NELSON MANDELA UNIVERSITY

INTEREST RATE LIBERALISATION AND ECONOMIC GROWTH IN SADC COUNTRIES

by

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DECLARATION:

In accordance with Rule G5.6.3, I hereby declare that the above-mentioned treatise/ dissertation/ thesis is my own work and that it has not previously been submitted for assessment to another University or for another qualification.

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ABSTRACT

The pioneers of financial liberalisation, McKinnon (1973) and Shaw (1973) argue that interest rates determined by market forces have a positive effect on economic growth rates. Interest rates that are kept at low levels through the intervention of a central bank discourage savings and capital accumulation, and distort the allocation of resources. Interest rate liberalisation results in higher real interest rates which could have a positive effect on savings, investments and economic growth (Ang & McKibbin 2007). Interest rate liberalisation also reduces capital flight and encourages capital inflows by increasing return for investors which supplements domestic investments. Shaw (1973) argued that interest rate liberalisation promotes financial development by encouraging savings and increasing the availability of funds for lending purposes.

The study provides an empirical analysis of the channels through which interest rate liberalisation impacts on economic growth in SADC countries for the period 1990 to 2015. The study is motivated by the concerns on the impact of interest rate liberalisation on economic growth in the period after the 2008-'09 global financial crisis as well as concerns that interest rate liberalisation increases the likelihood of financial crises. Higher interest rates resulting from interest rate liberalisation may increase the likelihood of financial crises by encouraging risk-taking on the part of banks in an attempt to take advantage of higher returns. Authorities in most countries have reduced interest rates in an attempt to boost aggregate demand, which is expected to speed up the recovery from the crisis. However, the lowering of interest rates may result in a decrease in savings and investments, which are the main drivers of long-term economic growth. Real interest rates below equilibrium may encourage banks to take more risks in their lending practices in order to earn higher returns which may result in an increase in non-performing loans. The influence of interest rates on financial crises has thus received considerable attention since the onset of the 2008-'09 global financial crisis and this thesis contributes to the literature by determining how interest rates impact on economic growth in SADC countries and whether interest rate liberalisation increases the likelihood of financial crises.

The study examines the relationship between interest rate liberalisation and economic growth through different channels. These include savings and investments, capital flows and financial development. The study uses the Pooled Mean Group (PMG) estimator proposed by Pesaran *et al* (1999) to estimate the effect of interest rate liberalisation on economic growth through the abovementioned channels. The study also examines whether interest rate

liberalisation increases the likelihood of financial crises. This is estimated using the logit model, due to the binary nature of the dependent variable.

The results provide limited support for the McKinnon and Shaw hypothesis. Interest rate liberalisation has a positive effect on economic growth through higher savings and investments. Interest rate liberalisation has a positive outcome on capital inflows, which indicates that the prospect of earning higher returns encourages foreign investors to invest in the domestic economy. However, capital inflows do not enhance economic growth. This could be due to the low levels of human capital in SADC countries.

Interest rate liberalisation boosts financial development through higher savings and investments. However, financial development has a negative effect on economic growth because of the link between financial development and financial crises. The results show that interest rate liberalisation decreases the likelihood of financial crises directly, however, it increases the probability of financial crises indirectly through financial development. This suggests that the major cause of financial crises in the region is the low levels of institutional quality and lack of adequate supervisory frameworks to monitor the functioning of the financial system. Therefore, the results imply that the negative impact of interest rate liberalisation may outweigh the positive effect of higher savings and investments in SADC countries.

A number of policy recommendations can be drawn from the study. Liberalisation of interest rates has a positive effect on economic growth through savings and investments. However improving the levels of institutional quality is vital for preventing financial crises. Interest rate liberalisation may not have a direct influence on financial crises, but higher levels of financial development emanating from higher interest rates increase the likelihood of financial crises. Therefore, a sound monitoring framework is necessary for the benefits of financial liberalisation to be realised. Also, investment in education, training and research and development is a necessity so as to increase levels of human capital, which in turn may allow the region to reap the benefits of capital inflows.

DEDICATION

I dedicate this thesis to my Great God and Saviour who guided me through this thesis and gave me the strength to complete it.

I also dedicate this thesis to my family, my mother Mrs Cynthia Moyo, my father Mr Marcelius Moyo, and my sister Sanelisiwe Moyo, who have supported me throughout my academic career. Without them this would not have been possible.

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ABBREVIATIONS AND ACRONYMS

DFE – dynamic fixed effects

FDI – foreign direct investments

GDP – gross domestic product

GMM – generalised methods of moments

IMF – International Monetary Fund

LPM – linear probability model

MG – mean group

OECD – Organisation for Economic Co-operation and Development

OLS – ordinary least squares

PMG – pooled mean group

SADC – Southern African Development Community

SAP – stabilisation adjustment programme

SSA – sub-Saharan Africa

TSLS – two-stage least squares

UNCTAD – United Nations Conference on Trade and Development

CHAPTER ONE

INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 Introduction

This chapter provides the background, motivation, significance, objectives and hypotheses of the study. Economic theories of competitive and efficient markets suggest that financial liberalisation is positively related to economic growth and development and thus in recent decades, there have been increasing calls for developing countries to liberalise their financial sectors (O'Toole, 2012; Commission on Growth and Development 2008).

The pioneers of financial liberalisation were McKinnon (1973) and Shaw (1973), whose recommendations are often referred to as the McKinnon and Shaw hypothesis. This hypothesis states that interest rates determined by market forces have a positive effect on economic growth rates. Interest rates that are kept at low levels through the intervention of a central bank discourage savings and capital accumulation, and distort the allocation of resources. The negative effect of below-equilibrium interest rates on economic activity prompted calls for interest rate liberalisation, which is defined as the removal of interest rate controls and allowing market forces to determine domestic interest rates. Interest rate liberalisation results in higher real interest rates, which could have a positive effect on savings, investments and economic growth (Ang & McKibbin 2007). Interest rate liberalisation also reduces capital flight and encourages capital inflows by increasing return for investors, which supplements domestic investments. Furthermore, Shaw (1973) argued that interest rate liberalisation promotes financial development by encouraging savings and increasing the availability of funds for lending purposes. The finance and growth nexus was also discussed extensively by Schumpeter (1912) and Levine (1997), who argued that financial sector development has a positive outcome on economic growth through savings mobilisation and capital accumulation, risk management and reducing transaction costs. A developed financial sector would enable an economy to mobilise funds effectively from sectors with surpluses to sectors with deficits and hence increasing investment (Woldie & Kalowoleadeniji, 2008). A developed financial sector would also increase investment funding good business opportunities, creating a good environment for saving, enhancing trading and allowing investors to hedge risks by diversifying their portfolios (Akingunola *et al*, 2013).

The views of McKinnon (1973) and Shaw (1973) are supported by Kapur (1976), Mathieson (1980), Galbis (1977) and Fry (1980), among others, who argued that interest rate reforms

have a positive effect on the quantity and quality of investments which in turn boost economic growth. The Austrian school of thought proposes that interest rates should be determined by the market for loanable funds. By controlling interest rates, authorities may exert negative effects on an economy such as preventing market forces from providing accurate information and causing misallocation of capital in an economy (Snowdon & Vane 2005). Production processes may be lengthened and thus too many capital goods end up being produced at the expense of consumer goods which would be against consumer preferences, as consumers would desire to make more expenditures in the current period. This would result in idle production capacities which in turn can cause financial crises.

Critics of the McKinnon-Shaw hypothesis include the Neo-Structuralist school of thought and also the Keynesians, including the New-Keynesians and the Post-Keynesians, who argue that interest rate liberalisation affects economic growth negatively by reducing the availability of funds in the economy and reducing aggregate demand, which is a major component of gross domestic product. Stiglitz & Weiss (1981), Mankiw (1986), Stiglitz (1994), and Arestis & Demetriades (1999) argue that financial markets are prone to market failures due to imperfect information. So government intervention in the market is necessary to prevent financial crises. Financial crises may also prevail if there is inadequate institutional quality.

In the light of the above, there are two strands of literature, one advocating for, the other against interest rate liberalisation. This study is motivated by the need to determine whether interest rate liberalisation has a positive influence on economic growth in the SADC region. The region is plagued by low economic growth rates which have prevented a rise in employment and standards of living. Furthermore, a number of financial crises have occurred down the years, so determining the cause of these is necessary. The global financial crisis of 2008-'09 has prompted most central banks to reduce interest rates in an attempt to boost investment and economic growth. This study sheds light on whether interest rate liberalisation promotes or hinders economic growth.

1.2 Background to the study

Most of the countries in the SADC began a process of liberalising their financial sectors during the late 1980s and early '90s in line with the proposals of McKinnon and Shaw, so as to boost investment and economic growth levels (Mowatt, 2001). Prior to this liberalisation, most of these countries had repressed financial sectors with interest rates kept at negative rates by the state, exchange controls being employed, and financial institutions subject to

portfolio restrictions (Nyawata & Bird 2004). Financial liberalisation in SADC involved increasing real interest rates to positive levels, allowing the market to allocate credit, strengthening prudential regulation and the supervision and restructuring of state-owned banks.

Table 1.1: Real interest rate trends in SADC countries

Country	1990-'99	2000-'09	2010-'15
Botswana	3.81	7.82	3.53
Lesotho	6.37	6.76	5.14
Madagascar	9.93	19.66	46.11
Malawi	4.01	14.76	13.23
Mauritius	11.34	12.65	6.06
Namibia	8.97	4.98	2.94
Seychelles	12.92	0.03	8.77
South Africa	6.98	5.04	3.25
Swaziland	3.97	4.22	0.25
Tanzania	6.75	5.24	6.86
Zambia	-1.16	11.76	5.03

Source: World Bank (2016)

As shown in Tables 1.1, real interest rates rose into positive territory in most SADC countries over the period 1990 to 2015. Savings and investments also increased during the same period as indicated by table 1.2 which suggests that there could be a link between interest rate liberalisation, savings and investments. However, there were several financial crises recorded in the period after the interest rate reforms, so whether the effect of interest rate liberalisation on growth is positive is still inconclusive.

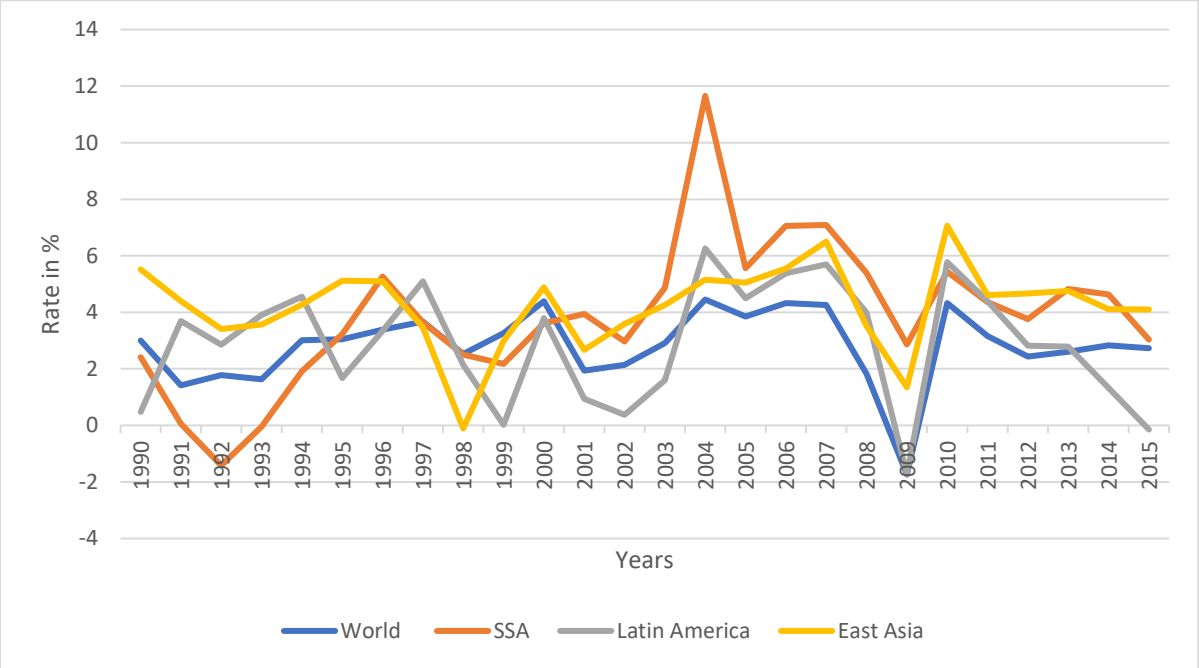
Table 1.2: Trends in savings and investments in SADC countries

Country	1990-'99		2000-'09		2010-'15	
	Savings	**Investments**	**Savings**	**Investments**	**Savings**	**Investments**
Botswana	39.64	29.69	39.02	30.73	39.74	33.92
Lesotho	27.97	61.20	39.69	29.23	23.64	33.10
Madagascar	4.84	12.53	17.41	24.89	12.55	17.85
Malawi	4.62	8.67	10.46	16.09	7.50	14.01
Mauritius	19.91	30.28	22.39	24.17	17.41	24.70
Namibia	24.37	21.82	26.53	21.70	21.16	26.99
Seychelles	23.74	29.45	12.66	25.80	17.74	36.39
South Africa	17.77	17.80	16.35	18.73	15.76	19.78
Swaziland	14.78	26.85	22.47	24.78	6.82	7.37
Tanzania	19.95	25.79	18.31	21.27	20.23	30.27
Zambia	8.20	14.72	23.12	28.21	35.74	33.14

Source: World Bank (2016)

Higher savings and investment rates are crucial for long-term growth and reductions in unemployment and poverty levels. However, in most emerging economies in African countries, the investment rates are too low to have any significant influence on economic growth rates (Ndikumana, 2014). Inadequate savings levels could explain the low investment levels. Investments can be boosted by allowing interest rates to be determined by market forces which could have a positive effect on savings. Interest rate liberalisation could also result in the development of the financial sector as more individuals take part in economic activity through saving (Spratt, 2009). Foreign direct investment may increase due to a rise in returns for investors, which results in job creation and brings greater expertise to firms in the domestic industry. Higher levels of investments, financial development and foreign direct investments could have a positive outcome on economic growth, which in turn would reduce unemployment and poverty levels.

Figure 1.1: Growth rates in sub-Saharan Africa and other developing countries

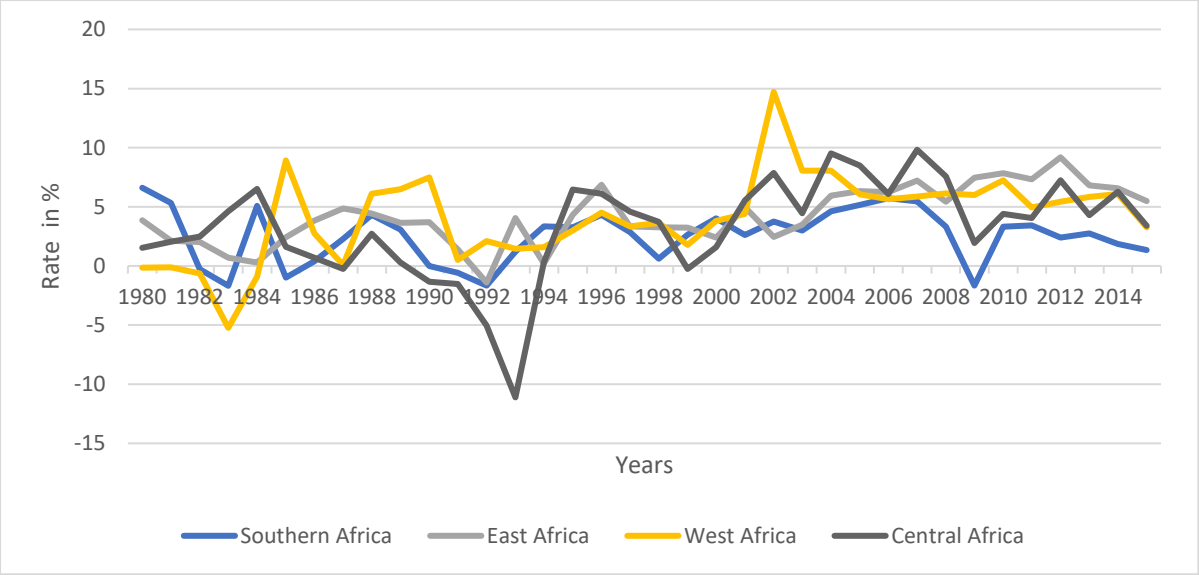


Source: World bank (2016)

Figure 1.1 shows that average growth rates in sub-Saharan Africa (SSA) have been, on average, higher than in other regions since the early 2000s. What is more, the growth rates have been higher than the world average. However, Southern Africa is the slowest-growing region, as shown on Figure 1.2, which depicts per capita GDP growth rates in SSA. GDP per capita

growth rates over the period 1990-2015 have averaged 4.23% in East Africa, 4.12% in West Africa, 3.24% in Central Africa and 2.54% in Southern Africa.

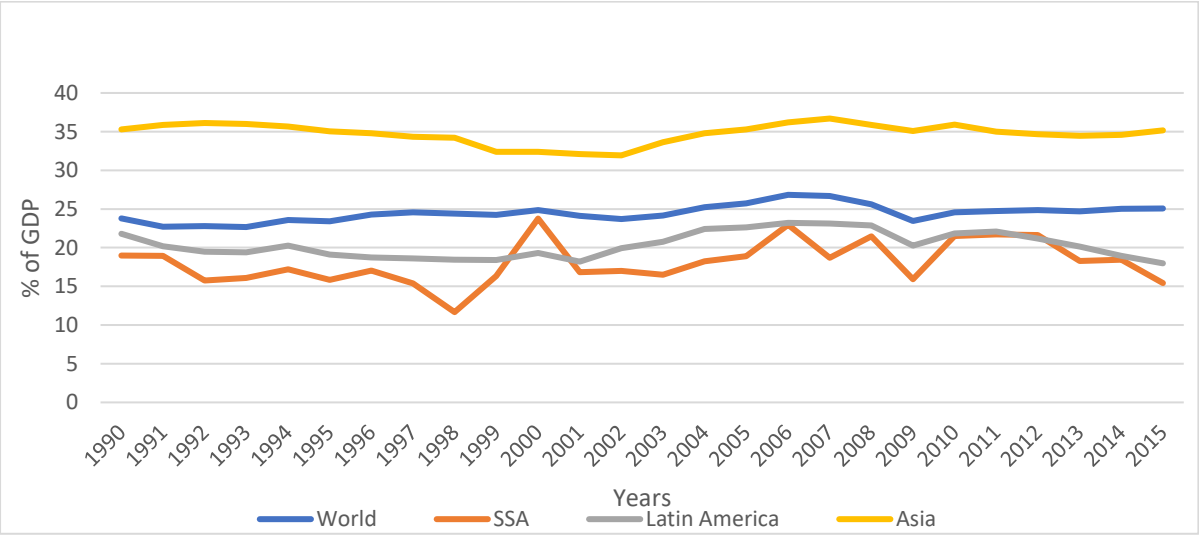
Figure 1.2: Economic growth rates: Southern Africa and other African regions



Source: UNCTAD (2016)

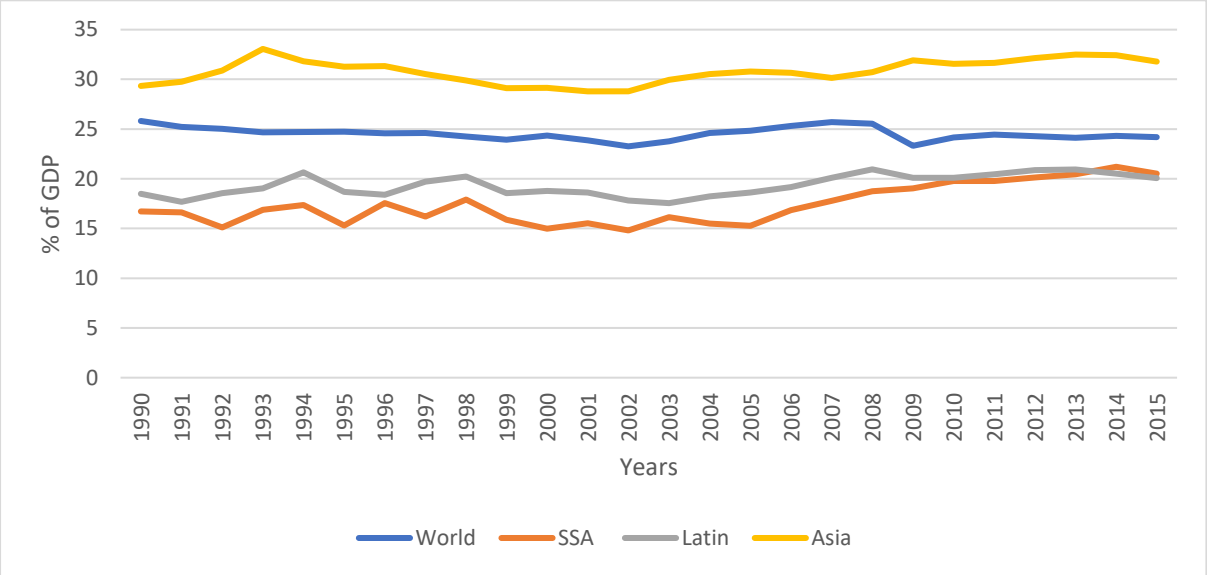
Savings and investment rates are lower in SSA countries compared with other developing and emerging countries. As shown in figures 1.3 and 1.4, savings and investment levels in SSA have been the lowest in the developing regions considered for the period 1990-2015. Savings and investment have also been lower than the world average.

Figure 1.3: Savings: sub-Saharan Africa and other emerging countries



Source: World Bank (2016)

Figure 1.4: Investments: sub-Saharan Africa and other emerging countries



Source: World Bank (2016)

Policies that promote savings and investments may be vital for ensuring that the high economic growth levels in SSA are sustainable and so need to be implemented. Interest rate liberalisation may have a positive influence on savings by increasing returns for savers, which in turn would boost investment levels. Interest rate reform may also encourage the development of the financial sector, which will ensure that households and firms have access to secure channels for saving.

On the other hand, interest rate liberalisation could result in widening spreads between lending and deposit rates and narrowing the focus of banks faced with increasing competition. Interest rate liberalisation can also destabilise the financial system and cause financial crises if not carried out appropriately (Ang & McKibbin, 2007). High interest rates may not have a positive effect on savings, investments and economic growth in countries with low income levels, as substantial amounts of the income would be devoted to consumption. So any increase in the interest rate would have no effect on savings. This is particularly true for most countries in SADC and sub-Saharan Africa, where a large number of people earn very low incomes. Stiglitz (1994) also argues that although a moderate increase in interest rates can result in an increase in savings and lending rates, increases in interest rates above a certain level would result in lower levels of lending, as this would favour borrowers in the high-risk category.

1.3 Problem statement

The 2008-'09 global financial crisis has brought the issue of interest rates into the spotlight. According to the advocates of the Austrian school, like Kates (2010) and Templeman (2012), the crisis was caused by a decrease in interest rates below equilibrium, which resulted in mal-investments, a situation where the activities of producers and consumers are not coordinated. Also, maintaining low interest rates during a crisis slows the recovery process. However, the Keynesians argue that the financial crisis was caused by a drop in aggregate demand as well as the savings glut resulting from excess savings in Asian economies (Kotios & Galanos, 2012; Tridico, 2011). So the Keynesians advocate for low interest rates so as to boost aggregate demand. Authorities worldwide have reduced interest rates to low levels in an attempt to boost aggregate demand and economic growth. Lower interest rates are also purported to increase investment levels by reducing borrowing costs. The recovery from the global financial crisis has been slow despite the lowering of interest rates conducted by most authorities around the world. Investments and economic growth rates continue to be at low levels in most parts of the world. So there is an urgent requirement for new policies to be implemented that would result in higher long-term economic growth. Interest rates kept low for too long can have a negative influence on an economy by reducing savings – a vital determinant of investments. However, there is no conclusive evidence on whether the effect of higher interest rates on savings outweighs the negative outcome of higher interest rates on investment through rising borrowing costs.

Investment is one of the major determinants of long-term economic growth in an economy. Realising that, the SADC region set targets for savings and investments ratios as a percentage of GDP at 30% and 35% respectively. However most countries have not been able to reach those levels, and reducing real interest rates may reverse the progress made. The ratio of investment to GDP is low for most developing countries and this is mainly due to low savings rates (Ndikumana, 2014). Historically the fastest growing countries in the world, like China, have had investment rates in excess of 30% – this can be made possible by an increase in savings (Commission for Growth and Development, 2008).

Despite the improvements in economic growth in SSA over the years, there are still high rates of unemployment and poor standards of living. Poverty rates are still close to 50%, 30% of the population is undernourished and inequality still remains a big problem (Schaffnit-Chatterjee, 2013). One of the reasons for the high unemployment rates and low living standards is

undeveloped financial systems in developing countries (Forowe 2013). Lowering interest rates may have a negative effect on financial development by reducing savings levels. According to Shaw (1973), interest rate liberalisation promotes financial development by increasing savings and financial intermediation.

Based on World Bank publications, the average credit-to-GDP ratio in 2010 for sub-Saharan Africa (SSA) was below 20%, although higher in some countries (Griffith-Jones, 2013). In addition, World Bank surveys revealed that only 17% of the small enterprises in SSA have access to credit, which is the lowest among all emerging country regions. In Latin America and the Caribbean 41% of the small enterprises have access to credit, while in SSA 48% of small enterprises and 41% of medium enterprises state that lack of funds is a constraint for their investment and report that it is the major obstacle to their investment ambitions (Griffith-Jones, 2013). Interest rate liberalisation would increase the savings rate, which would make funds available for investment purposes and hence increase economic growth.

Critics of interest rate liberalisation argue that it increases the likelihood of financial crises by encouraging banks to take more risks in their lending practices, as well as reducing franchise values through a rise in competition. Also, a number of households are heavily indebted and a drastic or sudden increase in interest rates could result in an increase in defaults on borrowed funds, which in turn could result in a financial crisis. For example, in South Africa, due to the rise in private sector credit between 2003 and ’06, the ratio of household debt to income was 83% in 2008 (IMF, 2014). This ratio decreased from 83% to about 75% in 2013 due to the global financial crisis, but this figure is still high by historical standards, and when compared with other countries. It was estimated that a 100-basis-point increase in the interest rate would increase the household interest-only debt service ratio of income to just over 9% from 7.9%. This figure is higher than that experienced during 2002-’03, when there was significant household debt distress (IMF, 2014). However, reducing interest rates to very low levels may encourage banks to undertake risky lending so as to earn higher returns, which also increases the probability of financial crises.

An increase in interest rates could also increase borrowing costs, which in turn could decrease the amount of investments undertaken by domestic firms. This outcome would be greater for small businesses than larger firms, which have greater profitability and higher cash flows. Higher interest rates could also reduce the demand for goods and services due to

the rise in borrowing costs. Private consumption represents a considerable amount of GDP in SADC, so a reduction in private consumption could have a negative effect on the economic growth rate.

The analysis above highlights that interest rate liberalisation has two opposing influences on economic growth, the growth-enhancing and growth-retarding effects, through financial crises. So this thesis will examine the channels through which interest rate liberalisation affects economic growth in eleven[1] SADC countries so as to draw conclusions on whether implementing the policy is vital for sustainable long-term growth in the region.

1.4 Study objectives

The broad objective of the thesis is to examine whether interest rate liberalisation has a positive influence on economic growth in SADC countries. The specific objectives of the thesis include:

i. Providing an overview of interest rate liberalisation in SADC countries;
ii. Surveying the theoretical and empirical literature regarding interest rate liberalisation;
iii. Examining the relationship between interest rate liberalisation, savings and investments;
iv. Investigating whether interest rate liberalisation has a positive influence on capital inflows;
v. Examining whether interest rate liberalisation results in the development of the financial sector;
vi. Determining whether interest rate liberalisation increases the likelihood of financial crises.
vii. Investigating the effect of financial development and institutional quality on financial crises.

1.5 Significance of the study

Understanding the influence of interest rate liberalisation on economic growth is critical for policy-makers, especially during this period when economies are recovering from the 2008-'09 global financial crisis. The study is conducted at a time when different growth strategies

[1] Botswana, Lesotho, Madagascar, Malawi, Mauritius, Namibia, Seychelles, South Africa, Swaziland, Tanzania and Zambia. Angola, DRC, Mozambique and Zimbabwe are omitted due to insufficient data.

need to be adopted as expansionary monetary policy has had limited success in influencing savings, investments and economic growth. Lowering interest rates to below equilibrium levels may increase investments and aggregate demand. However, savings may be reduced, which in turn retards investments. There is no conclusive evidence on whether interest rate liberalisation has a positive or negative effect on investment levels. Determining whether the effect of higher real interest rates on investments outweighs that of lower real interest rates is crucial for sustainable long-term growth, as investments are a major driver of economic growth.

There is scant evidence on the channels through which interest rate reforms influence economic growth in SSA countries. Studies by Odhiambo (2009a, 2009b, 2010), Odhiambo & Akinboade (2009), Akinboade & Kinfack (2013) and Ahmed (2013) focus mostly on the effect of interest rate/financial liberalisation on financial development and economic growth. These studies use individual measures of financial development like credit to the private sector, liquid liabilities, broad money and bank deposits. This study incorporates other channels in which interest rate liberalisation may influence economic growth, namely savings and investments and capital inflows, as well as the influence of interest rate liberalisation on financial crises. This study also constructs financial development indices using principal components analysis (PCA) in order to mitigate the effect of collinearity among individual financial development indicators.

There is scant evidence on the effect of interest rate liberalisation on financial crises in SSA countries despite the frequency of financial crises in the region over the years. Misati & Nyamongo (2012) use the Chinn-Ito index as a measure of financial liberalisation in examining the influence of reforms on financial fragility. However, most of the problems in the banking sector are caused by interest rates, which influence bank risk-taking and competition. This study contributes to the literature by investigating whether interest rates and financial development affect financial crises. Higher levels of financial development, and in particular, bank credit and credit to the private sector in an environment of low institutional quality, result in an increase in the number of non-performing loans, which in turn increases the probability of financial crises.

A number of studies on financial reforms focus on the direct influence of financial liberalisation on economic growth. This study contributes to the debate by examining the channels in which interest rate liberalisation has an effect on economic growth.

Most studies on interest rate or financial liberalisation in Africa have focused mainly on sub-Saharan Africa as a whole, such as Fowowe (2013), Ahmed (2012), and Misati & Nyamongo (2012). Region-specific studies, for instance studies focusing on SADC countries, are crucial since there are disparities between regions with regards to economic growth. The studies that have examined the influence of interest rates or financial liberalisation on economic growth in SADC countries are Odhiambo (2009a, 2009b, 2010 2011), Odhiambo & Akinboade (2009), Nyawata & Bird (2004) and Mowatt (2001). The empirical studies by Odhiambo and by Odhiambo & Akinboade focused only on the financial deepening channel of interest rate liberalisation as stated above, while those of Nyawata & Bird (2004) and Mowatt (2001) include no econometric estimation. This study incorporates more channels in which interest rate liberalisation affects economic growth, and uses econometric estimation techniques.

1.6 Study hypotheses

H_1: Interest rate liberalisation has a positive effect on savings

H_2: There is a positive relationship between savings and investments

H_3: Investments and economic growth are positively related

H_4: Interest rate liberalisation has a positive effect on capital inflows

H_5: Capital inflows and economic growth have a positive relationship

H_6: Interest rate liberalisation has a positive effect on financial development

H_7: Financial development and economic growth are positively related

H_8: Interest rate liberalisation increases the likelihood of financial crises

H_9: Financial development increases the likelihood of financial crises

H_{10}: Institutional quality reduces the likelihood of financial crises

1.7 Organisation of the study

The thesis is organised into eleven chapters, structured as follows:

Chapter one provides the introduction, background, problem statement, motivation and objectives of the study.

Chapter two provides an overview of selected SADC countries, including the history of financial/interest rate liberalisation. Trends in savings, investment and economic growth for the period 1990-2015 will be presented.

Chapter three reviews the literature on interest rate liberalisation, including the views of both supporters and critics of the policy. Furthermore, theories of financial crises are also provided.

Chapter four reviews the literature on growth theories which place emphasis on savings and investment. Theories relating financial development and capital flows to economic growth are also discussed.

Chapter five surveys the empirical literature on the relationship between interest rate liberalisation and economic growth through savings and investments, capital inflows, financial development and financial crises. The chapter also provides a survey of the estimation techniques in the literature.

Chapter six outlines the methodology of the study. A discussion of the estimation techniques as well as model specifications is provided.

Chapter seven examines the relationship between interest rate liberalisation, savings, investments and economic growth.

Chapter eight examines the relationship between interest rate liberalisation, capital inflows and economic growth.

Chapter nine examines whether interest rate liberalisation results in the development of the financial sector, which in turn promotes economic growth.

Chapter ten examines whether interest rate liberalisation has a positive effect on financial crises.

Chapter eleven concludes the study. The chapter summarises the main issues and findings of the study and also provides recommendations and suggestions for future research.

1.8 Conclusion

This introductory chapter set out the background, discussed the objectives, problem statement, significance, hypotheses and the organisation of the study. The study is motivated by concerns about the influence of interest rate liberalisation on economic growth in the period before after the 2008-'09 global financial crisis. Authorities in most countries have reduced interest rates in an attempt to boost aggregate demand, which is expected to speed up recovery from the crisis. However, the lowering of interest rates may result in a decrease in savings and investments – the main drivers of long-term economic growth. The influence of interest rates on financial crises has received considerable attention since the onset of the 2008-'09 global financial crisis. Interest rates below equilibrium are regarded as a major cause of the crisis, so this study examines the influence of interest rate liberalisation on economic growth through channels like savings and investments, capital inflows and financial development in SADC countries. The study also investigates whether interest rate liberalisation increases the likelihood of financial crises.

The chapter showed that SSA is lagging behind other developing countries with regard to saving and investments, which may hinder the achievement of sustainable long-term growth. Lowering real interest rates so as to boost aggregate demand may have the negative effect of reducing savings and investments. With regard to specific regions in SSA, the chapter showed that SADC countries, on average, have had the lowest economic growth levels in the region, which necessitates a survey of growth-enhancing policies like interest rate liberalisation.

The chapter also points out that interest rate liberalisation may increase the likelihood of financial crises (Stiglitz, 1994). So an investigation into the influence of interest rate liberalisation on financial crises is considered. The study deviates from other studies by examining the channels in which interest rate liberalisation affects economic growth, instead of its direct relationship. There is also scant evidence on the influence of interest rate liberalisation on economic growth in SADC countries.

The following chapters comprise analyses that assist in achieving the objectives of the study. Chapter two provides an overview of interest rate liberalisation in the selected SADC countries, as well as the trend in savings, investments and economic growth, with emphasis placed on the period 1990-2015.

CHAPTER TWO

HISTORY OF FINANCIAL LIBERALISATION IN SADC COUNTRIES

2.1 INTRODUCTION

SADC was established in 1980 as the Southern African Development Co-ordination Conference (SADCC) in order to curb the dependence of the other Southern African countries on South Africa. South Africa later joined the union in 1995 and to date there are 15 countries in SADC[2] (Mowatt, 2001). SADC countries have a history of repressed financial systems, low economic growth and high poverty levels. Financial liberalisation was implemented in the late 1980s to early '90s in most SADC countries, which resulted in an increase in interest rates from negative to positive territory, an increase in savings and investments as well as an increase in bank sector performance in most countries.

However, in some countries, like South Africa and Lesotho, financial reforms did not have the desired effect, as savings and investments have not been responsive to the increase in interest rates. In some countries, like Lesotho, financial reforms resulted in bank failures which had a negative effect on savings and investments (Matlanyane, 2002). The purpose of this chapter is to discuss the history of financial liberalisation in SADC countries, with particular focus on interest rate liberalisation and its effect on savings, investments and economic growth. The chapter also discusses briefly the SADC objectives, including the targets set by the region with regard to economic growth, investments, public debt and inflation.

In what follows, a discussion of the SADC objectives and targets is provided. This is followed by a discussion of the history of financial liberalisation in the SADC region, and lastly a conclusion.

2.2 SADC TARGETS

The major priorities of the Southern African Development Community (SADC) include trade, economic liberalisation, poverty eradication and infrastructure development in support of regional integration (SADC 2011). It is evident from these objectives that SADC countries view financial liberalisation as crucial to economic growth and development. SADC has set a number of policies or targets to foster regional and economic integration among member countries. These targets include having a SADC free trade area, a customs union, a common

[2] Angola, Botswana, DRC, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.

market and the establishment of a monetary union (Bank of Botswana 2013). To achieve these targets, SADC has proposed greater co-ordination between its member countries with regard to macroeconomic variables like inflation rates, current account deficit as a percentage of GDP, fiscal deficit as a percentage of GDP, and public debt as a percentage of GDP.

SADC has also set other macroeconomic targets for the period 2008-'18, like achieving economic growth rates of 7%, increasing domestic savings as a percentage of GDP to about 35% and domestic investment as a percentage of GDP to 30% by 2018 (Bank of Botswana 2013). Other targets set by the region include reducing the public-debt-to-GDP ratio to less than 60% and reducing the inflation rate to less than 3% by 2018. Achieving these targets continues to be a huge challenge for most of the SADC countries. Financial liberalisation with its effect on savings, investment and economic growth could be the catalyst to achieving the targets set.

According to the SADC Regional Indicative Strategic Development Plan trade 2005-'20, industry, finance and investment (TIFI) is a crucial sector for regional and economic integration. TIFI was devised to facilitate trade, financial liberalisation, poverty reduction, industrial development and increased investment (SADC, 2011).

2.3 HISTORY OF FINANCIAL LIBERALISATION IN SADC COUNTRIES

This section discusses the history of financial liberalisation in selected individual SADC[3] countries with the aim of making comparisons between the countries and assessing whether interest rate liberalisation has had a positive influence on savings, investments and economic growth. The period of the analysis is 1990-2015.

2.3.1 Botswana

When Botswana attained independence in 1966 it was one of the poorest countries in the world (Chakrabarti 2004). However, since independence the country has achieved substantial economic growth which has propelled it into being a middle-income country (Harvey, Shiphambe & Segosebe, 2000). After independence Botswana had two commercial banks – Barclays Bank and Standard Chartered Bank – which were largely British-owned (Makgetla, 1982). The two banks were managed and regulated in South Africa and did not provide any credit to businesses or small-scale farmers. The government did not establish a central bank

[3] Botswana, Lesotho, Madagascar, Malawi, Mauritius, Namibia, Seychelles, South Africa, Swaziland, Tanzania and Zambia.

or issue its own currency at the time of independence (Harvey, 1996). Botswana used the South African rand and so had no autonomy with regard to monetary and exchange rate policies.

The National Development Plan published in 1968 raised a few concerns with regard to the financial system at that time (Ahmed, 2006). The plan also noted that over 50% of the commercial banks' assets were invested outside the country, but despite these concerns the government did not intervene. In 1976 the government established a central bank and issued its own currency, the pula (Harvey *et al*, 2000). This was made possible by the good performance of the economy, buoyed by the growth in the mining industry; the Southern African Customs Union (SACU) decision to raise customs revenue received from mining imports; and the ability of Botswana's government to balance its budget without assistance from the British government (Harvey 1996). Despite the creation of a central bank, the authorities continued their non-intervention policy in the allocation of commercial lending, choosing only to use indirect instruments (Ahmed, 2006).

In the late 1970s the government introduced exchange controls on dealings with South Africa (Ahmed, 2006). Botswana residents were required by law to sell their South African rands and hold Botswana currency. The liquid assets of commercial banks were held in pula and deposited at the central Bank of Botswana (Harvey, 1996). Non-residents could not borrow from Botswana banks an amount greater than the foreign currency they had brought to the country. This was done to encourage foreign capital inflows and to increase the availability of credit to Botswana residents (Ahmed 2006). This new financial legislation enabled the central bank to set all interest rates in the economy, including the deposit and lending rates of commercial banks. The central bank set interest rates below those in South Africa so as to increase bank lending, and also set interest rates on its call account below those of commercial banks and those in South Africa, which increased its profits at the expense of commercial banks (Harvey 1996). The low interest rates did not have the desired effect and often led to capital outflows due to lower returns.

The Botswana government became the major lender in the economy in the 1980s – this was the most significant form of government intervention in the financial sector (Harvey, 1996). This government lending was made possible by foreign borrowing and budget surpluses. Funds were often lent at lower rates than commercial banks and at longer terms. However, this lending was directed mostly to public sector borrowers, with limited amounts lent to the

private sector (Ahmed, 2006). Government lending continued to increase in the 1980s and reached 57% of total lending in the economy (Harvey, 1996).

Since 1972 Botswana's economy has to a large extent been market-oriented, compared with other African countries (Ahmed, 2006). However, the authorities further liberalised its financial sector in the mid- to late 1980s so as to improve the efficiency of the financial system in using financial surpluses that existed in the economy (Chakrabarti, 2004). Unlike in other African countries these reforms were not initiated due to balance of payments or external debt problems. Foreign exchange reserves increased from six months to two years of import cover during the 1980s, and the ratio of external debt to exports was only 4% in 1990 with no government debt in the domestic economy (Harvey, 1996). The reason for these excess reserves was rapid growth in GDP, which in turn was caused by the performance of the diamond mining sector.

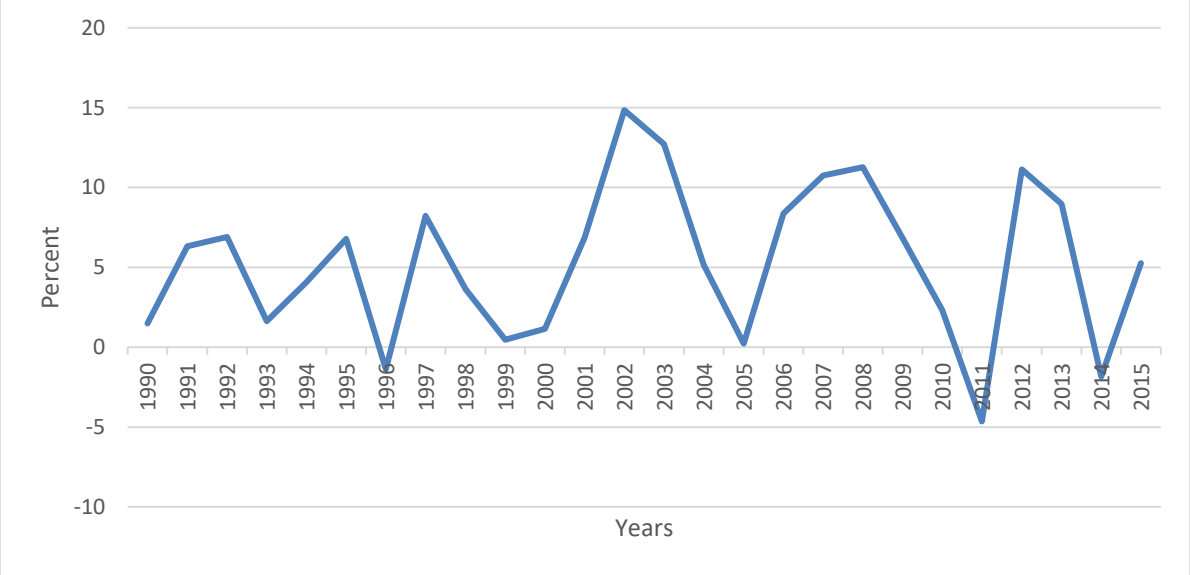
The National Development Plan published in 1985 suggested that the financial sector performed well and also outlined that total credit growth was 11% a year – twice the size of the growth in the economy excluding mining (Harvey, 1996). However, in 1986 the central bank noted that the growth of credit was not sufficient as excess reserves increased further. So the central bank thus reduced commercial bank lending rates from 11.5% to 10% and the exchange controls, levied on borrowing by foreign nationals, were abolished (Harvey 1996).

In 1988 the central bank noted that real interest rates were negative and well below those in South Africa (Harvey, 1996). In 1989 the government announced that real interest rates would be increased until they reached positive territory (Ahmed, 2006). The increase in interest rates was also meant to increase bank competition and financial deepening. In 1991 the central bank introduced Bank of Botswana certificates which had higher interest rates than the commercial banks' three-month deposits (Mowatt, 2001; Chakrabarti, 2004). These certificates were introduced so as to make short-term interest rates market-determined and to increase financial deepening. Financial liberalisation by the authorities resulted in an increase in the entry of new foreign-owned commercial banks in the 1990s (Ahmed 2006). Bank competition increased substantially, despite a minimal increase in the type of bank finance provided by the economy. The profits of Barclays Bank and Standard Chartered fell considerably during the 1990s (Harvey, 1996).

Figure 2.1 shows the trend in the real interest rate in Botswana. The real interest rate was negative during the mid- to late 1980s but increased. However after the reform initiated by

the authorities, real interest rates reached positive territory in the early 1990s. Following the 1997-'98 Asian financial crisis, there was a downward trend in the real interest rate, possibly due to the attempt to boost the economy. A similar trend is observed in the period after the 2008 global financial crisis.

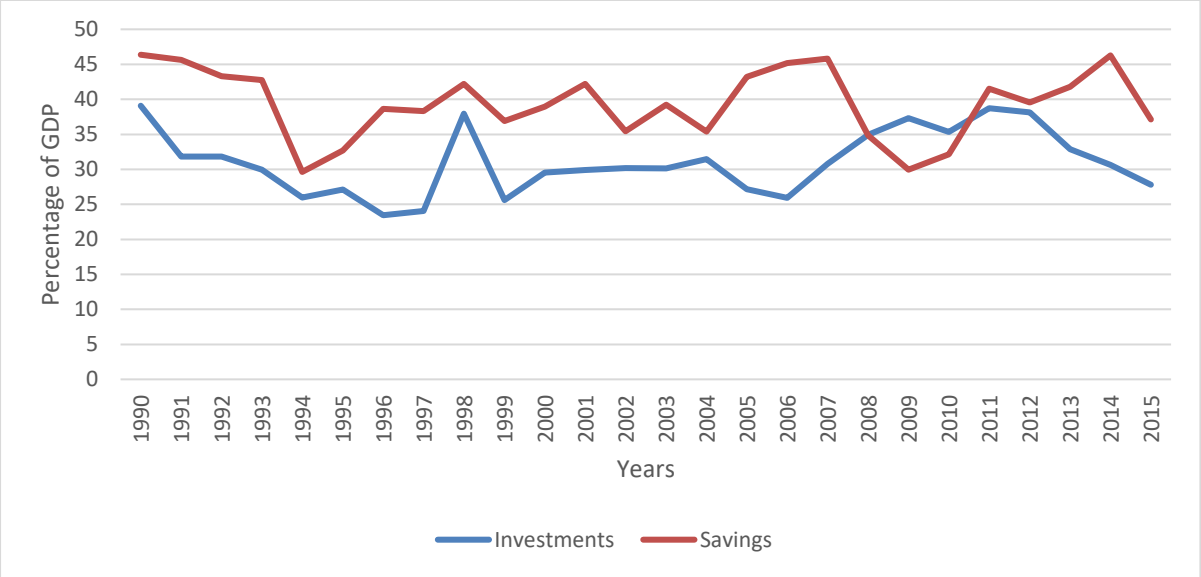
Figure 2.1: Botswana real interest rate trend



Source: World Bank (2016)

Figure 2.2 shows domestic savings and investments as a percentage of GDP in Botswana. The country has had one of the highest savings and investment rates in the SADC region. During the period from the early 1990s to the mid-2000s, savings fluctuated around 30% and 40% of GDP before increasing to just under 50% in 2007, while investments have fluctuated around the 30% mark during the same period. Between 2007 and '09 there was a reduction in savings due to the global financial crisis. However investment exhibited an upward trend during that period. The period after the financial crisis was characterised by an increase in savings as the economy recovered from the crisis, but since 2013 there has been a downward trend in both savings and investments.

