768296
Determinant Residual Covariance		1.30E-09					
Log Likelihood		8.087332					
Akaike Information Criteria		5.623161					
Schwarz Criteria		9.654653					

Appendix 6: Vector Error Correction Estimates (Normalised Cointegrating Coefficients: 3 Cointegrating Equations)

Date: 10/27/10 Time: 18:00
Sample(adjusted): 1982 2008
Included observations: 27 after adjusting endpoints
Standard errors & t-statistics in parentheses

Cointegrating Eq:	CointEq1	CointEq2	CointEq3
LNRDPI(-1)	1.000000	0.000000	0.000000
INF(-1)	0.000000	1.000000	0.000000
LNRBC(-1)	0.000000	0.000000	1.000000
LNRGDP(-1)	7.138865	840.6291	-12.13177
	(4.00775)	(523.820)	(6.17968)
	(1.78127)	(1.60481)	(-1.96317)
LNRGI(-1)	-0.927501	-61.10706	1.120539
	(0.50750)	(66.3307)	(0.78252)
	(-1.82760)	(-0.92125)	(1.43195)
LNRER(-1)	-0.094339	-23.87058	0.385676
	(0.11400)	(14.8995)	(0.17577)
	(-0.82756)	(-1.60210)	(2.19415)
LNRLR(-1)	-0.620668	-17.60939	0.219960
	(0.08881)	(11.6075)	(0.13694)
	(-6.98879)	(-1.51707)	(1.60628)
C	43.47011	-6114.777	80.76758

Error Correction:	D(LNRDPI)	D(INF)	D(LNRBC)	D(LNRGDP)	D(LNRGI)	D(LNRER)	D(LNRLR)
CointEq1	-0.197949	-48.09876	0.714570	0.007515	-0.173924	-1.465755	-2.306438
	(0.42455)	(40.6504)	(0.23793)	(0.05357)	(0.30563)	(0.59882)	(0.55653)
	(-0.46626)	(-1.18323)	(3.00322)	(0.14029)	(-0.56907)	(-2.44775)	(-4.14430)
CointEq2	0.005665	-0.826171	-0.002216	-0.000697	-0.007347	-0.000271	-0.019926
	(0.00400)	(0.38285)	(0.00224)	(0.00050)	(0.00288)	(0.00564)	(0.00524)
	(1.41670)	(-2.15797)	(-0.98878)	(-1.38130)	(-2.55255)	(-0.04812)	(-3.80158)
CointEq3	0.807909	-43.80224	-0.659025	-0.044166	-0.421023	0.597554	-0.429510
	(0.48366)	(46.3104)	(0.27106)	(0.06103)	(0.34818)	(0.68219)	(0.63402)
	(1.67042)	(-0.94584)	(-2.43126)	(-0.72372)	(-1.20920)	(0.87593)	(-0.67744)
D(LNRDPI(-1))	-0.689600	2.161602	-0.200412	0.004627	0.300445	0.463709	1.138000
	(0.21707)	(20.7847)	(0.12166)	(0.02739)	(0.15627)	(0.30618)	(0.28456)
	(-3.17684)	(0.10400)	(-1.64736)	(0.16894)	(1.92261)	(1.51451)	(3.99920)
D(INF(-1))	0.002123	0.121047	-0.000989	0.000953	0.003122	-0.003983	0.003807
	(0.00404)	(0.38716)	(0.00227)	(0.00051)	(0.00291)	(0.00570)	(0.00530)
	(0.52508)	(0.31265)	(-0.43657)	(1.86832)	(1.07265)	(-0.69830)	(0.71818)
D(LNRBC(-1))	1.137484	-49.54170	0.855828	0.080755	-0.475291	-2.293585	-1.863782

	(0.45806)	(43.8593)	(0.25672)	(0.05780)	(0.32976)	(0.64609)	(0.60047)
	(2.48327)	(-1.12956)	(3.33374)	(1.39722)	(-1.44134)	(-3.54996)	(-3.10389)
D(LNRGDP(-1))	2.488760	204.3502	-2.031678	0.056543	-1.328084	1.423206	3.487095
	(2.38591)	(228.451)	(1.33717)	(0.30105)	(1.71761)	(3.36530)	(3.12766)
	(1.04311)	(0.89450)	(-1.51939)	(0.18782)	(-0.77322)	(0.42291)	(1.11492)
D(LNRGI(-1))	-1.218570	8.625926	-0.007654	-0.051374	-0.269958	0.776945	1.287086
	(0.33057)	(31.6525)	(0.18527)	(0.04171)	(0.23798)	(0.46627)	(0.43335)
	(-3.68623)	(0.27252)	(-0.04131)	(-1.23167)	(-1.13438)	(1.66630)	(2.97011)
D(LNRER(-1))	0.025625	32.32579	0.116464	-0.006285	-0.058997	0.080812	0.467840
	(0.30682)	(29.3780)	(0.17196)	(0.03871)	(0.22088)	(0.43276)	(0.40221)
	(0.08352)	(1.10034)	(0.67729)	(-0.16235)	(-0.26710)	(0.18674)	(1.16319)
D(LNRLR(-1))	-0.015170	-0.929398	-0.176755	-0.000261	0.070885	0.119748	0.015279
	(0.17346)	(16.6085)	(0.09721)	(0.02189)	(0.12487)	(0.24466)	(0.22738)
	(-0.08746)	(-0.05596)	(-1.81823)	(-0.01195)	(0.56767)	(0.48945)	(0.06720)
C	-0.024585	-13.50458	0.023466	0.020894	0.071926	0.264489	-0.173441
	(0.11845)	(11.3414)	(0.06638)	(0.01495)	(0.08527)	(0.16707)	(0.15527)
	(-0.20756)	(-1.19074)	(0.35349)	(1.39804)	(0.84351)	(1.58312)	(-1.11702)
R-squared	0.814438	0.539966	0.666030	0.396015	0.716734	0.609499	0.834243
Adj. R-squared	0.698461	0.252445	0.457299	0.018525	0.539692	0.365435	0.730646
Sum sq. resids	1.480362	13572.16	0.464981	0.023568	0.767201	2.945151	2.543909
S.E. equation	0.304175	29.12490	0.170474	0.038380	0.218975	0.429036	0.398741
F-statistic	7.022436	1.878003	3.190849	1.049074	4.048392	2.497297	8.052711
Log likelihood	0.886593	-122.2805	16.52021	56.77836	9.760039	-8.399703	-6.422517
Akaike AIC	0.749141	9.872631	-0.408904	-3.390990	0.091849	1.437015	1.290557
Schwarz SC	1.277075	10.40056	0.119029	-2.863056	0.619783	1.964949	1.818490
Mean dependent	0.012645	0.348148	0.015634	0.019403	0.021610	0.324331	0.055527
S.D. dependent	0.553927	33.68548	0.231407	0.038741	0.322753	0.538587	0.768296
Determinant Residual Covariance		3.42E-10					
Log Likelihood		26.05845					
Akaike Information Criteria		5.329003					
Schwarz Criteria		10.03241					