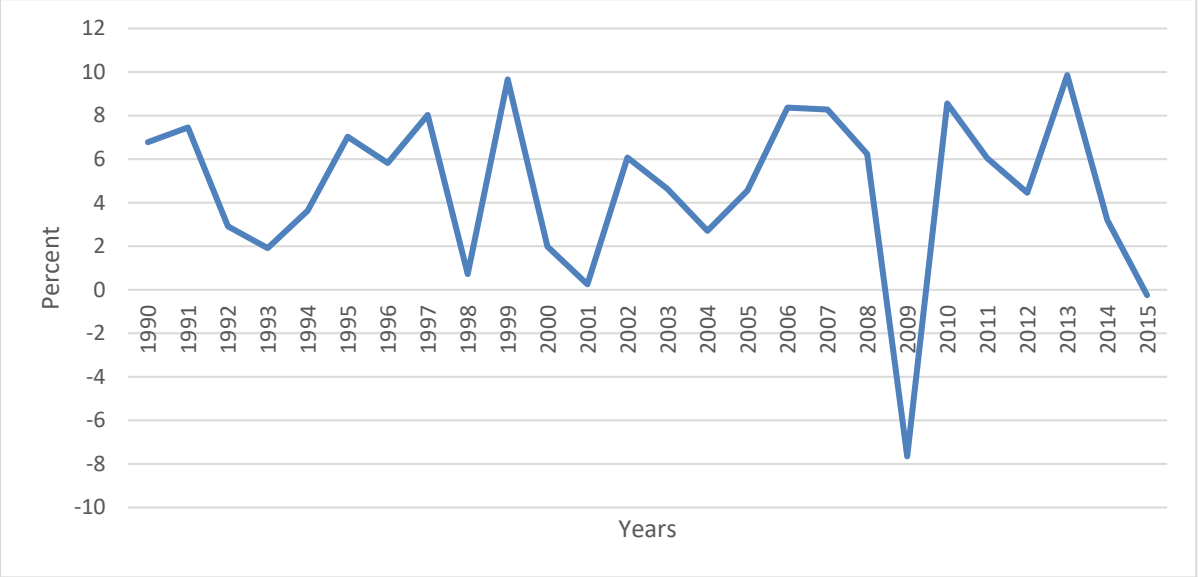
Figure 2.2: Botswana trends in savings and investments



Source: World Bank (2016)

The economy performed well from the mid- to late 1980s, with GDP above 10% during that period. This coincided with the initiation of financial reforms, suggesting that financial reforms had a positive effect on GDP growth. As shown on figure 2.3, economic growth decreased in the early 1990s, mostly due the drought that affected some Southern African countries. GDP decreased from the late 1980s to the early '90s and reached 1.92% in 1993 before increasing to just over 8% in '97. The period 1997 to 2001 was characterised by low economic growth, mostly due to the Asian financial crisis, despite a rise to 9.67% in 1999. GDP increased from 0.25% in 2001 to 8.68% in 2007 before declining during the period 2007-'09 (the global financial crisis). The period 2010-'13 saw an upward trend in GDP growth. However, there was a sharp decrease from 9.86% in 2013 to -0.25% in 2015.

Figure 2.3: Botswana GDP trend



Source: World Bank (2016)

2.3.2 Lesotho

Lesotho is a member of the Common Market Area (CMA) of Southern Africa, together with South Africa, Namibia and Swaziland (Mowatt, 2001; Central Bank of Lesotho, 2004). This arrangement integrates the financial and capital markets of the four countries. The Lesotho financial system uses the South African rand and the Lesotho currency, maloti, in a dual currency system (Matlanyane, 2002). The rand and the maloti have the same value, as the exchange rate is one to one between the currencies. Lesotho and South Africa have cross-border trade in financial services to a large extent.

Prior to financial reforms in Lesotho, the banking sector comprised one state-owned commercial bank, two foreign banks, two specialised banks and two development finance institutions owned by the government (Matlanyane, 2002). The involvement of the government in the financial sector was to ensure that a vast amount of credit was channelled to domestic investments, especially in the industrial and agricultural sectors (Matlanyane, 2002). However, this was not the case, as most of the domestic credit was held by the government in the early 1990s.

The limited number of financial institutions, coupled with the significant state involvement, resulted in low levels of competition in the financial sector (Matlanyane, 2002). The govern-

ment banks were exempt from tax while the foreign banks were taxed, and this further reduced the level of competition in the financial sector. Interest rates were determined by the state and capital controls were set between Lesotho and the countries outside the CMA (Odhiambo, 2011). Financial institutions were only allowed to borrow an amount equal to 15% of their total liabilities, to ensure that most of the financial institutions' assets were domestic (Matlanyane, 2002).

The substantial amount of state involvement in the financial sector resulted in poor performance by the financial sector (Matlanyane, 2002). As a result, the government initiated a number of financial sector reforms in 1988 (Motelle & Masenyetse, 2012). In 1992 the Central Bank of Lesotho introduced an auction market for treasury bills and all interest rates were deregulated in 1993, with the exception of the savings deposit rate (Odhiambo, 2011). In 1994 the Central Bank introduced its own commercial paper, but in 1996 the issuing of this paper was abolished (Odhiambo, 2011). The aim of the reforms was to increase the number of money market instruments available and to limit the restrictions on cross-border banking so as to enhance the level of competition in the financial sector (Matlanyane, 2002).

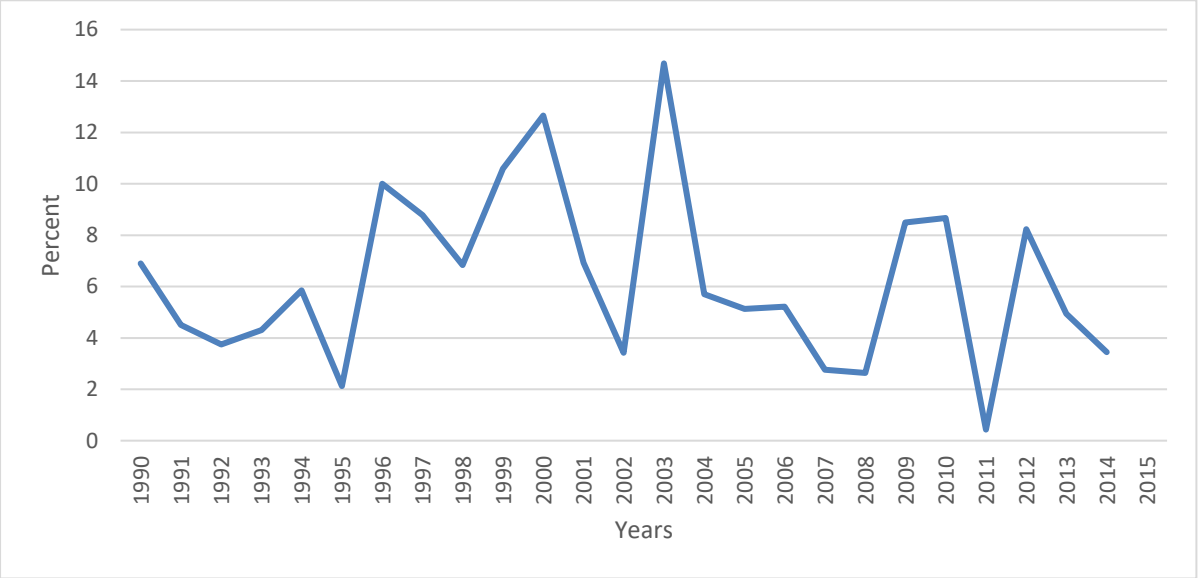
However, these reforms did not have the desired effect on the banking sector as its performance worsened (Matlanyane, 2002). The Lesotho Bank experienced a decline in net income by 6% and operating costs increased by 1.4% in 1990. The performance of the Lesotho Agricultural Development Bank (LADB) deteriorated significantly in the 1990s due to a rise in operating costs and bad debts, which resulted in its closure in 1998 (Mowatt, 2001). The LADB was liquidated in 1998 and the Lesotho Bank was partially liquidated and restructured in '99 (Motelle & Masenyetse, 2012).

The economy was characterised by significant capital outflows due to the loss of confidence in the banking sector as investors decided to shift their funds in the more developed financial system in South Africa (Central Bank of Lesotho, 2004). The bank failures also resulted in the growth of the interest rate spreads between lending and deposit rates and a reduction in the credit to the private sector in the 1990s (Odhiambo, 2011). The financial sector in general performed poorly after the reforms as the share of financial and insurance services to domestic output declined from 11% in 1991 to 5% in '96 (Matlanyane, 2002). The reason for the poor performance of the financial sector after the reforms was the lack of robustness in the sector to deal with external shocks as well as inappropriate regulatory and legal framework at the time of the reforms.

The real interest rate in Lesotho increased to positive territory in the early 1990s due to the financial reform. Between 1990 and 2003 there was a fluctuating but upward trend in the real interest rate to a high of 14.69% in ’03. From the early to the mid-’90s there was a slight decrease in the real interest rate possible due to the poor performance of the financial sector at that time.

Figure 2.5 shows domestic savings and investments as a percentage of GDP for the period 1990-2015 in Lesotho. Savings decreased during the early to late ’90s. However investments increased and averaged close to 70% of GDP in the early to mid-’90s, which coincided with the rise in real interest rates during that period.

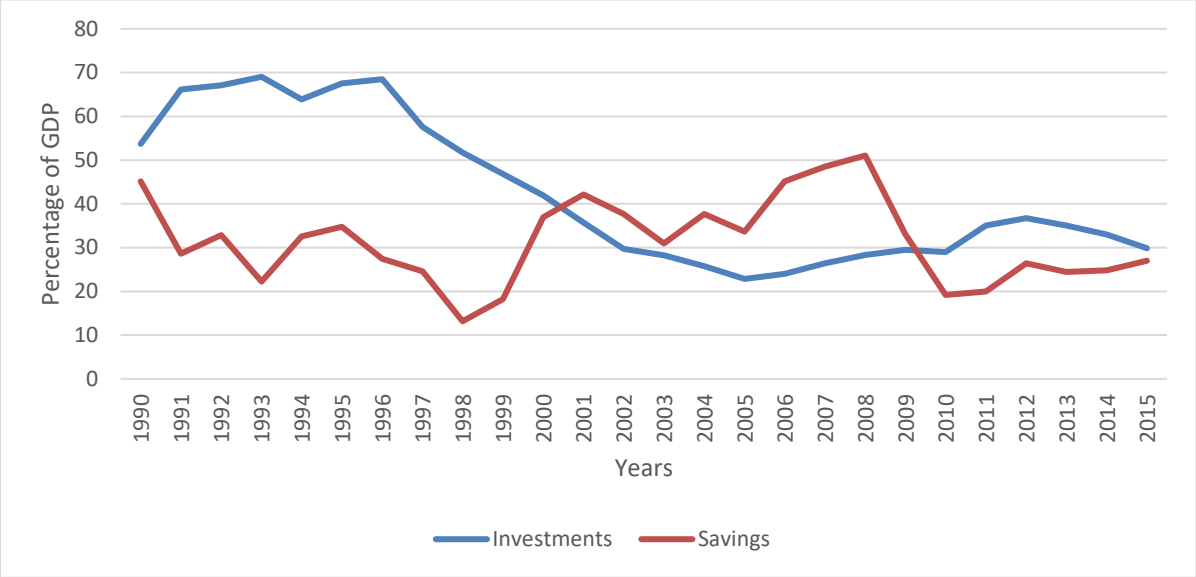
Figure 2.4: Lesotho real interest rate trend



Source: World Bank (2016)

However, during the mid- to late ’90s there were substantial reductions in investments which could have been caused by the poor performance of the financial sector in general and the series of bank failures in the ’90s.

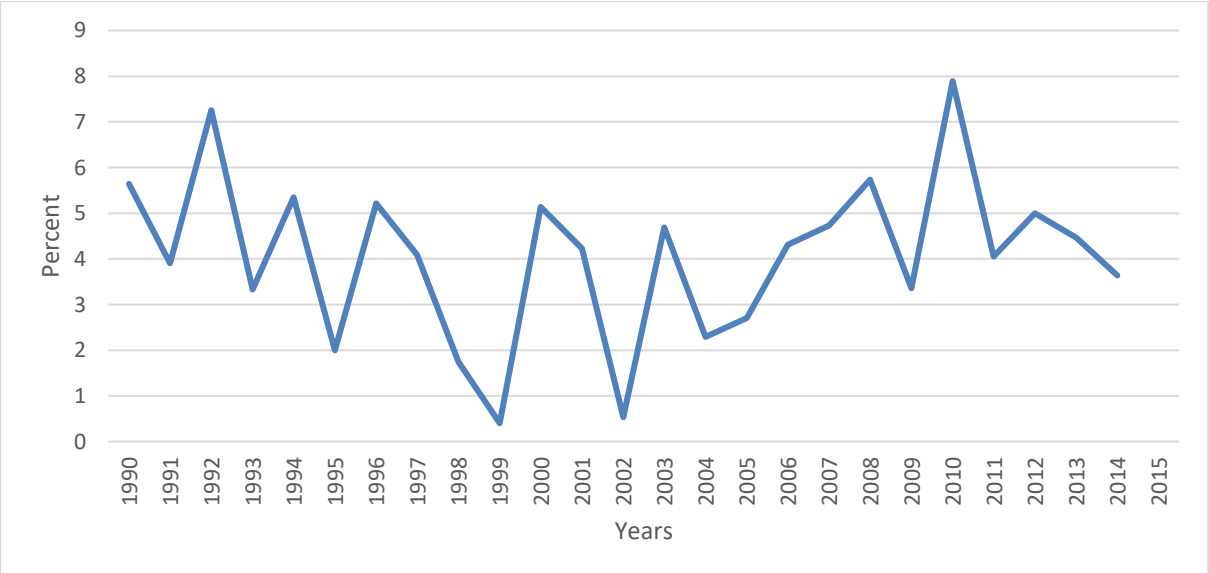
Figure 2.5: Lesotho trends in savings and investments



Source: World Bank (2016)

Figure 2.6 shows the trend in GDP in Lesotho for the period 1990-2015. GDP fluctuated to a great extent during that period. The ’90s were characterised by a fluctuating but downward trend. This downward trend in GDP coincided with a drop in savings and investments which in turn was caused by the poor performance of the financial sector.

Figure 2.6: Lesotho GDP trend



Source: World Bank (2016)

The poor performance of the financial sector as well as the growing fiscal and current account deficits resulted in the implementation of a structural adjustment programme in Lesotho with the aid of the International Monetary Fund (IMF) in the late 1990s and early 2000s (Central Bank of Lesotho, 2004). This programme included financial reforms in the financial sector with more emphasis on the banking sector. The Financial Institutions Acts (FIA) of 1999 and the Central Bank of Lesotho (CBL) Act of 2000 were introduced in an attempt to revamp the regulatory framework and ensuring the operational independence of the central bank (Central Bank of Lesotho, 2003). The CBL Act was also introduced to ensure the transparency and accountability of the central bank to the government and the public.

In addition to the FIA and the CBL Acts, the government established a commercial court and a credit bureau (Central Bank of Lesotho, 2004). The commercial court was established to provide judgment in financial cases which would encourage banks to lend more funds to the private sector as there was a legal system to prosecute defaulters. The credit bureau was established to increase the amount of credit to the private sector by providing information on the creditworthiness of borrowers (Motelle & Masenyetse, 2012). A post bank was established to provide banking services to the rural communities who had seen a decline in banking opportunities due to the collapse of state-owned banks (Matlanyane 2002).

Following the structural adjustment programme, the real interest rate decreased between 2000 and ’02 before increasing in ’03. Between 2003 and ’12 there was a downward trend in the real interest rate despite slight increases in 2009 and ’12. Savings picked up after 1998 and reached a high of 51.05% in 2008, possibly due to the structural adjustment programme which included reforms to the banking sector, while investments remained stagnant around the 30% mark during the early to late 2000s. The 2008-’09 global financial crises resulted in the drop in savings. However the variable has averaged over 20% of GDP during the period 2010 to ’15. Investments have exhibited an upward trend since 2005 and averaged over 30% of GDP during the period 2010-’15.

Economic growth recovered from a low 0.4% in 1999 and fluctuated to just below 6% in 2008, which was followed by a decrease as a result of the global financial crisis. The sharp increase in 2009 was short-lived, as economic growth has exhibited a downward trend since 2011.

2.3.3 Madagascar

During the 1970s the government in Madagascar controlled most of the large financial, transport, marketing, mining and manufacturing firms (Brownbridge & Gayi, 1997). The state also controlled prices and restricted the repatriation of profits by foreign firms. Due to the substantial state intervention in the economy, economic growth was below the population growth in the 1970s (World Bank 2000). In the 1980s the balance of payments was in deficit territory and, this coupled with low economic growth, encouraged the government to request adjustment loans from the IMF and World Bank (World Bank, 2000). The request was granted provided the government reduced the current account and budget deficits, reduced the growth of credit to the public sector, limited public sector salaries and devalued the currency. These policies were successful in increasing economic growth, but inflation increased in 1980s.

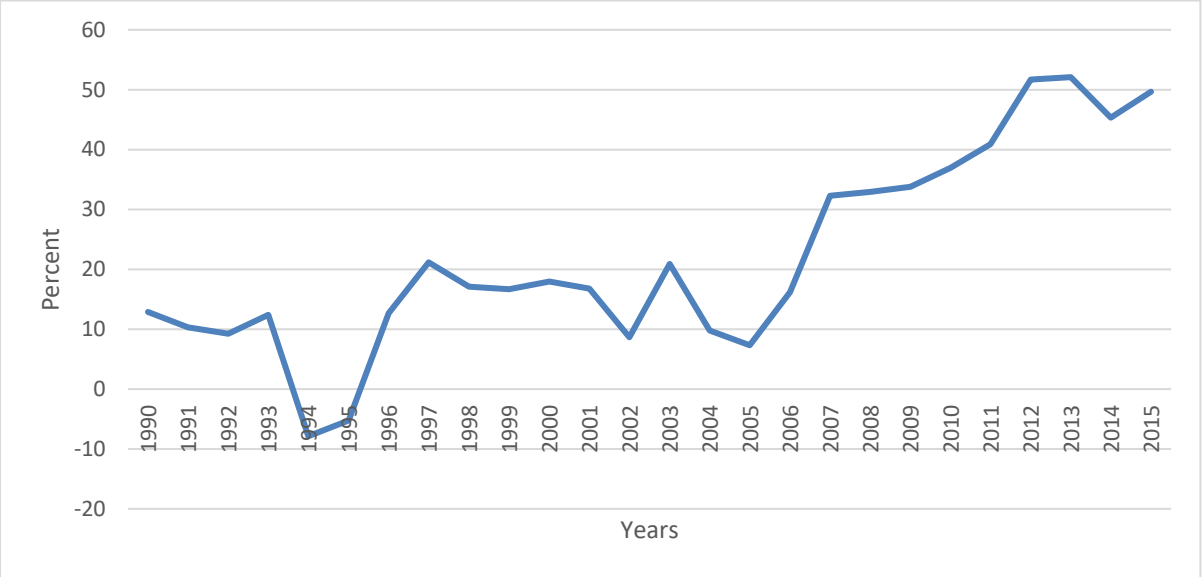
In 1990 the government embarked on a structural adjustment programme with the aid of the World Bank (World Bank, 2000; IMF, 2005). The programme was referred to as the Financial Sector and Private Enterprise Development (APEX) project. The project was conducted to assist the government in its efforts to restructure the economy and improve the operation of the financial sector by liberalising interest rates, introducing a number of monetary policy instruments to increase competition in the financial sector and assisting small businesses in order to increase employment (World Bank, 2000).

However, the newly elected leadership in 1992 decided not to implement the reforms fully and this had a negative outcome on the economy as macroeconomic imbalances and high inflation were the norm in the early 1990s (World Bank, 2000). In 1996 the government requested assistance from the World Bank, which decided to restructure the APEX project to assist Madagascar in its privatisation plans to strengthen the private sector. The programme was again restructured in 1998 with an emphasis on bank privatisation, liberalisation of the financial system, the introduction of indirect instruments of monetary policy and improvements in bank legislation and supervision (World Bank, 2000; IMF, 2005).

The project was successful, as the efficiency of the financial sector improved substantially and output increased (Brownbridge & Gayi, 1997). State-owned banks were privatised, and a number of new institutions were established in the late 1990s, including banks (IMF 2005). More jobs were created, and this had a significant effect in reducing the unemployment rate. Bank privatisation was successful in Madagascar, compared with many other African countries, as the level of competition in the banking sector increased (World Bank, 2000). The

competition in the banking sector was evident from the rise in bank lending to the private sector by the late ’90s (Brownbridge & Gayi, 1997). Interest rates and the exchange system were fully liberalised by the late 1990s, inflation was at low levels and indirect instruments of monetary policy were used (World Bank, 2000).

Figure 2.7: Madagascar real interest rate trend



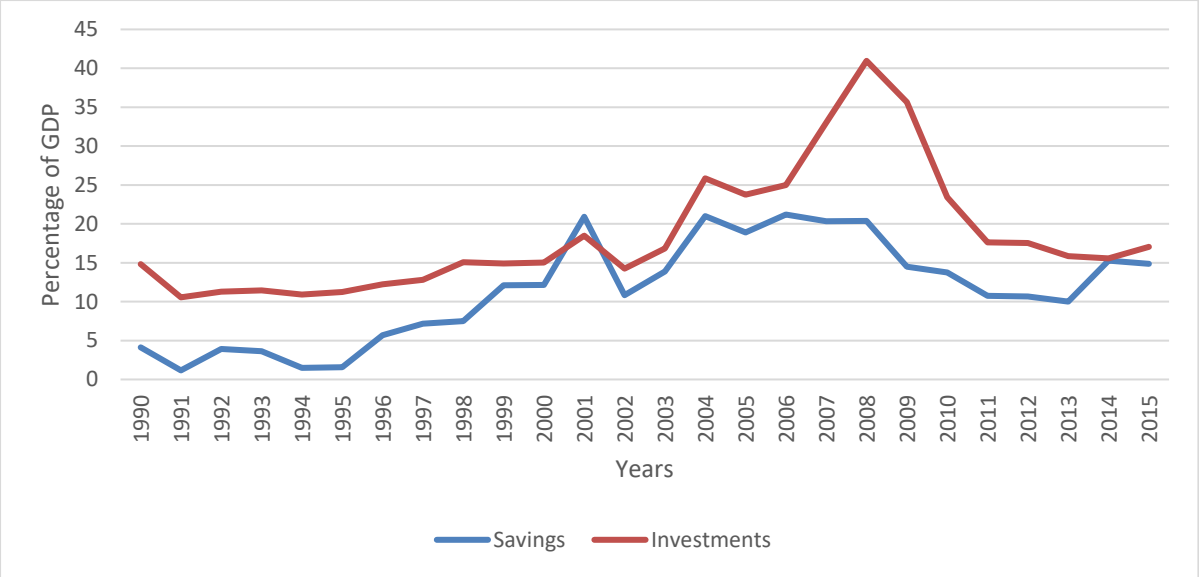
Source: World Bank (2016)

Figure 2.7 shows the trend in the real interest rate for the period 1990-2015, suggesting that Madagascar has had positive real interest rates for most of those years. However, during the period before 1996 when financial reforms were not fully implemented, the real interest rate was negative in 1994 and ’95. The reason for the negative real interest rate could have been the high inflation rate recorded before the implementation of the reforms. From 1996 onwards, the real interest rate increased and remained positive. The period 2005-’12 was characterised by a substantial increase in the real interest rate from 7.35% to a high of 51.23%.

Domestic savings and investments as a percentage of GDP have followed a similar trend to the real interest rate, suggesting that there is a link between the three variables. Savings and investments increased in the mid- to late ’80s as shown by Figure 2.8, before declining in the early to mid-’90s. From the mid-’90s, both savings and investments increased and this coincided with the implementation of reforms in 1996. Between 2002 and ’08 both variables exhibited an upward trend. However, the increase was more profound in investments. The

global financial crises resulted in a drastic decrease in both variables, which have failed to recover in the post-crisis period.

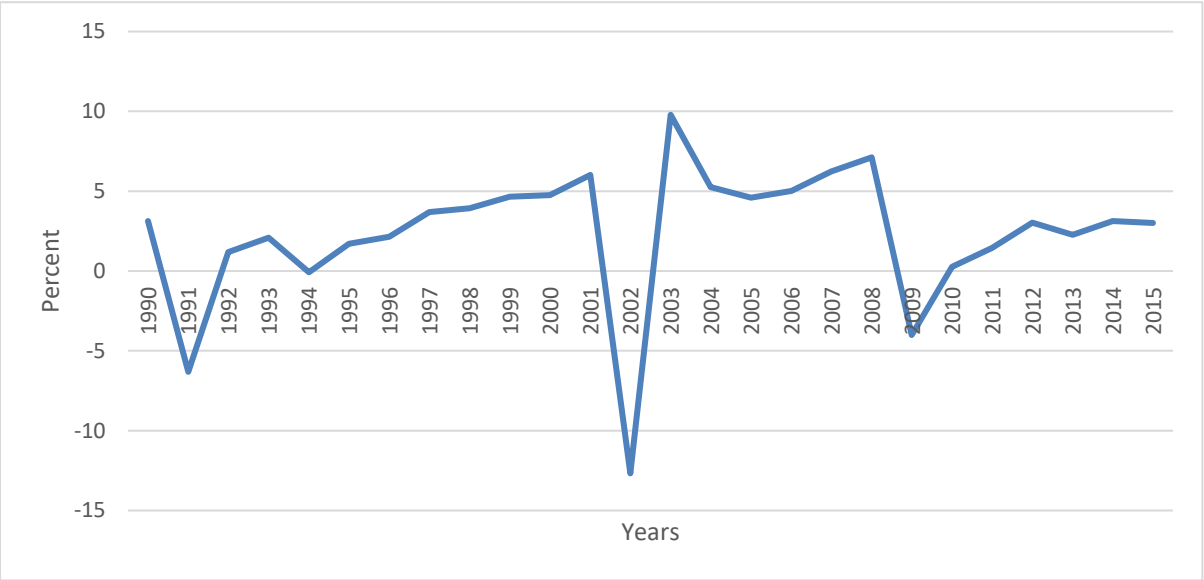
Figure 2.8: Madagascar trends in savings and investments



Source: World Bank (2016)

GDP was low during the mid to late 1980s due to government intervention in the economy, which resulted in current account and budget deficits. However the late ’80s were characterised by a modest rise in economic growth. In 1990 and ’91, GDP growth dropped markedly from 3.13% to -6.31%. GDP exhibited an upward trend between 1992 and 2001 from 1.19% in ’92 to 6.02% in ’01. However, in 2002 there was a drastic reduction in GDP to -12.67%, which was followed by a sharp increase to 9.78% in ’03. GDP exhibited a downward trend between 2003 and ’09, despite a slight increase between 2005 and ’08. The global financial crises affected economic growth negatively to a large extent and the recovery has been modest.

Figure 2.9: Madagascar GDP trend



Source: World Bank (2016)

2.3.4 Malawi

Malawi attained independence in 1961, but the period after independence did not bring any financial prosperity in the economy despite government efforts (Kabango & Paloni, 2010). In 1981 a number of reforms were initiated with the aid of structural adjustment and sectoral adjustment loans from the World Bank (Mlachila & Chirwa, 2002). The reforms included industrial licensing, deregulation, the abolition of monopoly rights and industrial price controls, and the privatisation of public enterprises (Kabango & Paloni, 2010). These reforms were conducted to increase the level of competition in the manufacturing sector. However, these policies did not have the desired effect and in the late 1980s the World Bank suggested that financial sector underdevelopment was responsible for retarding economic growth and development in the manufacturing sector (World Bank, 1996a).

In the late 1980s a number of financial sector reforms were initiated, like the liberalisation of lending and deposit rates, the removal of credit controls and the abolition of laws that prevented the entry of new banks into the financial system (Bittencourt, Mwabutwa & Viegi, 2012). Prior to the interest rate liberalisation, interest rates were controlled by the Reserve Bank of Malawi, which kept interest rates low in an attempt to support private investments and reduce government expenditure. The monopoly powers of the central bank were altered

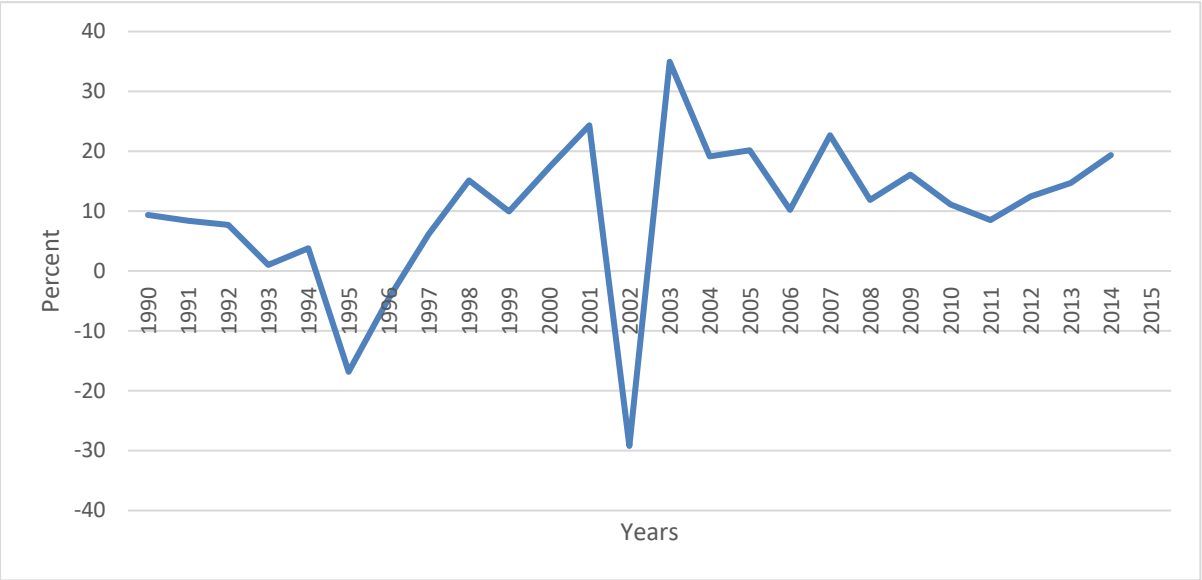
by the Reserve Bank of Malawi (RBM) Act and the Banking Act to ensure that it played more of a supervisory and regulatory role in the financial sector (Mlachila & Chirwa, 2002). The aim of the reforms was to encourage the entry of new banks into the financial system so as to increase the level of banking competition and to create an environment conducive for savings. Credit controls were abolished to increase the availability of credit, which in turn would encourage the growth and development of small businesses (Bittencourt *et al*, 2012).

The central bank also introduced central bank and treasury bills as indirect instruments to utilise the excess liquidity in the economy (Mlachila & Chirwa 2002). Reserve requirements were introduced in 1989 as the main monetary policy instrument but in the mid- to late 1990s open market operations became the main monetary policy tool. In 1998 exchange controls were abolished and the country allowed a floating exchange rate regime with no intervention from the RBM (Mlachila & Chirwa 2002).

Financial sector reforms had a positive impact on bank competition and financial development in Malawi. Reinhart & Tokatlidis (2003) suggest that Malawi is one of the few countries that have made great progress in financial development since the implementation of financial reforms, and financial crises have not resulted. Prior to the financial sector reforms, Malawi had only two commercial banks; as a result of the reforms three commercial banks and three non-banking institutions entered the financial system in the 1990s and by 2008 there were nine banks in total (Kabango & Paloni, 2010). The development of the financial sector resulted in the establishment of the Malawi stock exchange in 1995.

Interest rate liberalisation resulted in an increase in nominal interest rates, but due to high and fluctuating inflation the real interest rate remained low initially and was recorded at -16.86% in 1995, as shown in Figure 2.10. The real interest rate increased between 1995 and 2000 but was very volatile in the early 2000s. In ’01 the rate reached 24.31% before falling to -29.22% in ’02 and increasing in ’03 to 34.95%. Between 2003 and ’12 there was a downward trend in the real interest rate to 8.48% in ’11, which was followed by a gradual increase from ’12.

Figure 2.10: Malawi real interest rate trend

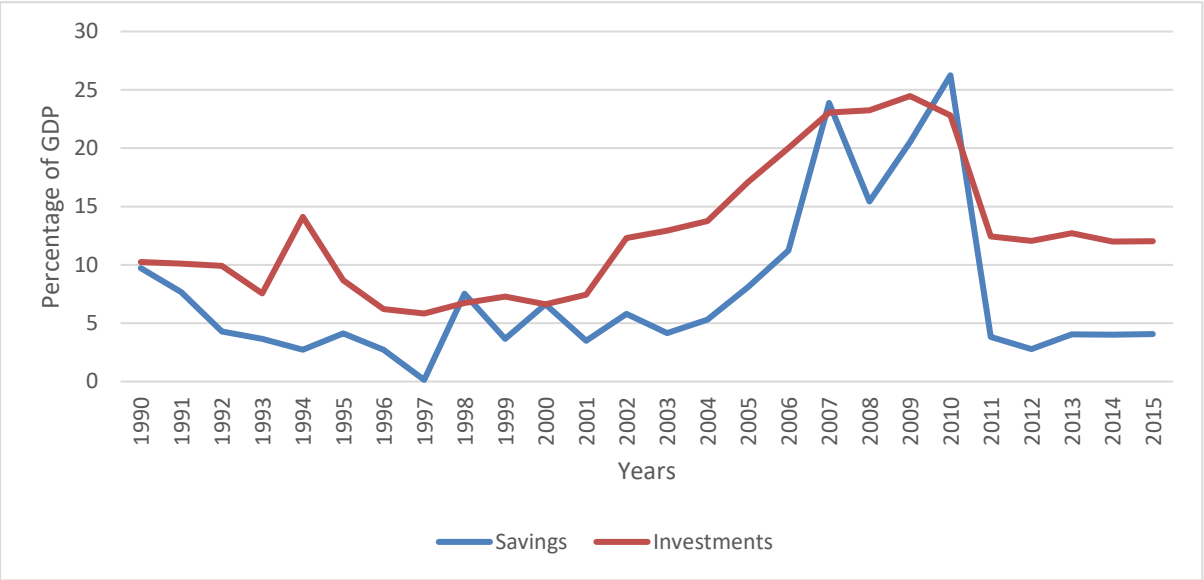


Source: World Bank (2016)

Figure 2.11 shows Malawi's trends in domestic savings and investments as a percentage of GDP for the period 1990-2015. Savings and investments followed a trend similar to that of the real interest rate. There was a decreasing trend in both variables from the early 1990s despite a rise between 1994 and '95. This increase was short-lived as a decrease followed between 1996 and '97. Both variables remained stagnant from the late 1990s into the early 2000s before increasing gradually until '10. In 2008, however, there was a reduction in savings due to the financial crisis, which was followed by a recovery in 2009 before a sharp decline in '11. Both savings and investments decreased in 2011 and remained till '15 with the savings ratio averaging less than 5%.

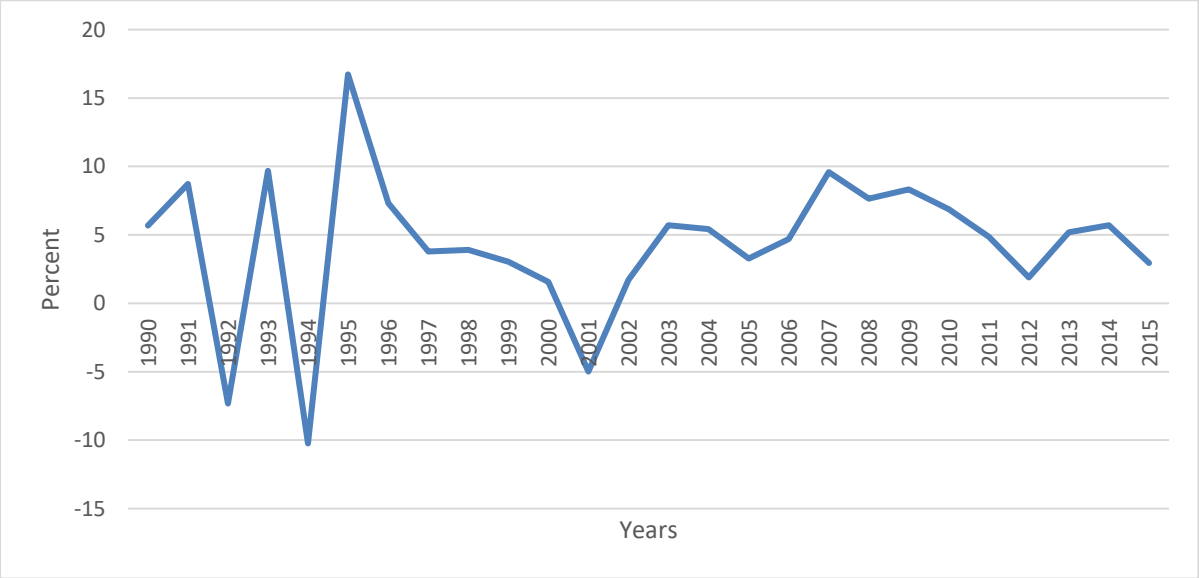
Figure 2.12 shows the trend in GDP between 1990 and 2015 in Malawi. The period 1991-'95 was marred by considerable fluctuations in GDP, with 1992 and '94 recording negative figures and 1993 and '95 recording values of 9.69% and 16.73% respectively. Between 1995 and 2001 GDP exhibited a downward trend from the high value of '95 to -4.97% in 2001 before increasing from the negative value in 2001 to just over 9% in '07. The global financial crises resulted in a decrease in economic growth to 1.89% in 2012. Despite the recovery in GDP between 2012 and '14 there was a decrease in 2015.

Table 2.11: Malawi trends in savings and investments



Source: World Bank (2016)

Figure 2.12: Malawi GDP trend



Source: World Bank (2016)

2.3.5 Mauritius

Mauritius gained its independence in 1968 and in the ’70s the economy was heavily dependent on agriculture (African Development Bank, 2014). However, since the 1970s the eco-

nomy has been transformed into a middle-income economy with diversified economic sectors like tourism, industrial and financial services. In the 1970s the government controlled the activities of the financial sector (Jankee, 1999). Interest rates charged by banks were controlled, cash ratios and liquid asset ratios were imposed on the financial sector and there were exchange controls on capital and current transactions. Controls on the financial system were conducted to regulate the growth of credit in the economy and to direct credit to the most important sectors of the economy (Bundoo & Dabee, 1999).

Financial sector reforms were initiated in the early 1980s in preparation for global integration (Larose, 2003). The reforms were initiated with the aid of the Stabilisation Adjustment Programme (SAP) monitored by the IMF. The programme was conducted to reduce inflation, the demand for consumption, budget deficit and public spending. The SAP agreement encouraged the Mauritian government to increase investments in productive sectors of the economy like agriculture, so as to increase economic growth and foreign exchange reserves (Larose, 2003).

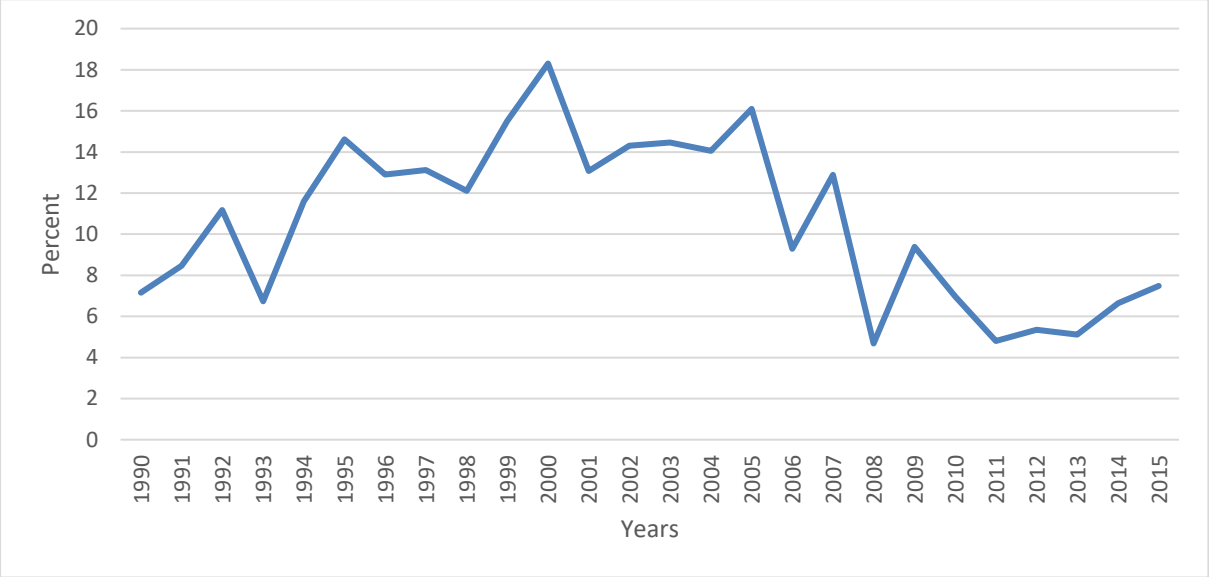
The financial sector reforms initiated included the removal of controls on interest rates, credit and competition, as well as the privatisation of public financial institutions and the introduction of market-based securities (Jankee, 2003). The reforms were carried out to improve the efficiency of the economy and to increase the allocation of financial services to all sectors of the economy (Larose, 2003). Other reforms included the reduction of the cash ratio and liquid asset ratios, the abolition of exchange controls and the auctioning of Treasury bills. The Mauritius stock exchange was established in 1989 to ensure that the financial system was modernised (Larose, 2003).

At the time of independence in 1968, the financial sector in Mauritius was fairly developed, with 11 banks, but after the reforms more financial institutions entered the sector and by 2007 there were 19 commercial banks and 14 non-bank deposit-taking institutions (Jankee, 1999; IMF, 2008). The financial reform of the late 1980s resulted in an increase in the real interest rate (World Bank, 2016). As shown on figure 2.13, there was an upward trend in the real interest rate from the early 1990s to a high of 18.3% in 2000. There was a downward trend in the real interest rate from 2001 to ’11 before a slight increase from 2012.

Figure 2.14 shows the trends in domestic savings and investments as a percentage of GDP in Mauritius for the period 1990-2015. Both variables exhibited a downward trend during the ’90s. Savings increased from the late 1990s to a high of just under 30% before exhibiting a

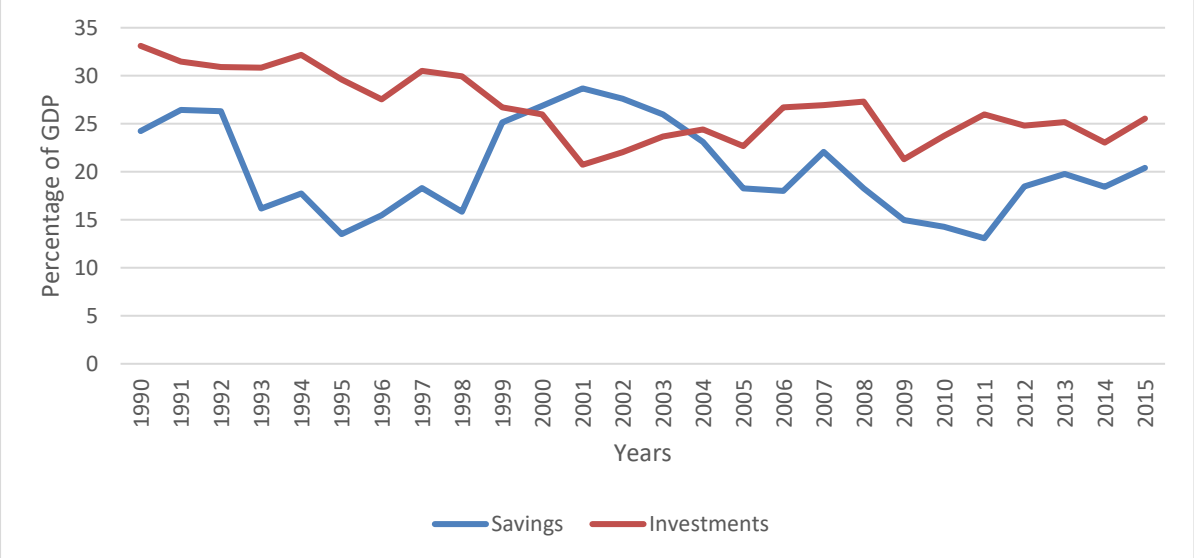
downward trend that has resulted in a savings-to-GDP ratio below 20% between 2005 and '15. Investments decreased from 32.17% in 1994 to 20.73% in 2001. The variable has fluctuated around 25% since 2002.

Figure 2.13: Mauritius real interest rate trend



Source: World Bank (2016)

Figure 2.14: Mauritius trends in savings and investments

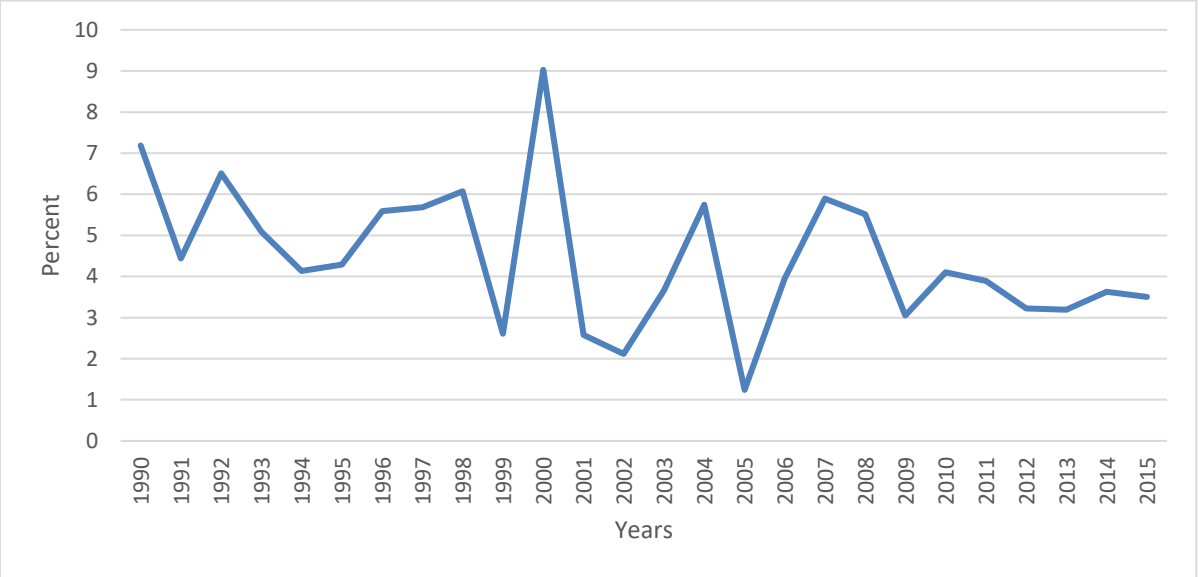


Source: World Bank (2016)

Mauritius has been one of the best-performing countries in the SADC, as shown by the trend in GDP between 1990 and 2015 in Figure 2.15. Despite a decline in the early 1990s, GDP

averaged above 4%. Between 2000 and ’02 GDP declined from a high of 9.03% in 2000 to 2.11% in ’02 before exhibiting an upward trend from 2003 to ’07. A decline in GDP was recorded between 2008 and ’12 due to the global financial crisis, despite a slight increase in 2010. Economic growth has averaged below 4% since 2011.

Figure 2.15: Mauritius GDP trend



Source: World Bank (2016)

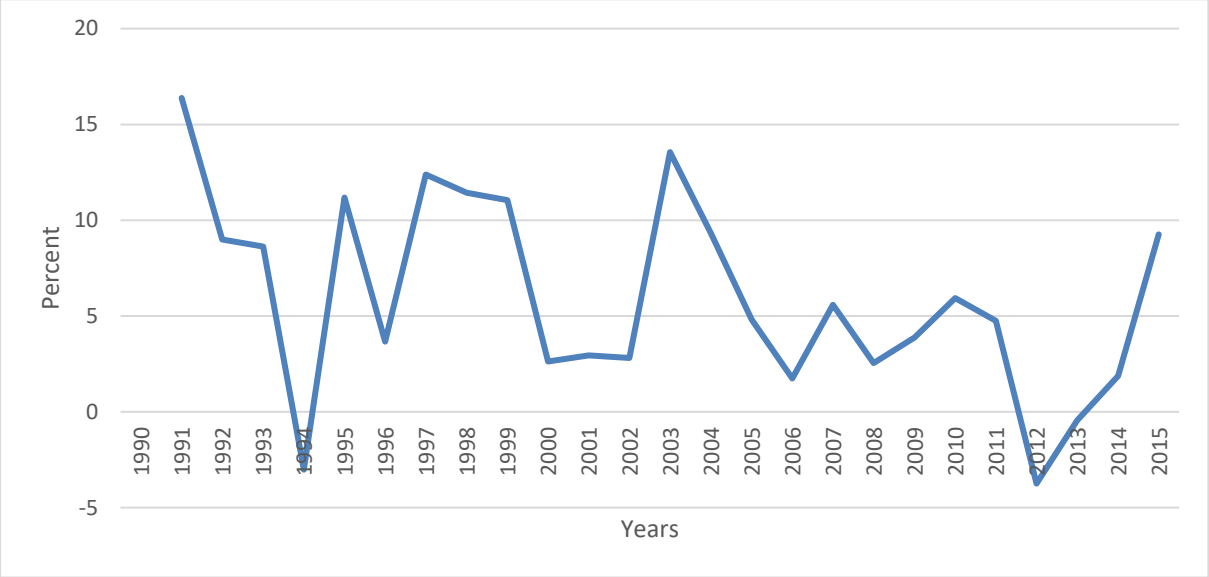
2.3.6 Namibia

Namibia gained its independence from South Africa in 1989 and the major sectors in the economy are mining and agriculture (Mowatt, 2001). The financial sector in Namibia was liberalised to a large extent by the time of independence, so no major reforms were required. The economy has performed well since the 1990s due to high export earnings, high economic growth and prudent fiscal policies (Mowatt, 2001). As a member of the CMA, Namibia has free movement of capital between the CMA countries, which has ensured its close links with South Africa and benefited financial institutions (IMF, 2007). The Namibian dollar is pegged to the South African rand, which has had a positive outcome for the country, maintaining a low and stable inflation rate.

The financial system over the years has been one of the best-performing such systems in Africa, with a large number of private institutions and strong links with the South African financial markets (AFDB, OECD & UNDP, 2014). The Namibia Stock Exchange (NSX) was established in the early 1990s with most of the listed companies being dual-listed South Afri-

can companies (Mowatt, 2001). By the late 1990s the market capitalisation of the NSX was one of the highest in Africa. The banking sector is developed to a large extent and by the early 2000s there were already five commercial banks.

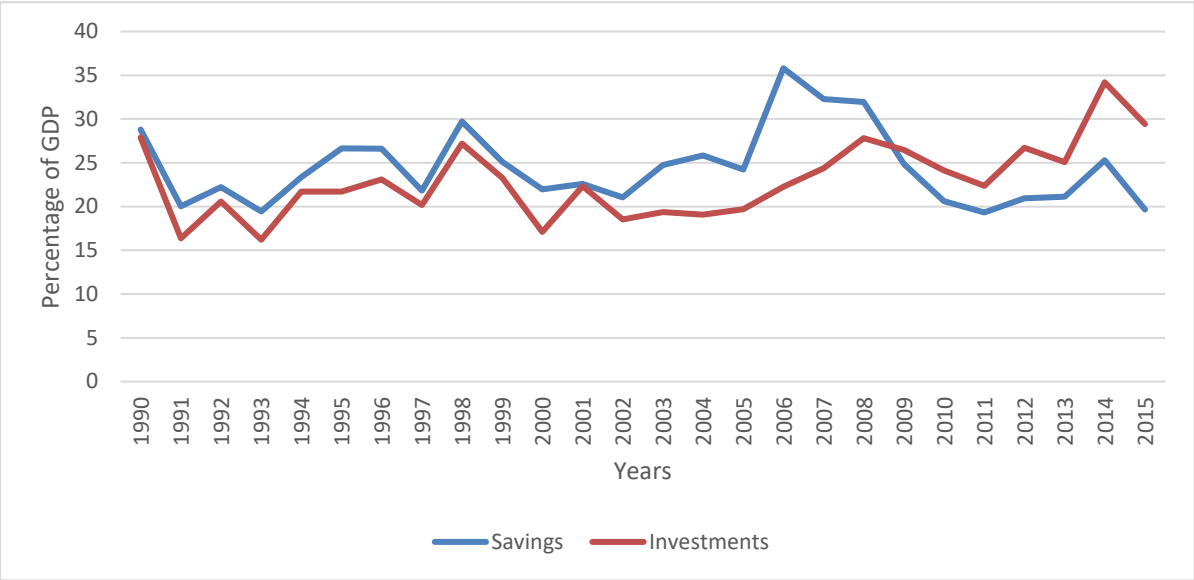
Figure 2.16: Namibia real interest rate trend



Source: World Bank (2016)

Figure 2.16 shows the trend in the real interest rate in Namibia for the period 1990-2015. During this period real interest rates have fluctuated to a great extent. In the early 1990s the real interest rate decreased substantially from a high of 16.38% in ’91 to -3.02% in ’94. During the rest of the ’90s the rate exhibited an upward trend and reached 12.37% in ’97. However, in 2000 the rate dropped significantly before rising to 13.56% in ’03. Between 2003 and ’12 the real interest rate decreased from a high of 13.56% in ’03 to -3.75% in ’12 before recovering from 2012 onwards.

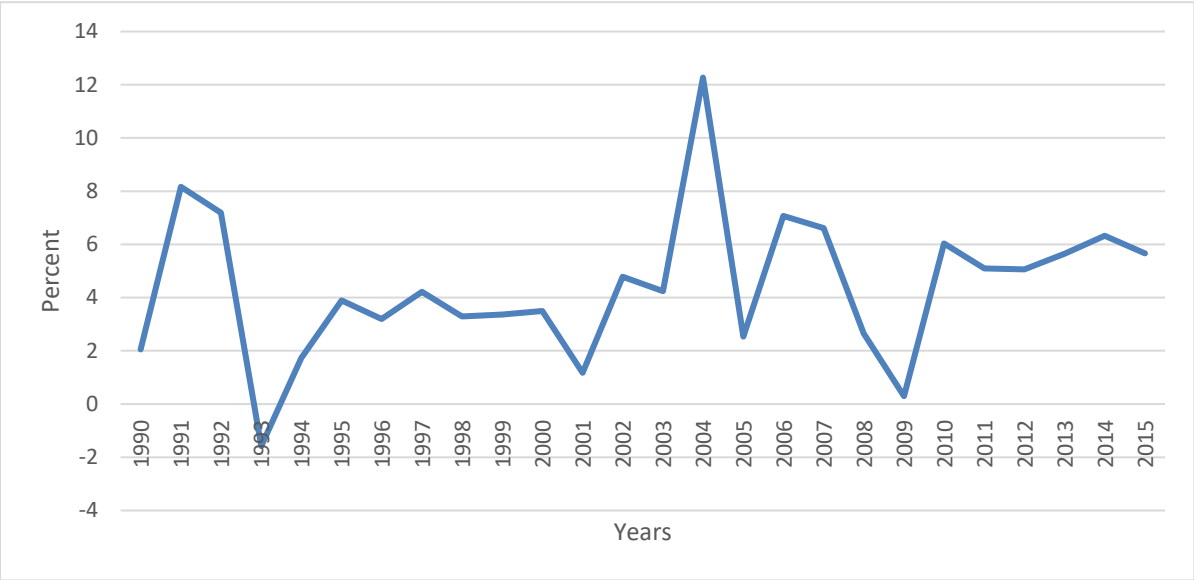
Figure 2.17: Namibia trends in savings and investments



Source: World Bank (2016)

Figure 2.17 shows the trend in domestic savings and investments as a percentage of GDP for the period 1990-2015. Both variables increased from the early 1990s before decreasing from 1999 to the early 2000s. During the early 2000s to '05, both variables were stable with savings around 25% of GDP and investment around 20% of GDP. The period 2005-'07 exhibited a sharp increase in both saving and investments. However since 2008 both variables have been on a downward trend with the reduction more profound in savings, which fell from a high of 31.96% in 2008 to 19.65% in '15. This reduction can to a large extent be attributed to the financial crisis. Investments on the other hand, have recovered since 2011.

Figure 2.18: Namibia GDP trend



Source: World Bank (2016)

Figure 2.18 shows the trend in GDP in Namibia for the period 1990-2015. Between 1991 and ’93 GDP decreased substantially and reached a low of -2% in ’93 before rebounding to 7.32% in ’94. The period 1994 to the 2000s saw economic growth averaging around 4% before a reduction to 1.18% in 2001. The variable recovered between 2001 and ’04 and reached a high of 12.27%. However, the period 2004 -’09 exhibited a downward trend in GDP from the high value of 2004 to -0.3% in 2009. GDP picked up in 2010 as the economy recovered from the financial crisis and has averaged more than 4%.

2.3.7 Seychelles

Seychelles attained independence in 1976 under President James Mancham but in 1977 he was removed by a coup and France-Albert René was elected president (World Bank, 2013). The new leadership had two main goals: to redistribute wealth in land and capital and to create jobs. The government thus acquired a significant amount of land during his presidency, which was seen as a crucial resource for supporting economic growth in the economy (World Bank 2013).

In an attempt to create jobs, the government established a number of public enterprises in a variety of industries including transport, hotel and hospitality, retail, manufacturing, banking, education and agriculture (IMF, 2004). State intervention became the norm in the economy as

the government controlled most sectors of the economy and was the major employer and regulator. The government also established a number of government-owned monopolies which produced a variety of goods and services (IMF, 2004).

Tourism was key part of the economy before and after independence (World Bank, 2013). The state controlled most of the large hotels and service industries, with the private sector playing a minimal role in the economy. The government was heavily involved in the operation of the financial system by borrowing substantial amounts from banks and controlling the foreign exchange in the country (IMF, 2004). The financial system was also characterised by low levels of private sector credit, low demand for credit, surplus liquidity in the banking system and large spreads between deposit and lending rates (IMF, 2004). Despite privatisation in some sectors of the economy, like tourism, manufacturing, schools and clinics, the government still controlled most of the industries in the economy (Larose 2003).

The economy performed well during the mid-1980s and into the ’90s with GDP averaging 6% in the late 1980s (IMF, 2004). However, government borrowing and spending grew at extremely high levels and this resulted in a large public debt in the mid- to late ’90s. The Seychelles rupee was pegged to a number of currencies in the ’90s, which had a positive effect on state borrowing and a negative effect on the amount of foreign exchange. From 1999 GDP and standards of living decreased (World Bank, 2013).

During the period 1999-2001, a significant amount of the domestic credit from the banking sector belonged to the government (World Bank, 2013; IMF, 2004). Money supply was increased in an attempt to reduce interest rates, but the inflation rate increased. Public external debt was recorded at US$320 million in 2001, which was 50% of GDP (World Bank 2013). So the government imposed tighter restrictions on foreign exchange to reduce the accumulation of arrears on debt, but this did not have the desired effect, as arrears on debt continued to increase.

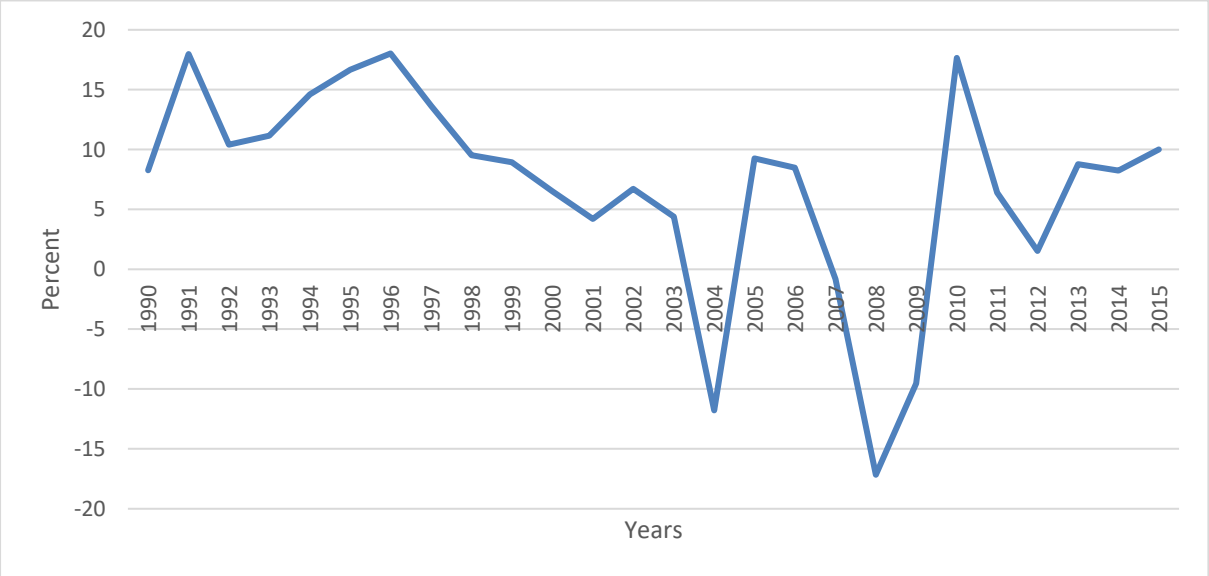
The government realised that foreign exchange restrictions had a negative effect on the economy and decided to introduce a structural adjustment programme with the support of the IMF, the World Bank and the African Development Bank (World Bank, 2013). The programme included measures to shift the exchange rate regime to a crawling peg which would mimic the market rate, reducing the private sector and tightening fiscal policy. However, the government did not carry out the financial reforms and instead reintroduced exchange controls (World Bank, 2013). Economic growth became negative in 2001 and this downturn wor-

sened in 2003 and ’04 as exchange controls discouraged tourism. However, from 2005 the performance of the tourism industry improved.

In 2007 the Finance Minister established a team with the aid of the IMF to initiate economic reforms designed to address the economic problems in the country (World Bank, 2013). Currency controls and state control of the major activities in the economy had not been successful. The major reforms included abolishing currency and price controls, allowing the market to influence the economy and repaying public debt (World Bank, 2013). The exchange rate fluctuated after the reforms but stabilised in 2010.

Figure 2.19 shows the real interest rate in Seychelles for the period 1990-2015. The rate fluctuated slightly between 1990 and ’92 before increasing between 1992 and ’96 from 10.4% in 1992 to 18.02% in ’96. The rate then declined from 1996 to a low of -11.78% in 2004, due mostly to the expansionary monetary policy conducted by the authorities, before rising to 9.27% in ’05. Between 2005 and ’08 the real interest rate decreased to -17.16% in 2008 before rising to 17.65% in ’10, due possibly to the reforms of 2007. Despite the reduction between 2011 and ‘12, the real interest rate has remained in positive territory since the financial reforms.

Table 2.19: Seychelles real interest rate trend

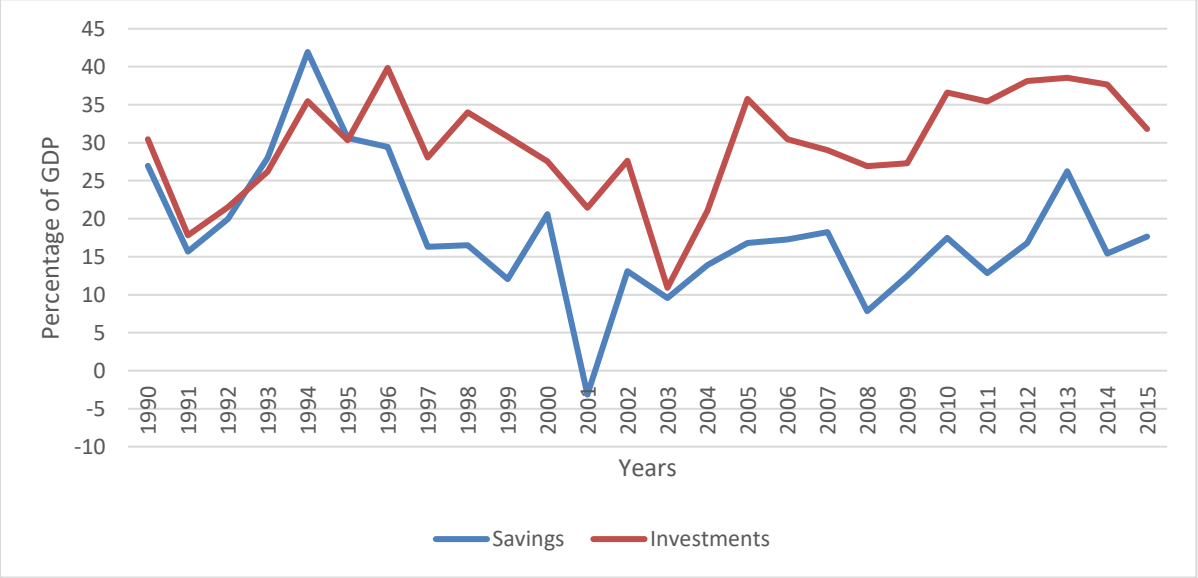


Source: World Bank (2016)

Figure 2.20 shows the trends in domestic savings and investments as a percentage of GDP for the period 1990-2015. Both variables showed a similar trend to the real interest rate. There

was a slight increase in both variables from 1992 till the mid-'90s before a downward trend resumed into the early 2000s. The downward trend was substantial in savings, which fell from 35.459% in 1994 to -3.14% in 2001, while investments decreased from 39.85% in 1996 to 10.90% in 2003. Both variables have since exhibited an upward trend since the early 2000s despite a slight decline between 2007 and '08 due to the global financial crisis. This decrease during the financial crisis also coincided with the real interest rate drop into negative territory. So both variables have recovered since the global financial crises, with investments averaging over 35% of GDP.

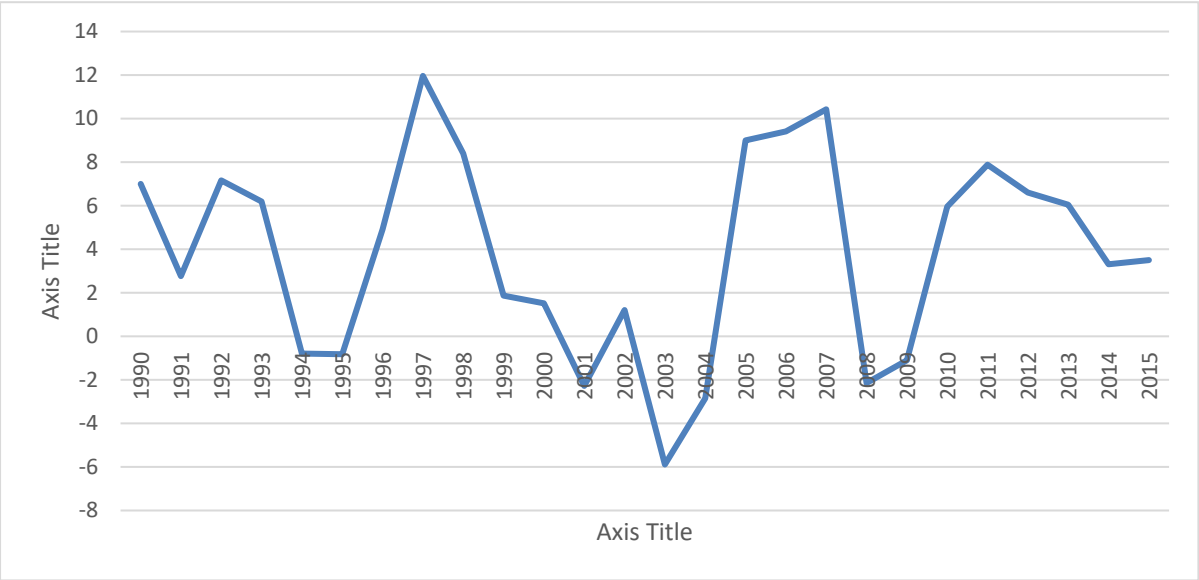
Figure 2.20: Seychelles trends in savings and investments



Source: World Bank, IMF (2016)

Figure 2.21 outlines the GDP trend in the Seychelles for the period 1990-2015. GDP exhibited a downward trend from 1990 to '94 before rising to a high of 11.96% in '97. However, from 1997 GDP declined and reached -5.89% in 2003. Between 2004 and '07 GDP increased and reached 10.42% in '07 before declining in '08 due to the global financial crisis. Between 2009 and '11, GDP rose to 7.89% before declining from 2012 onwards.

Figure 2.21: Seychelles GDP trend



Source: World Bank (2016)

2.3.8 South Africa

Financial liberalisation in South Africa began as a result of the recommendations made by the De Kock Commission in 1980 (Aziakpono, Wilson & Manuel, 2007). Prior to 1980, South Africa had a repressed financial system under which credit, interest rates and foreign exchange were controlled by the state. During the 1960s and '70s there were limits on the loans banks could make and credit controls were imposed on monetary and non-monetary banks so as to limit competition between these two types of banks (Odhiambo, 2011). Interest rates were also controlled during the 1960s and '70s. There were limits on the maximum interest rates that banks could pay on deposits. This was implemented to protect building societies, which were in direct competition with banks (Odhiambo, 2011). After 1972 controls were enacted on direct deposits as well as lending rates.

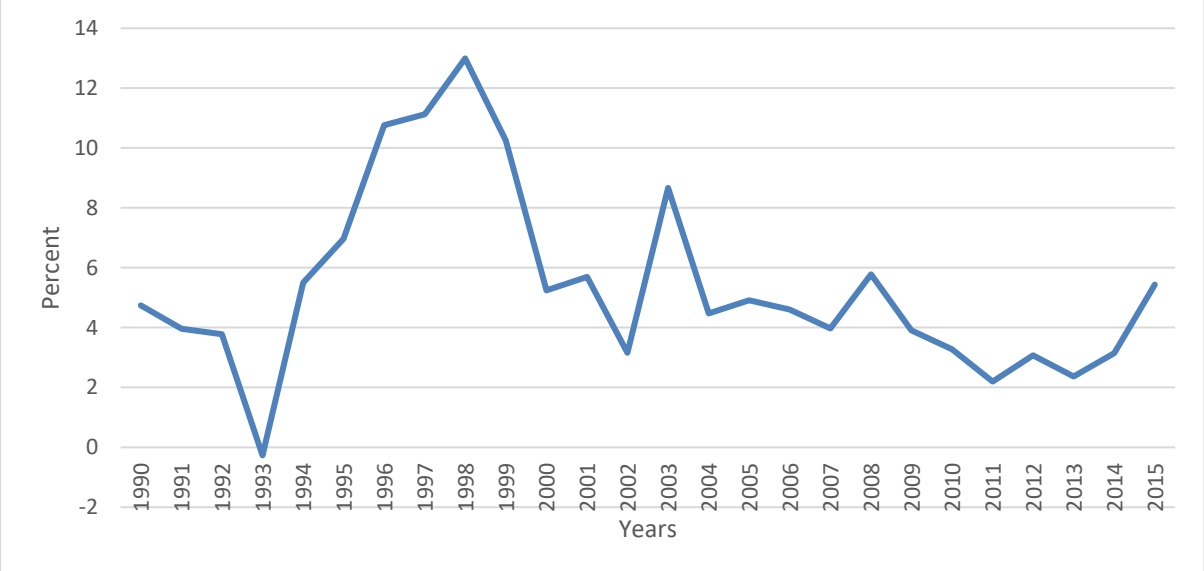
The De Kock Commission was appointed in the late 1970s to examine the South African monetary system and monetary policy, and to make recommendations with regard to interest rates, credit ceilings, cash reserves, liquidity asset requirements, exchange rates, government regulation and capital flows (Aziakpono & Wilson, 2010). The commission recommended the removal of credit and interest rate ceilings and also suggested that bank regulation should be guided by market forces, not the state (Schoombee, 2003). Interest rate liberalisation was

viewed as a crucial policy as it was linked to the exchange rate (Odhiambo, 2011). Higher interest rates resulting from interest rate liberalisation would cause a rise in the value of the exchange rate by making the currency more attractive to hold.

In 1980 financial repression polices were abandoned and this, coupled with the removal of control on capital flows, resulted in an increase in the number of foreign banks, which came to 51 in 1997 (Chipote, Mgxekwa & Godza, 2014). Controls on capital were removed in 1980 and reintroduced in the mid-1980s as capital flight was on the rise, but were later again abolished. The removal of capital not only resulted in an increase in foreign banks in South Africa but also encouraged South African banks to open branches in other countries and increase the number of participants in the financial system (Odhiambo, 2011). The increase in the number of banks resulted in an increase in competition in the banking sector, which had a positive influence on financial development in South Africa (Chipote *et al*, 2014).

Liberalisation of interest rates was carried out to encourage bank competition and to increase banks' flexibility (Aziakpono *et al*, 2007). During the years of financial repression, deposit and lending rates were set at 2% and 2.5% respectively (Odhiambo, 2011). Real interest rates remained negative after interest rate liberalisation and turned positive only in the late 1980s. Figure 2.22 shows the trend in the real interest rate in South Africa for the period 1990-2015. The real interest rate declined from 1990 to '93 before rising to a high of 12.99% in 1998.

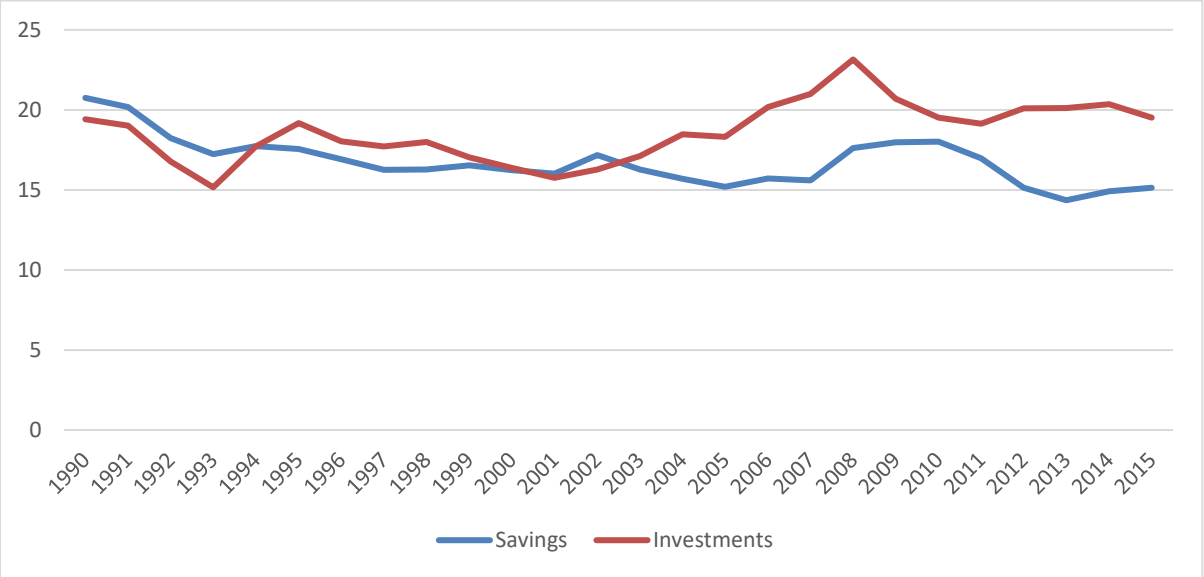
Figure 2.22: South Africa real interest rate trend



Source: World Bank (2016)

Figure 2.23 shows the trends in domestic savings and investments as a percentage of GDP from 1990 to 2015. Both savings and investments remained stagnant from the early 1990s, with ratios below 20% despite the increase in the real interest rate from the early ’90s to the late ’90s.

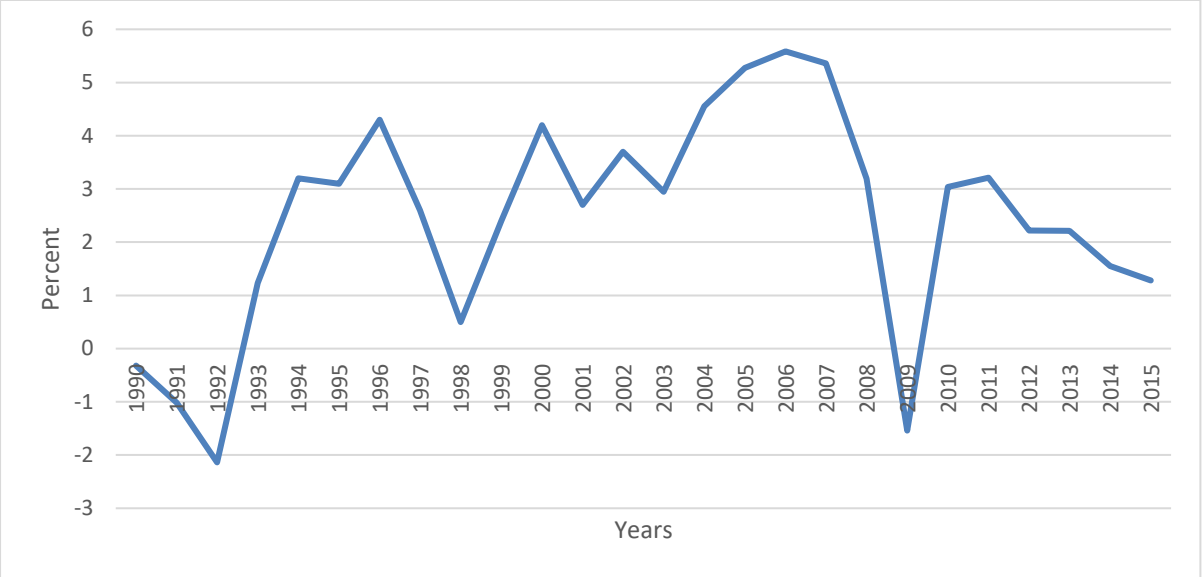
Figure 2.23: South Africa trends in savings and investments



Source: World Bank (2016)

Figure 2.24 outlines the trend in GDP in South Africa for the period 1990-2015. GDP declined between 1990 and ’92, due mostly to the drought. Between 1992 and ’96 GDP rose from -2.14% in 1992 to 4.3% in 1996 before declining from 1997 to ’98 because of the Asian financial crisis.

Figure 2.24: South Africa GDP trend



Source: World Bank (2016)

In 1998 the SARB introduced the repo system as a new accommodation system to ensure more flexibility in the conduct of monetary policy (Small & De Jager, 2001:3). This system involves transactions between the SARB and the commercial banks on a regular basis. The repo rates could change daily depending on the repo tenders and as a result the repo rate played a major role in the determination of interest rates charged by the commercial banks to businesses and households (Aziakpono *et al*, 2007).

In 2000 the SARB introduced inflation targeting as the dominant monetary policy tool to keep inflation at low and stable levels and set an inflation target of between 3% and 6%. This has helped in stabilising the inflation rate (Kaseeram, 2010:98). In September 2001 the SARB made an adjustment to the repo system to ensure that the repo rate had a more direct effect on the overnight interbank rate (Brink & Kock, 2009:5). This change was made to improve the effectiveness of monetary policy, and with this system changes in the repo rate affect the overnight interbank rate, which in turn affects the money market and other interest rates in the economy (Absa, 2001).

The real interest rate showed a decreasing trend from the late 1990s until 2015 despite slight increases in 2003 and ’08. The drop in the real interest rate can be attributed to the introduction of the repo system. Investments increased in the early 2000s and reached a high of 23.15% in ’08. However, because of the global financial crisis, the variable declined and remained stagnant around the 20% mark. Savings have remained stagnant at about 15% of

GDP since the 1990s. Between 1998 and 2007 there was an upward trend in GDP from 0.52% in ’98 to 5.55% in ’07, despite declines in 2001 and ’03. The global financial crisis resulted in a substantial decline in GDP between 2008 and ’09, which was followed by a recovery between 2010 and ’11. Economic growth has been characterised by a declining trend since 2012.

2.3.9 Swaziland

Swaziland achieved high economic growth in the mid-1980s as a result of capital inflows (Dlamini, 2003). A significant amount of the capital inflows were a result of sanctions imposed on South Africa, and membership in the South African Customs Union (SACU) encouraged inflows from South Africa. Domestic investment levels were high, which had a positive effect on employment. Good fiscal management and high export growth were crucial in ensuring that the government budget and balance of payments were in surplus (World Bank, 1996).

The financial system was small but diversified and liberalised to a certain extent by the 1990s and was regulated and supervised by the Central Bank of Swaziland (Elhiraika 2001). Interest rates were kept below those in South Africa so as to increase investment levels. The banking sector was relatively developed by the mid-1980s, with four privately owned commercial banks: Barclays Bank, Standard Chartered, Stanbic and First National Bank (FNB) (World Bank, 1996). The banking sector also included the Swaziland Development and Savings Bank, which was government-owned, as well as the Central Bank (World Bank, 1996).

However, in the 1990s the economy’s performance was poor, with the economic growth rate averaging less than 2% (World Bank, 1996; IMF, 2008). This was caused by two droughts and the lifting of sanctions on South Africa in the early 1990s, which resulted in a significant drop in agricultural production and a drop in private investments as a percentage of GDP (Dlamini, 2003). This downturn in the economy resulted in an increase in unemployment and deficits in the government budget and the balance of payment.

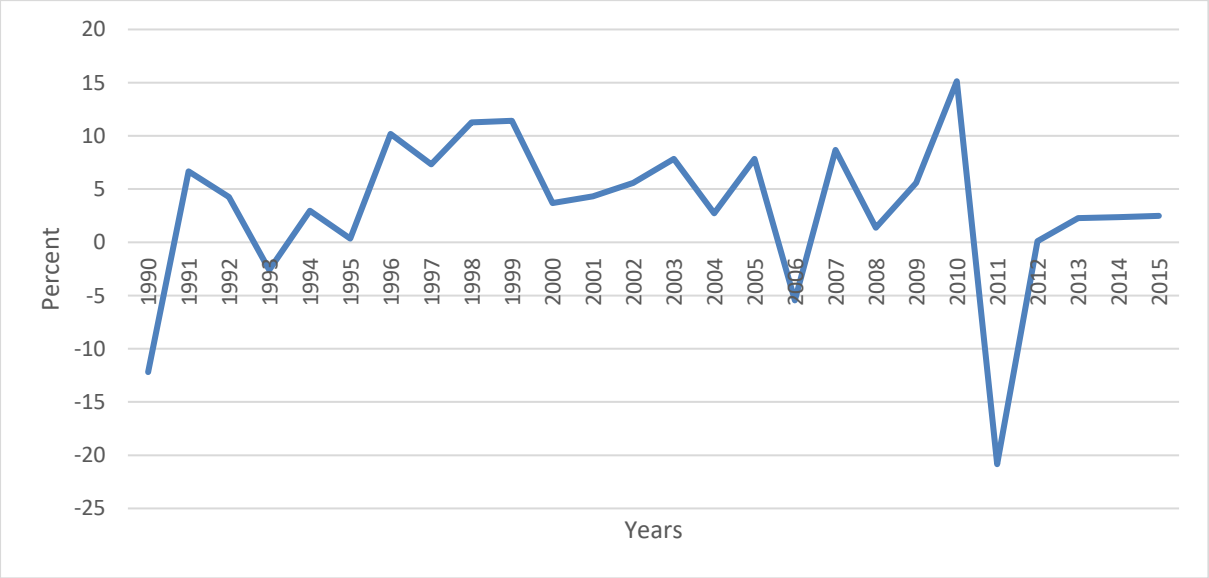
Due to the deteriorating performance of the economy, the Swaziland government introduced a stabilisation programme with the aid of the World Bank and the IMF (World Bank, 1996). In 1995-’96, representatives from the government and the World Bank prepared a report on Swaziland’s financial sector which outlined the role the financial sector could play in increasing economic growth. The report suggested that the Swaziland authorities should create an

environment conducive for the development of the financial sector (Elhiraika, 2001). Lending and deposit rates were negative for most of the 1980s and ’90s, which had a negative effect on savings, investments, capital inflows and economic growth (Elhiraika, 2001).

The report advised the government to supervise all the institutions in the financial sector (World Bank, 1996). During the 1980s and early ’90s, only deposit-taking institutions like banks, the Swaziland Development and Savings Bank, and Swaziland building societies were being supervised. The report recommended that supervision should be extended to other deposit-taking institutions, insurance companies and financial markets (World Bank, 1996). So the Swaziland authorities implemented a legal and regulatory framework which was up to standard with international practices. The other major reforms included the creation of a market on which debt securities were used as investment and liquid management tools, and liberalising interest rates (World Bank, 1996). Interest rate liberalisation was required to foster positive deposit and lending rates, which would in turn increase savings and investments.

Figure 2.25 shows the real interest rate in Swaziland for the period 1990-2015. The rate rose into positive territory in the early 1990s despite a drop to -2.59 in ’93. Between 1993 and ’99 there was an upward trend in the real interest rate from -2.59% in ’93 to 11.43% in ’99, possibly aided by the stabilisation programme introduced in 1995-’96. The real interest rate fluctuated from the early 2000s to a high of 15.14% in ’10. In 2011 the rate dropped substantially to -20.84% before recovering modestly to 2.48% in ’15.

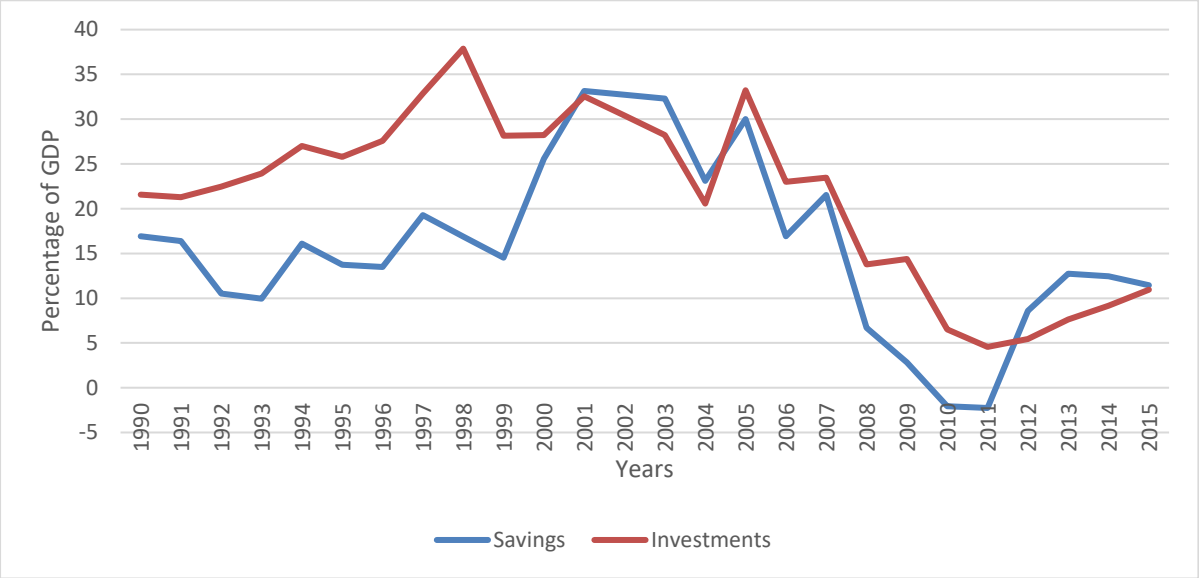
Figure 2.25: Swaziland real interest rate trend



Source: World Bank (2016)

Figure 2.26 shows Swaziland's trends in domestic savings and investments as a percentage of GDP for the period 1990-2015. Investments exhibited an upward trend during the 1990s and early 2000s, from 14.55% in '90 to 22.97% in '01. However, after 2001 investments decreased, reaching 4.56% in '11. Savings fluctuated around the 15% mark during the '90s. The period between 2001 and '03 was, however, characterised by a rise in savings. From 2003 to '11 savings reduced drastically, from 32.29% in '03 to -2.26% in '11, with major reductions recorded during 2008 and '09 due to the global financial crisis. Savings have recovered modestly since 2012.

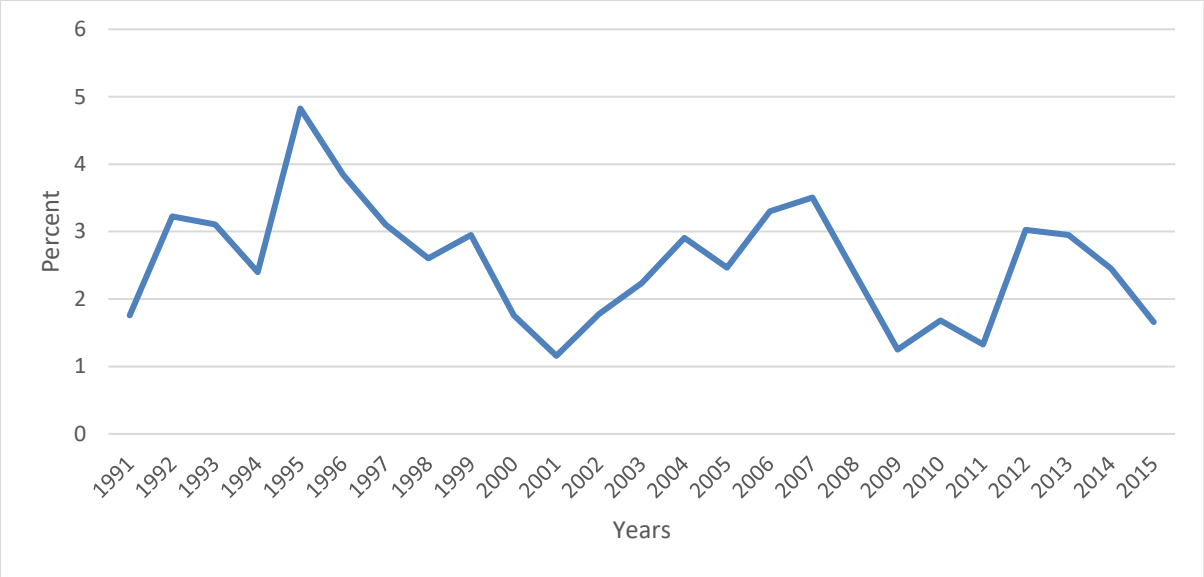
Figure 2.26: Swaziland trends in savings and investments



Source: World Bank (2016)

Figure 2.27 shows Swaziland's GDP trend for the period 1991-2015. GDP exhibited an upward trend from the early to mid-1990s before declining from '95 to 2001. The period 2002-'07 was characterised by an upward trend in GDP before a decline between 2007 and '11 due to the global financial crisis. Despite a recovery in 2012, economic growth has been on a downward trend since '13.

Figure 2.27: Swaziland GDP trend



Source: World Bank (2016)

2.3.10 Tanzania

Financial reforms were initiated in Tanzania from 1986 into the early ’90s, following a period of declining economic growth that began in the ’70s (Muganda, 2004). This decline in economic growth resulted in a rise in external debt arrears, fiscal deficits and inflation, as well as a reduction in real wages which in turn caused a financial crisis in the early 1980s. During the late ’70s the government intervened, setting prices in the economy, and a number of state-owned institutions were established (Mowatt, 2001). The government also directed credit to state-owned institutions at low rates while real interest rates were negative, which had a negative effect on savings and investments (African Development Fund, 2000).

So the financial sector was liberalised between 1986 and ’92, including the removal of controls on prices, liberalisation of trade, a removal of restrictions on the participation of the private sector in domestic trade, and the liberalisation of the exchange rate (Muganda, 2004; Yona & Inanga, 2014). These reforms formed part of the Financial Sector Adjustment Programme (FSAP), initiated with the aid of the IMF and other donors in 1991, which sought to reduce state intervention in the financial system and to allow market forces to play a more significant role in determining transactions in the financial system (African Development Bank, 2000).

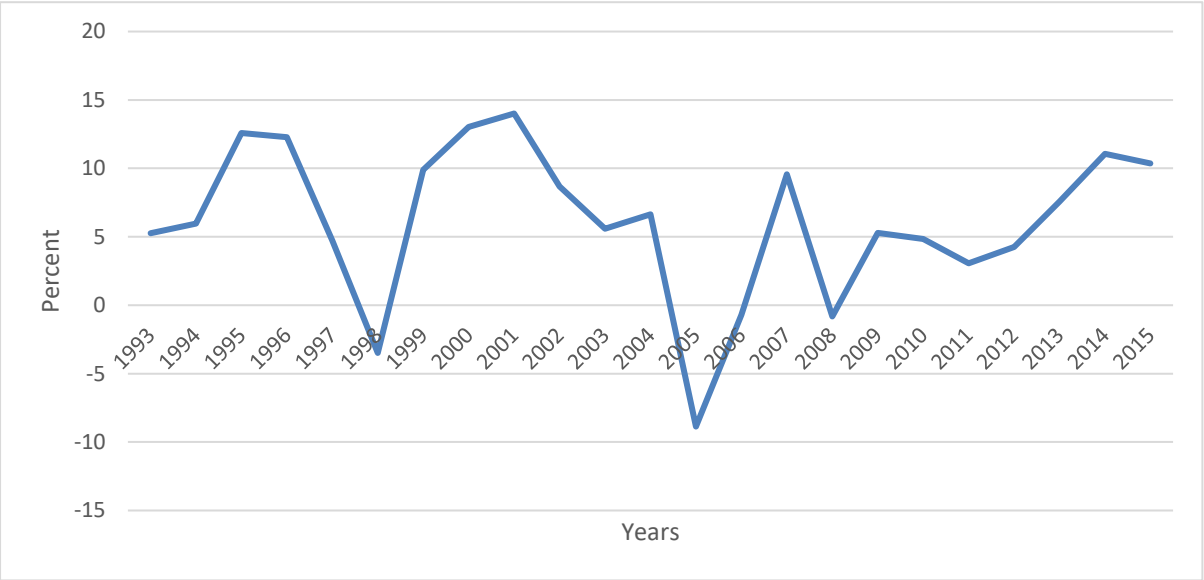
Financial liberalisation had a positive influence on the economy as reflected in GDP growth. Figure 2.30 shows Tanzania's GDP trend for the period 1990-2015. GDP rose from the mid-1980s to '90 from 1.5% in '85 to 7.05% in '90. Financial reforms also had a positive influence on the financial sector (Yona & Inanga, 2014; Randhawa & Gallardo, 2003). The financial sector comprised four state-owned banks before the reforms, but afterwards the number of private institutions increased significantly and by 2013 there were 53 banks (Yona & Inanga, 2014).

In 1992 interest rates were liberalised with the exception of the maximum lending rate, which was abolished in 1993 (Odhiambo, 2010a). A *bureau de change* market was established in 1993 to ensure that exchange rate determination was based on market forces, and Treasury bill auctions were set up so as to allow market forces to determine the operation of the financial system. Policies which prevented financial institutions from being established were also abolished in 1993 (Odhiambo, 2010a).

The period between 1991 and '94 was marred by deterioration in the performance of the Tanzanian economy as GDP decreased substantially and averaged below 2% during that period as shown in Figure 2.30. This was mainly due to poor management of the economy by the newly elected leadership (Gabagambi, 2013). The growth of credit to the public sector was not managed properly and there was a rise in tax evasion, combined with low revenue collections. The inflation rate increased in 1994 and donors like the World Bank were discouraged from lending to Tanzania due to these economic problems (Gabagambi, 2013).

As a result of these economic problems the Helleiner process was established in 1994 with the aid of the Danish government (Muganda, 2004). The Helleiner process prioritised areas such as mending the relations between Tanzania and its donors, ensuring the credibility of the government and attempts to ensure that the government did not deviate from the reform programme. In 1995 new leadership was elected and its main aim was to ensure that there was macroeconomic stability in the economy (Muganda, 2004). Since then reforms have been well managed and macroeconomic stability has been maintained. Inflation decreased from the mid-1990s to the early 2000s and the GDP growth rate increased from 3.57% in 1995 to 7.83% in 2004. Poverty levels and the government deficit reduced significantly, and because of the macroeconomic stability and the strengthening of property rights, FDI inflows increased (Muganda, 2004).

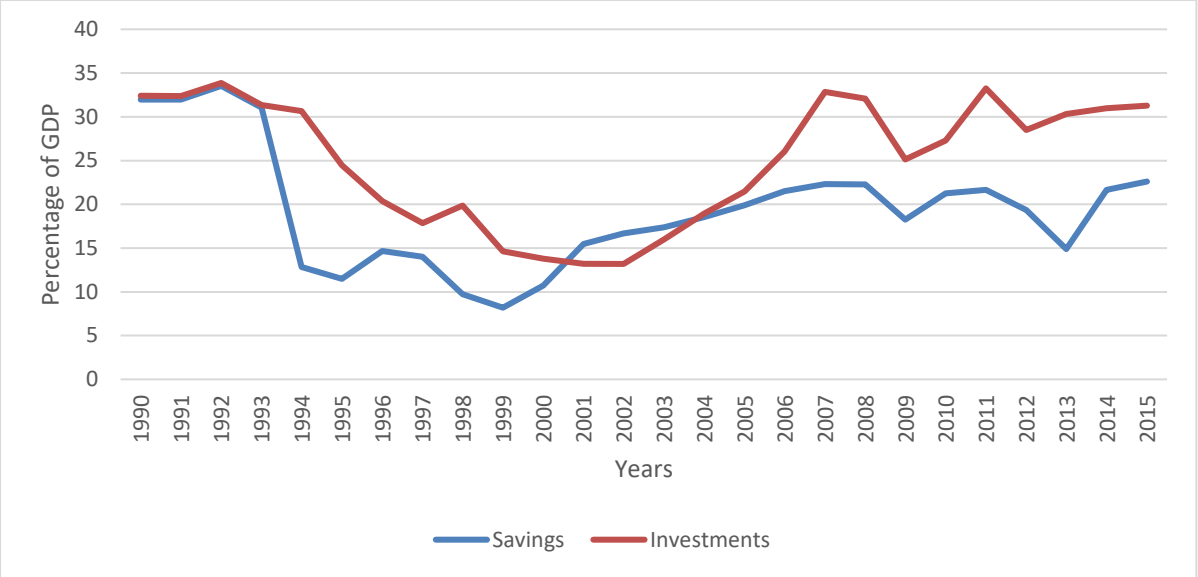
Figure 2.28: Tanzanian real interest rate trend



Source: World Bank (2016)

Figure 2.28 shows the trend in the real interest rate in Tanzania for the period 1993-2015. Despite the liberalisation of interest rates in the early 1990s, real interest rates decreased substantially from 12.59% 1995 to -3.49% in ’98. The reason for the decline in the real interest rate could be the high inflation rate recorded in Tanzania during that period. Between 1998 and 2001 there was a substantial increase in the real interest rate, due possibly to the drop in inflation in the late 1990s and early 2000s. The real interest rate exhibited a declining trend in the early 2000s and reached a low of -8.87% in ’05. The rate recovered to 9.57% in 2007 before declining in ’08. The rate increased between 2008 and ’15.

Figure 2.29: Tanzanian trends in savings and investments

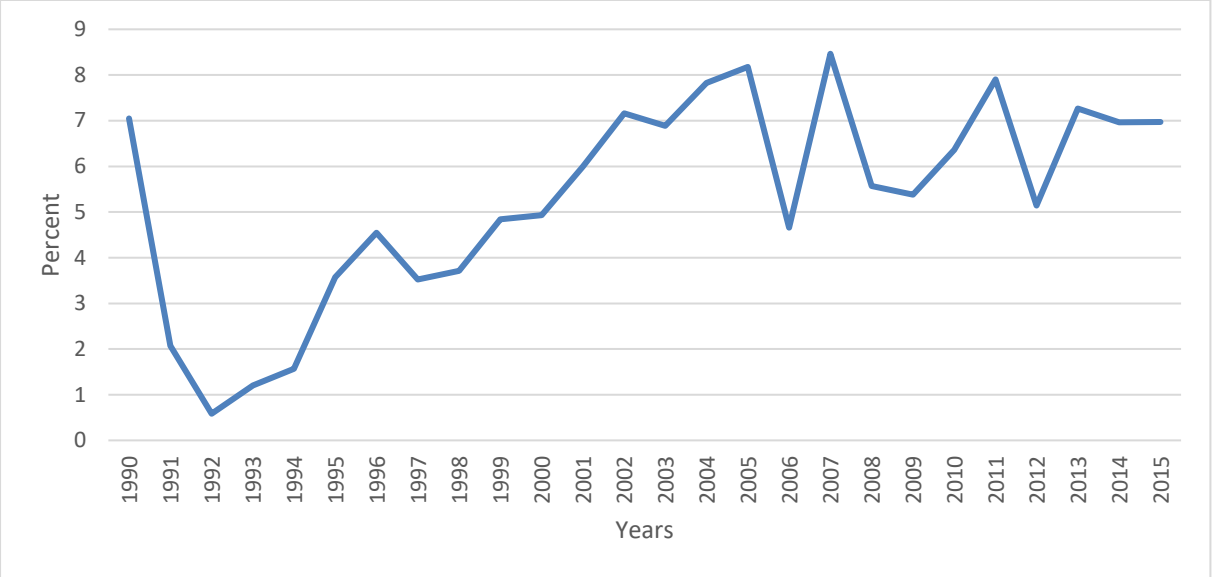


Source: World Bank (2016)

Figure 2.29 shows the trends in domestic savings and investments as a percentage of Tanzania's GDP for the period 1990-2015. Both variables decreased substantially from the mid-'90s to the early 2000s. Despite a slight decrease from 2004 to '07, savings picked up from 2008 to 23.52% in '12. Both savings and investments increased from the early 2000s despite the downward real interest rate trend. Savings and investment ratios have averaged 20% and 30% respectively since the mid-2000s. As shown in Figure 2.30, economic growth increased substantially between 1992 and 2002.

In 2003 an FSAP was initiated so as to assess and improve the performance of the financial sector (IMF, 2010). Despite the FSAP's positive effect on credit to the private sector between 2003 and '09, Tanzania ranks below other African countries in that regard, which has slowed business growth (IMF, 2010). The FSAP had a positive effect on Tanzania's GDP, which has averaged above 6% between 2003 and '12.

Figure 2.30: Tanzanian GDP trend



Source: World Bank (2016)

2.3.11 Zambia

Zambia gained its independence in 1964 and the newly elected government decided to nationalise the most important sectors of the economy (Kalyalya, 2001). This process continued up until the late 1980s. By that time 80% of the economy's financial activities were controlled by the government and more than 150 parastatals had been established. The Zambian economy is dependent on its mining sector to a large extent, with copper the most important commodity (Mowatt, 2001). In the 1970s there was a drastic fall in oil prices worldwide, coupled with a drop in copper prices, which led to stagflation in the economy (Kalyalya, 2001).

The economic problems caused by stagflation persuaded the government to decide to implement some structural changes to the economy with the help of the World Bank and IMF (Maimbo & Mavrotas, 2003). The structural adjustment programme, introduced in the late 1980s, was only fully implemented in the early '90s. The structural adjustment programme included economic liberalisation, privatisation, improvements in the efficiency of the public sector and the introduction of monetary policy instruments to stabilise the economy (Saasa, 1996). Economic liberalisation was implemented to allow the market mechanism to allocate economic resources instead of the state. Several other reforms were implemented during the 1990s and the economy was liberalised to a large extent by the 21st century (Kalyalya, 2001).

Interest rates were liberalised in 1992, which allowed financial institutions to make their own decisions with regard to savings and deposit rates (Odhiambo, 2011).

Exchange rate liberalisation was undertaken in 1994 after the abolition of the Exchange Control Act (Kalyalya, 2001). Exchange controls were removed so as to make the Zambian currency competitive in foreign markets and to eradicate rent-seeking. In 1993 the Treasury bill tender system was introduced (Chiumya, 2004). This system, used as one of the monetary policy instruments, was a major step towards allowing the market to determine the price of Treasury bills and government bonds. Treasury bill yield rates were used by commercial banks as an indicator of interest rates in the economy (Kalyalya, 2001).

Prior to financial liberalisation, fixed interest rates, credit allocation, core liquid assets and statutory requirements were used as direct monetary policy instruments (Maimbo & Mavrotas, 2003). Real interest rates were negative and so discouraged individuals and businesses from saving and using the banking system (Chiumya, 2004; Mowatt, 2001). However, during the 1990s the new leadership decided to make the private sector the main driver of economic growth and development (Kalyalya, 2001). Market forces became the major determinant of activities in the economy and indirect instruments of monetary policy like open market operations, Treasury bills and government bonds were used more often than direct instruments (Maimbo & Mavrotas, 2003).

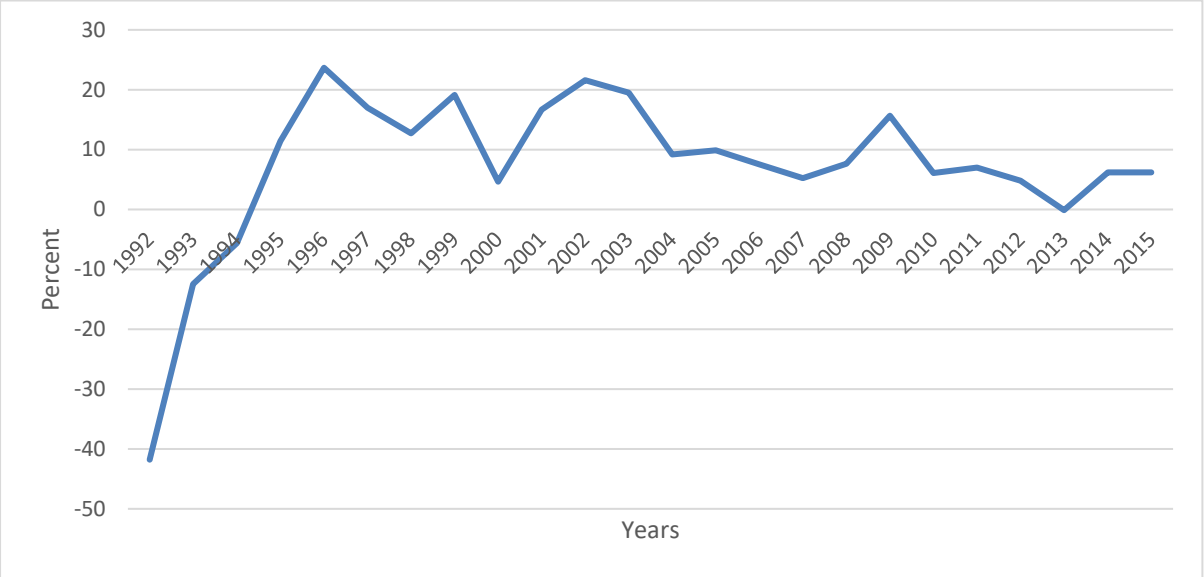
In 1994 the Lusaka Stock Exchange (LuSE) was created as the first formal capital market in Zambia, which created an additional source of funding for businesses (Mowatt, 2001). The Banking and Financial Services Act was introduced in December 1994 to strengthen financial sector regulation (Kalyalya 2001). The Act was amended in 2000 in an attempt to align it with international standards for prudential regulation.

The number of commercial banks increased following the reforms and in 2004 there were 13 commercial banks, seven of which were foreign, four were domestic, one was government-owned and one was a joint venture between the Zambian and Indian governments (Chiumya, 2004). Prior to the reforms there were only three commercial banks, all foreign-owned (Maimbo & Mavrotas, 2003).

Figure 2.31 shows Zambia's real interest rate trend in for the period 1992-2015. The rate was in negative territory in the early '90s, which represented the period before interest rates were liberalised. Following the liberalisation of interest rates in '93, the real interest rate increased

and has remained in positive territory since ’94. The real interest rate reached a maximum of 23.67% in 1996 and declined in the late ’90s, reaching 6.15% in 2000. Between 2000 and ’02 there was an increase in the real interest rate to 21.24%, However, the period from 2003 to ’15 is characterised by a downward trend in real interest rates.

Figure 2.31: Zambian interest rate trend

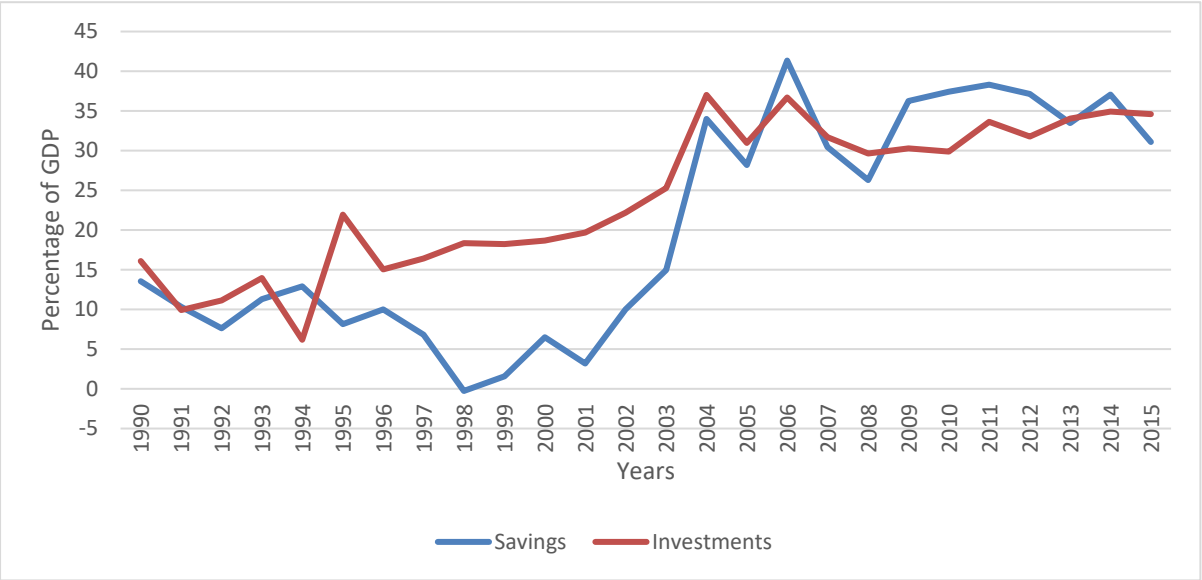


Source: World Bank (2016)

Figure 2.32 shows Zambia’s trends in domestic savings and investment as a percentage of GDP for the period 1990-2015. Savings declined from the mid- to late 1990s and reached a low of -0.27% in ’98. The period 1999 to 2006 as characterised by a substantial rise in savings, which reached a high of 41.34% in 2006. However, between 2006 and ’08 savings declined, possibly due to the global financial crisis, before recovering from ’09 onwards. Investments exhibited an upward trend during the late 1990s. Both savings and investments have averaged close to the 30% mark for more than a decade, which has had a positive effect on economic growth.

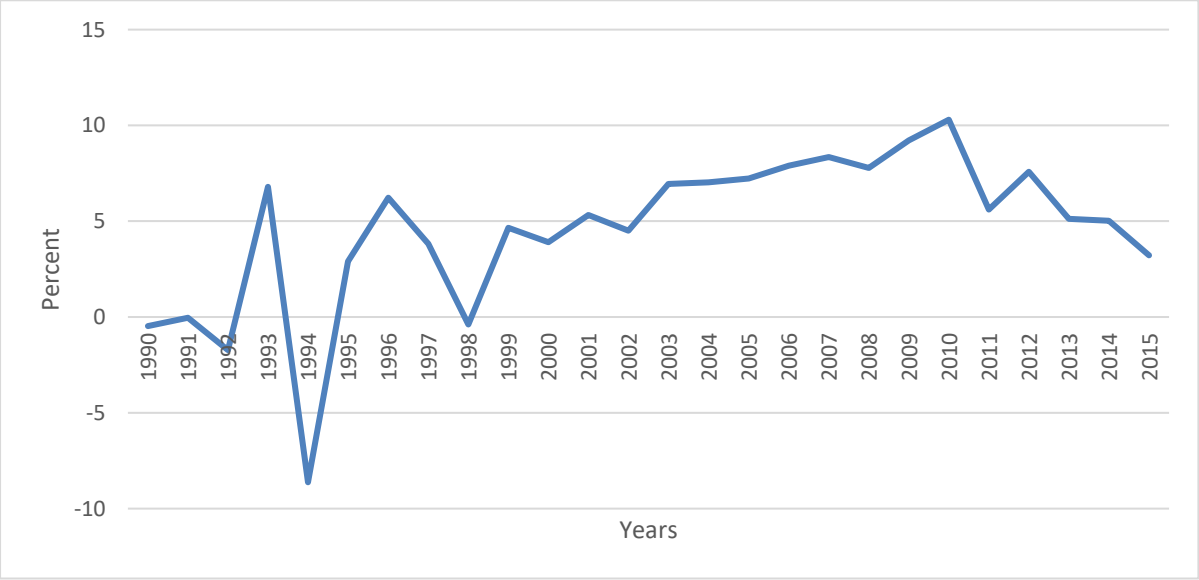
Figure 2.33 shows Zambia’s GDP trend for the period 1990-2015. GDP fluctuated to a large extent in the early 1990s in the midst of the droughts that affected Southern Africa, and decreased during the Asian financial crisis. Between 1998 and 2010, GDP exhibited an upward trend despite a slight decline in ’02. This rise in GDP has coincided with an increase in savings and investments. However, there was a downward trend in economic growth in 2011 and ’15 despite the high savings and investment levels.

Figure 2.32: Zambian savings and investments trend



Source: World Bank (2016)

Figure 3.33: Zambian GDP trend



Source: World Bank (2016)

The analysis above suggests that most SADC countries introduced financial reforms in the 1980s and '90s. Prior to the reforms, the financial systems of most of these countries were largely controlled by the respective governments, real interest rates were negative and there was a lack of competition, especially in the banking sector. However, since 1972 the Botswa-

na economy has been market-oriented to a large extent, as government intervention in the financial sector has been minimal. The reforms initiated by the Botswana authorities in the late 1980s and early ’90s were conducted to further liberalise an already liberal economy. In the Seychelles, the authorities delayed the initiation of major reforms until 2007, when it became clear that state control in the major activities in the economy had a negative effect on the economy’s performance.

Financial liberalisation policies had a positive influence on the performance of the banking industries of most of the SADC countries as more banks entered the financial systems and increased the level of competition, with the exception of Lesotho. Financial reforms also had a positive effect in turning real interest rates from negative to positive territory, despite the obstacles of high inflation and increasing savings and investments in a number of countries. Financial reforms were, to a large extent, successful in Botswana and Mauritius. Due to a market-oriented economy, savings and investments have been high in Botswana, which has had a positive effect in increasing economic growth and propelling the country into middle-income territory with a high standard of living. Financial reforms initiated in Mauritius had a positive effect on real interest rates, savings, investments and economic growth, so the economy had the highest GDP per capita in the SADC region for the period 2000-’09 (Gorlach & Le Roux, 2013).

Financial reforms had a negative effect on the Lesotho economy as banking sector performance worsened due to a series of bank failures. These failures were caused by weak regulatory and legal frameworks, which suggests that financial liberalisation policies should be accompanied by the strengthening of regulation and supervision in an economy. In South Africa, financial reforms did not have the desired effect on savings and investments, which decreased and remained stagnant from the late 1980s onward, despite an increase in the real interest rate. Reforms had a positive effect on the banking sector as a number of South African banks opened branches in other countries. Financial reforms in Swaziland had a similar effect to those in South Africa in terms of savings and investments. Savings and investments have exhibited a downward trend since the early 2000s. A summary of the liberalisation dates in SADC countries based on the above analysis is shown on table 2.1.

Table 2.1: Summary of liberalisation dates in SADC countries

Country	Interest rate liberalisation date	Financial liberalisation date
Botswana	1989	1989
Lesotho	1993	1988
Madagascar	1998	1994
Malawi	1988	1988
Mauritius	1981	1981
Namibia	1989	1991
Seychelles	1993	1993
South Africa	1980	1980
Swaziland	1996	1982
Tanzania	1992	1986
Zambia	1992	1992

2.4 Conclusion

The purpose of this chapter was to discuss the history of financial liberalisation in SADC countries, with more emphasis placed on the effect of interest rate liberalisation on savings, investments and economic growth, as well as to discuss briefly the targets set by the region with regard to economic growth, public debt, investments and inflation.

The analysis revealed that most of the SADC countries initiated financial sector reforms in the 1980s and ’90s. Financial reforms included the removal of interest rate controls, exchange rate controls, credit controls, price controls and policies that prevented the entry of firms to the financial sector. Prior to the reforms, the financial sectors of most SADC countries were state-controlled, with governments making the major decisions with regard to the operation of the financial sectors.

Financial reforms had a positive effect in most countries with regard to increasing banking sector performance, with the exception of Lesotho, where bank failures resulted. Real interest rates increased following financial reforms in all countries, despite the major obstacle of high inflation. Savings and investments increased in a number of countries after the initiation of reforms. Botswana and Mauritius in particular benefited from financial liberalisation to a large extent, as savings, investments and economic growth increased and remained high, which in turn has increased standards of living. This suggests that there is a link between interest rate liberalisation, savings and economic growth, so the next chapter discusses in detail the link between these variables based on the McKinnon and Shaw hypothesis.

CHAPTER THREE

LITERATURE REVIEW: FINANCIAL LIBERALISATION HYPOTHESIS

3.1 Introduction

McKinnon (1973) and Shaw (1973) initiated the discussion on financial liberalisation, which involves lifting restrictions or controls on economic activity by the state. Interest rate liberalisation involves the removal of controls on the interest rates in an economy and, represents the main focus of this thesis. Interest rate liberalisation results in an increase in interest rates, which exerts a positive effect on savings, as individuals are encouraged to consume less by the higher returns from saving (McKinnon, 1973; Shaw, 1973). The increase in savings improves the availability of funds that can be used for investment purposes, which in turn improves long-term economic growth. Although higher interest rates result in an increase in capital inflows, they reduce the economy's dependence on them, as domestic savings are higher (World Bank, 2011).

Financial liberalisation has been supported on a theoretical basis by authors like Kapur (1976), Galbris (1977), Mathieson (1980), Fry (1980) and Mishkin (2001). However, it has also been criticised theoretically by a number of authors, like Stiglitz (1994), Van Wijnbergen (1983), Arestis and Demetriades (1999), Mankiw (1986) and Taylor (1983), who argue that it might not affect an economy positively, as suggested by McKinnon (1973) and Shaw (1973), and often results in financial crises.

The objective of this chapter is to introduce and explain the effect of financial liberalisation on economic growth from a theoretical perspective. The chapter also outlines the main arguments for and against financial liberalisation and is organised into five sections. Section two discusses the McKinnon and Shaw hypothesis. Sections three and four outline the theoretical arguments for and against financial liberalisation respectively. Section five discusses the effect of interest rate liberalisation on financial crises and Section six concludes the chapter.

3.2 McKinnon and Shaw hypothesis

Financial liberalisation is a process which involves the removal of financial sector controls by the government, namely credit and interest rate controls. It also involves the removal of barriers to foreign financial institutions, privatising financial institutions, and eradicating restric-

tions on foreign financial transactions (Guha-Khasnobis & Mavrotas, 2008). Research on financial liberalisation was initiated by Robert McKinnon and Edward Shaw in the early 1970s (Abiad *et al*, 2008). These two economists argued that when prices and interest rates are controlled by governments, not market forces, this results in misallocation of resources in that economy. They also argued that credit controls shift the flow of credit to projects favoured by the state, not those with the highest possible returns (Sulaiman *et al*, 2012). McKinnon (1973) and Shaw (1973) emphasised that allowing market forces to determine economic variables would result in higher economic growth. Their findings are referred to as the McKinnon and Shaw hypothesis (Spratt, 2009).

McKinnon (1973) argued that investments cannot take place prior to the accumulation of money balances by individuals. For this accumulation of money balances to take place, real interest rates have to be positive but not in excess of the real rate of return on investments. The model representing the McKinnon (1973) complementary hypothesis can be written as follows:

$$M/P = F(Y, c, d - \pi^e) \qquad 3.1$$

where: M/P = the demand for real money balances

Y = the real income

c = the real average return on capital

$d - \pi^e$ = the real deposit rate ($d =$ nominal deposit rate and π^e = expected inflation)

The model states that the demand for real money balances is positively related to the real income, the real deposit rate and the real average return on capital. So the demand for real money balances depends on the transactions and speculative motives for holding cash, as well as the need to finance the accumulation of capital. The demand for real money balances is complementary to investments, because investments are positively related to the real return on money balances (real deposit rate), and the increase in the real deposit rate also increases the demand for real money balances.

The investment function can be represented as follows:

$$I/Y = F(c, d - \pi^e) \qquad 3.2$$

where: $I/Y =$ the ratio of investment to income

Due to the difficulty of measuring the real return on capital, McKinnon (1973) suggested that the ratio of investment to income be used, as opposed to the real return on capital. The models that are often used in empirical studies can be represented as follows:

$$m/p = F(y, i/y, d - \pi^e) \quad 3.3$$

$$i/y = F(d - \pi^e, dc) \quad 3.4$$

where: $m/p = \ln(M/P)$

$i/y = \ln(I/Y)$

$y = \ln(Y/P)$

dc = ratio of domestic credit to the private sector to GDP

Shaw (1973) argued that financial liberalisation is crucial for financial deepening, and higher interest rates are vital for encouraging individuals and corporations to save. Shaw (1973) also states that higher real interest rates are critical for capital accumulation and this process operates through the increase in the level of financial intermediation. His analysis thus focuses on the role of financial intermediaries in promoting financial development and economic growth. The amount of funds that financial intermediaries can lend depends on the returns offered to savers, so the higher the returns, the greater would be the quantity of savings, which in turn increases the funds available for lending purposes. The greater the available funds for lending purposes, the higher would be the quantity of investments.

Shaw's (1973) model can be represented as follows:

$$M/P = F(Y, \gamma, d - \pi^e) \quad 3.5$$

where: γ is a vector of opportunity cost of holding money in real terms.

McKinnon (1973) and Shaw (1973) both stress the importance of real the interest rate in influencing the accumulation of financial capital which is crucial for investment purposes. Interest rates that are kept artificially low by central banks prevent capital accumulation and

so reduce the amount of investments undertaken. Both authors suggest that financial repression has a negative effect on savings, investment and economic growth.

McKinnon (1973) and Shaw (1973) suggested that financial liberalisation results in higher interest rates which equate the demand for and supply of savings. McKinnon (1973 argued that savings will rise as a result of higher interest rates reflecting social and private time preferences. Higher interest rates increase the opportunity cost of consuming currently and so encourage the deferment of current consumption and an increase in savings.

Shaw (1973) pointed out that a rise in interest rates sets in motion two opposing effects: the income and substitution effects. The income effect reduces savings and encourages consumption, as individuals have higher expected future income, while the substitution effect has a positive effect on savings. He argued that savers may ignore an increase in the rate of return from 4% to 6%, for example, but would not ignore an increase from negative return to 10%.

McKinnon (1973) and Shaw (1973) also suggest that interest rates below the equilibrium level result in capital flight, which limits the available savings for domestic investments, as savers search for higher returns in other economies. Shaw (1973) argues that the mobility of savings worldwide encourages savers to circumvent low interest rates by investing in foreign asset markets. McKinnon (1973) suggests that higher interest rates would increase the amount of savings and investments in the domestic economy, as funds would be shifted from foreign investments with low returns.

3.2.1 Financial repression

Financial repression is formally defined as a situation where direct government intervention replaces the market mechanism in determining the level of financial variables in an economy (Spratt, 2009). Williamson and Mahar (1998) suggest that financial repression includes six elements: the control of the interest rate by the government, credit controls, barriers to entry in the financial sector, banking operations controlled by the government, government ownership of banks, and a situation where international capital flows are restricted. Agenor & Montiel (1996) define financial repression as a situation where the financial system is marginalised by government interventions that often result in very low or negative interest rates which in turn reduce savings, investments and economic growth. Shane (2013) and Achy (2005) go a step further and define financial repression as a situation when the holding of Treasury bills

and bonds is compulsory, when the financial system is uncompetitive and segmented, and when monetary authorities impose high reserve requirements on banks.

Financial repression is often conducted for a number of reasons. One is that it is a way of protecting domestic financial markets and ensuring financing for domestic firms. Interest rate controls that keep interest rates below the free market level are seen as a way to foster investment and economic growth, while interest rates above the free market level are seen as a way of keeping inflation low (Nyawata & Bird, 2004). Exchange rate controls are maintained by a number of developing countries to ensure that their exports are competitive in international markets and offset the problem of exchange rate volatility (Commission on Growth and Development, 2008). Capital controls are seen as a way to keep inflation low, and large capital inflows can result in currency appreciations which could also result in the central banks losing their monetary control.

McKinnon (1973) and Shaw (1973) highlighted the negative effects of financial repression on savings, investment and economic growth. The two authors argued that financial repression reduces the return on savings by keeping interest rates low and so encourages savers to retain their savings in unproductive assets like land, gold and foreign exchange. Financial repression affects the efficiency of the allocation of savings to investments negatively, as well as the level of savings and investments through the return on savings. High reserve requirements imposed on banks lower the cash levels available for lending purposes, which reduces investments. So financial repression affects the level of investment and economic growth negatively, in two ways. Firstly, lowering the real interest rates would reduce savings, which in turn reduces the availability of funds for investment purposes. Secondly, credit rationing by the state prevents credit from flowing to projects with the highest returns, but rather to those favoured by the state. This in turn has a negative effect on investments and economic growth, as a number of firms would be discouraged from investing.

Real interest rates determined by market forces or at equilibrium level eliminate investments with low returns and improve the efficiency of investments, which is crucial, as is the increase in the quantity of investments (McKinnon, 1973; Shaw, 1973). The two authors stress that financial repression results in self-investment, as opposed to saving and investing in the financial system. Shaw (1973) argues that due to low returns, savings may be diverted to inventories, while McKinnon (1973) suggests that savings may be used to create excess capaci-

ty in plant and equipment. The returns on such investments would be low or negative due to the high cost of maintenance, so resources would be allocated inefficiently in the economy. Higher real interest rates resulting from financial liberalisation not only increase the levels of savings, credit and investments, but also improve the efficiency of investments. Economic growth would rise because of the increase in the quantity and quality of investments, as well as through the increase in the average productivity of capital.

McKinnon (1973) and Shaw (1973) also suggest that financial repression encourages the operations of an underground or informal market where returns to savings would be higher. The underground market has higher risks since it is not supervised by the government and is more susceptible to economic shocks. The organised financial sector is more efficient compared with the informal market, so the greater the shift of savings to the organised sector, the greater the overall efficiency of investments.

McKinnon (1973) and Shaw (1973) suggested that financial repression results in dualism in an economy, as firms favoured by the state would have a significant amount of available funds at low repayment levels, while the firms not favoured by the state would have limited access to such funding. The firms favoured by the state would invest in relatively capital-intensive technologies, while the firms not favoured would only be able to invest in projects with high returns and short maturities, due to the high repayment costs. This dualism in an economy could result in an increase in rent-seeking behaviour by firms as they seek to access the subsidised credit. The social return to rent-seeking behaviour is zero, and this exerts a negative effect on economic growth (Romer 2012).

McKinnon (1973) and Shaw (1973) argued that financial repression results in interest rates that are below the market clearing level and as a result, other non-market mechanisms have to be used to clear the market. These include a variety of ways used to allocate available credit, like restriction on the amount of credit undertaken and auctions which also result in rent-seeking behaviour.

In the analysis above, McKinnon (1973) and Shaw (1973) suggest that financial repression has a number of disadvantages which result in lower economic growth as compared with a situation where financial variables are liberalised (Ince, 2011). Low interest rates controlled by the state discourage saving by households and firms because current consumption would be favoured, compared with future consumption. Low interest rates also reduce the amount of bank deposits, as individuals would prefer to place their savings in unproductive areas like

gold and foreign exchange. As a result of low interest rates, there would be a considerable amount of capital flight in search of higher rates elsewhere and a greater reliance on external finance due to a low savings rate (Spratt 2009). A lower savings rate would eventually result in lower levels of investment and lower economic growth. Directed credit policies result in rent-seeking, as borrowers compete for the limited credit available which is a waste of resources (Galindo *et al*, 2002).

3.3 Theoretical arguments supporting financial liberalisation

The McKinnon and Shaw hypothesis is supported theoretically by a number of authors like Kapur (1976), Mathieson (1980), Galbis (1977), Fry (1980) and Mishkin (2001). The hypothesis is also in line with the recommendation made by the Austrian school of thought. Kapur (1976) examined the effect of interest rate liberalisation and stabilisation in a closed economy with surplus labour and under-used capital. He argued that credit is the major source of funds for financing working capital and so has a positive effect on capital accumulation. He also suggested that the supply of credit is determined by the demand for broad money, which in turn is dependent on inflation and the deposit rate. A rise in the deposit rate, possibly due to interest rate liberalisation, has a positive effect on the amount of bank deposits, which in turn increases the supply of credit and capital accumulation.

Kapur (1976) also argued that stabilisation programmes have a negative effect on output, due to the stickiness of prices and adaptive expectations. Stabilisation programmes that reduce nominal money supply in an attempt to reduce inflation result in a reduction in real money supply, which in turn reduces the supply of credit available. Increasing the deposit rate instead would have the positive effects of reducing inflation through the rise in the demand for broad money and increasing the amount of bank deposits. The increase in the amount of deposits results in an increase in the quantity of credit available, which in turn has a positive effect on investments and output. Mathieson (1980) presented a model similar to that of Kapur (1976), but went a step further and suggested that the supply of credit is a major source of funding for both working capital and fixed capital. He also assumed that fixed capital was fully used and suggested that the greater the amount of investment, the higher the economic growth rate.

Kapur (1976) and Mathieson (1980) also argued that high reserve requirements have the same effect as interest rate ceilings. A fixed required reserve ratio prevents the deposit rate from increasing if inflation is assumed to be zero. Inflation increases the spreads between de-

posit and lending rates. A reduction in the reserve requirements increases the amount of funds available for banks to lend and also raises the deposit rate, which in turn has a positive effect on the number of bank deposits. The greater the amount of deposits, the greater would be the size of the financial sector, so this would support financial development.

The Kapur-Mathieson views can be represented by the following model:

$$Y = \sigma K \qquad 3.6$$

where: Y = real output

σ = a constant for the output/capital ratio

K = total fixed and working capital

In this model the financial sector has an influence on the quantity of investments, which in turn has a positive effect on real output.

Galbis (1977) and Fry (1980) extended the model by Kapur (1976) and Mathieson (1980) and argued that the real deposit rate can affect both the quality (efficiency) and quantity of investments. Galbis (1977) introduced a two-sector model and suggested that financial repression results in the emergence of a traditional sector with a low rate of return to capital and a modern sector with a high rate of return to capital. A low deposit rate encourages a significant amount of investments in the traditional sector, as investing in the modern sector would offer lower returns. Increasing the deposit rate would increase the demand for money in the traditional sector, which in turn would increase investments in the modern sector. The shift of investments to the modern sector improves the efficiency of investments and thus leads to an increase in economic growth.

In the models developed by Kapur (1972), Mathieson (1980), Galbis (1977) and Fry (1980), a deposit rate determined by market forces has the greatest influence on economic growth. These authors also suggest that interest rate controls and credit controls should be abolished, and reserve requirements reduced, so allowing market forces to determine prices in the financial sector. Kapur (1976), Mathieson (1980) and Fry (1988) also argue that interest rate liberalisation not only affects economic growth positively, but also reduces the contractionary effects of monetary stabilisation programmes.

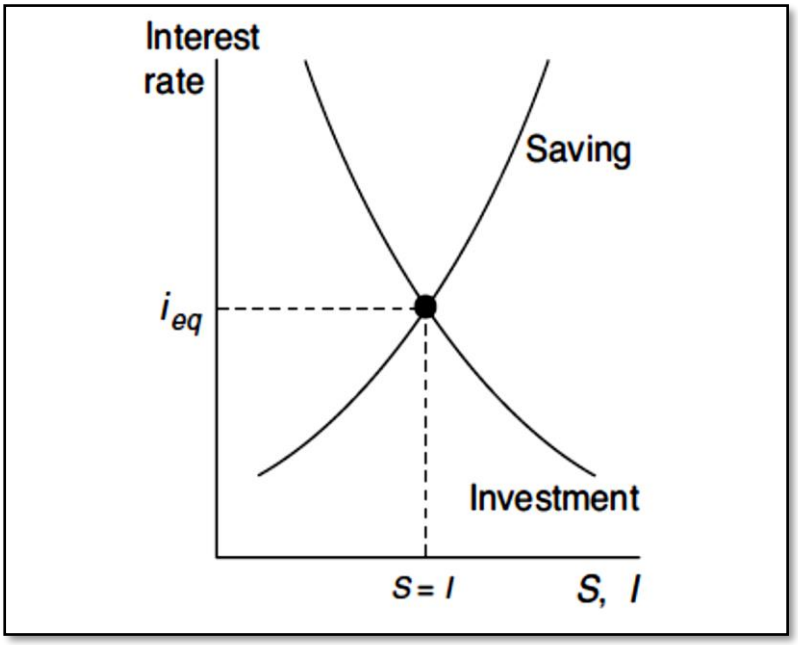
Mishkin (2001) supports the McKinnon and Shaw hypothesis by arguing that private institutions have an incentive to minimise the problem of adverse selection and moral hazard issues due to the fear of making less profit, a series of bad debts and going bankrupt. So they can lend funds to those with the ability to pay back or those with high-yield investments. Governments have less incentive to solve the adverse selection and moral hazard issues, since they do not seek to make the highest profit possible. In most cases, state-owned banks are not profit-driven and so often make less profit and have the most non-performing loans.

The Austrian school of thought also echoes the views of McKinnon and Shaw that interest rates in an economy should be determined by market forces. The Austrians advocate that interest rates should be determined in the market for loanable funds, which includes the supply and demand for funds (Oppers, 2002). The supply of loanable funds constitutes savings by individuals and corporations (Snowdon & Vane, 2005). An increase in cash holdings that are not consumed may be regarded as savings, as this constitutes income that is not consumed, but this does not represent an increase in the supply of loanable funds and so is excluded from the analysis (Snowdon & Vane, 2005). So the supply of loanable funds represents that part of savings that is channelled to financial intermediaries like banks.

The demand for loanable funds originates from the willingness of businesses to use the savings for investment purposes (Snowdon & Vane 2005). The greater the willingness to invest in plant and equipment, the greater is the demand for loanable funds. The interest rate is responsible for the coordination of the demand and supply of loanable funds and is often referred to as the natural rate of interest (Garrison, 2001). Figure 3.1 outlines the loanable funds market.

An increase in the supply of loanable funds would result in a shift of the savings curve to the right, indicating that there is a greater supply of resources that can be used for investment purposes, thereby reducing the interest rate (Garrison, 2001). This would encourage businesses to invest as the borrowing cost would be lower.

Figure 3.1: The loanable funds market



Source: Snowdon & Vane (2005)

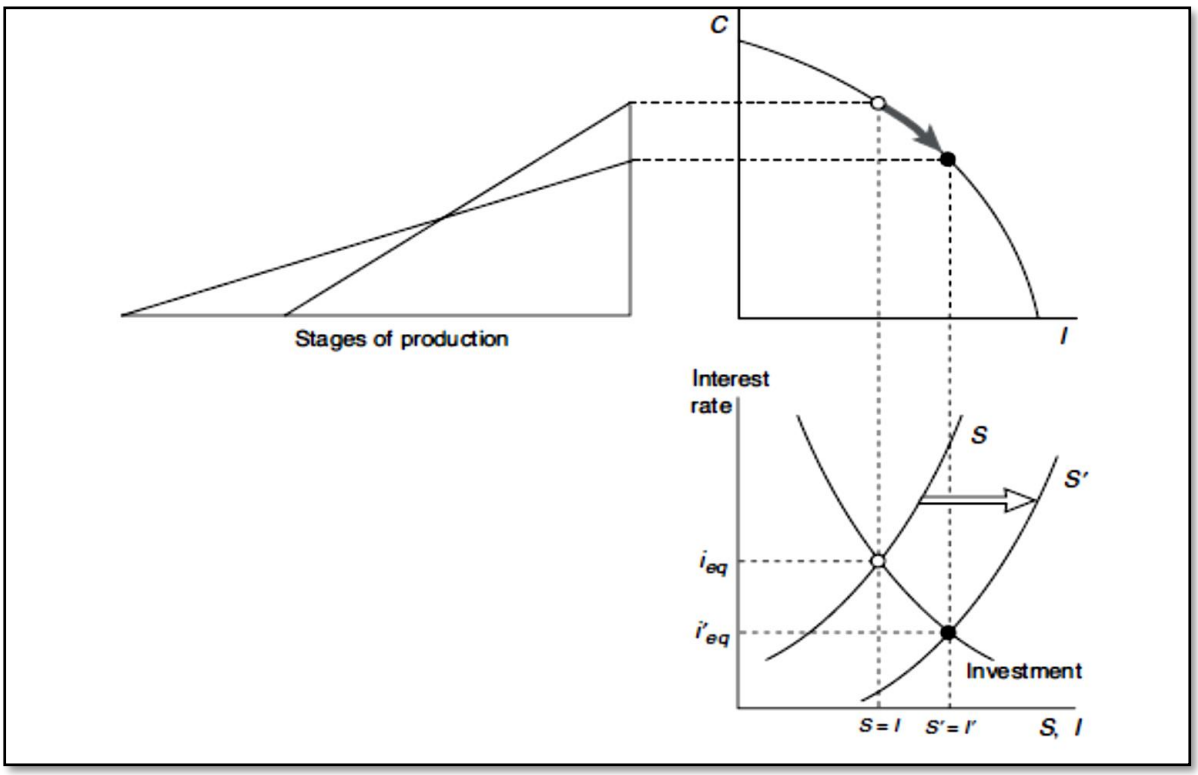
The discussion above ignored the effect of resource constraints on the economy's ability to undertake investment activities (Snowdon & Vane, 2005). The resource constraints can be represented by a production possibilities frontier (PPF) which indicates the number of investment activities that can be undertaken given the resources in an economy, as shown by Figure 3.2. An economy can operate on its PPF if resources are used efficiently, and inside the PPF if resources are not used efficiently (Garrison, 2001). The economy cannot operate outside its PPF, as this requires more resources.

The horizontal axis of a PPF represents gross investments, while the vertical axis represents consumption (Snowdon & Vane, 2005). If gross investment is greater than capital depreciation in the economy, economic growth would occur, so shifting the PPF outwards. If gross investment is equal to capital depreciation, no economic growth would take place. Fredrick Hayek modelled the production activities in an economy as a sequence of inputs and outputs using a right-angled triangle (Hayekian triangle) (Garrison 2005). Output in one stage represents an input in next stage of production. The horizontal axis of the Hayekian triangle outlines the production time, while the vertical axis represents the value of consumable goods produced (Snowdon & Vane, 2005). This is shown in Figure 3.2.

An increase in savings in the economy would result in a shift of the supply of the loanable funds to the right, thereby reducing the natural rate of interest (Garrison 2005). A reduction in the interest rate results in an increase in the demand for funds for investment purposes, as borrowing costs would be lower. The increase in savings causes a reduction in consumption as shown by the PPF, but due to the rise in investments, the economy remains on the PPF (Snowdon & Vane, 2005).

Due to the reduction in the demand for current consumable output, the prices of inputs in the late stages of production are reduced (Snowdon & Vane, 2005). The prices of inputs of in the early stages of production are increased because of the reduction in borrowing costs. Resources would thus be shifted from the late stages of production to the early stages in response to the changes in the input prices (Garrison, 2001). The changes are represented by the change in the slope of the Hayekian triangle's hypotenuse. This capital restructuring, caused by a rise in the savings rate, would result in an increase in the output of consumable goods and services, and eventually the PPF would shift outwards to represent an economy experiencing secular growth (Snowdon & Vane, 2005).

Figure 3.2: Savings-induced capital restructuring



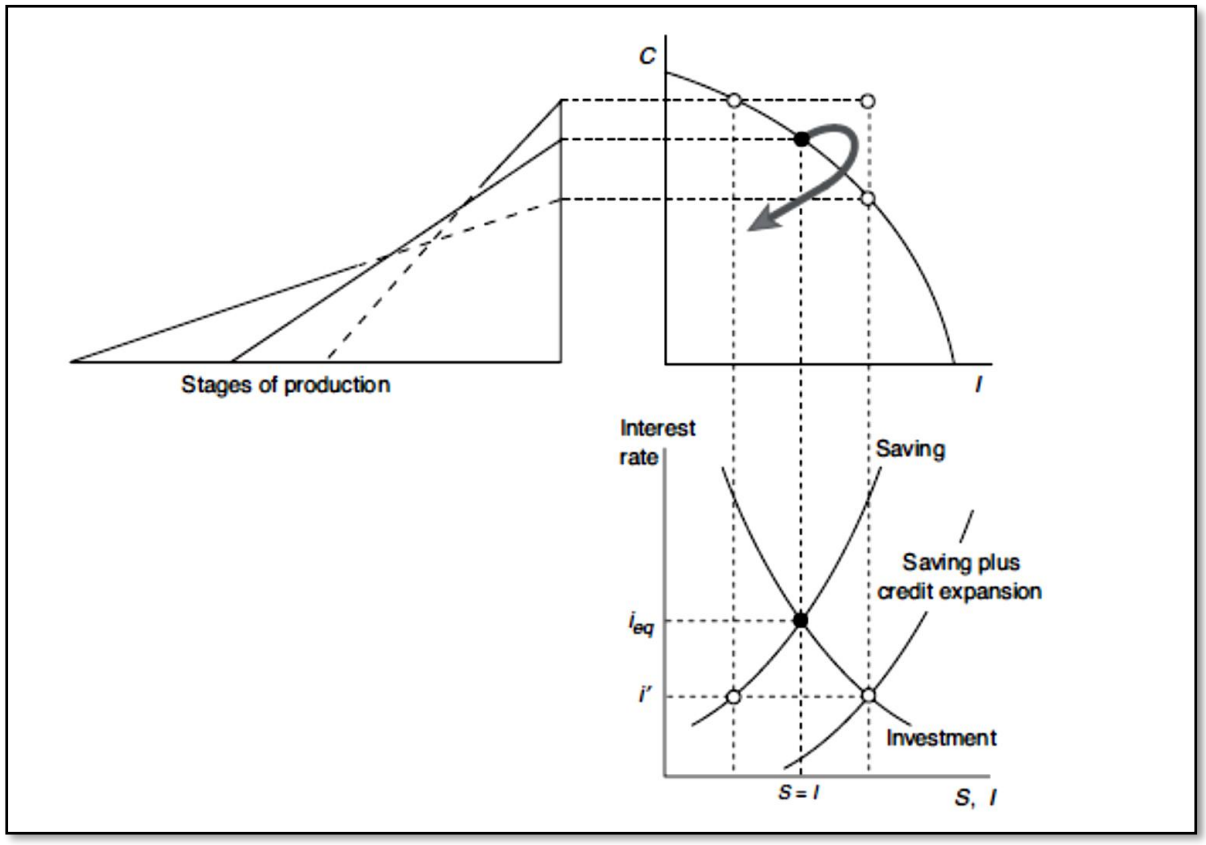
Source: Snowdon & Vane (2005)

The Austrians argue that market forces have the capability of allocating resources efficiently with the aid of an interest rate determined by market forces (Oppers, 2002). Interest rates that are influenced by external forces like central banks distort the allocation of resources in an economy. The Austrians argue that financial crises are caused by central bank interventions in the setting of interest rates (Snowdon & Vane, 2005). This proposition is referred to as the Austrian business cycle – it is a theory of how external forces initiate a boom in the economy and a bust that occurs as the market forces attempt to correct the process.

A boom caused by a rise in savings is genuine and requires no self-correction from market forces (Templeman, 2012). However, a boom resulting from the intervention of central banks is artificial and often results in financial crises, as low interest rates encourage producers to lengthen production processes when there are inadequate savings (Snowdon & Vane 2005). This process is illustrated diagrammatically in Figure 3.3. Initially there is no growth in the economy, with an equilibrium interest rate of i_{eq}. An intervention by central banks which results in interest rates that are below the natural rate causes an artificial boom, as the supply of loanable funds is augmented by the aid of an expansion in credit (Garrison 2001). This expansion in credit and the resultant decrease in interest rates results in disequilibrium in the economy, as savings would decrease while the demand for borrowed funds would increase. The horizontal distance between the supply of loanable funds and the demand for credit depicts borrowing and investment that is undertaken without sufficient savings (Snowdon & Vane 2005).

The low interest rates cause conflicts between consumers and investors (Snowdon & Vane, 2005). Consumers would be consuming more and saving less, while investors would aspire to invest more and, as result of this conflict, the economy would operate outside the PPF but only temporarily (Kates, 2010; Garrison, 2001). The labour force would expand due to the favourable labour market conditions caused by low interest rates. However, this boom would be turned into a bust due to the changes in the structure of production, as shown by the clashing Hayekian triangles (Snowdon & Vane, 2005). The low interest rates result in excessive production of capital goods and other activities, yet their payoffs are long-term. This excessive allocation to long-term projects is called malinvestment (Bocutoglu & Ekinci, 2010).

Figure 3.3: Policy-induced recession



Source: Snowdon & Vane (2005)

Due to the lack of savings, the economy would be pushed backwards towards its PPF, as shown by the arrow in Figure 3.3 (Snowdon & Vane, 2005). The prices of consumer goods, as well as those of inputs, would increase because of the shortage of savings, and interest rates would rise as borrowers compete for the limited loanable funds. There would be a considerable number of business closures, as most of the businesses created during the period of low interest rates would be unprofitable (Kates 2010). The economy would thus operate inside its PPF as unemployment increases, and this represents the bust in the economy.

The economy could recover from this bust, as market forces work to correct the misallocation of resources (Snowdon & Vane, 2005). Employment would increase, and the economy would return to operating at a point on the PPF. However, expansionary monetary policies conducted by a central bank aimed at combating the recession could prolong the financial crisis or worsen it (Oppers, 2002). So the Austrians recommend that during a financial crisis, central banks should resist the temptation to boost the economy through expansionary monetary policies (Kates, 2010).

3.4 Theoretical arguments against financial liberalisation

The major theoretical critics of the McKinnon-Shaw hypothesis are the Neo-Structuralists, who include Wijnbergen (1983) and Taylor (1983) and the Keynesians, including the New-Keynesians and Post-Keynesians. The Neo-Structuralists argue that interest rate liberalisation results in the reduction of funds in the financial system, while the Keynesians suggest that a rise in the interest rates and the subsequent increase in savings cause a reduction in aggregate demand in the economy, leading to a decrease in economic growth. The New-Keynesians, including Stiglitz and Weiss (1981), Mankiw (1986), Stiglitz (1994) and Arestis and Demetriades (1999), argue that financial markets are prone to market failures, due to imperfect information.

Van Wijnbergen (1983) and Taylor (1983) used Tobin's portfolio theory for household sector asset allocation which states that households have three categories of asset: gold or currency, time deposits and informal market loans. An increase in interest rates on time deposits would encourage households to substitute time deposits for gold or cash and informal market assets. Van Wijnbergen (1983) suggests that the views of McKinnon, Shaw and other authors affiliated with them are based on the assumption that funds shifted into time deposits following a rise in interest rates come from an unproductive asset like gold, cash or commodity stocks. He then argued that it is not clear whether time deposits are closer substitutes to cash, gold and commodity stocks or are closer to loans on the informal markets. Taylor (1983) suggests that time deposits are closer substitutes to loans on the informal market rather than gold, cash and commodity stocks. A study conducted by Van Wijnbergen (1982) on Korea found evidence supporting Taylor's (1983) views.

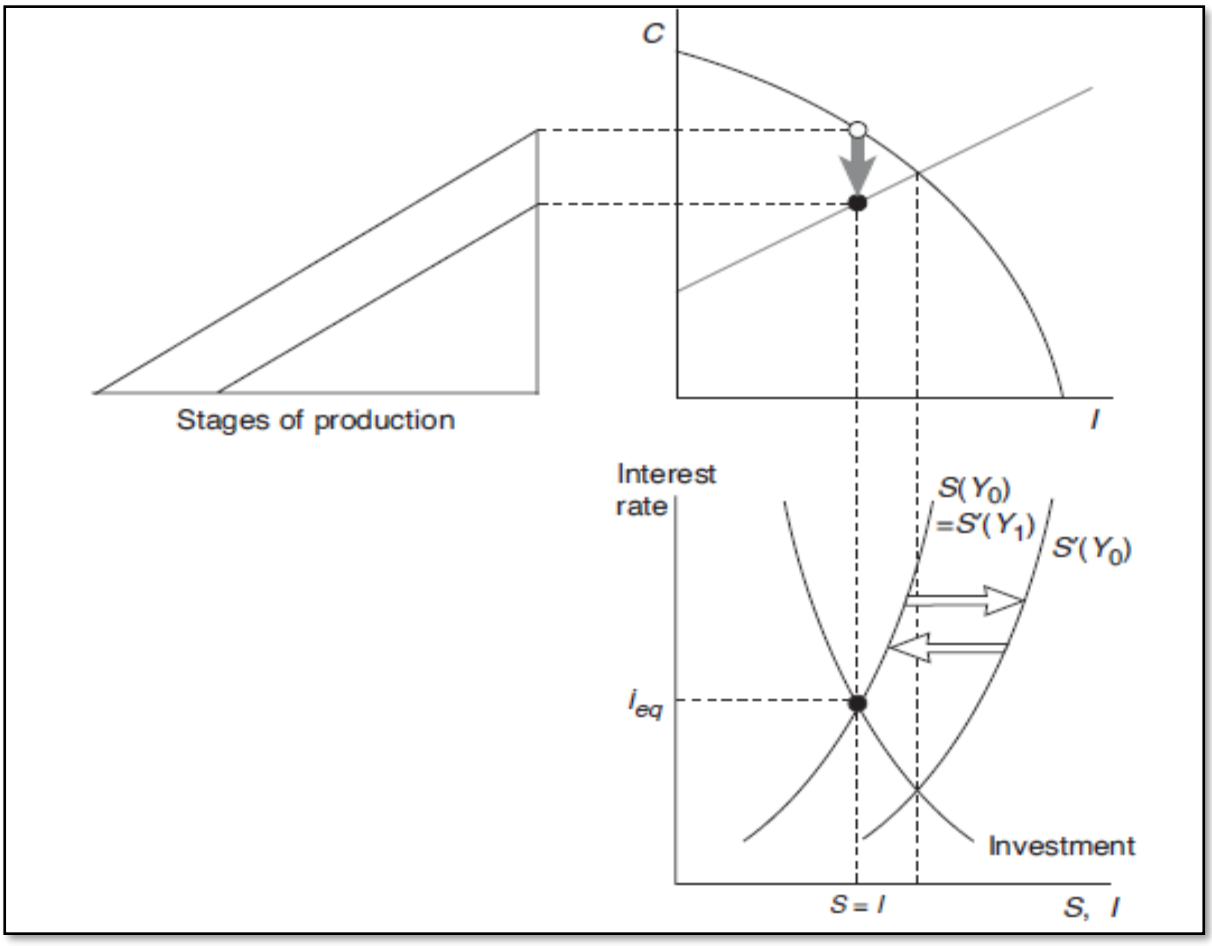
Van Wijnbergen (1983) also argued that following a rise in interest rates, the total supply of funds in the formal sector would decline as funds are shifted from the informal markets. The reason for this decline in funds is that the banking sector is subject to reserve requirements, as opposed to the informal sector. The greater the reserve requirements, the fewer would be the available funds for borrowing purposes. Taylor (1983) is in agreement with Van Wijnbergen's views (1983) and argues that an increase in bank deposits following a rise in the deposit rate will have a positive effect on the available credit only if the increase in bank deposits occurs due to a shift of funds from unproductive assets. Taylor (1983) went further and argued that an increase in savings results in a reduction in aggregate demand, which in turn causes a contraction in the economy. This view is in line with the Keynesian viewpoint.

Van Wijnbergen (1983) and Taylor (1983) assume that the efficiency of investments is similar whether loans are financed by the banking sector or the informal market. This view contrasts with that of McKinnon (1973) and Shaw (1973), who suggest that the efficiency of investments is lower if the loans are financed by the informal market as compared with the banking sector.

The Keynesians argue that investments are the main driver of economic growth, not savings (Keynes, 1936). Therefore, interest rates should be kept low or negative to reduce the cost of borrowing and promote investments. Keynes (1936) argued that saving is the amount left over after consumption spending, which is dependent on income. Despite low and/or negative interest rates, households would still save as interest rates have no (or minimal) effect on savings, and increasing the rate of interest results in an oversupply of funds which can destabilise the financial system (Snowdon & Vane, 2005). Keynesians also argue that an increase in savings does not result in an increase in investments because movements in the interest rate do not equal savings and investments.

The major argument against the McKinnon-Shaw hypothesis emanating from the Keynesians is that an increase in savings results in a decrease in aggregate demand, which in turn results in a contraction in the economy which could lead to a recession (Snowdon & Vane, 2005). This argument is represented by Figure 3.4 below. The initial savings schedule is $S(Y_0)$ with the income level at Y_0 (Snowdon & Vane, 2005). An increase in savings shifts the savings schedule rightwards to $S'(Y_0)$, which reduces interest rates. The market process that restores equilibrium between savings and investments is prevented from taking place by the income effect which dominates the substitution effect. The increase in savings results in a decrease in spending which in turn reduces the available income for those who sell consumer goods (Garrison, 2001). The demand for inputs that are used to produce consumer goods is also reduced. The reduction in income results in a decrease in savings which shifts the savings schedule leftwards from $S'(Y_0)$ to $S'(Y_1)$, where income Y_1 is less than Y_0. Both savings and investments return to their original levels, but the reduced consumer spending would result in a recession as shown by the economy moving inside its production possibilities frontier (Snowdon & Vane, 2005). The reduction in income or profits for firms that sell consumer goods would in turn decrease investments and, as a result, investments would be lower in an economy with a liberalised financial system as compared with one with a repressed financial system (Dutt & Burkett, 1991).

Figure 3.4: Savings-induced recession



Source: Snowdon & Vane (2005)

The negative effect of a reduction in aggregate demand outweighs the positive effect of an increase in savings due to the perceived lower future profits, which result in a decline in savings, investments and economic growth.

The New-Keynesians argue that credit rationing can still occur in perfectly competitive markets even without government intervention. Stiglitz & Weiss (1981) argue that despite equilibrium in the market for loanable funds, credit rationing can still exist. The two authors begin their argument by stating that when making loans, banks consider the interest rate they receive on the loan as well as how risky the loan is. The interest rate that banks charge has an influence on the riskiness of these loans due to the adverse selection effect, which involves sorting potential borrowers, and the incentive effect, which affects the actions of borrowers. These effects occur because of imperfect information in the loan market. The two authors then argue that borrowers prepared to pay high interest rates may be high risk as they view

their probability of repayment to be low. So as interest rates rise, the riskiness of borrowers increases and so lowers bank profits. As a result, banks have an incentive to ration credit and so not to increase the interest rate to its market clearing level.

Mankiw (1986) presented a model similar to that of Stiglitz & Weiss (1981) and argued that the equilibrium resulting from financial liberalisation is inefficient, so government intervention is warranted. He also argued that changes in interest rates can result in large and inefficient changes in credit allocation. He also suggested that the recommendations provided by Stiglitz & Weiss (1981), that there should be interest rate controls, does not solve the problem of market failure. According to Mankiw (1986) a credit subsidy has the ability to improve market allocation, and restrictive monetary policy can result in a financial crisis.

Stiglitz (1994) argued that financial markets are prone to market failures and thus certain forms of government intervention are necessary to improve the functioning of the economy. He argued that economies have imperfect information and incomplete markets and thus are not Pareto-efficient. As a result, there are possible government interventions that can make all individuals better off. The removal of any barriers to entry will not result in fully competitive markets due to the existence of costly information. He also argued that financial repression has a positive effect on the economy by improving the pool of loan applications, lowering the cost of capital and thus increasing firm equity, and increasing the availability of credit in profitable sectors, like exporters, or sectors with high technological spill-overs.

Hellmann *et al* (2000) suggest that a Pareto-efficient outcome can be achieved by financial repression policies including deposit rate controls and capital requirements, and freely determined deposit rates are inconsistent with Pareto efficiency. The authors develop a model of moral hazard problems of banks in a dynamic setting and argued that increased competition in the banking sector encourages banks to invest in inefficient gambling assets that yield high private returns if the gamble pays off, but costs depositors in the case that it fails. Prudential regulation is warranted to force banks to invest prudently. Capital requirements force banks to risk their own capital when investing, and thus encourage efficient gambling. Deposit controls can be used to create franchise value for banks, and if a bank fails in its gambles the franchise value reduces. Banks with high franchise values would invest prudently and so avoid taking gambles.

Arestis & Demetriades (1999) argue that the McKinnon and Shaw hypothesis is based on three assumptions that realistically cannot be met. These assumptions are perfect information,

profit-maximising competitive behaviour by commercial banks and institution-free analysis. Arestis & Demetriades (1999) argue that imperfect information is the norm in financial markets due to unequal or asymmetrical distribution of information between the agents in any financial transaction. Asymmetric information leads to adverse selection and moral hazard issues. The two authors also argue that banking sectors in many developing countries are not perfectly competitive and thus large spreads between lending and deposit rates would occur as a result of financial liberalisation. Asymmetric information could also result in imperfect competition, even if the number of banks is high. They also argued that McKinnon (1973) and Shaw (1973) ignored the issue of institutions like bank supervision and central banks. Due to weak institutions and poor regulatory framework, financial liberalisation results in financial crises like those that occurred in Latin America and Asia. This view is line with the recommendation of the Post-Keynesians. The McKinnon and Shaw hypothesis also failed to address the issue of stock markets which result in financial instability, especially in developing countries.

The Post-Keynesians argue that the supply of bank credit is not exogenous, as suggested by the McKinnon and Shaw hypothesis, but rather endogenous (Odhiambo, 2011). If banks can create credit without a subsequent increase in deposits, credit in the financial sector would remain unchanged even in the event of an increase in savings. They also argue that an increase in real interest rates leads to stagflation due to the high costs of borrowing, a reduction in aggregate demand which is the main driver of an economy, and causes financial stability (Gibson & Tsakalotos, 1994).

The Post-Keynesians also argue that the financial liberalisation thesis of McKinnon (1973) and Shaw (1973) omitted the role of institutions like the state, firms, banks and trade unions, which collect information and reduce uncertainty in financial markets (Sarialioglu-Hayali, 2000). They also argue that developing countries should supplement financial liberalisation policies with the development of institutions so as to improve relations between economic agents (Gibson & Tsakalotos 1994). Without the development of institutions, financial liberalisation policies would have a negative effect on savings, investments, inflation and economic growth.

Despite the arguments against it, the financial liberalisation hypothesis continues to be an issue of debate because of its links to savings, investments and financial development which are crucial for economic growth. Furthermore, if implemented in an environment with high

levels of institutional quality, financial crises will be mitigated. This is discussed in detail in the next section.

3.5 Interest rate liberalisation and financial crises

Criticism of financial liberalisation discussed in the previous section highlights that reforms in the financial sector should be undertaken with caution since they increase the risk of financial crises. This is true for developing countries, which are characterised by low levels of institutional quality (Spratt, 2009).

Financial liberalisation increases a country's exposure to international shocks and results in an increase in capital flight, so when considering the benefits of financial liberalisation, the possibility of financial crises should be taken into account (Tswamuno *et al*, 2007). Capital inflows caused by financial liberalisation can affect countries' trade balances by causing an appreciation of the domestic currency. An appreciation of the currency would result in a decrease in the demand for exports, which in turn would result in balance of payments problems. Rapidly rising capital inflows can also result in an increase in consumption, which can cause a rise in the inflation rate and current account deficits. Capital inflows in a country with an underdeveloped financial system can cause a rapid increase in bank lending, which can in turn result in a financial crisis if the lending is to unworthy candidates (McLean & Shrestha 2002).

Liberalisation of financial markets usually results in the relaxation of bank supervision and regulation, which in turn results in irresponsible practices by banks. These imprudent bank practices, coupled with credit insurance, result in lending to individuals who are not creditworthy. This lending boom can result in an increase in non-performing loans caused by banks' inability to check the credit-worthiness of borrowers and monitoring the loans effectively (Fowowe, 2013). Non-performing loans increase the likelihood of banking crises.

The major causes of banking crises are macroeconomic instability and structural weaknesses in an economy (Mezui, Nalletamby & Kamewe, 2012). Macroeconomic instability results from fiscal and current account deficits, currency devaluations, high inflation and high interest rates. Structural weaknesses emanate from weak regulatory and supervisory frameworks, a significant proportion of government or state ownership of banks, an increase in banking competition which reduces the franchise values of banks, and high non-performing loans (Mezui *et al*, 2012). The other cause of banking crises is financial liberalisation, which is as-

sociated with moral hazard problems and a rise in capital inflows (Arestis & Demetriades, 1999). Financial liberalisation is also related to the major causes of both macroeconomic instability and structural weaknesses in the economy.

Financial liberalisation has been criticised by a number of economists and adjudged to be the main cause of the East Asian financial crises of 1997-'98 and the 2008 global financial crisis (Arestis & Demetriades, 1999). On the other hand, financial repression policies like interest rate controls and excessive state ownership of banks may also cause financial crises. A sound regulatory and supervisory framework reduces the likelihood of financial crises (Mishkin, 2001).

This section discusses the relationship between interest rate liberalisation and financial crises. In what follows, a discussion of how financial liberalisation and in particular interest rate liberalisation results in financial crises is provided, as well as how a sound regulatory framework reduces the likelihood of financial crises. This is followed by a discussion of the link between financial liberalisation and the Asian financial crisis, as well as the 2008-'09 global financial crisis.

3.5.1 Interest rate liberalisation and risky lending

Financial liberalisation, and in particular interest rate liberalisation, encourages banks to take a more expansive approach in lending activities due to higher interest rates (Misati & Nyamongo, 2012). The number of risky and low return projects increases as the prospect of earning more returns entices banks to relax their monitoring or screening mechanisms (Angkiand, Sawagngoenyuan & Wihlbong, 2010). The increase in interest rates resulting from interest rate liberalisation causes financial instability in an economy, as borrowers with higher credit risks would be willing to borrow, compared with those with lower credit risks (Mishkin, 1997). The possibility of financial institutions, like banks, lending to borrowers with high risks increases with higher interest rates. So banks become vulnerable to banking crises due to adverse selection and the surge in non-performing loans (Misati & Nyamongo, 2012).

The period under financial repression prevents banks from financing risky projects because of the limits imposed on lending rates (Demirgüç-Kunt & Detragiache, 1998). Controls on interest rates limit the profits earned as well as the problems of adverse selection, so preventing banks from financing risky projects. However, controls on interest rates which result in low returns also encourage banks to undertake risky projects in an attempt to earn higher profits

(Snowdon & Vane, 2005). This view is suggested by the Austrian school of economics, which argues that low interest rates recorded in the United States in the early 2000s were the major cause of the 2008 global financial crises.

3.5.2 Interest rate liberalisation and bank competition

Daniel & Jones (2006) developed a model which outlined how financial liberalisation increases the likelihood of banking crises. The immediate period after financial liberalisation is characterised by low levels of capital stock and high marginal productivity of capital. Following financial liberalisation policies, foreign banks enter the market and at the initial stage lend at high interest rates so as to discourage projects with low returns. Returns earned by banks would be high as a result of higher interest rates and risks are low at this period. After the initial period, the capital stock increases, which in turn reduces its returns. Foreign banks become more experienced in the economy, so foreign debt becomes less costly. Interest rates on loans decrease, thereby encouraging both domestic and foreign banks to undertake riskier projects so as to preserve their competitive advantage.

The entry of new banks and financial institutions following the liberalisation of the financial sector reduces the profits earned by banks as well as their franchise values, which encourages them to undertake risky projects in an attempt to earn more profits (Demetriades, Fattouh & Shields, 2001). Entry of new banks into the financial sector also increases the bidding for bank deposits, so causing a further rise in interest rates (Chowdhury, 2010). Banks pass this rise in deposit rates to borrowers through higher lending rates, which attract borrowers with greater risks. The increase in bank competition following the liberalisation of the financial system decreases the franchise values of banks, which in turn makes banks less incentivised to avoid risk (Demetriades *et al*, 2001). The erosion of monopolistic profits due to the entry of new banks reduces the costs of insolvency, like losing a banking licence, and so encourages banks to finance risky investment projects (Demirgüç-Kunt & Detragiache, 1998).

The traditional view on the relationship between bank competition and financial stability suggests that an increase in bank competition has a negative effect on financial stability, as the diminishing franchise values of banks encourage them to take more risks in their lending in an attempt to earn higher returns (Cubillas & Gonzalez, 2014). However, there is another view on the relationship between bank competition and financial stability which suggests that the increase in bank competition fosters financial stability if banks charge lower interest rates to borrowers, as risks would be reduced (Boyd & De Nicolò, 2005). This view assumes that

the increase in the number of banks and other financial institutions prevents excessive lending rates, as borrowers have a wide range of lenders to choose from. A concentrated banking sector with a small number of banks could result in collusion, with borrowers forced to pay higher interest rates.

3.5.3 Interest rate liberalisation and moral hazard issues

The availability of implicit or explicit government bailouts in the event of a crisis makes the banking system more prone to crises due to moral hazard issues (Daniel & Jones, 2007). Government bailouts encourage banks to fund riskier projects than they would if such bailouts were not available. Government guarantees to deposits, or deposit insurance, often reduce the liability of banks when bad debts emerge (García-Páez & DelaCruz, 2012). Because of these government guarantees, banks engage in risky lending by financing risky projects and often relax some of the standards set in terms of screening borrowers and monitoring loans made.

The reduction in bank franchise values due to interest rate liberalisation, and the removal of barriers to entry in the banking sector, could contribute to moral hazard problems (Demirgüç-Kunt & Detragiache, 1998). Furthermore, the prospect of making high returns from higher interest rates exacerbates moral hazard problems by encouraging banks to lend to borrowers without adequately assessing the riskiness of the borrowers (Demetriades *et al*, 2001). Financial liberalisation coupled with implicit deposit insurance causes a surge in lending, which could have a negative effect on the banking sector in the long run if the rate of defaults on loans increases.

3.5.4 Interest rate liberalisation and bank balance sheets

Interest rate liberalisation often increases the volatility of nominal interest rates, which may have a negative effect on the ability of banks to perform one of their functions, that of borrowing short and lending long, so deteriorating the bank's balance sheets (Demirgüç-Kunt & Detragiache, 1998). Banks borrow short and lend long so as to make profits and so have more long-term assets than short-term liabilities (Mishkin, 1997). A rise in interest rates reduces the value of long-term assets and increases the value of short-term liabilities. The drop in the value of longer-duration assets outweighs the increase in the value of short-term liabilities, so decreasing the net worth of those banks (Mishkin, 1997). The rise in bad debts resulting from non-performing loans also causes a deterioration of bank balance sheets.

Lending booms initiated by capital inflows also increase the risk of banking crises by widening the maturity mismatch between banks' assets and liabilities, as well as increasing the risks associated with movements in exchange rates (Demetriades *et al*, 2001). Short-term capital inflows denominated in foreign currency, coupled with long-term loans made by banks in the domestic economy, result in bank balance sheets with long-term assets and short-term liabilities, which in turn increases the risk of banking crises, especially if capital inflows are reversed. The reversal of capital inflows depreciates the currency and increases the costs of clearing the banks' liabilities (Demetriades *et al*, 2001).

3.5.5 Interest rate liberalisation, banking and currency crises

Evidence has revealed that there is a link between currency and banking crises in emerging and developing countries (Kaminsky & Reinhart, 1999). Countries like Thailand, Indonesia, Korea, Chile, Finland, Mexico, Norway and Sweden experienced both types of crises at the same time. One view suggests that the causality runs from banking crisis to currency crisis, as maturity mismatches and currency disequilibriums in the banking sector are among the major factors that initiate currency crises (Mezui *et al*, 2012).

Another view suggests that currency crises usually precede banking crises (Cubillas & Gonzalez, 2014). The increase in domestic interest rates following interest rate liberalisation, coupled with the removal of capital controls, increases capital inflows in search of higher returns. Domestic banks might be encouraged to raise foreign currency funds abroad and lend to domestic borrowers due to the higher domestic interest rates (Cubillas & Gonzalez, 2014). This exposes such banks to foreign exchange rate risks as devaluation or depreciation of the domestic currency could reduce the franchise value of the banks if a significant amount of their liabilities are in foreign currency. It also sheds light on how currency crises often precede banking crises (Cubillas & Gonzalez, 2014; Kaminsky & Reinhart, 1999).

Stoker (1994) also argued that banking crises result from balance of payments problems, such as an increase in foreign interest rates during a period when an economy is seeking to maintain a fixed parity. Capital outflows increase in search of higher returns in an economy with higher interest rates, which in turn could result in a credit crunch and bankruptcies.

3.5.6 Interest rate liberalisation and the regulatory environment

Despite the proposed benefits of financial liberalisation, like encouraging capital inflows which supplement domestic savings, lower the cost of capital and foster high levels of invest-

ment and economic growth, many critics argue that it exposes banks to financial risks due to its association with weak regulatory and supervisory frameworks and inexperience of banks in operating in a liberal financial environment (Mishkin, 1997; Mezui et al, 2012). A surge in capital inflows in a banking environment that is not effectively managed and supervised increases the risk of banking crises due to the rise in risky banking lending. Lack of a sound and effective regulatory and supervisory framework also has a negative influence on the balance sheets of banks, as it fails to prevent excessive lending on the part of banks (Mishkin, 1997).

Prudent practices, like monitoring the credit-worthiness of borrowers, are often relaxed as banks focus more on earning higher returns (Angkiand *et al*, 2010). Another reason why bad debts increase is that banks might not have the skills or managerial expertise to evaluate and monitor risky projects (Chigumira & Makochekanwa, 2014). The skills that were required to operate a bank in the period of financial repression might be redundant or outdated. As mentioned above, the prospect of earning higher profits as a result of relaxation of controls on interest rates encourages the entry of new banks into the banking sector. However, most of the new banks often lack the expertise required to operate in such a liberalised environment and the growth in the banking sector is often initiated before major reforms in regulation and supervision (Demirgüç-Kunt & Detragiache, 1998). Bank failures thus become the norm as the lack of expertise and weak regulation and supervision encourages excessive risk-taking in bank lending.

According to Mishkin (2001), in order for financial liberalisation to reduce the likelihood of financial crises, these institutional/governance prerequisites should be in place:

1. Adequate prudential supervision
2. High accounting and disclosure standards
3. Effective legal and fiduciary system
4. The facilitation of market-based discipline through entry and exit policies and competition policies
5. The reduction of the role of state-owned financial institutions
6. Elimination of too-big-to-fail in the corporate sector

The probability of financial crises after financial liberalisation is low if the level of institutional development is high in a country (Galindo *et al*, 2002). Financial liberalisation requires

improvements in the domestic economic governance framework so that it is in line with international standards, especially in developing countries, and the adoption of a system of prudential regulation and supervision (Walter, 2002). Such a framework could, for example, include mechanisms that ensure that borrowing is undertaken by individuals and companies that can afford to pay back the borrowed funds. A country without such mechanisms would experience a large number of defaults in payment of borrowed funds, which could result in a financial crisis.

On the other hand, a study performed by Lee (2005), on whether financial liberalisation induces regulatory governance reforms, revealed that the probability of regulatory governance reforms increases after partial and full liberalisation. This suggests that financial liberalisation should be implemented without such reforms, as financial liberalisation itself may prompt regulatory governance reforms. The financial liberalisation process may encourage governments to implement regulatory reforms that prevent market failures. Financial liberalisation increases the number of participants in the financial market, including those from other countries (Lee, 2005). This may also put pressure on the government to upgrade the regulatory standards to international levels. The pressure could also come from external sources, like the International Monetary Fund (IMF) or the World Bank.

3.5.7 East Asian financial crisis

Financial liberalisation has been criticised by a number of economists who argue that it was the root cause of the East Asian financial crises of the mid- to late 1990s (Bustelo, 1998; García-Páez & DelaCruz, 2012). Between the 1960s and the mid-'90s, East Asian countries[4] recorded high and sustained economic growth which translated into a high standard of living. During the period 1990-'96, East Asia's share of world gross output and global investments was a fifth and two-thirds respectively. Between 1990 and '96 East Asia had sound macroeconomic fundamentals like GDP growth rates in the region of 6% to 8%, fiscal surplus, single-digit inflation, savings and investment rates above 30% of GDP in all countries (with the exception of the Philippines) as well as large foreign exchange reserves (Hussain, Mlambo & Oshikoya, 1999). The East Asian countries also received a significant amount of capital inflows attracted by low labour costs, high interest rates and an environment that was conducive for investments (Bustelo, 1998). The capital inflows were largely directed at invest-

[4] Hong Kong, Japan, China, Taiwan, Indonesia, Malaysia, Singapore, Thailand and Philippines

ments, as opposed to consumption, and thus assumed to be sustainable (Arestis & Demetriades, 1999).

Prior to the eruption of the crises, some of the East Asian countries suffered from a number of structural weaknesses which could possibly provide an explanation for the financial crises (Hussain *et al*, 1999). Large current account deficits, currency appreciations, rapid expansion of domestic credit and accumulation of foreign debt were experienced in some of the countries in the region (Zhuang & Dowling, 2002). However, despite the large current account deficits, there was sufficient capital inflow required to compensate for them. East Asian countries pegged their currencies to the US dollar and thus had overvalued currencies (Bustelo, 1998). The overvaluation was less than 10%, with the exception of Indonesia and the Philippines, which had currency overvaluations of around 25% from 1993.

From the analysis above, it can be deduced that the East Asian countries did not satisfy the requirements specified by the first-generation and second-generation models of currency crises. The first-generation models of currency crises associated with Krugman (1979) argue that crises are caused by macroeconomic imbalances, like large public sector deficits, which affect the exchange rate negatively as investors assume that the reserves required to maintain the currency peg would be depleted. Second-generation models associated with Obstfeld (1994, 1995) suggest that currency crises are caused by "herding" behaviour on the part of investors who assume that the government's ability to maintain a pegged exchange rate would be severely affected by future deterioration of macroeconomic fundamentals and high costs in terms of high interest rates required. The major causes of the East Asian crises put forward by economists include declining investments returns, banking crises, macroeconomic imbalances, financial liberalisation and reversals of capital inflows due to panics on financial markets (Bustelo, 1998).

Krugman (1997) argued that the East Asian crises resulted from a burst in the financial bubble which had been building due to capital inflows. Capital inflows were directed at speculative assets like real estate, which caused overinvestments in those assets. So investment returns declined when the bubble burst, leading to a substantial amount of capital outflows. So a boom-and-bust cycle was evident in investment and asset prices. Krugman (1998) also argued that banking crises caused by moral hazard issues were responsible for the East Asian crises. Liberalisation of major banking activities and implicit government guarantees encouraged banks to take excessive risks in their lending practices, which in turn resulted in a surge

in non-performing loans and over-indebtedness. Evidence suggests that most financial institutions had political connections, which propelled the notion that the government would protect them in the event of financial trouble.

Imprudent macroeconomic policies, like fixed exchange rates, large current account deficits and excessive growth in credit, were also blamed for the East Asian crises (IMF, 1998; Corsetti, Pesenti & Roubini, 1998). Asian countries had large current account deficits at the onset of the financial crises and, coupled with capital inflows, this resulted in real exchange rate appreciation. All the East Asian countries pegged their exchange rates to the US dollar, a policy which mitigated the risks faced by investors and hence encouraged capital inflows (Hussain *et al*, 1999). The pegging of the exchange rates to the US dollar also resulted in currency appreciations, which in turn made exports uncompetitive in international markets. The current account deficits expanded as a result of the slowdown in export growth, the surge in imports, as well as the investment boom, which widened the gap between savings and investments (Zhuang & Dowling, 2002). Pegging the currencies to the US dollar proved to be one of the major causes of the crises as the US dollar appreciated in 1995, forcing the Asian countries to devalue their currencies, as foreign exchange reserves were insufficient to maintain the pegs (Hussain *et al*, 1999). The rapid growth in domestic credit caused a significant rise in asset prices, an expansion of risky lending and funding of unprofitable projects as result of political pressures and moral hazard issues (Corsetti *et al*, 1998).

Financial liberalisation policies initiated in the early 1990s are regarded as the major cause of the East Asian financial crises (Arestis & Demetriades, 1999). Until the late 1980s, Asian economies had repressed financial systems with controls on interest rates and capital flows, restrictions on the entry of banks in the financial sector, directed credit allocation and government (state) ownership of banks (Bustelo, 1998). In an attempt to reduce the gap between savings and investments, Asian economies deregulated their financial systems by lifting all the financial repression policies. Financial deregulation in East Asia made it possible for banks to lend to domestic firms in foreign currency and allowed domestic firms to borrow abroad (Hussain *et al*, 1999). Domestic firms that borrowed in international capital markets at lower interest rates invested in the domestic economy where interest rates were higher. The lifting of controls on capital flows made Asian economies vulnerable to reversals of capital inflows (Arestis & Demetriades, 1999).

The removal of barriers to entry in the banking sector increased competition, which in turn resulted in a reduction of bank franchise values and lending margins (Chowdhury, 2010). Banks were thus encouraged to engage in risky lending in an attempt to earn more profits. Lending to the property sector increased substantially and thus investment returns reduced due to overinvestment (Chowdhury, 2010). The prices of real estate were also inflated, which initiated a banking crisis when property prices fell. Banking supervision weakened significantly, and so reckless lending surged, which in turn led to a proliferation of non-performing loans (Bustelo, 1998). The major reason for the failure of the financial liberalisation policies was the absence of sound supervisory and regulatory frameworks to monitor dealings in the financial system (García-Páez & DelaCruz, 2012).

Corsetti *et al* (1998) suggested that moral hazard problems in East Asia were evident in corporate, financial and international levels. At corporate level, it was envisioned that troubled financial institutions would be bailed out by the government, so investments were seen as insured. Firms with political connections could borrow easily and so invested in risky projects without considering the risk-return profile of the projects. At financial level, financial institutions were pressured into lending to corporations or individuals favoured by the state, a situation resembling a financially repressed system. Credit extended to corporations and individuals favoured by the state was viewed as less risky because of the assumption that it was guaranteed by the government. At international level, moral hazard problems resulted from the bailouts in Mexico in 1995 as well as those from the IMF. Asian financial institutions could borrow from international banks which did not conduct major background checks on borrowers, due to the belief that the financial institutions were guaranteed by their governments.

Radelet & Sachs (1998) argued that the Asian financial crises were caused by a surge in capital outflows or reversals of capital inflows, which in turn resulted from panics in financial markets. The panics were often trigged by rational behaviour of investors as they formed expectations about the behaviour of other investors. Investors experiencing financial trouble in one country often ignore economic fundamentals and so treat countries in the same region equally (Bustelo, 1998). Capital inflows into East Asia were attracted by an educated and cheap labour force and high interest rates which were used to maintain the exchange rate peg. Between 1990 and ’96 net private capital inflows to East Asia increased from US$19.3 billion to $108.7 billion, with FDI flows a major component of the capital inflows (Hussain *et al*, 1999). However, during the same period the growth of portfolio flows surpassed the growth in FDI inflows. Portfolio flows are more volatile compared with FDI inflows and are

usually invested for a short period, so increasing the chances of financial crises should there be reversals (Arestis & Demetriades, 1999). During the East Asian crises, the reversal of capital inflows was recorded at almost $100 billion, the bulk of which were bank loans (Hussain *et al,* 1999).

3.5.8 The 2008 global financial crisis

The global financial crisis was caused by the collapse of the mortgage market in the United States (Ramadham & Naseeb, 2009). The collapse of the mortgage market had its roots in the Fed's decision to lower interest rates to 1% in 2001. The reduction in interest rates was done to curb the negative effects of the 11 September attack (known as 9/11) on the growth of the US economy (Bodie *et al,* 2011). The lower interest rates encouraged investors to seek alternative ways of achieving high returns on their investments. The US mortgage market provided investors with the prospect of earning higher yields on their investments, which was then exploited.

During the early 2000s, there was a substantial inflow of funds to the US from China and the Middle East, which resulted in an increase in the amount of credit available (Merrouche & Nier, 2010). This increase in the availability of credit encouraged many US citizens to buy houses on credit by acquiring loans from mortgage lenders like Fannie Mae and Freddie Mac. In a typical mortgage contract, a homeowner borrows money from a mortgage lender to purchase a house and then repays the borrowed amount with interest over a period, for example 30 years (Bodie *et al*, 2011). However, this system began to change as mortgage lenders like Fannie Mae and Freddie Mac began to purchase mortgage loans from other loan mortgage lenders and pooling them into assets that could be traded like any other financial asset (Horwitz, 2012). These pools were dubbed mortgage-backed securities, as they were claims on the mortgages; this practice was called securitisation.

Initially, the mortgage loans were guaranteed by Fannie Mae and Freddie Mac and most of the mortgages were low-risk as households managed to pay the interest as required (Bodie *et al,* 2011). However, credit-worthy applicants started to diminish and as a result, mortgage lenders extended credit to risky applicants who had bad credit histories. The increase in the number of risky applicants resulted in securitisation of loans with high default risk, called "sub-prime" loans (Beachy, 2012). The loans were not guaranteed by the mortgage lenders, so the risk of non-payment by homeowners was borne by investors.

Investors were induced into purchasing sub-prime mortgages by the investment banks, which managed to produce AAA (highest-rated) securities from junk loans (Marshall, 2009). Of these sub-prime loans, 80% were rated AAA and 95% were rated A. As a result, the falsely rated sub-prime loans seemed attractive to investors. Investment bankers managed to create financial instruments called collateralised debt obligations (CDOs), which aimed to focus the credit risk of a number loans on some of the investors and ensuring that the other investors were protected from risk (Howells & Bain, 2008). The investors protected from risk were referred to as the senior tranches, while the other investors were called junior tranches. However, due to the inaccurate ratings created by the credit rating agencies, senior tranches were not devoid of risk (Allen & Carletti, 2009).

Credit default swaps (CDSs) also encouraged investors to purchase sub-prime loans. A CDS is an insurance contract taken by an investor as protection against the default of one or more borrowers in exchange for an annual premium (Marshall, 2009). The CDS issuers, like AIG, issued a substantial number of CDSs without enough capital to back those issues; these CDSs were referred to as naked CDSs. For example, AIG sold more than $400 billion in CDS contracts on sub-prime mortgages. (Bodie *et al*, 2011)

The originating mortgage lenders did not perform thorough checks on the ability of borrowers' ability to repay loans, which this led to an increase in the number of sub-prime loans (Beachy, 2012). The idea behind sub-prime loans was that defaults by some risky applicants would not be a problem as their houses could be sold to other households at a high price since house prices were increasing (Howells & Bain, 2008). From 2004, the ability of homeowners to refinance loans using the value of their houses declined, due to interest rate increases and a decrease in the growth rate of house prices from 2006.

The default rates associated with sub-prime loans were substantial and as a result investment banks had many houses at their disposal, but no buyers for those houses (Horwitz, 2012). This situation of low demand and high supply resulted in a huge decline in house prices. The decline in house prices encouraged prime loan owners to default on their loans as well, as it was worthless to make payments on low-priced houses (Ramadham & Naseeb, 2009). As a result of these defaults, investment banks and investors had in their possession large loans and worthless houses, while mortgage lenders could not find new households to lend to. The whole financial system then collapsed, which led to bankruptcies in firms like Lehman Bro-

thers, Merrill Lynch and AIG, and the closure of financial firms in the US and around the world.

The Keynesians argue that the main cause of the 2008 global financial crisis was insufficient aggregate demand (Kotios & Galanos, 2012). This insufficient aggregate demand was caused by low levels of investment spending as a percentage of GDP, poor macroeconomic management policies, lack of adequate consumption by consumers in general, and a lack of effective systematic regulation (Stojanov, 2009). Low levels of spending resulted in a decrease in employment and a further decrease in incomes.

The Keynesian school of thought also explained the 2008 recession, using the theory on the savings glut and the imperfect capital market (Tridico, 2011). The savings glut was caused by an excess of savings in China and other Asian countries. Excess savings resulted in an increase in production, which in turn led to disequilibrium between aggregate supply and aggregate demand. The imperfect capital market was a result of the increased systematic risk, which was caused by the credit boom and the securitisation of mortgage-backed securities prior to 2008 (Kotios & Galanos, 2012).

Monetarists believe that the economy is stable, as the price mechanism works well to clear the market – provided the government is prevented from manipulating the real interest rate (Hetzel, 2012). Monetarists view the real interest rate as an integral part of the price system, since it is the price of current consumption in terms of forgone future consumption. So the monetary authorities should avoid conducting monetary policies that prevent market forces from determining the appropriate real rate of interest (Hetzel, 2012).

The monetarists suggest that the cause of the 2008 global financial crisis was the Fed's decision to keep money, and hence credit, cheap for a long time (Tridico, 2011). This is referred to as the money glut theory, which contrasts to the savings glut theory proposed by the Keynesians. The monetarists claim that the savings glut theory does not give a good account of the financial crisis because if people save more in Asia, this will be balanced out by an increase in spending in the US and other countries in Europe, and equilibrium will be restored (Tridico, 2011). The Fed reduced interest rates in the early 2000s, which resulted in an increase in the borrowing, especially by households seeking to buy houses (Kates, 2010). The increase in the indebtedness of households and defaults on mortgage payments led to the

collapse of the US financial system, as financial institutions reduced the number of loans they made to the private sector – which represented a reduction in money supply – and hence the global financial crisis.

Another interpretation of the 2008 recession provided by monetarists states that the persistent inflation shock in the US from 2007 onward caused a decline in real incomes and increased headline inflation (Hetzel, 2013). This resulted in low business and consumer confidence, which needed to be offset by a low real interest rate so as to maintain aggregate demand at high levels. The US monetary authorities focused their attention on the likely negative effects of a high headline inflation rate, like rising wage demands, and so increased the repurchase rate. The increase in the repurchase rate, coupled with the Fed's decision not to reduce the funds rate, signified tight monetary policy – which then led to a recession (Hetzel, 2009).

The Austrian school of thought suggests that the 2008 global financial crisis was caused by the Fed's decision to reduce interest rates in the early 2000s, a move which resulted in an expansion of credit in the US (Bocutoglu & Ekinci, 2010). The expansion of credit led to an increase in investments by households in mortgage-backed securities such as houses. The period 2002-'07 was characterised by a boom in residential real estate, but the boom was unsustainable and so was preceded by a bust which had a substantial negative outcome on the US economy and the rest of the world (Templeman, 2012).

The above analysis suggests that interest rate liberalisation has a positive effect on banking crises due to its association with higher interest rates, increases in non-performing loans, relaxation of banking supervision and monitoring, and higher levels of banking competition. However, financial repression policies such as exchange rate controls, high state ownership of banks and low interest rates can also result in banking crises.

3.6 Conclusion

The purpose of this chapter was to discuss theories of financial liberalisation. The chapter also discussed the theoretical arguments for and against the financial liberalisation hypothesis. The study of financial liberalisation was initiated by McKinnon (1973) and Shaw (1973), who argued that government controls on economic activities retards economic growth. McKinnon (1973) suggested that real interest rates must be positive so as to encourage the accumulation of money balances, which is crucial for investments and economic growth.

Shaw (1973) argued that interest rate liberalisation is vital for financial deepening. McKinnon (1973) and Shaw (1973) also maintained that interest rate liberalisation has a positive effect on savings, which leads to higher investment and economic growth levels.

The McKinnon and Shaw hypothesis is supported by authors like Kapur 1976), Mathieson (1980), Galbis (1977), Fry (1980) and Mishkin (2001), as well as the Austrian school, which argued that state control of economic activities should be minimised. On the other hand, the Neo-Structuralists, the Keynesians, New-Keynesians and the Post-Keynesians are of the view that government intervention in an economy is warranted and financial liberalisation would result in financial crises.

Interest rate liberalisation may increase the likelihood of financial crises by encouraging banks to undertake risky lending practices as a result of the opportunity to earn higher returns, more intense competition, moral hazard problems and a deterioration in balance sheets. Interest rate liberalisation is regarded as one of the causes of the 1997-'98 Asian financial crisis, as well as the 2008-'09 global financial crisis. So economies are encouraged to implement a sound regulatory and supervisory framework so as to reduce the likelihood of financial crises. This chapter highlighted that interest rate liberalisation has a positive effect on economic growth through savings and investments, capital inflows and financial development channels. Chapter four discusses growth theories linked to these channels.

CHAPTER FOUR

LITERATURE REVIEW: GROWTH MODELS

4.1 Introduction

Chapter three highlighted that interest rate liberalisation may influence economic growth through channels like savings and investments, financial development and capital inflows. The purpose of this chapter is to review the literature on growth theories, with emphasis placed on the different channels mentioned above. The savings and investment channel has been considered at length by growth models like those of Harrod-Domar, Solow-Swan and Romer (1986). These models emphasise that savings and investments are among the main drivers of economic growth.

Financial development is regarded as another important determinant of economic growth (Levine, 1997). Financial intermediaries play a crucial role in promoting investments, which in turn enhance economic growth. Capital inflows boost economic growth by augmenting investments and encouraging technological advancements. However, it should be noted that under certain conditions, capital inflows may not be growth-enhancing.

The chapter is organised as follows: Section two discusses the models of savings, investments and economic growth, Section three reviews the literature on the effect of capital flows on economic growth, Section four discusses the theories of financial development and economic growth and lastly, Section five concludes the chapter.

4.2 Models of savings, investments and economic growth

The McKinnon-Shaw hypothesis is also supported by models of savings and economic growth like those of Harrod (1939), Domar (1946), Solow (1956), Swan (1956) and Romer (1986). These models suggest that higher levels of savings have a positive effect on investment as well as economic growth. The Harrod-Domar model emphasises the importance of capital accumulation in boosting economic growth. The Solow-Swan model suggests that savings have a short-term influence on economic growth, while the Romer model suggests that savings have a long-term or direct influence on economic growth.

4.2.1 Harrod-Domar model

The publication of Keynes's general theory in 1936 led to a considerable amount of research by economists as they sought to examine long-run growth, which was in contrast with

Keynes's short-run theory. Harrod (1939) and Domar (1946) developed similar models which suggested that investment spending had a positive impact on an economy's productive capacity. For the purposes of this analysis, the differences in the models are ignored and so the model will be referred to as the Harrod-Domar model.

The Harrod-Domar model assumes an exogenous rate of labour force growth (*n*), a given technology exhibiting fixed factor proportions (constant capital-labour ratio) and a fixed capital output ratio (Snowdon & Vane, 2005). The national income equation can be written:

$$Y_t = C_t + S_t \quad 4.1$$

where: Y_t = GDP

C_t = consumption

S_t = savings

Equilibrium in this closed economy can be written thus:

$$I_t = S_t \quad 4.2$$

where: I_t = investment spending

Based on the above equation, the national income equation can be written:

$$Y_t = C_t + I_t \quad 4.3$$

GDP is dependent on consumption and investment spending (Snowdon & Vane, 2005). Investments in capital are required for economic growth, and the evolution of the capital stock over time can be written as follows:

$$K_{t+1} = (1 - \delta)K_t + I_t \quad 4.4$$

where: δ = depreciation rate of the capital stock

K_t = the capital stock

The relationship between capital and output is referred to as the capital-output ratio and is defined as follows:

$$v = {}^{K}/_{Y} \quad 4.5$$

where: v = capital-output ratio

The equation for the evolution of capital can be rewritten based on these assumptions:

$$S_t = sY_t \quad (4.6)$$

$$K = vY \quad (4.7)$$

$$I_t = S_t \quad (4.8)$$

The first assumption states that total savings are equal to a fraction of GDP.

The equation for the evolution of capital can thus be written as follows:

$$vY_{t+1} = (1 - \delta)vY_t + sY_t \quad (4.9)$$

The equation can be simplified by dividing through by v and subtracting Y_t from both sides of the equation, so writing it as follows:

$$Y_{t+1} - Y_t = [{}^{S}/_{v} - \delta]Y_t \quad (4.10)$$

Dividing by Y_t results in the following equation:

$$[Y_{t+1} - Y_t]/_{Y_t} = ({}^{S}/_{v}) - \delta \quad (4.11)$$

$[Y_{t+1} - Y_t]/_{Y_t}$ is the growth rate of GDP

Defining G = $[Y_{t+1} - Y_t]/_{Y_t}$, the Harrod-Domar growth equation can be written as follows:

$$G = ({}^{S}/_{v}) - \delta \quad (4.12)$$

The equation states that the growth rate of GDP is dependent on the savings ratio divided by the capital-output ratio (Snowdon & Vane, 2005). The greater the rate of savings and the lower the capital-output ratio and the depreciation rate, the quicker the growth rate in an economy. The Harrod-Domar model thus emphasises the importance of capital accumulation in promoting higher economic growth (Snowdon & Vane, 2005). Capital accumulation is made possible by high savings and investments.

4.2.2 Solow-Swan Model

The equation that describes the production function in the model devised by Solow (1956) and Swan (1956) is written as follows:

$$Y(t) = F\big(K(t), A(t)L(t)\big) \tag{4.13}$$

where *Y* is output, *K* is capital, *L* is labour, *A* is the effectiveness of labour and *t* is time.

The most important assumption of the model is that the production function has constant returns to scale in capital and effectiveness of labour, implying that doubling either of the inputs while keeping *A* constant results in doubling of output produced.

The model can be represented in labour-intensive form as follows:

$$y = f(k) \tag{4.14}$$

where *k* is amount of capital per unit of effective labour (*K/AL*) and *y* is output per unit of effective labour (*Y/AL*).

The marginal product of capital is positive but decreases as capital per unit of labour rises. This condition is outlined by the expression; $f'(k) > 0, f''(k) < 0$. Labour and knowledge grow at constant rates and their growth rates are represented by the following equations:

$$\dot{L} = nL(t) \tag{4.15}$$

$$\dot{A} = gA(t) \tag{4.16}$$

where n and g are exogenous parameters while $\dot{L}$ and $\dot{A}$ represent $\frac{dL(t)}{dt}$ and $\frac{dA(t)}{dt}$ respectively.

Output is split into consumption and investment. The fraction of output attributed to investment, *s*, is exogenous and constant. One unit of output devoted to investment yields one unit of new capital and capital depreciates at a rate of δ. The growth rate of capital is thus represented by this equation:

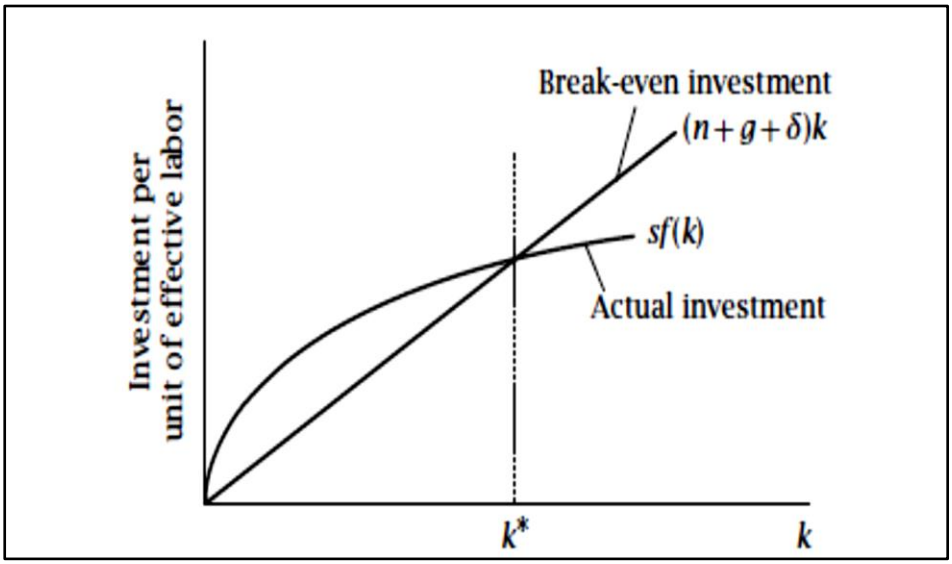
$$\dot{K}(t) = sY(t) - \delta K(t) \tag{4.17}$$

Given that *Y/AL* is equal to $f(k)$, the growth rate of capital can also be written as:

$$\dot{K}(t) = sf\big(k(t)\big) - (n + g + \delta)k(t) \qquad 4.18$$

The first term of the equation $sf\big(k(t)\big)$ is the actual investment per unit of effective labour while the second term $(n + g + \delta)k(t)$ is the break-even investment – the level of investment is required to keep capital at existing levels. When actual investment per unit of effective labour is greater than the break-even investment, capital is rising. Capital is constant when the two terms are equal and decreasing when actual investment per unit of labour is less than break-even investment. This is outlined by Figure 4.1.

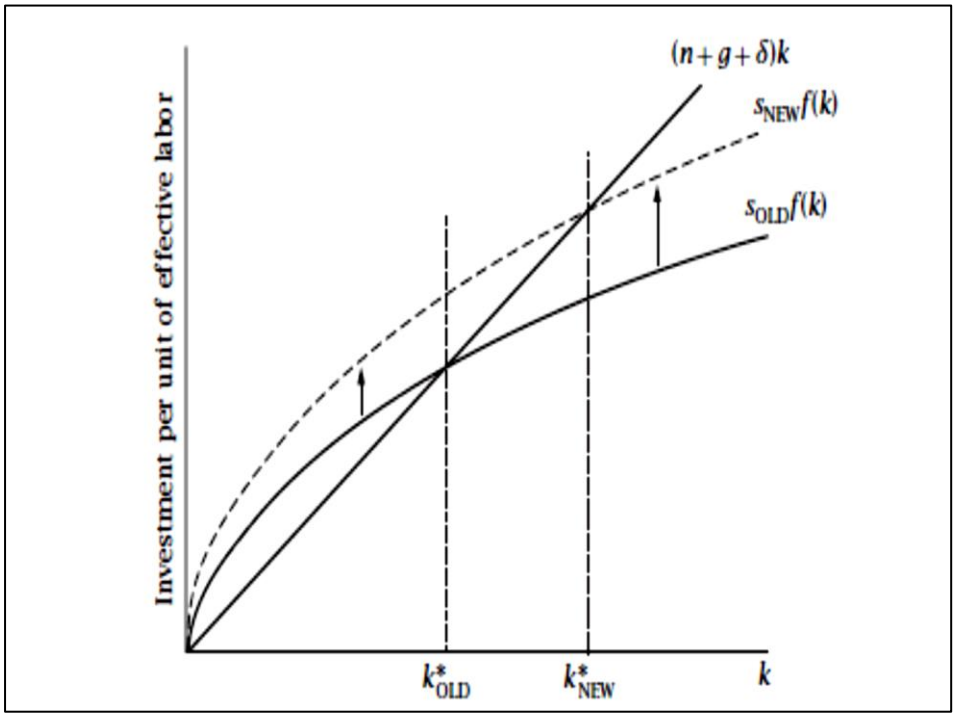
Figure 4.1: Actual and break-even investment



Source: Romer (2012)

The Solow-Swan model implies that the economy converges into a balanced growth path which occurs when all the variables in the model are growing at a constant rate. The growth rate of output per worker is dependent only on the rate of technological progress. An increase in the savings rate shifts the actual investment line upwards, resulting in a rise in capital (k^*). At the original k^*, investment is greater than the break-even investment, so causing a rise in capital (k). Capital rises until a new value of k is reached where it remains constant. The growth rate of output per effective labour also increases until k reaches the new k^* and then returns to its original growth rate. So a permanent increase in the savings rate results in an increase in the growth rate of output per worker, but only temporarily. This is represented by Figure 4.2.

Figure 4.2: The effect of an increase in savings on investments



Source: Romer (2012)

4.2.3 The Romer model

The Romer (1986) model differs from the Solow-Swan model in the sense that technology is endogenised, so a rise in savings results in an increase in both the per capita output and the growth rate of per capita output. The production function in the model is represented as follows:

$$Y = f(K_f K.L) \qquad 4.19$$

where Y represents output, K_f represents the physical capital stock used by all firms in an economy, L represents the labour input and K is the spill-over effect from investment. The model makes the assumption that there are positive returns to all factors of production although they are declining. It is also assumed that there are constant returns to scale in capital, K_i, which is the capital stock in each firm and labour for all firms, but at social level there are constant social returns in K_i and K for a given labour input.

The production function can be written in labour-intensive form as follows:

$$y = {}^{Y}/_{L} = f(K_f, K) \quad 4.20$$

The average product of capital can be represented as follows:

$${}^{Y}/_{k} = f\,{}^{K}/_{k} = f(L) \quad 4.21$$

There are constant marginal costs which can be written as follows:

$$y = Kf(L) \quad 4.22$$

$$Y = K\big(f(L)\big) \quad 4.23$$

$$\frac{\partial Y}{\partial K} = f(L) > 0 \quad 4.24$$

$$\frac{\partial Y^2}{\partial^2 Y} = 0 \quad 4.25$$

The above equations imply that there is no change in marginal product of capital as the capital-labour ratio increases.

The growth rate of capital can be represented as follows:

$$\dot{k} = \frac{sy}{k} - g_L \quad 4.26$$

$$= sf(L) - g_L \quad 4.27$$

Since:

$$\frac{\partial f(L)}{\partial K} = 0 \quad 4.28$$

it follows that:

$$\frac{\partial \dot{K}}{\partial K} = 0 \quad 4.29$$

The growth rate of the capital-labour ratio is not declining, so the growth rate of per capita output is not declining in the capital ratio either. So an increase in savings has a positive effect on the growth rate of the capital labour ratio and per capita output, but the increase in the growth rate would continue indefinitely.

The difference between the model by Solow (1956) and Swan (1956) and the Romer (1986) model is the treatment of the capital stock. In the Romer model the social returns to capital as well as the marginal product of capital are constant, so the investment in capital continues as the capital-labour ratio increases.

4.3 Capital flows and economic growth

There are three main categories of capital flows: foreign direct investment (FDI), foreign portfolio flows and other foreign investments, like foreign loans, deposits between banks, companies and governments (Wesso, 2001). FDI flows are investments in firms where foreign investors have at least 10% voting rights, while portfolio flows include bonds and equities listed on stock exchanges. FDI flows are more resilient to external shocks than other types of capital inflows, while portfolio flows are subject to large reversals during financial crises and then have a negative influence on economic growth (Ahmed, Arezki & Funke, 2005).

Capital inflows are influenced by various factors, like GDP growth, real interest rates, the investment environment, macroeconomic performance, quality of institutions and financial development (Wesso, 2001). An economy with a high economic growth rate receives a significant amount of capital as this indicates high current and future returns, and lower risks (Ahmed *et al*, 2005). Higher real interest rates signify that returns to investments are high and since investors seek the highest possible returns, capital flows would be higher (McLean & Shrestha, 2002).

The investment environment is characterised by the volatility of inflation and exchange rates as well as exchange rate controls (Ahmed *et al*, 2005). Exchange rate volatility has a negative influence on capital inflows, especially those that are directed at export-oriented industries, since it increases uncertainty with regard to the demand for exports. A high and volatile inflation rate increases uncertainty with regard to investment returns due to its negative effect on the real value of domestic assets, and so discourages capital inflows (Wesso, 2001; Ahmed *et al*, 2005). High inflation can also depreciate the domestic currency and fuels capital outflows due to the fear of capital losses in terms of the domestic currency (Wesso, 2001). Capital controls reduce capital inflows by placing restrictions on the movement of capital across borders. These controls limit the repatriation of profits and other capital outflows and so discourage foreign investors from investing in the domestic economy (Ahmed *et al*, 2005).

Developed financial markets attract more capital inflows compared with less developed markets (Ahmed *et al*, 2005). Financial development is a precondition for portfolio inflows and in particular FDI, as it improves access to finance for foreign firms to meet capital requirements. There is a growing strand of literature which suggests that the development of the financial sector is crucial for FDI flows to have a positive influence on economic growth (McLean & Shrestha, 2002). Countries with developed financial sectors extract more benefits from FDI than countries with shallow financial systems. Lack of financial development also limits the number of financial instruments available for investment purposes in the financial markets (Mougani, Rivera, Zhang, Mezui & Kim, 2013).

Economic theory suggests that capital inflows can have a positive influence on economic growth by supplementing domestic savings and investments, and through technological diffusion (McLean & Shrestha, 2002). Barro, Mankiw & Salai-Martin (1995) developed a neoclassical growth model in an open economy where capital is mobile between countries in search of higher returns. The model suggested that capital inflows boost the rate of capital accumulation and also enhance an economy's speed of convergence on its steady-state level of output.

Capital inflows can be used to finance a current account deficit. The determinants of the fluctuations in the current account can be represented by national accounting identities (Olivei, 2000). The starting point involves defining a nation's gross national product in period *t*:

$$GNP_t = Y_t + r_t B_t \qquad 4.30$$

where: Y_t = the country's GDP

$r_t B_t$ = is the net income from abroad which can also be regarded as the ex post return r_t earned on the stock B_t of net foreign assets entering period *t*.

Equilibrium in the economy can be specified as follows:

$$Y_t = C_t + G_t + I_t + NX_t \qquad 4.31$$

where: C_t = private consumption

G_t = government expenditure

I_t = investments

NX_t = net exports

Based on the above identities, the current account can be specified as follows:

$$CA_t = NX_t + r_t B_t = GNP_t - (C_t + G_t + I_t) \quad 4.32$$

Since the difference between a country's gross national product and private and government consumption is national savings, the current account can be written as the difference between savings and investments:

$$CA_t = S_t - I_t \quad 4.33$$

Defining the current account as the difference between national savings and domestic investments is appropriate when analysing international capital flows (Higgins & Klitgaard, 1998). To balance the current account, savings and investments should be equal. If national savings are not sufficient to finance domestic investments, foreign savings are then required to finance the excess investments over savings. A high current account deficit has a negative effect on domestic firms and employment levels in a country as imports displace domestically produced goods (Higgins & Klitgaard, 1998). However, an inflow of capital could allow the economy to make investments that could maintain the level of employment. If domestic savings are greater than investments, the surplus in the current account would be invested abroad as net outflow of capital (Olivei, 2000). However, Feldstein (1992) argues that a current account deficit can be financed by capital inflows in the short run, but in the long run the current account is balanced by changes in investments.

The effect of capital inflows on economic growth through technological diffusion has received considerable attention down the years. Solow's (1957) neoclassical model initiated the analysis of the effect of foreign investments on economic growth through technological advancements. Solow's model was developed by Findlay (1978), who constructed a dynamic model that captures the process of technological diffusion when FDI inflows are incorporated. In Findlay's model the rate of technological progress in the "backward" region is dependent on the degree of openness to foreign investments.

The endogenous growth models of Romer (1990), Grossman & Helpman (1997), Barrel & Pain (1997) and Borensztein *et al* (1998) incorporate the role of technological progress in the production process and conclude that technological progress is an important determinant of economic growth. Romer (1990) argues that technological progress enhances human capital,

which promotes economic growth through higher levels of productivity. Grossman & Helpman (1997) state that FDI promotes competition and innovation that boosts technological progress and productivity. Barrel & Pain (1997) focus on the effect of technological transfers on the rate of technical change and economic growth, and conclude that the rate of technical change is dependent on the rate of direct investments. Borensztein *et al* (1998) propose that FDI results in a reduction in the cost of introducing capital goods. Economic growth in countries that produce fewer capital goods will also be faster, due to the lower cost at which technology can be adopted. The authors conclude that the effect of technological progress on growth is dependent on the levels of human capital.

Capital inflows in the form of portfolio flows often result in a surge in asset prices and an appreciation in the exchange rate in a floating exchange rate regime (Kim & Yang, 2008). The increase in asset prices occurs due to the increased demand for stocks. The increase in stock prices can result in a reduction in the expected rate of return which increases the demand for other assets, like bonds and property (Kim & Yang, 2008). The increase in demand for bonds and property puts upward pressure on their prices. An appreciation of the exchange rate caused by capital inflows increases the demand for imports by making them cheaper, and reduces the demand for exports which in turn has a negative influence on the current account balance (Benes, Guajardo, Sandri & Simon, 2013; Sidaoui, Ramos-Francia & Cuadra, 2011). On the other hand, an appreciation of the currency has the benefit of reducing the cost of imported goods or raw materials, which reduces the cost of production as well as inflation.

On the other hand, capital inflows may not be growth-enhancing and pose a significant amount of concern to policy-makers in developing countries (Benes *et al*, 2013). Under a floating exchange rate regime, capital inflows have a major effect on both the nominal and real exchange rates. A surge in capital inflows results in a sharp appreciation of the nominal exchange rate, while the real exchange rate appreciates if domestic prices are sticky (Sidaoui *et al*, 2011). The appreciation of the exchange rate disadvantages exporters as the prices for their goods increases, which in turn can result in business closures and a deterioration of the trade balance. The trade balance is further worsened by the increase in imports caused by the drop in the prices of imported goods resulting from the appreciation of the exchange rate (Sidaoui *et al*, 2011).

Capital inflows increase the availability of funds for borrowing purposes, which fosters a surge in credit expansion (Sidaoui *et al*, 2011). Credit expansion in an environment character-

ised by a weak regulatory framework may increase the number of non-performing loans, as credit standards are sometimes reduced. Defaults in the repayment of credit results in financial instability in the economy and can result in financial crises. Another concern with regard to capital inflows is the possibility of sudden reversals, which cause a reduction in domestic expenditures and production, real exchange rate depreciation and a drop in asset prices (Benes *et al*, 2013). The concerns regarding capital inflows stem from the experiences of Asian countries during the 1997-'98 financial crisis when capital inflows increased substantially prior to the crisis and resulted in the growth of credit, appreciation of exchange rates and loss of competitiveness, as well as the 2008 global financial crisis.

FDI inflows may retard economic growth under certain conditions. Reis (2001) postulated that despite the positive effect of foreign investments through technological advancements, there is a possibility that they may not boost domestic welfare, as investment returns are repatriated. Furthermore, domestic producers may not be able to operate in the research and development sector, which has a negative effect on national income. The author concludes that foreign investments are welfare-enhancing only when the increase in productivity outweighs the loss of profits. Firebaugh (1992) argues that FDI inflows may not be growth-enhancing, as multinationals repatriate profits rather than invest in the domestic economy and use capital-intensive production processes which have no effect on employment levels. FDI inflows may also crown out, rather than supplement domestic investments.

4.4 Financial development and economic growth

McKinnon (1973) and Shaw (1973) argued that financial repression policies, like controls on interest rates, promote a shallower financial system than one where the financial sector is liberalised, hence having a negative influence on financial development. According to McKinnon (1973), financial liberalisation results in financial deepening as more savers and investors enter the financial system and use financial intermediaries. So the flow of resources between individuals and institutions is more efficient, which in turn encourages savings and increases the availability of funds for capital accumulation. The role of financial development in promoting economic growth is discussed to a large extent by Schumpeter (1912), Greenwood & Jovanovic (1990), Bencivenga & Smith (1991), Saint-Paul (1992) and Levine (1997).

The discussion on the influence of financial development on economic growth was initiated by Schumpeter (1912), who suggested that the availability of credit encourages entrepreneurs to innovate and produce more goods and services. Financial intermediaries arise due to

problems created by information asymmetry. The cost of acquiring information for individual savers and investors is high, which may prevent mutually beneficial exchanges from taking place (Levine, 1997). Also, a financial system performs five broad functions: producing information about possible investments, mobilising and pooling savings and allocating capital, monitoring investments and exerting corporate governance after providing finance, facilitating the trading, diversification and management of risk, and easing the exchange of goods and services (Schumpeter, 1912; Levine, 1997).

4.4.1 Acquiring investment information

The ability of individuals to shift savings to investments is often hindered by the huge costs of obtaining information (Levine, 1997). So savers are discouraged from investing in projects, so increasing the possibility that savings may remain idle. Financial intermediaries have the ability to collect and process information on efficient investments, including the best firms and managers, more effectively than individual savers, which encourages savers to invest (Hassan, Sanchez & Yu, 2011). The quality of investments is thus improved as financial intermediaries invest in profitable and productive firms. Also growth is enhanced, as funds will be channelled to effective managers, so ensuring an efficient allocation of capital (Greenwood & Jovanovic, 1990).

4.4.2 Monitoring investments

Financial intermediaries as shareholders and creditors have the ability to monitor the behaviour of managers with regard to how they use the invested funds at a lower cost than individual savers (FitzGerald, 2006). So managers are compelled to make decisions that maximise profits and firm value, which in turn improves resource allocation. Individual savers are prevented from monitoring the behaviour of firms and exerting corporate governance due to the large information and transaction costs involved (Estranda *et al*, 2010). Without financial intermediaries that monitor managers, savings mobilisation may be discouraged, which in turn reduces investments and economic growth (Stiglitz & Wiess, 1981).

4.4.3 Risk management

Financial intermediaries are crucial for trading, hedging and pooling of risk (Levine, 1997). The two most prominent types of risks are liquidity and idiosyncratic risks. Liquidity risk refers to the ease with which assets can be converted to cash. Information asymmetries create uncertainties with regard to the conversion of assets into cash, which in turn discourages in-

vestments. Developed financial markets enable the trading of financial assets at a low cost and reduce uncertainty. This encourages investors to hold long-term assets in the knowledge that they can easily be converted to cash. So financial development promotes investments in long-term projects – a major determinant of economic growth (Bencivenga & Smith, 1991).

Financial intermediaries also mitigate risks associated with individual firms or projects. By investing in a variety of firms and industries, risk is diversified, which in turn has a positive effect on the allocation of resources and economic growth (Greenwood & Jovanovic, 1990). Through risk diversification, financial intermediaries invest more in high-return projects (Saint-Paul, 1992). According to King and Levine (1993), innovation requires a substantial amount of investments. However they involve a great deal of risk on the part of investors. At the same time, individual savers are risk-averse and so prefer to invest in low-risk projects which have low returns (FitzGerald, 2006). This may prevent investments in risky or long-term projects, which are the main drivers of economic growth. Financial institutions invest in both low-risk and high-risk investment projects, with more funds invested in high-risk projects with higher returns. Also through risk diversification, technological advancements are promoted, which enhances economic growth.

4.4.4 Pooling savings

Financial intermediaries aid in the pooling of savings which can be invested in a variety of projects. This enables individual savers to hold diversified instruments, which in turn boosts liquidity. Also, savings collected are used to create a large pool of funds, which results in higher levels of investments and faster capital accumulation (FitzGerald, 2006; Greenwood & Jovanovic, 1990). The rate of economic growth would thus be higher due to higher levels of investment.

4.4.5 Exchange of goods and services

Financial intermediaries aid in the exchange of goods and services by reducing transaction costs (FitzGerald, 2006). The reduction of transaction costs boosts economic growth by facilitating the specialisation of economic activities by workers. The specialisation of activities also has a positive influence on the ability of workers to produce more goods and services and more technologies (Estranda *et al*, 2010). Specialisation encourages inventions/innovations in production of goods and services.

Financial development is the establishment and expansion of financial institutions, instruments and markets, which has a positive impact on investment and economic growth (Ndebbio, 2004). Financial development improves the efficiency of investments by shifting funds from less productive sectors to more productive ones (FitzGerald, 2006). A larger financial system enables an economy to take advantage of economies of scale due to the significant amount of fixed costs in operating financial intermediaries. An increase in the number of individuals in the financial system enhances available credit for investment purposes and also improves the performance of financial intermediaries (FitzGerald, 2006).

The availability of financial services in rural or poorer communities can also have a positive effect on economic growth as the number of participants in the financial system increases (Estranda *et al*, 2010). The availability of financial services in rural communities can also boost farming production through the increase in funds which can be borrowed for the purchase of high-yield seeds, fertilisers and farming equipment. Rural communities could be encouraged to use those financial services for savings and investment purposes, which would enable them to smooth lifetime consumption and provide a means for coping with negative income shocks. Poverty levels could thus be reduced by enhancing the availability of financial services to poor communities (Spratt, 2009).

Another channel through which financial development can affect economic growth is the stability or lack of it in the financial system (Estranda *et al*, 2010). A stable financial system is characterised by sound financial markets and financial institutions which make an economy resilient to adverse shocks. Financial development also boosts economic growth by providing access to financial services. Lack of finance has a negative influence on investments and business activity. The growth and development of small business enterprises (SMEs) especially depends on the availability of funds for investment purposes. SMEs have an influence on growth through job creation, the production of goods and services and increasing competition in the economy.

4.5 Conclusion

The purpose of this chapter was to review the literature on selected growth theories. The theories discussed stress the importance of investments in promoting economic growth. The savings and investment growth theories highlight the importance of savings in promoting investments. The Solow-Swann model suggests that savings have a short-term effect on economic growth, while Romer (1986) argues that the relationship is long-term in nature.

Capital inflows have a positive effect on economic growth by supplementing domestic investments and enhancing technological progress. In a period of inadequate savings, capital inflows may allow economies to maintain high levels of investments. However, as suggested by Feldstein (1992), the effect of capital inflows on economic growth may be short-term in this regard. Foreign investments may enhance technological progress in the domestic economy, which in turn boosts productivity and economic growth. However, foreign direct investments may under certain conditions not be growth-enhancing. The likelihood of financial crises in the case of reversals and currency appreciations may result from capital inflows which deteriorate the trade balance as exports are reduced. FDI inflows may not be growth-enhancing in countries with low levels of human capital, and multinational corporations are more likely to repatriate profits rather than invest in the domestic economy.

Financial development has a positive effect on economic growth by creating an environment that is conducive for savings and investments. Without financial intermediaries, savings may be idle due to the cost of acquiring information, which discourages investments and economic growth. Chapter five surveys the existing empirical literature on the relationship between interest rate liberalisation and economic growth through the different channels as well as the empirical literature on the impact of interest rate liberalisation on financial crises.

CHAPTER FIVE

EMPIRICAL LITERATURE

5.1 Introduction

Based on the analysis in Chapters three and four, interest rates affect economic growth through a number of channels. These channels include savings and investments, financial deepening, capital flows, exchange rates and inflation and lastly financial crises. McKinnon and Shaw suggest that higher interest rates resulting from interest rate liberalisation encourage savings, which in turn increase the availability of loanable funds for investments (McKinnon, 1973; Shaw, 1973). According to Shaw (1973), interest rate liberalisation is vital for financial deepening, which promotes higher economic growth. Interest rates can have a positive effect on capital inflows in search of higher returns (Wesso, 2001; De Jager, 2012).

Interest rate liberalisation increases the likelihood of financial crises by enhancing risk-taking on the part of banks (Demirgüç-Kunt & Detragiache 1998). On the other hand, interest rate liberalisation could reduce the likelihood of financial crises and promote stability in the banking sector (Triki & Maktour 2012). The purpose of this chapter is to present some of the existing empirical literature on the relationship between interest rate liberalisation and economic growth. The studies selected in this are mostly from developing countries in Asia, Latin America and African countries with only a few from developed countries. Furthermore, the chapter surveys the estimation techniques that can be employed in examining the effect of interest rates on economic growth.

In what follows, Section 5.2 presents the empirical evidence on the effect of interest rate liberalisation on savings, investments and economic growth. Section 5.3 presents a review of some empirical evidence on the effect of interest rates on capital flows and economic growth. Section 5.4 presents empirical evidence on the role played by interest rate reforms in promoting financial development and economic growth. Section 5.5 presents empirical evidence on the relationship between interest rate liberalisation and financial crises, while Section 5.6 identifies the gaps in the existing literature. Section 5.7 surveys the various estimation techniques that can be employed in the study, and Section 5.8 concludes the chapter.

5.2 Interest rate liberalisation, savings, investments and economic growth

This section includes studies that analysed the relationship between interest rates and savings, savings and investments as well as investments and economic growth.

Boskin (1978) examined the relationship between taxation, savings and interest rates in the United States for the period 1929-'69 using the ordinary least squares (OLS) and instrumental variables techniques. Boskin (1978) concluded that savings are highly interest-elastic, meaning that an increase in interest rates has a positive effect on savings. This suggests that higher interest rates resulting from interest rate liberalisation boost savings.

Fry (1978) investigated the effects of money, capital and financial deepening in economic development in selected Asian countries for the period 1962-'72 using the TSLS technique as well as a least squares dummy variable (LSDV) model. Fry (1978) reported that the real interest rate has a positive effect on savings and economic growth, a result which is line with Boskin (1978). In response to Fry (1978), Giovannini (1983) examined the interest elasticity of savings in selected Asian developing countries for the period 1964-'80 and suggested that the effect of interest rates on savings was insignificant, despite using the same empirical approach as Fry (1978).

According to empirical literature studies by Gupta (1986), Athukorala & Rajapatirana (1993), Athukorala (1998), De Melo & Tybout (1986), Warman & Thirwall (1994) and Gupta (1987), the effect of interest rates on savings varies between different geographical regions. To a large extent, interest rates have a positive effect on savings in Asian countries. However for Latin American countries, empirical studies suggest that interest rates have an insignificant effect on savings. Empirical studies on Asian countries include that of Gupta (1986), who examined the relationship between financial development and economic growth in India and South Korea for the period 1960-'81. Using dynamic multiplier analysis, Gupta (1986) found that financial liberalisation had a positive impact on financial development and investments. An increase in nominal interest rates also has a positive effect on private savings, but the effect is larger in India. Athukorala & Rajapatirana (1993) concur with the results of Gupta (1986) when examining the effect of domestic financial liberalisation on the Sri Lankan economy for the period 1960-'87. Athukorala & Rajapatirana (1993) reported that interest rates have a positive effect on savings in the post-liberalisation stage. Athukorala (1998) concluded that higher interest rates promote both financial and total savings in India.

Furthermore, the impact of the higher real deposit rate on investments, outweighs the negative effect of higher real lending interest rate.

As mentioned above, some empirical studies suggest that interest rates have an insignificant effect on savings in Latin American countries. One such study is by De Melo & Tybout (1986), who examined the impact of financial liberalisation on savings and investments in Uruguay for the period 1962-'83 using an instrumental variables model. De Melo & Tybout (1986) concluded that the real interest rate and savings have a positive but weak correlation. In the post-reform period there is no interest rate elasticity of savings. Warman & Thirwall (1994) are in agreement with De Melo & Tybout (1986) when examining the relationship between interest rates, savings, investments and economic growth in Mexico for the period 1960-'90. Using the OLS technique, Warman & Thirwall (1994) found that the real interest rate is positively related to financial savings while total savings and the growth rate are invariant with respect to the real interest rate. Also, the real interest rate is negatively related to investments.

In a study on the relationship between aggregate savings, financial intermediation and interest rates in 22 Latin American and Asian countries, Gupta (1987) concluded that interest rates are positively related to savings in Asia, while for Latin America, interest rates have no effect on savings. Bayoumi (1993) examined the effect of financial deregulation on household savings in the United Kingdom for the period 1971-'88 using the three-stage least squares model. The results suggest that financial deregulation reduced savings by 2.25% on average, while real interest rates have a positive but insignificant effect on savings.

Bandiera *et al* (2000) investigated the effect of financial reforms on savings in Malaysia, Ghana, Zimbabwe, Korea, Indonesia, Turkey, Mexico and Chile for the period 1970-'94. A financial liberalisation index was constructed for each country using principal component analysis, and estimation techniques like the GMM, GLS, OLS and panel cointegration were used. Bandiera *et al* (2000) concluded that financial liberalisation has a positive effect on savings in Ghana and Turkey and a negative effect on savings in Korea, Mexico and Zimbabwe. Furthermore, the real interest rate has an insignificant effect on savings and in the long run affects savings negatively in Ghana and Indonesia. In contrast, Shrestha and Chowdhury (2007) found evidence supporting the McKinnon and Shaw hypothesis when testing the validity of the financial liberalisation hypothesis in Nepal. The authors conclude that the real interest rate has a positive impact on investments through savings.

Ang and Sen (2011) investigated the roles of financial liberalisation and expected pension benefits in influencing private savings in India and Malaysia for the period 1950-2005. Ang & Sen (2011) constructed a financial liberalisation index and applied the ARDL and ECM estimation techniques. The results suggest that the real interest rate has a positive effect on savings in India but is negative towards savings in Malaysia. Also, financial liberalisation has a negative effect on savings in both countries, which is in line with the findings of Bayoumi (1993).

The effect of interest rates on investments in ambiguous. A rise in interest rates has a positive effect on investments by increasing the availability of loanable funds for investment purposes. A similar conclusion is reached by Khan & Hasan (1998) on examining the relationship between financial liberalisation, savings and economic development in Pakistan for the period 1959-'95. Laumas (1990) concurs with the findings of Khan and Hasan (1998) in the examination of the relationship between monetisation, financial liberalisation and economic development in India for the period 1954-'75 using the TSLS technique. The results of Khan & Hasan (1998) and Laumas (1990) are in support of McKinnon's complementary hypothesis.

A rise in interest rates can impact negatively on investments through the rise in borrowing costs. Interest rates may also fail to significantly influence the level of investments. A study by Gelb (1989) investigated the relationship between financial policies, growth and efficiency in 34 countries for the period 1965-'85 using cross-country regressions. The results suggest that the real interest rate is positively related to economic growth through a rise in the efficiency of investments, not the quantity, suggesting that the real interest rate has no effect on the quantity of investments. Rittenberg (1991) examined the relationship between investment spending and interest rate policy in Turkey for the period 1964-'86 using OLS and a switching model. Rittenberg (1991) concluded that for below-equilibrium interest rates, an increase in real interest rates has a positive effect on real private investments. For above-equilibrium interest rates, real interest rates have a negative effect on investments.

Achy (2003), as well as Bandiera, Caprio, Honohan & Schiantarelli (2000) constructed financial liberalisation indices in their respective analysis and report contrasting results. Achy (2003) examined the relationship between financial liberalisation, savings, investments and economic growth in MENA countries using panel data modelling for the period 1970-'98. Achy (2003) constructed two financial liberalisation indices. The first was constructed using interest rates, reserve requirements, bank supervision, pro-competition measures, security of

markets, prudential regulation and capital account openness. The second financial liberalisation index was constructed using financial depth, total liquid liabilities, deposit money, bank assets and private credit. The results revealed that financial depth and financial liberalisation have a negative effect on private investments, while the real interest rate has a positive effect on investments. Also, interest rates have a positive effect on savings and economic growth, while private investments have a positive effect on economic growth.

There is contrasting evidence on the effect of interest rate liberalisation on economic growth. Romero-Á vila (2009) examined the effect of capital account and interest rate liberalisation in EU-15 countries for the period 1960-2007. Using the GMM estimation technique and ANOVA analysis, Romero-Á vila (2009) found that lifting capital controls as well as liberalising interest rates has a positive effect on economic growth. Also, the growth effect of interest rate liberalisation is 0.3% a year. A similar conclusion is reached by Kendall (2000), who examined the relationship between interest rates, savings and economic growth in Guyana for the period 1965-'95 using the two-stage least squares (TSLS) technique. Kendall (2000) found that savings and the real deposit rate are positively correlated. Furthermore, savings and real deposit rates have a positive effect on economic growth. Other studies that report a positive relationship between interest rates and economic growth are those of Achy (2003) and Fry (1978).

Hye & Wizarat (2013) reported that the real interest rate together with financial liberalisation have a negative effect on economic growth in a study of the effect of financial liberalisation on economic growth in Pakistan. Hye & Wizarat (2013) used the autoregressive distributed lag (ARDL) model as well as the ECM, and the period of the study is 1971-2009. The results also suggest that investments has a positive effect on economic growth.

Empirical studies from African countries suggests that on average there is a positive relationship between interest rates, savings, investments and economic growth. Boadi, Li & Lartey (2015) examined whether interest rate liberalisation had an effect on bank deposits in Ghana for the period 1991-2012, using the OLS method. Boadi *et al* (2015) found that interest rate liberalisation had a positive effect on bank deposits. Opoku & Ackah (2015) concur with Boadi *et al* (2015) in a study of the responsiveness of private savings to changes in real interest rates in Ghana for the period 1970-2013. Using the ADF Engle Granger cointegration test and the ECM, Opoku & Ackah (2015) concluded that the real interest rate has a positive and significant effect on long-run savings during the reform period of 1988 to

2013 and pre-reform period of 1970 to 1987. Also, the real interest rate has a positive effect on short-run savings in the reform period, but an insignificant effect during the pre-reform periods. Owusu & Odhiambo (2015) examined the relationship between financial sector reforms and economic growth in Ghana for the period 1969-2008 using the ARDL cointegration test. Owusu & Odhiambo (2015) constructed a financial liberalisation index using principal components and concluded that financial sector reforms had a positive but insignificant effect on economic growth, while an increase in capital accumulation has a positive and significant effect on economic growth.

Kargbo (2010), Mottelle & Masenyetse (2012) as well as Bouzid (2012) examined McKinnon's complementary hypothesis in developing countries. Kargbo (2010) focused on Sierra Leone for the period 1977-2008 using the ARDL model and reported that the real interest rate is positively related to the demand for money balances, and savings have a positive but insignificant effect on demand for money balances. Mottelle & Masenyetse (2012)'s analysis was for Lesotho during the period 1990-2006. Estimation techniques used included the Granger causality test, the Johansen cointegration test and the vector error correlation model (VECM). The results were in support of the McKinnon and Shaw hypothesis, as money and demand and the ratio of savings to gross national income are positively correlated. Also, an increase in the real interest rate increases savings mobilisation. Bouzid (2012) focused on Tunisia, Morocco and Algeria for the period 1973-2003 using the OLS method. The author found that McKinnon's complementary hypothesis holds only for Algeria, where the investment rate is positively related to real money demand and where the real interest rate is positively related to the accumulation of money balances.

Orji, Ogbuabor & Anthony-Orji (2015) investigated the impact of financial liberalisation on economic growth in Nigeria for the period 1981-2012 using OLS, ECM and the Engle-Granger cointegration test. Orji *et al* (2015) constructed a financial liberalisation dummy variable index taking the value of 0 for the years before the reforms and 1 for years after the reforms. The results showed that financial liberalisation and savings have a positive effect on economic growth. Also, the lending rate is positively related to economic growth. In examining the relationship between financial reforms, interest rates and economic growth in Nigeria for the period 1970-2006, Obamuyi & Olaranfemi (2011) concur with Orji *et al* (2015) to a certain extent. Using the Johansen cointegration test as well as the error correction model (ECM), Obamuyi & Olaranfemi (2011) concluded that real deposit and lending rates are positively correlated with economic growth in both the long and the short run. However, savings are

negatively related to economic growth, suggesting that the positive influence of interest rates on economic growth is through another channel. This contrasts with the findings of Orji *et al* (2015), who report a positive link between savings and economic growth.

Orji, Eigbirenmolen & Ogbuabor (2014) examined the impact of financial liberalisation on private investment in Nigeria for the period of 1970 to 2012. Using the Engle-Granger cointegration test as well as the Granger causality test, Orji *et al* (2014) found that the real interest rate and savings have a positive impact on private investments.

5.3 Interest rate liberalisation, capital flows and economic growth

This section includes studies that have examined the relationship between interest rates and FDI and those that have analysed the impact of FDI on economic growth.

Calvo & Reinhart (1996) investigated the evidence of contagion effects in capital flows to Latin American countries for the period 1970-'93 using principal components analysis. Calvo & Reinhart (1996) reported that an increase in real short-term US interest rates has a negative effect on capital flows to Latin American countries and also increases capital outflows. Capital inflows and outflows in larger Latin American countries have an effect on capital inflows and outflows in smaller countries, suggesting the presence of contagion effects. Ahmed, Arezki & Funke (2005) reached a similar conclusion to that of Calvo & Reinhart (1996) when examining the determinants of capital flows to emerging economies. Ahmed *et al* (2005) concluded that higher international interest rates deter FDI inflows to emerging economies. Also, a higher economic growth rate attracts FDI inflows, while financial development attracts portfolio inflows.

Jeanneau & Micu (2002) examined the trends in international bank lending to emerging market countries for the period 1985-2000 using panel data modelling. The results showed that the real GDP growth rate in lending countries is positively correlated with bank lending. There is a positive relationship between real short-term interest rates in the lending countries and bank lending, which contradicts the findings of Calvo & Reinhart (1996) and Ahmed *et al* (2005). Higher economic growth in emerging countries is positively related to bank lending, which confirms the findings of Ahmed *et al* (2005).

Ralhan (2006) examined the determinants of capital flows in Australia, India, Indonesia, Argentina, Brazil, Chile, Mexico and Colombia for the period 1970-1995. Using the OLS and seemingly unrelated regression, Ralhan (2006) reported that there is a positive relationship

between GDP and capital flows, so confirming the findings of Jeanneau & Micu (2002) and Ahmed *et al* (2005). Ralhan (2006) also concluded that foreign interest rates measured by the London interbank offered rate have an insignificant effect on capital inflows in all countries, which contradicts the findings of Ahmed *et al* (2005) and Calvo & Reinhart (1996).

Wesso (2001) examined the dynamics of capital flows in South Africa for the period 1991-2000 using a VAR model as well as an ECM. The results showed that economic growth and the exchange rate adjusted interest rate have a positive effect on capital flows. Aw & Tang (2009) examined the determinants of inward FDI in Malaysia for the period of 1970-2005 using the ARDL, Engle-Granger and Johansen cointegration tests as well as an ECM. Aw & Tang (2009) found that there is a positive long-run relationship between FDI and its determinants, like interest rates and GDP per capita.

Verma & Prakash (2011) examined the sensitivity of capital flows to interest rate differentials in India for the period 1996-2001 using cointegration analysis, Granger causality and a VAR model. Using the difference between 91-day Government of India T-bill and three-month US Treasury bill rates, Verma & Prakash (2011) suggested that net capital flows as a whole are sensitive to interest rate differentials in both the short and long term. However, FDI is not sensitive to interest rate differentials. Ahmed & Zlante (2013) examined the determinants of capital flows to emerging market economies in Asia and Latin America for the period 2002-'12 using panel data modelling. Ahmed & Zlante (2013) found that interest rate and economic growth differentials are positively related to net private inflows and portfolio flows. The results are to a large extent in line with those of Verma & Prakash (2011).

Brana & Lahet (2008) examined the determinants of capital flows in four Asian economies for the period 1990-2007 using panel data modelling, OLS and GLS. The results showed that lower economic growth in OECD countries encourages capital flows to emerging economies. Also, the US federal funds rate is positively related to capital flowing to emerging economies, which contradicts the findings of Calvo & Reinhart (1996) as well as Ahmed *et al* (2005), who suggested that higher international interest rates have a negative effect on capital flows to emerging economies. Yang, Xiong & Ze (2013) examined the determinants of international capital flows to Asian and Latin American countries for the period 1981-2011 using the GMM estimation technique. Yang *et al* (2013) concluded that for Asian countries, FDI flows are positively correlated with domestic growth and negatively correlated with economic growth in developed countries. This result confirms the findings of Brana & Lahet (2008).

GDP in developed countries is positively correlated with FDI flows in Latin American economies, which contrasts with the findings of Brana & Lahet (2008). Also, GDP and interest rates have an insignificant effect on net portfolio investments in both regions, while financial development exerts a positive effect on net portfolio investments in Latin American countries.

Byrne & Fiess (2011) investigated the global and national determinants of international capital flows to 78 emerging and developing countries for the period 1993-2009 using correlation analysis, panel analysis of non-stationarity in idiosyncratic and common components (PANIC), OLS and Bivariate cointegration. The results showed that there is a negative correlation between capital flows and long-term US interest rates, while short-term US interest rates have an insignificant effect on capital flows to emerging economies. Real GDP growth rates in OECD countries have an insignificant effect on capital flows to emerging economies. This contrasts with the findings of Brana & Lahet (2005) and Yang *et al* (2013), who concluded that growth in developed countries has a significant effect on capital flows to emerging countries.

Olaberria (2014) examined the impact of US long-term interest rates on capital flows to emerging economies and reported that higher US long-term interest rates result in lower levels of gross inflows in emerging economies, which confirms the findings of Byrne & Fiess (2011). High growth rates in advanced countries result in higher levels of gross inflows. This result confirms the findings of Yang *et al* (2013). Domestic growth has a positive effect on gross inflows while domestic interest rates have an insignificant effect on gross inflows. Higher US interest rates are also associated with lower levels of gross capital outflows from domestic investors, while domestic interest rates and growth have an insignificant effect on gross capital outflows.

Khan & Hye (2013) examined the relationship between FDI and financial liberalisation in Pakistan for the period 1971-2009 and conclude that financial liberalisation and the real interest rate have a negative effect on FDI. Faroh & Shen (2015) examined the impact of interest rates on FDI in Sierra Leone for the period 1985 to 2012 using the OLS method. The authors concluded that the real interest rate and GDP have an insignificant effect on FDI flows in Sierra Leone.

Bailliu (2000) examined the relationship between private capital flows, financial development and economic growth in 40 developing countries for the period 1975-'95 using GMM

estimations. Bailliu (2000) concluded that capital flows have a positive effect on economic growth for countries with developed banking sectors (high levels of financial development). Agbloyor, Abhor, Adjasi & Yawson (2014) reached a similar conclusion to that of Bailliu (2000) when examining the effect of domestic financial markets on private capital flow and economic growth in 14 African countries for the period 1990-2007. Agbloyor *et al* (2014) reported that capital flows have a negative effect on economic growth in countries with underdeveloped financial markets.

Borensztein, Gregorio & Lee (1998) examined the effect of FDI on economic growth in developing countries in sub-Saharan Africa and Latin America for the period 1970-'89. Using the seemingly unrelated regression techniques as well as the TSLS method, Borenszetein *et al* (1998) concluded that the effect of FDI on economic growth is dependent on human capital. In countries with high levels of human capital, FDI exerts a positive effect on economic growth. McLean & Shrestha (2002) examined the relationship between international financial liberalisation and economic growth in 40 developed and developing countries for the period 1976-'95 using a panel data regression model. The results showed that FDI and portfolio flows have a positive effect on economic growth, while bank flows have a negative effect on economic growth.

Aizenman & Jinjarak (2011) examined the relationship between capital flows and economic growth in more than 100 countries and reported that FDI flows have a positive effect on economic growth, and that the effect becomes large with exchange rate stability and monetary independence. Also, portfolio flows and equity investments have no effect on economic growth. Cavallari & d'Addona (2013) examined the effect of nominal and real volatility in output, interest rates and exchange rates on FDI in 24 OECD countries for the period 1985-2007 using panel data modelling. Cavallari & d'Addona (2013) concluded that interest rate volatility has a negative effect on FDI flows if it originates in the host country. Output volatility is also negatively related to FDI, especially if it originates in the source country. The findings of Aizenman & Jinjarak (2011) and Cavallari & d'Addona (2013) suggest that FDI has a positive effect on economic growth provided there is macroeconomic stability in an economy.

Ahmed and Mayowa (2012) investigated the determinants and effects of FDI in Nigeria for the period 1970-2009 using the VECM model and conclude that interest rates are among the major determinants of FDI inflows. However, FDI inflows have an insignificant effect on

economic growth. Uwubanmwen & Ogiemudia (2016) concur with the findings of Ahmed and Mayowa (2012). When examining the effect of foreign direct investment on economic growth in Nigeria using annual time series data covering the period 1979-2013, the authors conclude that FDI has both an immediate and time-lag effect on the Nigerian economy in the short run, but has a non-significant negative effect on the Nigerian economy in the long run.

Edrees (2015) examined the effect of FDI and the business environment on economic growth in 39 sub-Saharan African countries for the period 1992-2012 using the PMG model. The results indicate that FDI inflows have a negative effect on economic growth in both low- and middle-income countries. Agrawal (2015) assessed the relationship between FDI and economic growth in the five BRICS economies over the period 1989-2012 and concluded that there is a long-run equilibrium relationship between the variables. Furthermore, the direction of causality is from FDI to economic growth.

The relationship between interest rate liberalisation, capital flows and economic growth remains inconclusive based on the above empirical studies. Capital flows are responsive to interest rates in some emerging countries and unresponsive in others. With regards to the effect of capital flows on economic growth, studies show that capital flows have a positive impact on growth under certain conditions. Capital flows have a positive effect on countries with developed financial markets, high levels of human capital and macroeconomic stability.

5.4 Interest rate liberalisation, financial development and economic growth

This section discusses studies have examined the relationship between interest rate liberalisation and financial development mostly from African countries and those that have investigated the impact of financial development on economic growth.

Agrawal (2001) examined the relationship between interest rates, exchange rates and financial deepening in Malaysia, Indonesia, Korea and Thailand from the mid-1960s to the mid-'90s. The estimation techniques used are the ECM as well as dynamic OLS. Agrawal (2001) reported that the real interest rate and real GDP have a positive effect on financial deepening in all countries.

The relationship between interest rate liberalisation, financial deepening and economic growth in African countries has been examined by Nicholas Odhiambo, whose studies cover countries like Kenya, Zambia, Tanzania and Botswana and South Africa. The estimation techniques used in those studies are the Johansen cointegration test, the Granger causality

test, the ECM and the VECM, while the period covered ranges from the late 1960s to 2006. Odhiambo (2009a) concluded that in Kenya, interest rate reforms have a positive effect on financial deepening, however that effect is sensitive to the dependency ratio. Also, financial deepening Granger-causes economic growth. Odhiambo (2009b) concluded that in Zambia, the deposit rate and financial deepening are positively related, suggesting that interest rate liberalisation has a positive effect on financial development. There is also a short-run causal flow from economic growth to financial development and also from savings to financial development. There is a long-run causal flow from financial development to economic growth and from financial development to savings.

For Tanzania, Odhiambo (2010b) concluded that there is a positive and significant relationship between deposit rates and financial deepening. Furthermore, there is unidirectional causality from economic growth to financial depth. However, there is no causality between savings and financial development, nor between savings and economic growth. In the case of South Africa, interest rate reforms have a positive effect on financial development. However, financial development does not cause investments and economic growth under Granger conditions. Odhiambo & Akinboade (2009) concluded that the effect of interest rate liberalisation on financial deepening is sensitive to the proxy used in Botswana. Nominal interest rates have a positive and significant relationship with the ratio of bank deposits to GDP. However, nominal interest rates have an insignificant relationship with the ratio of liquid liabilities to GDP and private sector credit as a percentage of GDP.

Akinboade & Kinfack (2013) examined the relationship between interest rate reforms, financial deepening and economic growth in Cameroon for the period 1973-2007, using the Johansen cointegration test and the ECM. The results showed that the effect of interest rates on financial deepening is sensitive to the proxy used, similar to the conclusion that Odhiambo & Akinboade (2009) reached. Interest rate reforms have a negative effect on bank deposits as a ratio of GDP, on the domestic credit to GDP ratio, as well as credit to the private sector as a ratio of domestic credit. Interest rate reforms have a positive effect on liquid liabilities as a ratio of GDP as well as total credit. Also, financial development and economic growth are positively correlated. These results are in direct contrast with those of Odhiambo & Akinboade (2009) with regard to the effect of interest reforms on the different proxies of financial deepening.

Udoh & Ogbuagu (2012) examined the effects of interest rate liberalisation, financial development and economic growth in Nigeria for the period 1970-2008 and concluded that the deposit rate is positively related to financial development and there is causality from financial development to economic growth. Ahmed (2013) investigated the effect of financial liberalisation on financial development and economic growth in sub-Saharan African countries for the period 1981-2009 using the GMM estimation technique. The Chinn-Ito index was used as a proxy for financial liberalisation as well as two other indices constructed from indicators, like interest rate deregulation, liberalisation of entry-exit rules for banking, prudential regulation measures, bank denationalisation and the abolition of directed credit allocation. Ahmed (2013) concluded that financial liberalisation has a positive effect on financial development and the availability of credit to the private sector for countries with strong legal institutions, protection of property rights and greater human capital. However, the overall effect of financial liberalisation on economic growth is negative through capital flight and risks of financial fragility.

Mbulawa (2015) investigated the determinants of financial development in SADC countries for the period 1996-2010 using the GMM method. The researcher concluded that financial development is positively correlated with interest rates, while savings have a negative effect on financial development.

The pioneering empirical study on the relationship between financial development and economic growth was conducted by Goldsmith (1969). The study focused on 35 countries during the period 1860-1963 and concluded that financial intermediation has a positive effect on economic growth. King & Levine (1993) built on the study by Goldsmith (1969) and incorporated 77 countries in a study covering the period 1960-1989. The results showed that financial development boosts economic growth regardless of the growth indicator used. Levine & Zervos (1998) investigated whether stock market and banking sector development are important determinants of economic growth in 47 countries and concluded that both indicators are positively related to economic growth. Levine, Loayza & Beck (2000) extended King & Levine's (1993) measures of financial intermediary development to 1995 and reached a similar conclusion.

Dritsakis & Adamopolous (2004) examined the relationship between financial development and economic growth in Greece for the period 1960-2000. The estimation techniques used are the Johansen cointegration test, ECM, VAR model and the Granger causality test. Dritsakis &

Adamopolous (2004) concluded that there is a long-run relationship between financial development captured by the ratio of liquid liabilities to GDP and economic growth, and also that there is bilateral causality between the variables. Ndebbio (2004) concurs with Dritsakis & Adamopolous (2004) when examining the relationship between financial deepening, economic growth and development in sub-Saharan African countries for the period 1980-1989. Ndebbio (2004) found that financial deepening measured by financial intermediation and the growth rate of real and nominal money balances has a positive effect on economic growth.

Habibullah & Eng (2006) examined the causal link between financial development and economic growth in developing Asian countries for the period 1990-'98 using the GMM estimation techniques, as well as causality testing. Habibullah & Eng (2006) reported that financial development captured by the ratio of domestic credit to GDP promotes economic growth. Gondo (2009) reached a similar conclusion when examining the relationship between financial development and economic growth in South Africa. Also, credit availability and stock market liquidity have a positive effect on economic growth. Cojocaru, Hoffman & Miller (2011) reached a similar conclusion to that of Habibullah & Eng (2006) and Gondo (2009) when examining the relationship between financial development and economic growth in Central and Eastern European (CEE) countries and Commonwealth of Independent States (CIS). Using the GMM estimation techniques, Cojocaru *et al* (2011) found that domestic credit to the private sector has a positive impact on economic growth. Also the quality and efficiency of the financial system are more important than the size.

Ang & McKibbin (2007) and Bittencourt (2010) constructed financial development indices in their examination of the effect of financial development on economic growth and reached different conclusions. The study by Ang & McKibbin (2007) focused on Malaysia during the period 1960-2001 and uses the Johansen cointegration test, VAR models, principal components and a VECM. Ang & McKibbin (2007) constructed a financial repression index based on interest rate controls, direct credit programmes and statutory reserve requirements, and a financial development index based on liquid liabilities and bank credit, as well as commercial and central bank assets. The results revealed that financial repression and higher real interest rates are negatively related to economic growth. Also, despite the positive correlation between financial development and economic growth, the direction of causality is from economic growth to financial development. Financial sector reforms have resulted in financial deepening but have had no effect on economic growth.

Bittencourt (2010) focused on Latin American countries (Brazil, Argentina, Bolivia and Peru) for the period 1980-2007, using a dynamic panel data model with fixed effects. A financial development index is constructed by using liquid liabilities, private credit from deposit money banks, and stock market capitalisation. Bittencourt (2010) concluded that financial development has a positive effect on economic growth. Also, finance authorises the entrepreneur to invest in productive activities, so promoting economic growth, suggesting that the direction of causality is from financial development to economic growth.

Ijeoma, Paramaiah & Moshoeshoe (2011) examined the relationship between financial development, savings and economic growth in Lesotho for the period 1983-2007, using the Johansen cointegration test, VECM and a trivariate causality test. Financial development is captured by the ratio of liquid liabilities to GDP and credit by financial intermediaries to the financial sector. The results showed that there is no relationship between financial development and economic growth, due to restrictive lending practices and credit ceilings. Ince (2011) reached a different conclusion from that of Ijeoma *et al* (2011) when examining the relationship between financial liberalisation, financial development and economic growth in Turkey, despite using similar estimation techniques. Financial development is captured by domestic credit to the private sector as a ratio of GDP, total deposits as a ratio of GDP, commercial banks' assets and stock market capitalisation. Ince (2011) reported that there is a short-run relationship between financial development and economic growth and there is bi-directional causality between the two variables.

Hassan, Sanchez & Yu (2011) examined the relationship between financial development and economic growth in developing and developed countries for the period 1980-2007. The estimation techniques used are VAR modelling, Granger causality, OLS, panel data modelling and the weighted least squares method. The results revealed that savings and credit to the private sector have a positive effect on economic growth only in Latin America, the Caribbean, East Asia and the Pacific. The Granger causality test suggests that there is bi-directional causality between financial development and economic growth in all regions with the exception of East Asia, the Pacific and sub-Saharan Africa, where the causality runs from economic growth to financial development. This suggests that in developing countries, economic growth leads to financial development. This contradicts the findings of Kumar (2014) and Omoruyi & Ede (2014) who also examined the effect of financial development on economic growth in developing countries.

Phakedi (2014) examined the effect of financial development on economic growth in SADC countries for the period 1990-2014 and concluded that financial development supports economic growth in half the countries, while in the other half financial development is not growth-enhancing. Studies by Le Roux and Moyo (2015), as well as Bara, Mugano and Le Roux (2016) also found that financial development proxied by credit to the private sector impacts negatively on economic growth.

Kumar (2014) investigated whether financial development is an instrument of economic growth in India for the period 1971-2012 and concluded that there is a long-run relationship between financial development captured by the ratio of liquid liabilities to GDP and economic growth. What is more, the direction of causality runs from financial development to economic growth. Omoruyi & Ede (2014) reached a similar conclusion to that of Kumar (2014) when examining the relationship between financial system development and economic growth in Nigeria for the period 1980-2011. The results showed that the direction of causality is from financial development to economic growth. Stock market development and private sector credit also have a positive effect on economic growth. The difference between the findings of Kumar (2014) and Omoruyi & Ede (2014) is the effect of liquid liabilities on economic growth. Omoruyi & Ede (2014) concluded that liquid liabilities have an insignificant effect on economic growth, while Kumar (2014) suggested that the effect is positive and significant.

Estranda, Park & Ramayandi (2013) examined the relationship between financial development and economic growth in Asian countries for the period 1987-2008 using a fixed effects model. Estranda *et al* (2013) reported that financial development captured by liquid liabilities, private credit by deposit money banks and stock market capitalisation is positively correlated with economic growth. Ayadi, Arbak, Ben-Naceur & De Groen (2013) reached a different conclusion from that of Estranda *et al* (2013) when examining the relationship between financial development, bank efficiency and economic growth in Mediterranean countries for the period 1985-2009. Ayadi *et al* (2013) concluded that bank credit to the private sector has a negative effect on economic growth, while bank deposits have an insignificant effect on economic growth. The quality of the banking sector has an insignificant effect on growth, while stock market development has a positive effect on economic growth if institutional quality is improved.

Inove & Hamori (2016) examined the relationship between financial access and economic growth in 37 sub-Saharan African countries for the period 2004-'12 using the GMM estimation technique. Financial access is captured by commercial banks per 1 000km and commercial banks per 10 000 adults, while financial deepening is captured by outstanding deposits with commercial banks as a percentage of GDP, as well as outstanding loans from commercial banks as a percentage of GDP. The results revealed that financial access and financial deepening have a positive effect on economic growth.

5.5 Interest rate liberalisation and financial crises

Glick & Hutchison (1990) examined the relationship between banking and currency crises in 90 industrial and developing countries for the period 1975-'97 using a probit model. Banking and currency crises are captured by dummy variables. Glick & Hutchison (1990) concluded that currency and banking crises are positively correlated for both emerging and developed countries. Past banking crises help predict the onset of currency crises in emerging countries, but not in developing countries. Interest rate liberalisation also is correlated with banking crises. Kiminsky & Reinhart (1999) reached a similar conclusion when examining the causes of the twin crises of banking and balance of payment problems in 20 countries for the period 1970 to mid-'95. Using conditional and unconditional probabilities, Kiminsky & Reinhart (1999) reported that banking crises increase the probability of currency crises. What is more, deregulation of the financial system increases the probability that crises will occur. Financial liberalisation indicators like real interest rates, the ratio of domestic credit to nominal GDP and the ratio of domestic lending to deposit rates show an upward trend prior to the twin crises.

Demirgüç-Kunt & Detragiache (1998) examined the relationship between financial liberalisation and financial fragility in 53 countries for the period 1980-'95 using a multivariate logit model. A dummy variable was used for financial liberalisation capturing interest rate liberalisation, as well as a banking crisis dummy variable. The results showed that banking crises are associated with higher interest rates, low GDP growth, and excessive credit growth, while GDP per capita is negatively related to banking crises. Financial liberalisation is also positively correlated with the probability of banking crises through lowering of bank profits due to higher capitalisation and foreign entry.

Bonfliglioli & Mendicino (2004) assessed the link between financial liberalisation, banking crises and economic growth in 90 countries for the period 1975-'99 using GMM estimations.

Bonfliglioli & Mendicino (2004) found that banking crises have a negative effect on economic growth, while financial liberalisation has a positive impact on economic growth in countries with sound institutions. The cost of banking crises in terms of growth is reduced by sound institutions.

Ranciere, Tornell & Westermann (2006) examined the growth and crises effects of financial liberalisation in 60 countries for the period 1980-2002 using a probit model. A financial liberalisation dummy variable to as well as a crisis dummy variable capturing banking and currency crises were constructed. The results revealed that despite the positive effect of financial liberalisation on economic growth, financial liberalisation increases the probability of financial crises. The growth effects of financial liberalisation in terms of financial development and investments outweigh the negative effects of financial fragility. In their examination of the relationship between financial liberalisation, crises and economic growth in 58 countries for the period 1980-'99, Lee & Shin (2007) also found that financial liberalisation increases the likelihood of financial crises.

Misati & Nyamongo (2012) examined the relationship between financial liberalisation, financial fragility and economic growth in 34 sub-Saharan African countries for the period 1983-2008 using a pooled model, a fixed effects model and causality analysis. The results showed that financial liberalisation captured by the Chinn-Ito- index, as well as a dummy variable, have a positive effect on economic growth but also increases the likelihood of banking crises. This result is in line with the findings of Ranciere *et al* (2006) and Lee & Shin (2007). Banking crises have a negative effect on economic growth, which confirms the findings of Bonfliglioli & Mendicino (2004). However, the researchers conclude that the growth-retarding effects of financial liberalisation outweigh the growth-enhancing effects, which contrasts with the findings of Ranciere *et al* (2006) and Lee & Shin (2007). Enowbi, Mlambo and Asongu (2017) also found that financial liberalisation increases financial instability in in 41 African countries during the period 1985 to 2010. Furthermore, financial development also increases financial stability.

Shehzad & De Haan (2009) investigated the relationship between financial reforms and banking crises in 85 countries for the period 1973-2002 using a multivariate probit model. Dummy variables were used to capture systemic and non-systemic banking crises as well as financial liberalisation measures like interest rate controls, credit restrictions, entry barriers, supervision, securities policy, state ownership and capital flow restrictions. Shehzad & De Haan

(2009) concluded that financial reforms reduce the likelihood of systemic banking crises but increase the likelihood of non-systemic banking crises. Triki & Maktour (2012) also presented evidence suggesting that financial liberalisation can reduce the likelihood of financial crises. In examining the relationship between financial liberalisation and banking crises in 40 emerging and developed countries for the period 1989-2010, Triki & Maktour (2012) report that financial liberalisation increases the likelihood of banking crises, but reduces it in some countries. Economic growth reduces the likelihood of financial crises.

Angkinand, Sawangngoenyuuang & Wihlborg (2010) examined the relationship between financial liberalisation and banking crises in 21 developed and 27 developing countries for the period 1973-2005 using the random effect logit model. Banking crises are captured by a dummy variable. The results revealed that there is positive correlation between financial liberalisation and banking crises for repressed financial markets in emerging economies. Financial liberalisation increases the likelihood of banking crises up to partial-level financial liberalisation, however beyond a certain level financial liberalisation reduces the likelihood of banking crises. Higher world interest rates and credit growth increase the chance of banking crises in both groups of countries, which is in line with the findings of Kiminsky & Reinhart (1999). Also institutional quality, capital regulation and supervision reduce the likelihood of banking crises.

Altunbas, Gamboconta & Marqués-Ibáñez (2010) examined whether monetary policy has an effect on bank risk-taking in 1 100 banks across 16 countries for the period 1998-2008, using the dynamic GMM estimation technique. Altumbas *et al* (2010) reported that lower short-run interest rates for an extended period encourage banks to take more risks. The result suggests that higher interest rates resulting from interest rate liberalisation reduces bank risk-taking, which in turn reduces the likelihood of financial crises.

Barrell, Karim & Ventouri (2013) assessed the role of financial liberalisation and capital adequacy in financial crises models in OECD countries for the period of 1980 to 2012 using a Logit model. Barrell *et al* (2013) concluded that less regulated markets are associated with lower crises frequency. Deposit rate liberalisation adds to the strength of capital in protecting against crises. Barrell, Karim and Ventouri (2016) examined the impact of interest rate liberalisation on OECD banking crises during the period 1980-2012 and conclude that interest rate liberalisation reduces the likelihood of financial crises. These results suggest that financial deregulation reduces the likelihood of financial crises which is in line with the

findings of Shehzad & De Haan (2008), Altunbus *et al* (2010) as well as Triki & Maktour (2012).

Beju and Ciupac-Ulici (2012) investigated the impact of financial liberalisation on banking systems in developing countries in Central and Eastern Europe and concluded that financial liberalisation should be accompanied by prudential regulation in order to reduce the likelihood of banking crises. Hambi and Jlussi (2014) examined whether financial liberalisation triggers banking crises in developed countries during the period 1984-2007. The results show that financial liberalisation does not increase the probability of financial crises. However, foreign debt liabilities and foreign direct investment liabilities to total liabilities trigger banking crises.

Boyd, De Nicolò & Jalal (2006) examined the relationship between bank risk-taking and competition in developed and developing countries for the period 1993-2004 using the OLS and GMM estimation techniques. Bank concentration is captured by the Herfindahl and Hirschman concentration index, while bank risk-taking is captured by the Z-score. The results revealed that banking concentration increases the likelihood of banking failures, while more competition reduces the probability of bank failures. Zaghdoudi, Hamdi, Dkhili & Hakimi (2015) reported results contrasting with those of Boyd *et al* (2006) when examining the relationship between bank competition and risk appetite in Tunisia for the period 1980-2009. Using a similar approach, Zaghdoudi *et al* (2015) concluded that bank competition enhances risk-taking and so increases the likelihood of bank failures.

Jiménez, Lopez & Saurina (2007) investigated the effect of competition on bank risk-taking in Spain for the period 1998-2003 using the GMM estimation technique. The Lerner index captures market power, while bank risk is captured by commercial banks' non-performing loan ratios. The results showed that market power decreases bank risk-taking and non-performing loans, thus promoting stability. Yeyati & Micco (2007) concur to a large extent with the findings of Jiménez *et al* (2007). In examining the effect of competition and foreign penetration on Latin American banking sectors for the period 1993-2002, Yeyati & Micco (2007) concluded that foreign entry in the banking sector reduces competition and so has a positive effect on bank stability.

Uhde & Heimeshoff (2009) examined the relationship between consolidation in banking and financial stability in European banks for the period 1977-2005 using the TSLS technique. Bank risk-taking is captured by the Z-score, which is the ratio of the sum of equity capital to

total assets and ROAA, as well as the standard deviation of ROAA. Concentration in the banking sector is captured by the proportion of the country's banking assets held by the largest five domestic banks in 1997. The results showed that national banking market concentration has a negative effect on financial stability. Banking markets with lower levels of competition, higher proportions of government-owned banks and fewer opportunities for diversification are prone to financial instability. This result is in contrast with those of Jiménez *et al* (2007), as well as those of Yeyati & Micco (2007). Deposit insurance encourages banks to take a cautious approach in lending activities.

Ariss (2010) examined the implications of market power in the banking sectors of 60 developing countries for the period 1999-2005 using the tripod empirical approach. The Lerner index is used to capture market power while the Z-index captures bank risk-taking. Ariss (2010) reported that there is a positive relationship between bank market power and stability. Agoraki, Delis & Posiouras (2011), as well as Hope, Gwatidzo & Ntuli (2013) are in agreement with Ariss (2010). In examining the relationship between regulation, competition and bank risk-taking in 546 banks across 13 CEE countries for the period 1998-2005, Agoraki *et al* (2011) concluded that market power reduces bank risk-taking and non-performing loans, so promoting stability. Also, capital requirements and supervisory power reduce credit risk. Hope *et al* (2013) investigated the effect of bank competition on financial stability in 10 African countries for the period 2005-'10 and found that there is a positive relationship between market power and stability.

Cubillas & Gonzalez (2014) investigated the relationship between financial liberalisation and bank risk-taking for 4 333 banks in 43 countries for the period 1991-2007 using the GMM and TSLS estimation techniques. The Lerner index was used as a proxy for market power and the Z-score as a proxy for bank risk-taking. Financial liberalisation is captured by an index of financial reforms, the financial freedom component of the index of economic freedom by the Heritage Foundation and the Chinn-Ito index. Cubillas & Gonzalez (2014) concluded that financial liberalisation increases bank risk-taking through increased competition in developed countries and by expanding opportunities for risk-taking in developing countries. Capital requirements reduce the negative effect of financial liberalisation on bank risk-taking in both developed and developing countries, while official supervision and financial transparency reduce bank risk-taking due to competition in developing countries. This result is in line with the findings of Ariss (2010). Deposit insurance encourages risk-taking behaviour by banks, a result which contradicts that of Uhde & Heimeshoff (2009).

Ali, Intissar & Zeitun (2015) assessed the relationship between banking competition and financial stability in 173 developed and developing countries using the GMM estimation technique. Ali *et al* (2015) reported that banking concentration has a positive effect on financial stability through higher profitability and a negative effect through interest rates. Bank concentration has a positive effect on bank stability in developing countries.

5.6 Identified gaps in literature

In summary, according to the empirical literature the effect of interest rates on savings varies across different regions. So it is vital to isolate the SADC region when examining such a relationship, as the results could vary across the African regions. The study also constructs a financial deepening index to capture financial development. Studies examining the effect of financial development on economic growth differ on the effect of the different proxies of financial development on economic growth. The financial development proxies are correlated, and since there is no consensus as to which proxy is most appropriate, the construction of an index of financial development is warranted (Ang & McKibbin, 2007; Bittencourt, 2010).

Studies performed on the relationship between interest rate liberalisation and financial crises in African countries include Hope *et al* (2013) and Misati & Nyamongo (2012), who examine countries from different geographical regions. This study focuses on countries in the same region (SADC), which is vital for decisions pertaining to regional integration. Furthermore, this study examines the link between financial development and financial crises which has received very little attention in African countries.

Most studies examining the relationship between interest rate liberalisation and economic growth in African countries analyse the countries individually using time series techniques (Odhiambo 2009; Tswamuno *et al*, 2007). Time series techniques do not take into account the issue of simultaneity and often suffer from issues of collinearity. This study uses panel data estimation techniques such as the PMG estimator which mitigate the problems of collinearity. This is discussed fully in the next section.

5.7 Literature survey of estimation techniques

The main approaches used in examining the relationship between interest rate and economic growth in existing literature are time series and panel data approaches. The time series approach makes use of time series data which is collected at different time periods (Hill, Griffiths & Lim, 2012). With panel data, observations on different cross-sectional units are

pooled over several periods (Gujarati & Porter, 2009). The study uses the panel data approach for a number of reasons. Firstly, panel data control for the heterogeneity present in individuals, firms or countries, while time series and cross-sectional approaches do not take this heterogeneity into account and so increase the likelihood of generating biased estimates (Baltagi, 2005). Panel data is ideal for this study, where country and time-invariant variables have to be controlled. Secondly, panel data is a combination of time series and cross-sectional data, which permits more degrees of freedom, less collinearity, and more variability and efficiency (Hsiao, 2003). Time series estimations are associated with problems like multicollinearity, which occurs when the explanatory variables are intercorrelated or when there is a perfect linear relationship among the explanatory variables. Panel data minimises the possibilities of multicollinearity by including a cross-sectional component which adds variability to the data. The increase in the degrees of freedom resulting from more data points also reduces collinearity and so improves the efficiency of the estimated parameters. Panel data also minimises the omitted variable bias (Brooks, 2008).

A panel data model can be specified as follows:

$$y_{it} = \alpha + x'_{it}\beta + u_{it} \qquad i = 1, \dots, N; t = 1, \dots, T \tag{5.1}$$

where i represents households, individuals, firms or countries while t represents time. The panel data model contrasts with the time series and cross-sectional models because it possesses a double subscript on its variables. The two subscripts i and t denote the cross-sectional and the time-series components respectively: α is a scalar, β is a slope coefficient and x'_{it} denotes the independent or explanatory variables in the model (Baltagi, 2005).

The one-way error component model for the error terms is the most commonly used model in panel data analysis and is specified as follows:

$$u_{it} = \mu_i + v_{it} \tag{5.2}$$

where μ_i represents the unobservable, individual-specific and time-invariant disturbance, which caters for any individual-specific effect omitted from the regression model while v_{it} is the remainder disturbance that is variant with respect to time, individuals, firms or countries (Baltagi, 2005). Both μ_i and v_{it} are identically and independently distributed as follows:

$$\mathrm{E}(\mu_i) = \mathrm{E}(v_{it}) = \mathrm{E}(\mu_i v_{it}) \tag{5.3}$$

A number of relationships in economics are dynamic due to the strong persistent behaviour of most economic variables (Gorlach & Le Roux, 2013). Most of the models in the study are thus specified as dynamic panel models which include a lagged dependent variable as one of the explanatory variables. This way of researching is often referred to as the Cowles Commission approach and dates back to the early work of Tinbergen in the late 1930s (Fair, 2014). Including a lagged dependent variable as one of the explanatory variables is popular because it improves the fit of equations and also picks up partial adjustment effects (Fair, 2014).

A dynamic panel data model is specified as follows:

$$y_{it} = \delta y_{it-1} + x'_{it}\beta + u_{it} \tag{5.4}$$

The vector x_{it} may comprise predetermined and strictly exogenous regressors, lags of these regressors and lags of the dependent variable. The inclusion of the lagged dependent variable (y_{it-1}) as one of the regressors brings about the dynamism in the model (Baltagi, 2005). The conventional panel data estimation techniques include the pooled OLS, fixed effects, random effects, and instrumental variables models like Two Stage Least Squares (TSLS) and Generalised Methods of Moments (GMM).

5.7.1 Pooled OLS model

The pooled OLS technique pools all the observations in a model when estimating a regression without considering the cross-section and time series nature of the data (Gujarati & Porter, 2009). This method assumes that all the estimated coefficients are the same for all cross-sectional units. A pooled OLS model is specified as follows:

$$y_{it} = \beta_0 + \beta_1 x_{it} + \beta_2 x_{2it} + \cdots + \beta_k x_{kit} + e_{it} \tag{5.5}$$

where β_0, β_1, β_2 and β_k are the coefficients of the model. The coefficients do not have the i and t subscripts, implying that they are the same for all units (Hill *et al*, 2012). The model is only appropriate when the cross-sectional units under consideration are homogenous – a situation which rarely occurs (Asteriou & Hall, 2007).

The pooled OLS model is based on the following assumptions:

$$E(e_{it}) = 0 \tag{5.6}$$

$$Var(e_{it}) = \sigma^2 \tag{5.7}$$

$$Cov(e_{it}, e_{js}) = 0 \tag{5.8}$$

$$Cov(e_{it}, x_{it}) = 0 \tag{5.9}$$

These assumptions state that the expected value of the error term is equal to zero (Hill *et al*, 2012). The variance of the error term is assumed to be constant (homoscedasticity). There should be no correlation between disturbances and regressors or between disturbances themselves (Gujarati & Porter, 2009).

The major shortcoming of the pooled OLS model is that it does not differentiate between countries and so ignores the heterogeneity existing in different cross-sectional units (Hill *et al*, 2012). The differences are shifted to the error term, which may result in correlation between the error term and the regressors (Gujarati & Porter, 2009). This violates one of the assumptions of the classical linear regression model and as such the estimated coefficients would be biased and inconsistent. In line with this statement, the pooled OLS method also performs poorly when estimating a dynamic panel data model, due to the dynamic panel bias caused by the correlation between the disturbance term and the lagged dependent variable (Baltagi, 2005). Another shortcoming of the pooled OLS method is that time-invariant variables are regarded as being identical between cross-sectional units, hence they are pooled into a single population. This assumption is unrealistic in most datasets, resulting in inaccurate standard errors (Bell & Jones, 2015).

5.7.2 Fixed effects model

The fixed effects model estimates different intercept coefficients for each one of the cross-sections and so caters for individual specific effects which do not vary over time, like natural endowments and geographical factors (Asteriou & Hall, 2007). When using a fixed effects model, variables which are time-invariant should not be included as regressors, so as to avoid a case of perfect collinearity between variables and the fixed effects.

A fixed effects model is specified as follows:

$$y_{it} = \beta_{0i} + \beta_1 x_{it} + \beta_2 x_{2it} + \cdots + \beta_k x_{kit} + e_{it} \quad (5.10)$$

The intercept coefficients are different for the individual units as indicated by the i subscripts next to the intercept, but the slope coefficients are the same (Baltagi, 2005). All differences between them are captured by the intercept coefficients.

The fixed effects model can be estimated using two approaches, namely the least squares dummy variable (LSDV) technique and the fixed effects estimator (Hill *et al*, 2012).

The LSDV method allows the intercepts to vary by employing the differential intercept dummy variable technique as follows:

$$y_{ij} = \sum_{j=1}^{j} \beta_{0j} \; D_j \; + \; \beta_1 \, x_{ij} \; + e_{ij} \quad (5.11)$$

where D_j is a series of dummy variables, one for each cross-sectional unit j, β_{0j} is the intercept, x_{ij} represents independent variables and e_{ij} is the error term.

One shortcoming of the LSDV model is that when the number of cross-sectional units is large the estimator suffers from substantial loss of degrees of freedom (Baltagi, 2005). The extra parameters to be estimated also enhance the problem of collinearity among the independent variables. The LSDV method is most appropriate when the number of cross-sectional units is small (Brooks, 2008). When there is a large number of cross-sectional units, the LSDV method results in too many parameters being estimated, and so the fixed effects estimator is the ideal technique to estimate the fixed effects model (Hill *et al*, 2012). The fixed effects estimator is often referred to as the within-group estimator and the technique expresses the dependent and independent variable as deviations from their mean values as follows:

$$(y_{ij} - \bar{y}_j) = \beta_1 (x_{ij} - \bar{x}_j) + (e_{ij} - \bar{e}_j) \quad (5.12)$$

Time-invariant effects are assumed to be correlated with the variables included in the model and hence the fixed effect, β_{1i}, is eliminated (Greene, 2002). So the technique cannot be used to estimate the effect of time-invariant variables on the dependent variables – this is usually

the major downfall of the technique (Baltagi, 2005). By eliminating time-invariant effects, substantial amounts of information are lost, which becomes a problem when time-invariant variables are of particular interest (Bell & Jones, 2015). Another shortcoming of the fixed-effect within-group estimator is that it may eliminate long-run effects and so distort parameter estimates (Gujarati & Porter, 2009). The within-group estimator also does not resolve the dynamic panel bias (Baltagi, 2005). Despite the elimination of the individual effect, the lagged dependent variable is correlated with the error term and so underestimates the coefficients of a dynamic panel data model.

5.7.3 Random effects model

As with the fixed effects model, the random effects model uses the intercept coefficients to capture individual differences between cross-sectional units (Brooks, 2008). However, the random effects model assumes that the individual effects are random rather than fixed (Hill *et al*, 2012; Bell & Jones, 2015). The random effects model is specified as follows:

$$y_{ij} = \beta_{0j} + \beta_1 x_{1ij} + e_{ij} \quad (5.13)$$

where:

$$\beta_{0j} = \beta_0 + \beta_2 z_j + u_j \quad (5.14)$$

These equations are the macro and micro parts of the model respectively and are estimated as one equation by substituting the micro part into the macro part and estimating this equation:

$$y_{ij} = \beta_{0j} + \beta_1 x_{1ij} + \beta_2 z_j + (u_j + e_{ij}) \quad (5.15)$$

where y_{ij} is the dependent variable, β_0 is the intercept term in the fixed part of the model, x_{1ij} is a series of time-variant covariates with coefficient β_1, and z_j is a series of time-invariant covariates with coefficient β_2. The random part of the model consists of u_j, the disturbance term of the time-invariant variables also known as the random effect, and e_{ij} the regression disturbance term (Bell & Jones, 2015). So the random effects model is referred to as the error component model because the error term has two components (Brooks, 2008). The major advantage of a random effect model over the fixed effects model is that fewer parameters are estimated (Greene, 2002). The model assumes that there is no correlation between disturbances, or between disturbances and regressors (Bell & Jones, 2015). However, this as-

sumption does not hold in most random effects models and as such the technique is not widely used in empirical studies. Due to the failure of the pooled OLS, fixed effects and random effects models in dealing with the endogeneity of a regressor, instrumental variables models have been proposed.

5.7.4 Two-stage least squares

The TSLS technique is an instrumental variables estimator that provides a way of dealing with the problem of endogeneity of a regressor by using a proxy variable that is correlated with a particular regressor but orthogonal to the error term (Wooldridge, 2002). The proxy variable is referred to as an instrumental variable (Gujarati & Porter, 2009). The TSLS estimator, as the name suggests, involves two distinct stages. The first stage is a process of estimating a regression of each independent variable on all the predetermined variables including the instruments (Brooks, 2008). The second stage is a regression of the original equation with all the variables replaced by the fitted values from the first-stage regressions.

So as to resolve the dynamic panel bias, Anderson & Hsiao (1981, 1982) proposed the TSLS estimator for a first difference model that uses deeper lags of the dependent variable as instruments. First differencing involves subtracting a panel data model by itself lagged by one period (Arrelano & Bond, 1991). To illustrate this process, a dynamic panel data model with only the lagged dependent variable as the regressor will be introduced as follows:

$$y_{it} = \alpha y_{i,t-1} + \varepsilon_{i,t} \tag{5.16}$$

First differencing the above equation involves subtracting from it the following model:

$$y_{i,t-1} = \alpha y_{i,t-2} + \varepsilon_{i,t-1} \tag{5.17}$$

This yields the following:

$$(y_{i,t} - y_{i,t-1}) = \alpha(y_{i,t-1} - y_{i,t-2}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \tag{5.18}$$

$$(y_{i,t} - y_{i,t-1}) = \alpha(y_{i,t-1} - y_{i,t-2}) + (\mu_i - \mu_i) + (u_{i,t} - u_{i,t-1}) \tag{5.19}$$

$$(y_{i,t} - y_{i,t-1}) = \alpha(y_{i,t-1} - y_{i,t-2}) + (u_{i,t} - u_{i,t-1}) \tag{5.20}$$

The number of equations resulting from the first difference transformation is $T-1$ as the first period observations are dropped from the model. A more compact specification of the first difference model is as follows:

$$\Delta y_{it} = \alpha \Delta y_{i,t-1} + \Delta u_{it} \quad i = 1, \dots, N;\ t = 2, \dots, T \tag{5.21}$$

Where Δ is the first difference operator.

The first difference estimator is inconsistent when estimating a dynamic panel data model despite the elimination of the individual effects (Han & Phillips, 2010). Anderson & Hsiao (1981, 1982) argue that $y_{i,t-2}$ can be used as an instrument for $\Delta y_{i,t-1}$ since it is correlated with $\Delta y_{it} = y_{i,t-1} - y_{i,t-2}$ but not correlated with the error term Δu_{it}. The authors also suggest that $\Delta y_{i,t-2}$ is orthogonal to the error term and so can be used as an instrument for $\Delta y_{i,t-1}$, a strategy that is viewed as more efficient and consistent. The TSLS estimator does not use all the available instruments and so is not efficient (Baltagi, 2005). Moreover, using more of the available lags of the dependent variable instruments would improve the efficiency of the TSLS estimator. However, the deeper the lags of the dependent variable used as instruments, the smaller the sample size. The estimator is also inefficient in the presence of heteroscedasticity.

5.7.5 Generalised methods of moments

Due to the inability of the pooled OLS, fixed effects, random effects and the TSLS to resolve the dynamic panel bias adequately, Arellano & Bond, (1991), Arellano & Bover, (1995) and Blundell & Bond (1998) proposed various GMM estimation techniques which are more efficient than the other estimation techniques when estimating a dynamic panel data model. The GMM estimator is an instrumental variables technique generated from exploiting the sample moment counterparts present in population moment conditions of a data-generating model (Hansen 2007). The GMM estimator is popular because it can be used in the presence of heteroscedasticity by making use of the orthogonality conditions (Baum & Schaffer, 2003). The GMM estimators are designed for panels with a small number of time periods *T* and a large number of cross-sectional units (Roodman, 2009).

A formal representation of the methods of moments begins with the specification of a linear regression model:

$$y_t = x_t'\beta_0 + \varepsilon_t \qquad t = 1, 2, \dots, T \tag{5.22}$$

Where x_t' is a $K \times 1$ vector of explanatory variables, ε_t is the error term and β_0 is a vector of coefficients (Greene, 2002). The conditional expectations of y_t is $E(y_t \setminus x_t = x_t'\beta_0$ meaning that $E(\varepsilon_t \setminus x_t) = 0$. The unconditional population moment condition is specified as follows:

$$g(\beta_0) = E[x_t\varepsilon_t] = E[x_t(y_t - x_t'\beta_0)] = 0 \tag{5.23}$$

The sample moment condition is as follows:

$$g_T(\hat{\beta}) = \frac{1}{T}\sum_{t=1}^{T} x_t(y_t - x_t'\hat{\beta}) = \frac{1}{T}\sum_{t=1}^{T} x_t x_t'\hat{\beta} = 0 \tag{5.24}$$

The method of moments estimator is found by solving the above sample moment condition which results in the following expression:

$$\hat{\beta}_{MM} = \left(\sum_{t=1}^{T} x_t x_t'\right)^{-1} \sum_{t=1}^{T} x_t y_t \tag{5.25}$$

If some of the explanatory variables are correlated with the error term (endogenous) the linear regression model would be specified as follows:

$$y_t = x_{1t}'\Upsilon_0 + x_{2t}'\delta_0 + \varepsilon_t \tag{5.26}$$

Where x_{1t}' are the exogenous regressors, x_{2t}' are the endogenous regressors while Υ_0 and δ_0 are the coefficients. In order to estimate the above equation, instruments are required. These are variables that are correlated with the endogenous regressors but uncorrelated with the error term. The unconditional moment condition is specified as follows:

$$g(\beta_0) = E[z_t\varepsilon_t] = E[z_t(y_t - x_t'\beta_0)] = 0 \tag{5.27}$$

Where z_t are the instruments.

The sample moment condition is given by:

$$g_T(\hat{\beta}) = \frac{1}{T}\sum_{t=1}^{T} z_t(y_t - x_t'\hat{\beta}) = 0 \tag{5.28}$$

The method of moments estimator is this case is thus:

$$\hat{\beta}_{MM(IV)} = \left(\sum_{t=1}^{T} z_t x_t'\right)^{-1} \sum_{t=1}^{T} z_t y_t \tag{5.29}$$

If the number of instruments is greater than the number of parameters to be estimated then the equation is overidentified (Greene, 2002). The ideal estimator is the GMM technique which solves the equation by minimising the vector of empirical moments, $\frac{1}{T}\sum_{t=1}^{T} z_t(y_t - x_t'\beta)$. The GMM estimator minimises the weighted quadratic function of moments specified as follows:

$$J(\hat{\beta}) = \left[\frac{1}{T}\sum_{t=1}^{T} z_t(y_t - x_t'\beta)\right]' W \left[\frac{1}{T}\sum_{t=1}^{T} z_t(y_t - x_t'\beta\right] \tag{5.30}$$

Where W is the weighting matrix.

5.7.6 Seemingly unrelated regression, mean group and pooled mean group estimators

The conventional dynamic panel data estimations involved models with a large *N* and a small *T* (Pesaran & Smith, 1995). In such models, instrumental variables techniques like the TSLS and GMM are regarded as the best estimators compared with the pooled OLS, fixed effects and random effects models. However, these estimation techniques assume that the slope parameters are homogenous across groups, which could lead to inconsistent estimates if there is heterogeneity in a panel. Furthermore, as pointed out by Pesaran & Smith (1995), when *T* is large, such estimators can produce inconsistent estimates unless the slope coefficients are similar across groups.

Due to the availability of data, there has been a rise in panel data models in which both *N* and *T* are large (Pesaran & Smith, 1995). A larger *T* enables the estimation of separate regression for each cross-sectional unit, so allowing for parameter heterogeneity, which is not suitable for models with a small *T*. Models with slope heterogeneity can be estimated using the mean

group (MG) estimator proposed by Pesaran & Smith (1995), Zellner's (1962) seemingly unrelated regression (SUR) model, as well as the pooled mean group (PMG) estimator proposed by Pesaran, Shin & Smith (1999). The discussion of the MG estimator is initiated by considering a dynamic panel heterogenous model as follows:

$$y_{it} = \phi_i y_{it-1} + x_{it}\beta_i + \varepsilon_{it}, \quad i = 1, \dots, N, t = 1, \dots, T \tag{5.31}$$

where ϕ_i and β_i are parameters which are assumed to vary across groups. These parameters are independently distributed with y_{it}, x_{it} and ε_{it} for all t. x_{it} is a vector of explanatory variables which are assumed to be covariance stationary processes and uncorrelated with the error term ε_{it}.

The MG estimator estimates separate regressions for each cross-sectional unit and averages the individual estimates over the cross-sectional units as follows:

$$\hat{\beta}_{MG} = N^{-1} \sum_{i=1}^{N} \hat{\beta}_i \tag{5.32}$$

where $\hat{\beta}_i$ is the OLS estimator of β_i.

The SUR model was proposed by Zellner (1962) and estimates regression parameters in all equations simultaneously. The estimator yields more efficient estimates than single-equation least squares estimators. A SUR can be specified using the equation below:

$$y_\mu = X_\mu \beta_\mu + u_\mu \tag{5.33}$$

where y_μ is a vector of observations on the dependent variable, X_μ is a matrix of observations on explanatory variables, β_μ is a vector of regression parameters and u_μ is a vector of disturbance terms.

Equation (5.24) can be written in matrix form as follows:

$$\begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_m \end{bmatrix} = \begin{bmatrix} X_1 & 0 & \cdots & 0 \\ 0 & X_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & X_m \end{bmatrix} \begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_m \end{bmatrix} + \begin{bmatrix} u_1 \\ u_2 \\ \vdots \\ u_m \end{bmatrix} \tag{5.34}$$

The SUR and MG estimators do not take into account that some parameters could be similar across groups (Pesaran *et al*, 1999). Long-run relationships are likely to be similar in cross-sectional units because of arbitrage conditions, common technologies and related budget or solvency constraints. With dynamic heterogenous panels, long-run relationships between variables are less likely to be subject to slope heterogeneity compared with short-run relationships. Long-run relationships in dynamic panels can be estimated using the PMG estimator (Pesaran *et al*, 1999). This technique involves pooling and averaging of individual estimates across groups in which the intercept and short-run slope coefficients and the error variance are assumed to differ across units while the long-run coefficients are constrained to be similar across groups. The estimator is discussed in detail in the next chapter, as it forms the basis for the estimation procedure used in the study. The logit model is used to examine the effect of interest rate liberalisation on financial crises. The dependent variable in the logit model is a dummy variable indicating the occurrence of financial crises in a particular year. Models of this nature with a binary dependent variable cannot be estimated using the conventional panel data methods discussed in this survey of estimation techniques (Hill *et al*, 2012; Gujarati & Porter, 2009).

5.8 Conclusion

This chapter presented some of the existing empirical literature examining the relationship between interest rate liberalisation and economic growth. One channel through which interest rates can affect economic growth is through savings and investments. Based on the empirical literature presented in the chapter, interest rates and savings are to a large extent positively correlated. However, interest rates have an insignificant effect on savings in some countries, especially if incomes are low (De Melo & Tybout, 1986). The relationship between interest rates and investments is ambiguous. On the one side, interest rates increase borrowing costs, which affects investments negatively, while on the other side interest rates affect investments positively by increasing the availability of loanable funds (Laumas, 1990; Gelb, 1989).

Interest rate reforms can also affect economic growth through financial development. However, some studies suggest that the direction of causality is from economic growth to financial development (Odhiambo, 2010). Higher interest rates resulting from interest rate liberalisation can encourage capital inflows, which in turn has a positive effect on economic growth

(Wesso, 2001). However, interest rates might have an insignificant effect on some types of capital flows, like FDI.

Interest rates have an effect on inflation and exchange rates. Higher interest rates reduce inflation and also result in an appreciation of a currency through an increase in capital inflows (Batten & Thornton, 1985). Inflation and exchange rates have a negative relationship, and the empirical literature suggest that the direction of causality can be both ways. However, some studies suggest that interest rates have an insignificant effect on the exchange rate.

Interest rate liberalisation can exert a negative influence on an economy through its association with financial crises. Interest rate liberalisation encourages banks to take more risks in search of higher returns, as well as through entry of new banks, which promotes more banking competition (Ariss, 2010). On the other hand, some studies suggest that higher levels of bank competition promote financial stability and that the benefits of interest rate liberalisation through higher growth outweigh the negative effects associated with financial crises (Ranciere *et al*, 2006).

The chapter also highlighted the gaps in the literature on interest rate liberalisation and economic growth. The gaps include examining the effect of interest rate reforms on economic growth in different regions – for instance the SADC – in an attempt to foster regional integration. Most studies use time series techniques which assess countries individually. This study uses panel data techniques so as to evaluate the effect of interest rate reforms in selected SADC countries as a whole. Most studies on the effect of interest rate reforms on financial deepening and economic growth focus on the size of the financial system. However, the efficiency of the financial system could be more vital than its size.

The survey of estimation techniques indicated that models – like the pooled OLS, fixed effects and random effects – yield inconsistent results in a dynamic panel data model due to the dynamic panel bias (Baltagi, 2005). The estimators also assume that the slope parameters are homogenous across groups. The TSLS and the GMM estimators have been proposed as a way of dealing with the dynamic panel bias. The estimators also assume that the slope coefficients are similar in cross-sectional units and so could yield inconsistent estimates when the slope coefficients are in fact heterogenous. Furthermore, the TSLS and GMM estimators are designed for panels with a large N and small T and thus may produce inconsistent estimates if the T is large (Pesaran & Smith, 1995). The MG and SUR models may be used to estimate individual parameters for each cross-sectional unit. However, these estimators do not take into

consideration that parameters could be similar across groups. The dynamic models in the study will be estimated using the PMG estimator, which estimates heterogenous short-run slope coefficients for the cross-sectional units and homogenous long-run slope coefficients. The PMG estimator is discussed in detail in the next chapter, along with the logit model.

CHAPTER SIX

METHODOLOGY

6.1 Introduction

Chapter five surveyed the existing empirical literature on the relationship between interest rate liberalisation and economic growth, as well as the available panel data estimation techniques. The chapter suggested that the PMG estimator is superior to the MG, SUR, GMM, pooled OLS, fixed effects, random effects and TSLS techniques when estimating a dynamic panel data model involving a large *T*. The PMG estimator assumes that the intercepts, short-run coefficients and error variances differ across groups, while the long-run coefficients are constrained to be homogenous.

The objective of this chapter is to outline the methodology of the study, which includes a discussion of the estimation techniques used in analysing the channels in which interest rate liberalisation affects economic growth in eleven SADC countries for the period 1990-2015. The first channel is through savings and investments, as advocated by McKinnon (1973). The analysis follows a similar approach to Shrestha & Chowdhury (2007) and Fry (1978) among others, who employ a multiple equation specification. Shaw (1973) suggested that financial liberalisation has a positive influence on financial deepening, and so the relationship between interest rate liberalisation, financial development and economic growth is analysed. The analysis follows that of Odhiambo (2009), who used a two-equation specification. Interest rates affect the returns earned by investors, which in turn influences capital flows (McLean & Shrestha, 2002). The relationship between interest rate liberalisation, capital flows and economic growth is examined with the use of a two-equation specification. The abovementioned relationships are estimated using the PMG technique.

There are concerns that interest rate liberalisation increases the likelihood of financial crises and as such the link between interest rate liberalisation and financial crises is explored. The logit model is used to estimate the parameters of the regression model, due to the binary nature of the dependent variable (financial crises).

The chapter is organised as follows: the next section discusses the methodological approach used, while the subsequent sections outline the specified models, the estimation techniques, the analysis of the data, including stationarity tests, and finally a conclusion.

6.2 Methodological approach

The study examines the channels in which interest rate liberalisation affects economic growth. The first channel considered is through savings and investments. The McKinnon and Shaw hypothesis suggests that interest rate deregulation exerts a positive influence on savings by increasing the returns on savings (McKinnon, 1973; Shaw, 1973). Higher savings levels promote higher investment levels, which in turn foster higher economic growth. This channel is examined using a multiple equation specification, an approach similar to those of Fry (1978), Giovannini (1985), De Melo & Tybout (1986), Wirman & Thirlwall (1999), Strestha & Chowdury (2007) and Achy (2003). In particular this study uses a three-equation specification, where the first equation surveys the relationship between interest rate liberalisation and gross domestic savings. The effect of interest rate liberalisation on investments through savings is examined by the second equation, while the third equation observes the effect of interest rate liberalisation on economic growth through savings and investments.

Another channel in which interest rate liberalisation affects economic growth is through financial deepening. Shaw (1973) argued that higher interest rates resulting from interest rate liberalisation increase the amount of loanable funds, which encourages capital accumulation and financial deepening. Capital accumulation operates through the rise in the level of financial intermediation, which in turn promotes economic growth. The analysis follows the approach of Odhiambo (2009a) in using a two-equation specification. The first equation examines the role of interest rate liberalisation in promoting financial deepening, while the second assesses the effect of financial deepening on economic growth.

The study also analyses the effect of interest rates on capital flows. Higher interest rates resulting from interest rate liberalisation increase the returns to investing and so encourage capital inflows and reduce capital outflows (McLean & Shrestha, 2002). However, higher interest rates could signify macroeconomic instability, which discourages capital inflows. The effect of interest rate liberalisation on economic growth via savings and investments, financial development and capital flows is estimated using the PMG estimator, which is discussed in detail in Section 6.3.

Interest rate liberalisation increases the likelihood of financial crises and in particular banking crises (Demirgüç-Kunt & Detragiache, 1998). This is because higher interest rates resulting from interest rate liberalisation encourage banks to take more risks in anticipation of earning

higher returns, and because of greater competition (Cubillas & González, 2014). This study observes whether interest rate liberalisation increases the likelihood of financial crises in SADC countries, using an approach similar to that of Demirgüç-Kunt & Detragiache (1998), Lee & Shin (2007) and Barrell *et al* (2013). This analysis also examines whether institutional quality mitigates the negative effect of interest rate liberalisation on financial crises. The effect of financial development on financial crises is also investigated so as to determine whether lending practices in SADC countries can trigger financial crises. The logit model is used to conduct the analysis and is discussed in greater detail in section 6.10.

6.3 Pooled mean group estimator

The PMG estimator was developed by Pesaran *et al* (1999). This technique involves pooling and averaging of individual estimates across groups so that the intercept and short-run slope coefficients and the error variance are assumed to differ across units while the long-run coefficients are constrained to be similar across groups. The PMG estimator for a dynamic panel data model can be specified by extending the single time series ARDL model as follows:

$$y_{it} = \sum_{j=1}^{p} \lambda_i y_{i,t-j} + \sum_{j=0}^{q} x_{i,t-j}\delta_{ij} + \alpha_i + \varepsilon_{it}, \quad t = 1, 2, \dots, T, \;\; i = 1, 2, \dots, N \tag{6.1}$$

where α_i represents the fixed effects, x_{it} is a vector of explanatory variables, λ_{ij} and δ_{ij} are vectors of parameters.

The error correction form of the above equation is:

$$\Delta y_{it} = \phi_i y_{i,t-1} + x_{it}\beta_i + \sum_{j=1}^{p-1} \lambda_{ij}^{*} \Delta y_{i,t-1} + \sum_{j=0}^{q-1} \Delta x_{i,t-j}\delta_{ij}^{*} + \mu_i + \varepsilon_{it} \tag{6.2}$$

where:

$$\phi_i = -(1 - \sum_{j=1}^{p} \lambda_{ij}) \;\; and \;\; \beta_i = \sum_{j=0}^{q} \delta_{ij}$$

If time series observations for each cross-sectional unit are stacked, equation 6.2 can be specified as follows:

$$\Delta Y_{it} = \phi_i Y_{i,-1} + X_i \beta_i + \sum_{j=1}^{p-1} \lambda_{ij}^* \Delta Y_{i,-1} + \sum_{j=0}^{q-1} \Delta X_{i,-j} \delta_{ij}^* + \mu_i \iota_T + \varepsilon_i \quad (6.3)$$

where:

$$Y_i = \begin{bmatrix} y_{i1} \\ \vdots \\ y_{iT} \end{bmatrix}_{T \text{ x } 1}, X_i = \begin{bmatrix} x_{i1} \\ \vdots \\ x_{iT} \end{bmatrix}_{T \text{ x } k}, \iota_T = \begin{bmatrix} 1 \\ \vdots \\ 1 \end{bmatrix}_{T \text{ x } 1}, \varepsilon_i = \begin{bmatrix} \varepsilon_{i1} \\ \vdots \\ \varepsilon_{iT} \end{bmatrix}_{T \text{ x } 1}$$

The PMG technique makes the following assumptions:

- ε_{it}'s are serially uncorrelated across i and t, have zero means, variances $\sigma_i^2 > 0$, and finite fourth-order moment conditions. The ε_{it}'s are also independent of the explanatory variables, an assumption required for consistent estimation of short-run coefficients.
- The $ARDL\ (p, q, q, \dots, q)$ model is stable in that the roots of:

$$\sum_{j=1}^{p} \lambda_{ij} z^j = 1, \qquad i = 1, 2, \dots, N \quad (6.4)$$

lie outside the unit circle. This assumption ensures that $\phi_i < 0$ for all $i = 1, 2, \dots, N$, so there exists a long-run relationship between $y_{it}$and x_{it} defined by:

$$y_{it} = \theta_i x_{it} + \eta_{it} \quad (6.5)$$

where $\theta_i = -\beta_i' / \phi_i$ are the long-run coefficients while η_{it} is a stationary process.

- The long-run coefficients θ_i are constrained to be the same for all cross-sectional units.

When the assumptions of stability of the ARDL model and long-run heterogeneity hold, equation (6.3) can be written as follows:

$$\Delta Y_i = \phi_i \xi_i(\theta) + W_i \kappa_i + \varepsilon_i, \qquad i = 1, 2, \dots, N \quad (6.6)$$

Where the dependence of the error correction term on θ is represented by the equation below:

$$\xi_i(\theta) = y_{i,-1} - X_i\theta,\ i = 1, 2, \dots, N$$

$W_i = \left(\Delta y_{i,-1}, \dots, \Delta y_{i,-p+1}, \Delta X_i, \Delta X_{i,-1}, \dots, \Delta X_{i,-q+1}, \iota\right)$ and $\kappa_i =$
$(\lambda_{i1}^*, \dots, \lambda_{i,p-i}^*, \delta_{i0}^{*'}, \delta_{i1}^{*'}, \dots, \delta_{i,q-1}^{*'}, \mu_i)'$

The PMG model is estimated using a likelihood approach which assumes that the error terms are normally distributed. The estimator of the long-run coefficient, θ, is consistent as long as $T \to \infty$, irrespective of whether *N* is large.

6.4 Interest rate liberalisation, savings, investments and economic growth

As mentioned in section 6.2, this relationship is analysed using a three-equation specification in an attempt to model the effect of interest rate liberalisation on economic growth through savings and investments.

6.4.1 Interest rate liberalisation and savings

The long-run relationship between savings, real deposit rate, age dependency and GDP per capita was specified in the form:

$$SAV_{it} = \theta_{0i} + \theta_{1i}RDEP_{it} + \theta_{2i}AGE_{it} + \theta_{3i}\,GDP_{it} + \mu_i + \varepsilon_{it} \quad (6.7)$$

where: SAV = gross domestic savings

RDEP = real deposit rate

AGE = age dependency ratio

GDP = GDP per capita growth

μ_i = the country-specific effect

ε_{it} = error term

An $ARDL(1,1,1,1)$ dynamic specification is used for this relationship as follows:

$$SAV_{it} = \lambda_{1i}SAV_{it-1} + \delta_{10i}RDEP_{it} + \delta_{20i}AGE_{it} + \delta_{30i}GDP_{it} + \delta_{11i}RDEP_{it-1} + \delta_{21i}AGE_{it-1} + \delta_{31i}GDP_{it-1} + \mu_i + \varepsilon_{it} \quad (6.8)$$

The error correction form of equation (6.8) is specified as follows:

$$\Delta SAV_{it} = \phi_i(SAV_{it-1} - \theta_{0i} - \theta_{1i}RDEP_{it-1} - \theta_{2i}AGE_{it-1} - \theta_{3i}GDP_{it-1}) + \delta_{i01}\Delta RDEP_{it} + \delta_{i02}\Delta AGE_{it} + \delta_{i03}\Delta GDP_{it} + \mu_i + \varepsilon_{it-1} \quad (6.9)$$

where: $\phi = -(1 - \lambda_i)$,

$$\theta_{0i} = {}^{\mu_i}/_{(1-\lambda_i)},$$

$$\theta_{1i} = \frac{\delta_{10i} + \delta_{11i}}{1 - \lambda_i}$$

$$\theta_{2i} = \frac{\delta_{20i} + \delta_{21i}}{1 - \lambda_i}$$

$$\theta_{3i} = \frac{\delta_{30i} + \delta_{31i}}{1 - \lambda_i}$$

Gross domestic savings are calculated as GDP less final consumption expenditure. The deposit rate is the rate paid by commercial banks for demand, time and savings deposits. Higher deposit rates enhance the returns to saving and also increase the opportunity cost of increased current consumption expenditure in terms of returns foregone. McKinnon (1973) and Shaw (1973) argue that the deposit rate is positively correlated with savings. However, the effect of the deposit rate on savings depends on the substitution and income effect, so the variable can be negatively signed if the income effect outweighs the substitution effect (Ang & Sen, 2011). Keynes (1936) also argued that interest rates have an insignificant effect on savings, as individuals save despite low or negative interest rates. The deposit rate has been included in specifications involving savings and interest rates in studies like those of Fry (1978), De Melo & Tybout (1986) and Shrestha & Chowdhury (2007).

The GDP per capita growth variable is the growth rate of gross domestic product divided by mid-year population, and captures the effect of income on savings. According to the life-cycle hypothesis, higher income levels enhance savings as individuals in the labour force increase savings relative to those out of the labour force (Kargbo, 2010). However, the effect of income on savings would be insignificant if income levels are low and people spend most of their incomes on necessities (Opoku & Ackah, 2015). Age dependency ratio is the ratio of people younger than 15 or older than 64 to the working age population (those aged between 15 and 64). The variable captures the effect of demographics on the saving rate and is expected to be negatively correlated with savings (Ang & Sen, 2011). In countries where age dependency ratios are high, the effect of income on savings would mostly likely be insignificant (Khan & Hasan, 1998). Households with more children are likely to save less compared with those with fewer children. As such, the dissaving patterns of the fraction of

the population that is dependent would outweigh the saving patterns of those in the labour force, the larger the proportion of the population that is not working (Achy, 2003).

6.4.2 Savings and investments

The long-run relationship between investments, credit to the private sector, lending rates and savings was specified as follows:

$$INV_{it} = \theta_{0i} + \theta_{1i}CRED_{it} + \theta_{2i}RINT_{it} + \theta_{3i}\,SAV_{it} + \theta_{4i}FDI_{it} + \mu_i + \varepsilon_{it} \quad (6.10)$$

where: *INV* = investments

CRED = credit to the private sector

RINT = real interest rate

SAV = savings

FDI = foreign direct investments

μ_i = the country-specific effect

ε_{it} = error term

An $ARDL(1,1,1,1,1)$ dynamic specification is used for this relationship as follows:

$$\begin{aligned} INV_{it} = {} & \lambda_{1i}INV_{it-1} + \delta_{10i}CRED_{it} + \delta_{20i}RINT_{it} + \delta_{30i}SAV_{it} + \delta_{40i}FDI_{it} + \delta_{11i}CRED_{it-1} \\ & + \delta_{21i}RINT_{it-1} + \delta_{31i}SAV_{it-1} + \delta_{41i}FDI_{it-1} + \mu_i + \varepsilon_{it} \end{aligned} \quad (6.11)$$

The error correction form of equation (6.11) is specified as follows:

$$\begin{aligned} \Delta INV_{it} = {} & \phi_i(INV_{it-1} - \theta_{0i} - \theta_{1i}CRED_{it-1} - \theta_{2i}RINT_{it-1} - \theta_{3i}SAV_{it-1} - \theta_{4i}FDI_{it-1}) \\ & + \delta_{i01}\Delta CRED_{it} + \delta_{i02}\Delta RINT_{it} + \delta_{i03}\Delta SAV_{it} + \delta_{i04}\Delta FDI_{it} + \mu_i \\ & + \varepsilon_{it-1} \end{aligned} \quad (6.12)$$

where: $\phi = -(1 - \lambda_i)$,

$\theta_{0i} = {}^{\mu_i}/_{(1-\lambda_i)}$,

$$\theta_{1i} = \frac{\delta_{10i} + \delta_{11i}}{1 - \lambda_i}$$

$$\theta_{2i} = \frac{\delta_{20i} + \delta_{21i}}{1 - \lambda_i}$$

$$\theta_{3i} = \frac{\delta_{30i} + \delta_{31i}}{1 - \lambda_i}$$

$$\theta_{4i} = \frac{\delta_{40i} + \delta_{41i}}{1 - \lambda_i}$$

Investments are captured by gross fixed capital formation. Gross fixed capital formation includes land improvements, plant, and machinery and equipment purchases (World Development Indicators, 2014). It also includes the construction of roads, railways, schools and industrial buildings. The real interest rate is the bank rate that usually meets the short- and medium-term financial needs of the private sector. The variable is expected to have a negative effect on investments due to higher borrowing costs that are associated with higher lending rates (Shrestha & Chowdhury, 2007). The McKinnon and Shaw hypothesis suggests that savings are the largest determinant of investments. Shaw (1973) argued that investments are determined by the amount of funds that financial intermediaries can lend, which in turn depends on the quantity of savings. Higher levels of savings enhance the amount of loanable funds available and so have a positive effect on investments (McKinnon, 1973). Various growth theories, like those of Harrod-Domar, Solow-Swann and the Romer models, also stress the importance of savings in promoting capital accumulation/investments.

The availability of credit to the private sector encourages entrepreneurs to innovate and make investments that enable more production of goods and services (Bittencourt, 2010). Credit to the private sector is often used as an indicator of financial development. A developed financial sector has a positive effect on the quantity as well as the quality of investment (Levine, 2001). McKinnon (1973) suggests that financial deepening resulting from financial market liberalisation is an indication of increased use of financial intermediaries by savers and investors, which improves capital accumulation and the efficiency of investments by transferring capital from less productive to more productive sectors.

6.4.3 Investments and economic growth

The long-run relationship between interest rate liberalisation and economic growth was specified as follows:

$$GDPG_{it} = \theta_{0i} + \theta_{1i}GOV_{it} + \theta_{2i}INV_{it} + \theta_{3i}TR_{it} + \theta_{4i}INF_{it} + \mu_i + \varepsilon_{it} \quad (6.13)$$

where: *GDPG* = GDP growth

GOV = government spending

INV = investments

TR = trade in goods and services

INF = inflation

μ_i = the country-specific effect

ε_{it} = error term

An $ARDL(1,1,1,1,1)$ dynamic specification is used for this relationship as follows:

$$GDPD_{it} = \lambda_{1i}GDPG_{it-1} + \delta_{10i}GOV_{it} + \delta_{20i}INV_{it} + \delta_{30i}TR_{it} + \delta_{40i}INF_{it} + \delta_{11i}GOV_{it-1} + \delta_{21i}INV_{it-1} + \delta_{31i}TR_{it-1} + \delta_{41i}INF_{it-1} + \mu_i + \varepsilon_{it} \quad (6.14)$$

The error correction form of equation (6.14) is specified as follows:

$$\Delta GDPG_{it} = \phi_i(GDPG_{it-1} - \theta_{0i} - \theta_{1i}GOV_{it-1} - \theta_{2i}INV_{it-1} - \theta_{3i}TR_{it-1} - \theta_{4i}INF_{it-1}) + \delta_{i01}\Delta GOV_{it} + \delta_{i02}\Delta INV_{it} + \delta_{i03}\Delta TR_{it} + \delta_{i04}\Delta INF_{it} + \mu_i + \varepsilon_{it-1} \quad (6.15)$$

Where: $\phi = -(1 - \lambda_i)$,

$\theta_{0i} = {}^{\mu_i}/_{(1-\lambda_i)}$,

$$\theta_{1i} = \frac{\delta_{10i} + \delta_{11i}}{1 - \lambda_i}$$

$$\theta_{2i} = \frac{\delta_{20i} + \delta_{21i}}{1 - \lambda_i}$$

$$\theta_{3i} = \frac{\delta_{30i} + \delta_{31i}}{1 - \lambda_i}$$

$$\theta_{4i} = \frac{\delta_{40i} + \delta_{41i}}{1 - \lambda_i}$$

Government spending includes all government current expenditures for purchases of goods and services, including compensation to employees. It also includes most expenditure on national defence and security but excludes government military expenditures. Government expenditures may crowd out private investments by increasing the interest rate (Bonfiglioli, 2005). However, government expenditures in the provision of public services to the economy can complement private investment and hence increase economic growth (Misati & Nyamongo 2012:152). So the variable can possess either a positive or a negative coefficient.

Based on the McKinnon and Shaw hypothesis, interest rate liberalisation has a positive effect on GDP through savings and investments. If the McKinnon and Shaw hypothesis holds, the investment should be positively related to GDP. Inflation captures the effect of macroeconomic instability on economic growth. High and fluctuating inflation is an indication of macroeconomic instability, which increases the uncertainty with regard to the profitability of investment projects (Misati & Nyamongo, 2012). The increase in uncertainty dampens both domestic and foreign investments, which has a negative influence on economic growth. Trade openness is the sum of imports and exports of goods and services measured as a share of GDP. Trade openness may improve efficiency in an economy by promoting product specialisation, as specified by the theory of comparative advantage (Bonfiglioli, 2005). Trade also provides a larger market for domestic output, increases competition and provides producers with access to a variety of capital goods which may enhance productivity (Misati & Nyamongo, 2012). However, as postulated by Ahmed and Suardi (2009) trade liberalisation has a positive influence on economic growth if an economy's export structure is diversified. So the effect of trade openness on economic growth is ambiguous.

6.5 Interest rate liberalisation, capital flows and economic growth

The study assesses the link between interest rates, capital flows and economic growth using a two-equation specification. The first equation examines the effect of interest rates on capital flows, while the second equation examines the influence on capital flows on economic growth.

6.5.1 Interest rate liberalisation and capital flows

The long-run relationship between interest rate liberalisation and capital flows was specified as follows:

$$CF_{it} = \theta_{0i} + \theta_{1i}RINT_{it} + \theta_{2i}\,GDPC_{it} + \theta_{3i}DIFF_{it} + \theta_{4i}CRED_{it} + \theta_{5i}INF_{it} + \theta_{6i}CHINN_{it} + \mu_i + \varepsilon_{it} \quad (6.16)$$

where: *CF* = capital flows

R*INT* = the real interest rate

GDPC = GDP per capita

DIFF = interest rate differentials

CRED = credit to the private sector

INF = inflation

CHINN = Chinn-Ito index

μ_i = the country-specific effect

ε_{it} = error term

An $ARDL(1,1,1,1,1,1,1)$ dynamic specification is used for this relationship as follows:

$$CF_{it} = \lambda_{1i}CF_{it-1} + \delta_{10i}RINT_{it} + \delta_{20i}GDPC_{it} + \delta_{30i}DIFF_{it} + \delta_{40i}CRED_{it} + \delta_{50i}INF_{it} + \delta_{60i}CHINN_{it} + \delta_{11i}RINT_{it-1} + \delta_{21i}GDPC_{it-1} + \delta_{31i}DIFF_{it-1} + \delta_{41i}CRED_{it-1} + \delta_{51i}INF_{it-1} + \delta_{61i}CHINN_{it-1} + \mu_i + \varepsilon_{it} \quad (6.17)$$

The error correction form of equation (6.17) is specified as follows:

$$\Delta CF_{it} = \phi_i(CF_{it-1} - \theta_{0i} - \theta_{1i}RINT_{it-1} - \theta_{2i}GDPC_{it-1} - \theta_{3i}DIFF_{it-1} - \theta_{4i}CRED_{it-1} + \theta_{5i}INF_{it-1} + \theta_{6i}CHINN_{it-1}) + \delta_{i01}\Delta RINT_{it} + \delta_{i02}\Delta GDPC_{it} + \delta_{i03}\Delta DIFF_{it} + \delta_{i04}CRED_{it} + \delta_{i05}\Delta INF_{it} + \delta_{i06}\Delta CHINN_{it} + \mu_i + \varepsilon_{it-1} \quad (6.18)$$

where: $\phi = -(1 - \lambda_i)$,

$$\theta_{0i} = {}^{\mu_i}/_{(1-\lambda_i)},$$

$$\theta_{1i} = \frac{\delta_{10i} + \delta_{11i}}{1 - \lambda_i}$$

$$\theta_{2i} = \frac{\delta_{20i} + \delta_{21i}}{1 - \lambda_i}$$

$$\theta_{3i} = \frac{\delta_{30i} + \delta_{31i}}{1 - \lambda_i}$$

$$\theta_{4i} = \frac{\delta_{40i} + \delta_{41i}}{1 - \lambda_i}$$

$$\theta_{5i} = \frac{\delta_{50i} + \delta_{51i}}{1 - \lambda_i}$$

$$\theta_{6i} = \frac{\delta_{60i} + \delta_{61i}}{1 - \lambda_i}$$

Capital flows are captured by FDI flows, which are net inflows of investment to acquire a lasting management interest (10% or more voting stock) in an enterprise operating in an economy (World Bank, 2015). The real interest rate captures the effect of domestic interest rates on capital flows. Higher interest rates increase returns earned by investors and thus encourage capital inflows (McLean & Shrestha, 2002). However, high and volatile interest rates could be a sign of macroeconomic instability which discourages capital inflows, so the coefficient is ambiguous. Higher domestic GDP per capita is an indication of high current and future returns and so encourages capital inflows (Ahmed *et al*, 2005). Furthermore, higher levels of GDP per capita may represent higher levels of institutional quality which impact positively on capital inflows (Demirgüç-Kunt & Detragiache (1998).

A high inflation rate is an indication of macroeconomic instability and also increases uncertainty with regard to returns on investments. So the variable is expected to be correlated negatively with capital inflows (Wesso, 2001). Financial openness is represented by the Chinn-Ito index which measures the degree of financial openness for a country in a certain period and is constructed using binary variables based upon the IMF's Report on Exchange Arrangements and Exchange Restrictions (AREAER) (Chinn & Ito, 2013). The variable is expected to be positively related to capital inflows (Ahmed *et al*, 2005). The removal of capital controls which limit the repatriation of profits encourages capital inflows. Credit to the private sector captures the level of financial development. Financial development improves access to funds for foreign investors and so is expected to have a positive effect on capital inflows (McLean & Shrestha, 2002). A growing strand of literature suggests that financial development is a prerequisite for capital inflows and countries with shallow financial markets extract fewer benefits from capital inflows (Mougani *et al*, 2013; Agbloyor *et al*, 2014). A rise in foreign interest rates or a decrease in interest rate differentials between domestic and foreign interest rate has a negative effect on capital inflows and also encourages capital outflows as investors anticipate higher returns in the foreign countries (Arteta *et al*, 2015). Interest rate differentials is thus included in the analysis.

6.5.2 Capital flows and economic growth

The long-run relationship between capital flows and economic growth can be specified as follows:

$$GDPG_{it} = \theta_{0i} + \theta_{1i}GOV_{it} + \theta_{2i}INV_{it} + \theta_{3i}TR_{it} + \theta_{4i}CF_{it} + \theta_{5i}EXCH_{it} + \mu_i + \varepsilon_{it} \quad (6.19)$$

where: *GDPG* = GDP growth rate

GOV = government spending

INV = investments

TR = trade in goods and services

CF = capital flows

EXCH = exchange rate

μ_i = the country-specific effect

ε_{it} = error term

An $ARDL(1,1,1,1,1,1)$ dynamic specification is used for this relationship as follows:

$$GDPD_{it} = \lambda_{1i}GDPG_{it-1} + \delta_{10i}GOV_{it} + \delta_{20i}INV_{it} + \delta_{30i}TR_{it} + \delta_{40i}CF_{it} + \delta_{50i}EXCH_{it} + \delta_{11i}GOV_{it-1} + \delta_{21i}INV_{it-1} + \delta_{31i}TR_{it-1} + \delta_{41i}CF_{it-1} + \delta_{51i}EXCH_{it-1} + \mu_i + \varepsilon_{it} \quad (6.20)$$

The error correction form of equation (6.20) is specified as follows:

$$\Delta GDPG_{it} = \phi_i(GDPG_{it-1} - \theta_{0i} - \theta_{1i}GOV_{it-1} - \theta_{2i}INV_{it-1} - \theta_{3i}TR_{it-1} - \theta_{4i}CF_{it-1}) + \theta_{5i}EXCH_{it-1} + \delta_{i01}\Delta GOV_{it} + \delta_{i02}\Delta INV_{it} + \delta_{i03}\Delta TR_{it} + \delta_{i04}\Delta CF_{it} + \delta_{i05}\Delta EXCH_{it} + \mu_i + \varepsilon_{it-1} \quad (6.21)$$

where: $\phi = -(1 - \lambda_i)$,

$\theta_{0i} = {}^{\mu_i}/_{(1-\lambda_i)}$,

$$\theta_{1i} = \frac{\delta_{10i} + \delta_{11i}}{1 - \lambda_i}$$

$$\theta_{2i} = \frac{\delta_{20i} + \delta_{21i}}{1 - \lambda_i}$$

$$\theta_{3i} = \frac{\delta_{30i} + \delta_{31i}}{1 - \lambda_i}$$

$$\theta_{4i} = \frac{\delta_{40i} + \delta_{41i}}{1 - \lambda_i}$$

$$\theta_{5i} = \frac{\delta_{50i} + \delta_{51i}}{1 - \lambda_i}$$

Capital flows enhance savings and investment levels in an economy and so have a positive effect on economic growth (McLean & Shrestha, 2002). Capital inflows could also result in the transfer of technology and skills that are vital for the production of goods and services, so promoting economic growth (Agbloyor *et al*, 2014). Capital inflows in the form of foreign direct investments increase the level of competition in an economy, which in turn improves the efficiency of domestic firms. The coefficient of capital flows is expected to be related positively to GDP. The exchange rate captures macroeconomic instability in an economy. The coefficient is ambiguous based on the traditional and structural approaches to the impact of the exchange rate on economic growth (Salvatore, 2013).

6.6 Interest rate liberalisation, financial development and economic growth

The relationship is modelled using a two-equation specification. The first equation assesses the link between interest rate liberalisation and financial development, while the second examines the effect of financial development on economic growth.

6.6.1 Interest rate liberalisation and financial development

The long-run relationship between interest rate liberalisation and financial development can be specified as follows:

$$FD_{it} = \theta_{0i} + \theta_{1i}INT_{it} + \theta_{2i}GDPC_{it} + \theta_{3i}\,INF_{it} + \theta_{4i}CHINN_{it} + \mu_i + \varepsilon_{it} \qquad (6.22)$$

where: *FD* = financial development

GDPC = GDP per capita

INF = inflation

CHINN = Chinn-Ito index

INT = Real interest rate

μ_i = the country-specific effect

ε_{it} = error term

An $ARDL(1,1,1,1,1)$ dynamic specification is used for this relationship as follows:

$$FD_{it} = \lambda_{1i}FD_{it-1} + \delta_{10i}INT_{it} + \delta_{20i}GDPC_{it} + \delta_{30i}INF_{it} + \delta_{40i}CHINN_{it} + \delta_{11i}INT_{it-1} + \delta_{21i}GDPC_{it-1} + \delta_{31i}INF_{it-1} + \delta_{41i}CHINN_{it-1} + \mu_i + \varepsilon_{it} \qquad (6.23)$$

The error correction form of equation (6.23) is specified as follows:

$$\Delta FD_{it} = \phi_i(FD_{it-1} - \theta_{0i} - \theta_{1i}INT_{it-1} - \theta_{2i}GDPC_{it-1} - \theta_{3i}INF_{it-1} - \theta_{4i}CHINN_{it-1}) + \delta_{i01}\Delta INT_{it} + \delta_{i02}\Delta GDPC_{it} + \delta_{i03}\Delta INF_{it} + \delta_{i04}\Delta CHINN_{it} + \mu_i + \varepsilon_{it-1} \quad (6.24)$$

where: $\phi = -(1 - \lambda_i)$,

$$\theta_{0i} = {}^{\mu_i}/_{(1-\lambda_i)},$$

$$\theta_{1i} = \frac{\delta_{10i} + \delta_{11i}}{1 - \lambda_i}$$

$$\theta_{2i} = \frac{\delta_{20i} + \delta_{21i}}{1 - \lambda_i}$$

$$\theta_{3i} = \frac{\delta_{30i} + \delta_{31i}}{1 - \lambda_i}$$

$$\theta_{4i} = \frac{\delta_{40i} + \delta_{41i}}{1 - \lambda_i}$$

Five indicators of financial development are used to construct an index. This is done due to the strong correlations between the individual measures of financial development. The first indicator is broad money as a percentage of GDP, which includes currency outside banks and demand deposits other than those of the central government. This indicator captures the level of monetisation of an economy (Akinboade & Kinfack, 2013). The second indicator is credit to the private sector as a percentage of GDP, which includes credit provided by deposit-taking corporations excluding the central bank (World Bank 2016). The third indicator is deposit money bank assets as a percentage of GDP. This variable represents claims on the domestic real non-financial sector by banks (Beck, Demirgüç-Kunt and Levine, 2009). The fourth indicator is liquid liabilities as a percentage of GDP representing a broad measure of the size of the financial sector (Cojocaru *et al* 2011). The fifth measure is deposit money bank credit to the private sector as a percentage of GDP which represents banking sector development (Ayadi *et al* (2013).

The real interest rate represents the effect of interest rate liberalisation on financial development. In the McKinnon-Shaw hypothesis, higher real interest rates encourage savers to channel their saving from unproductive real assets to financial assets, so expanding the supply of

loanable funds. The expansion of loanable funds and the resulting expansion of the financial intermediation process have a positive influence on financial development. GDP per capita is a proxy for real income and expected to be positively related to financial development (Odhiambo, 2010). The effect of inflation on financial development is ambiguous. English (1999) argued that higher inflation has a positive effect on financial development by encouraging households to switch from purchased transactions to money balances. So inflation affects financial development positively through savings and investments. However, Azariadis & Smith (1996) argued that high inflation discourages savings by reducing the returns to savings, which in turn has a negative influence on the availability of credit. Moreover, high inflation is an indication of macroeconomic instability which creates uncertainty in the financial sector. Ayadi *et al* (2013) and Bittencourt (2008) suggest that macroeconomic stability – for instance low inflation rates – is crucial for financial development. Rajan & Zingales (2003) suggested that financial openness has a positive influence on financial development by increasing competition in the financial sector. Financial openness is captured by the Chinn-Ito index.

6.6.2 Financial development and economic growth

The long-run relationship between financial development and economic growth can be specified as follows:

$$GDPG_{it} = \theta_{0i} + \theta_{1i}GOV_{it} + \theta_{2i}INV_{it} + \theta_{3i}TR_{it} + \theta_{4i}FD_{it} + \theta_{5i}EXCH_{it} + \mu_i + \varepsilon_{it} \quad (6.25)$$

where: *GDPG* = GDP growth rate

GOV = government spending

INV = investments

TR = trade in goods and services

FD = financial development

EXCH = exchange rate

μ_i = the country-specific effect

ε_{it} = error term

An $ARDL(1,1,1,1,1,1)$ dynamic specification is used for this relationship as follows:

$$GDPG_{it} = \lambda_{1i}GDPG_{it-1} + \delta_{10i}GOV_{it} + \delta_{20i}INV_{it} + \delta_{30i}TR_{it} + \delta_{40i}FD_{it} + \delta_{50i}EXCH_{it} + \delta_{11i}GOV_{it-1} + \delta_{21i}INV_{it-1} + \delta_{31i}TR_{it-1} + \delta_{41i}FD_{it-1} + \delta_{51i}EXCH_{it-1} + \mu_i + \varepsilon_{it} \quad (6.26)$$

The error correction form of equation 6.26 is specified as follows:

$$\Delta GDPG_{it} = \phi_i(GDPG_{it-1} - \theta_{0i} - \theta_{1i}GOV_{it-1} - \theta_{2i}INV_{it-1} - \theta_{3i}TR_{it-1} - \theta_{4i}FD_{it-1} + \theta_{5i}EXCH_{it-1}) + \delta_{i01}\Delta GOV_{it} + \delta_{i02}\Delta INV_{it} + \delta_{i03}\Delta TR_{it} + \delta_{i04}\Delta FD_{it} + \delta_{i05}\Delta EXCH_{it} + \mu_i + \varepsilon_{it-1} \quad (6.27)$$

where: $\phi = -(1 - \lambda_i)$,

$$\theta_{0i} = {}^{\mu_i}/_{(1-\lambda_i)},$$

$$\theta_{1i} = \frac{\delta_{10i} + \delta_{11i}}{1 - \lambda_i}$$

$$\theta_{2i} = \frac{\delta_{20i} + \delta_{21i}}{1 - \lambda_i}$$

$$\theta_{3i} = \frac{\delta_{30i} + \delta_{31i}}{1 - \lambda_i}$$

$$\theta_{4i} = \frac{\delta_{40i} + \delta_{41i}}{1 - \lambda_i}$$

$$\theta_{5i} = \frac{\delta_{50i} + \delta_{51i}}{1 - \lambda_i}$$

Schumpeter (1912) initiated the research on financial development and economic growth and suggested that the availability of credit encourages entrepreneurs to innovate and produce more goods and services. Greenwood & Jovanovic (1990) and Levine (1991) argue that a developed financial system promotes economic growth by enhancing the quality of investments. Developed financial markets are effective in channelling funds to productive investment projects, thus promoting economic growth (FitzGerald, 2006). According to Bonfiglioli (2005), financial development spurs economic growth by increasing the availability of funds for investment purposes and enhancing productivity levels. Financial development is thus expected to be positively signed.

6.7 ARDL bounds testing approach

The PMG technique assumes that variables have a long-run relationship. So prior to estimating a model using the estimator, tests of cointegration are required. Cointegration refers to the notion that for a set of variables integrated of order one, some linear combination of the variables is stationary. Panel cointegration tests allow the pooling of information regarding common long-run relationships from across panels while allowing the short-run relationships and fixed effects to differ across members of a panel. The main approaches for conducting panel cointegration tests are the residual-based tests and the maximum-likelihood-based tests. The most popular residual-based tests are the McCoskey & Kao (1998), Kao (1999) and Pedroni (1995, 2004) tests while the maximum-likelihood-based tests are the Larsson & Lyhagen (1999), Groen & Kleibergen (2003) and Larsson *et al* (2001) tests. Most of the tests can only be applied when all variables are integrated of order one.

The study uses the ARDL bounds testing approach for the existence of a long-run relationship between variables developed by Pesaran, Shin & Smith (2001). The test can be used irrespective of whether variables are purely I(1), I(0) or a mixture of variables of different orders of integration. However, the technique cannot be used in the presence of I(2) variables.

The bounds testing approach is based on a VAR model which can be specified as follows:

$$z_t = c_0 + c_1 t + \sum_{i=1}^{p} \varphi_i \Delta z_{ti} + \varepsilon_t \qquad 6.28$$

where c_0 is a vector of intercepts, c_1 is a vector of trend coefficients and p is the lag length. The vector error correction model (VECM) is specified as follows:

$$\Delta z_t = c_0 + c_1 t + \Pi z_{t-1} + \sum_{i=1}^{p} \Gamma_i \Delta z_{t-i} + \varepsilon_t \qquad 6.29$$

Where Π and Γ are the long-run and short-run coefficient matrices respectively.

The null of no long-run relationship is tested against the alternative hypothesis using the Wald test (F-statistic). Pesaran *et al* (2001) provided critical values for the F-test. If the F-statistic is greater than the upper critical value, the null hypothesis is rejected. If the F-statistic is less than the lower critical value, the null hypothesis is not rejected irrespective of the order of integration of the variables. If the F-statistic falls between the upper and lower critical values, the result is inconclusive.

6.7.1 Diagnostic tests

Diagnostic tests are performed on the ARDL bounds testing results for individual countries to determine the adequacy of the model. The tests include the Breusch (1978)-Godfrey (1978) LM test for autocorrelation, the Breusch & Pagan (1979) test of heteroscedasticity, as well as the Ramsey (1969) reset test for model stability.

The Breusch-Godfrey LM test is selected over other tests such as the Durbin-Watson test because it allows for stochastic regressors such as lagged dependent variables (Gujarati & Porter, 2009). The null hypothesis of the test is that there is no serial correlation of any order. Ramsey (1969) proposed a test of model specification error under the null hypothesis that there is no misspecification. Rejection of the null suggests that the model is not correctly specified.

The popular tests of heteroscedasticity are the White (1980) and Breusch & Pagan (1979) tests. So the Breusch & Pagan test is selected for this study due to its simplicity compared with the White test. The White (1980) test adds squares of regressors which could make it less powerful compared with the Breusch & Pagan (1979) test by consuming degrees of freedom. Also, the significance of the test statistic under the White test could be a result of specification error. The null hypothesis of the Breusch-Pagan test is that the error variance is constant:

$$H_0: \alpha_i^2 = f(\alpha_0 + \alpha_1 z_1 + \alpha_2 z_2 + \cdots + \alpha_m z_m) \qquad 6.30$$

where the z variables are regressors. If the slope coefficients are all equal to zero, then $\alpha_i^2 = \alpha_0$ which is a constant. Therefore, the Breusch & Pagan test examines whether α_i^2 is homoscedastic by testing the hypothesis that $\alpha_1 = \alpha_2 = \cdots \alpha_m = 0$.

6.8 Principal components analysis

Principal components analysis (PCA) is used to construct the financial development index. The technique is used to examine the variance-covariance structure of a number of variables using a few linear combinations of these variables (Johnson & Wichern, 2007). Except in the situation where the number of variables is small, or the structure of the variables is simple, examining variances and covariances of all the variables is not an ideal process. So the main objective of PCA is to reduce a number of correlated variables to fewer uncorrelated components while retaining as much of the variation as possible (Jolliffe, 2002). Correlations be-

tween regressors results in multicollinearity, which has a negative effect on the precision of estimates, hence PCA is useful in mitigating such problems. If the amount of information contained by the principal components is more or less equivalent to the information in the original variables, the data reduction process is useful as the fewer components would replace the original variables without much loss of the information (Johnson & Wichern, 2007).

Principal components are weighted averages of the original variables generated in a way that maximises the total variation given the selected weights (Cudeck, 2000). The principal components are uncorrelated, so the covariance between them should be equal to zero. The uncorrelated linear combinations of variables derived from PCA can be specified as follows:

$$y_1 = w_{11}x_1 + w_{12}x_2 + \cdots + w_{1p}x_p \tag{6.31}$$

$$y_2 = w_{21}x_1 + w_{22}x_2 + \cdots + w_{2p}x_p \tag{6.32}$$

$$y_p = w_{p1}x_1 + w_{2p}x_2 + \cdots + w_{pp}x_p \tag{6.33}$$

where *y* is the constructed principle component, while *w* and *x* represent the weights and original variables respectively

The variance of the uncorrelated linear combinations can be specified as follows:

$$Var(Y_i) = w_i' \sum w_i \qquad i = 1, 2, \dots, p \tag{6.34}$$

Principal components are organised in such a way that most of the variation is preserved by the first few components (Jolliffe, 2002). As a result, most of the variation in the data is explained by the first principal component while the second principal component, derived in a similar fashion, accounts for the second-largest variation in the data. Additional principal components are derived in an approach similar to the first two components and the process continues until the number of components is equal to the number of variables (Jolliffe, 2002). In this case all the variations in the data would be accounted for.

Several criteria have been adopted for selecting the number of principal components to be analysed. Kaiser (1960) suggests that principal components with eigenvalues less than one contains less information than that provided by a single original variable and thus should be omitted from the analysis. Jolliffe (1972) argues that the criterion suggested by Kaiser (1960) is too large and proposed omitting principal components with less than 0.7 eigenvalues. However, omitting principal components with eigenvalues less than one may result in important components being overlooked if the largest eigenvalue is close to one, so caution should be exercised when using this criterion.

Another popular criterion for selecting the number of principal components is choosing the smallest number of principal components that account for the desired cumulative percentage of the total variation (Jolliffe, 2002). In practise, the cumulative percentage of the total variation selected is between 70% and 90% depending on the data set. In cases where the number of variables examined is small, a value greater than 90% may be required as the total variation is dominated by one or two principal components. In situations where the number of variables examined is large, the practical cut-off point should be below 70% so as to limit the number of principal components selected (Jolliffe, 2002).

Cattell (1966) suggested the use of a scree plot when selecting the number of principal components. This consists of plotting the variance of the principal components against the total number of principal components. The number of principal components chosen is determined by the point on the graph at which the slope of the lines joining the plotted points is steep to the left and relatively flat to the right (Jolliffe, 2002). The number of principal components retained is the value at which the "elbow" on the scree plot is defined (Johnson & Wichern, 2007).

6.9 Interest rate liberalisation and financial crises

The relationship between interest rate liberalisation and financial crises is specified as follows:

$$L_i = \beta_1 + \beta_2 RINT_{it} + \beta_3 GDPC_{it} + \beta_4 FD_{it} + \beta_5 CHINN_{it} + \beta_6 CA_{it} + \beta_7 INF_{it} + \varepsilon_{it} \quad (6.35)$$

where: L_i = dummy variable capturing financial crises

RINT = real interest rate

GDPC = GDP per capita

FD = financial development

CHINN = Chinn-Ito index

CA = current account balance

INF = inflation

ε_{it} = error term

The financial crisis dummy variable takes the value of 1 in a crisis year and 0 if there is no crisis. The construction of the crisis dummy variable is discussed in detail in section 6.11. Critics of interest rate liberalisation argue that it increases the likelihood of financial crises,

and in particular banking crises (Misati & Nyamongo, 2012). Higher interest rates encourage banks to take more risks in their lending practices due to the availability of higher returns. Also, banks undertake risky projects following the entry of new banks and financial institutions due to reduced profits and franchise values (Demetriades, Fattouh & Shields, 2001). Risky lending practices may result in a surge in non-performing loans, causing bank failures. However, lower interest rates also encourage banks to take more risks in search of higher returns and also result in excessive credit undertaking from consumers (Bocutoglu & Ekinci, 2010; Altumbas *et al*, 2010). Interest rate liberalisation may reduce bank risk taking, so reducing the likelihood of financial crises. The coefficient of the interest rate liberalisation index could be positive or negative, depending on the effect of interest rate liberalisation on the probability of banking crises.

GDP per capita captures the effect of higher levels of institutional quality on the likelihood of financial crises. GDP per capita is used as a proxy for institutional quality in studies by Demirgüç-Kunt & Detragiache (1998) and Angkinand *et al* (2010) who suggest that interest rate liberalisation reduces the likelihood of financial crises in countries with higher levels of institutional quality. So the coefficient of GDP per capita is expected to be negative (Triki & Maktour 2012). Financial development may increase the probability of financial crises. A rise in credit growth is expected to increase the number of non-performing loans and therefore is expected to increase the likelihood of banking crises (Angkinand *et al*, 2010). Financial openness is represented by the Chinn-Ito index of capital account openness. Critics of financial openness argue that it increases a country's exposure to external shocks and the reversal of capital inflows. Also, lending booms initiated by capital inflows also increase the risk of banking crises by widening the maturity mismatch between banks' assets and liabilities, as well as increasing the risks associated with movements in exchange rates (Demetriades *et al*, 2001). According to Barell *et al*, (2016), current account imbalances usually precede financial crises. Inflation is an indicator of macroeconomic instability, which enhances the likelihood of banking crises (Bonfiglioli, 2005). The relationship between interest rate liberalisation and banking crises is estimated using the logit model.

6.10 Logit model

In most empirical economic models, dependent variables are ratio scale variables. However, there are a number of econometric models where the dependent variable is a binary variable which takes the value of 1 or 0 (Johnson & Wichern, 2007). The values 1 and 0 indicate the presence or absence of a characteristic respectively. Binary variables are measured in nomi-

nal scale and represent categories such as male or female, employed or unemployed, or in the labour force or not in the labour force (Hill *et al*, 2012). This study examines whether interest rate liberalisation increases the likelihood of financial crises or not. Financial crisis, the dependent variable, is a binary variable specified as follows:

$$y = \begin{cases} 1 & \text{if a financial crisis takes place} \\ 0 & \text{otherwise} \end{cases} \tag{6.36}$$

Models with nominal scale dependent variables are referred to as qualitative response models. Such models can be estimated using a number of techniques one of which is OLS (Gujarati & Porter, 2009). The application of OLS to qualitative regression models produces a linear probability model (LPM) which is specified as follows:

$$Y_i = BX + u_i \tag{6.37}$$

where Y_i is the dependent variable, X is a set of explanatory variables and u_i is the error term.

The expected value of the dependent variable conditional on the value of the explanatory variables is the conditional probability that the event will take place, hence the model is called an LPM. The LPM is not the ideal method for estimating qualitative response models, for a number of reasons (Nagler, 1994). Firstly, the model is based on the assumption that the probability of an event taking place is linearly related to the value of the independent variables regardless of the size of the variables. Secondly, due to the inability of the OLS method to restrict the values of the estimated probabilities, the probability values from the LPM may not lie between 0 and 1 (Gujarati & Porter, 2009). Thirdly, the due to the fact that the dependent variable is a nominal scale variable, the disturbances follow as a Bernoulli distribution, so violating the assumption that the disturbance term is normally distributed. Lastly, the model is plagued by problems of heteroscedasticity which renders the significance tests invalid (Hill *et al*, 2012).

Due to the abovementioned limitations of the LPM, qualitative response models are usually estimated using logit and probit models (Nagler, 1994). These models ensure that the probability values of an event taking place always lie between 0 and 1 as the value of the dependent variable(s) changes. The relationship between the explanatory variables and the probability of an event is non-linear under the logit and probit models, unlike with the LPM. These models produce roughly the same estimation results, and due to its mathematical simplicity, the logit model is preferred in this study.

The probability that an event takes place is dependent on the probability distribution of Y_i, which in turn depends on the probability distribution of the disturbance term (Cakmakyapan & Goktas, 2013). The disturbance term under the logit model is assumed to follow a logistic probability distribution which can be specified as follows:

$$P_i = \frac{1}{1 + e^{-Zi}} \tag{6.38}$$

where P_i is the probability that an event takes place and:

$$Z_i = BX + u_i \tag{6.39}$$

The probability that an event does not take place can be specified as follows:

$$1 - P_i = \frac{1}{1 + e^{-Zi}} \tag{6.40}$$

The ratio of the probability that an event takes place against the probability that it does not take place produces the following equation:

$$\frac{P_i}{1 - P_i} = \frac{1 + e^{Zi}}{1 + e^{-Zi}} = e^{Zi} \tag{6.41}$$

where: $P_i/1 - P_i$ is the odds ratio of an event taking place.

Taking the natural log of the equation above produces the following equation:

$$L_i = \ln\left(\frac{P_i}{1 - P_i}\right) = Z_i = BX_i + u_i \tag{6.42}$$

where L_i is the log of odds ratio and is also referred to as the logit. A positive value of L_i implies that an increase in the value of the explanatory variables enhances the likelihood of an event taking place while a negative L_i value means that the probability of an event taking place decreases with an increase in the value of the explanatory variables (Gujarati & Porter, 2009). The equation above shows that L_i is a linear function of the independent variables and the slope coefficients measure the change in L_i resulting from a unit change in the independent variables.

6.11 Data sources

Table 6.1: Description of the variables

Variable	description
GDP	annual percentage growth rate of GDP at market prices
SAV	GDP less consumption expenditure as a percentage of GDP
INVS	gross fixed capital formation as a percentage of GDP
RINT	lending rate minus inflation
RDEP	deposit rate minus inflation
CRED	domestic credit to the private sector as a percentage of GDP
GDPP	GDP per capita (GDP divided by mid-year population)
GDPC	GDP per capita growth
TRA	sum of exports and imports as a percentage of GDP
GOV	current government purchases of goods and services as a percentage of GDP
AGE	ratio of people younger than 15 and older than 64 as a ratio of the working age population
INF	annual percentages of consumer prices
FDI	foreign direct investments net inflows as a percentage of GDP
CHINN	Chinn-Ito-index, a measure of a nation's financial openness
DIFF	interest rate differentials (domestic real interest rate minus the US real interest rate)
EXCH	domestic currency per US$ exchange rate
BROAD	broad money as a ratio of GDP
LIQ	liquid liabilities as a ratio of GDP
BA	deposit money bank assets as a ratio of GDP
BC	private credit provided by the banking sector as a ratio of GDP
FD index	financial development index created using principal components analysis
FD index2	financial development index created using principal components analysis
CA	current account balance as a percentage of GDP

Source: World Bank (2016), IMF (2016)

A description of all the variables used in the study is provided on Table 6.1. Most of the data on the variables is obtained from the World Bank's world development indicators and the International Monetary Fund (IMF). The Chinn-Ito index is taken from Chinn & Ito (2006) and measures the degree of financial openness for a country at a particular period of time. The index is constructed using binary variables based upon the IMF's Report on Exchange Arrangements and Exchange Restrictions (AREAER). Furthermore, the index encompasses the period from 1970 to 2015 in 182 countries and has a range of scores from 2.44 which represents the most financially open score to -1.86 which is the least financially open score. The financial development indicators are compiled by Beck, Demirgüç-Kunt and Levine (2000), Beck *et al* (2009) and Čihák, Demirgüç-Kunt, Feyen and Levine (2012). The data covers the period 1990-2015 and 11[5] of the 15 SADC countries were selected due to the unavailability of data for Angola, DRC, Mozambique and Zimbabwe.

Financial crises dates used to construct the financial crises dummy variable are sourced from Laeven & Valencia (2008, 2012), Reinhart & Rogoff (2011) and Caprio & Klingebiel (2003). The variable is a binary variable taking the value of 1 if a financial crisis occurred and 0 otherwise. Literature suggests that banking crises usually precede currency crises (Kaminsky & Reinhart, 1999; Glick & Hutchison, 1999). Both crises have common causes, like current account imbalances, high real interest rates, high inflation rates and financial liberalisation. Banking sector credit is sometimes financed by capital inflows in a liberal regime and as such, uncertainties in the domestic economy, like high inflation and low growth, may result in an attack against the domestic currency as capital outflows increase. Banking crises may occur as creditors have to be repaid in foreign currency, and because of the diminishing liquidity in the banking sector.

So as to increase the sample of crisis observations, the study combines data on banking and currency crises so that the binary variable 1 indicates the presence of a crisis, regardless of whether it involves banking or currency. Based on this strategy there are 44 total financial crises. Tables 6.2 and 6.3 present the banking and currency crises dates for the SADC countries. In Table 6.3 the crisis dates are those that are within the period of the study.

[5] Botswana, Lesotho, Madagascar, Malawi, Mauritius, Namibia, Seychelles, South Africa, Swaziland, Tanzania and Zambia

Table 6.2: Crises dates

Country	banking crisis	currency crisis
Botswana	1994, 1995	1984-1986, 1996
Lesotho	1988, 1995-1996, 1998-1999	1981, 1984-1985, 1988, 1996, 1998, 2000-2001, 2008
Madagascar	1988	1984, 1994, 2004
Malawi	1994	1982, 1985-1987, 1992, 1994
Mauritius		
Namibia	1984	1981, 1984-1986, 1988, 1996, 1998, 2000-2001, 2008
Seychelles		2008
South Africa	1977-1978, 1984, 1989, 1990	1981, 1984-1986, 1988, 1996, 1998, 2000-2001, 2008
Swaziland	1995-1999	1981, 1984-1986, 1988, 1996, 1998, 2000-2001, 2008
Tanzania	1987, 1988	1985, 1990-1995
Zambia	1995-1998	1983, 1985, 1988-1996, 2000, 2008-2009

Source: Caprio & Klingebiel (2003), Reinhart & Rogoff (2011) and Laeven & Valencia (2008, 2012)

According to Laeven & Valencia (2008, 2012), a banking crisis is defined as a significant sign of financial distress in the banking system as shown by bank runs, losses in the banking system, a large number of defaults and liquidations. Also, any noteworthy banking policy intervention measures in response to significant losses in the banking system also indicate a banking crisis. Caprio & Klingebiel (2003) define a banking crisis as a situation of financial distress in which the banking system has a negative net worth.

Reinhart & Rogoff (2011) state that banking crises are periods of bank runs that result in closure, mergers or takeovers by the public sector of one or more financial institutions. If there are no bank runs, the closure, takeover, or large scale government assistance of an important financial institution or a group of institutions can be classified as a banking crisis.

A currency crisis is defined as a nominal depreciation of the currency of at least 30% that is also at least 10% increase in the rate of depreciation compared with the previous year (Laeven & Valencia 2008, 2012). The exchange rate depreciations are measured as a percentage change at the end-of-period official nominal bilateral dollar exchange rate from the World Economic Outlook (WEO) database of the IMF.

Table 6.3: Crisis dates: 1990-2015

Country	banking crisis	currency crisis
Botswana	1994, 1995	1996
Lesotho	1995-1996, 1998-1999	1996, 1998, 2000-2001, 2008
Madagascar		1994, 2004
Malawi	1994	1992, 1994
Mauritius		
Namibia		1996, 1998, 2000-2001, 2008
Seychelles		2008
South Africa	1990	1996, 1998, 2000-2001, 2008
Swaziland	1995-1999	1996, 1998, 2000-2001, 2008
Tanzania		1990-1995
Zambia	1995-1998	1990-1996, 2000, 2008-2009

Source: Caprio & Klingebiel (2003), Reinhart & Rogoff (2011) and Laeven & Valencia (2012)

6.12 Unit root testing

To initiate the discussion of unit root testing, a first order autoregressive model is considered as follows:

$$y_{it} = \rho_i y_{i,t-1} + z'_{it}\gamma_i + \varepsilon_{it} \tag{6.43}$$

where: y_{it} is the variable being tested, ε_{it} is a stationary error term and z'_{it} represents panel-specific means or panel-specific means and a time trend.

The hypothesis tested in panel unit root tests is:

$H_0: \rho_i = 1$

$H_1: \rho_i < 1$

Equation (6.43) can be specified as follows:

$$\Delta y_{it} = \emptyset_i y_{i,t-1} + z'_{it}\gamma_i + \varepsilon_{it} \quad (6.44)$$

With this type of specification, the null hypothesis is $H_0: \emptyset_i = 0$ for all cross-sectional units, while the alternative hypothesis is $H_1: \emptyset_i < 0$. There are a number of panel unit root tests available, like the Im Pesaran & Shin (2003) (IPS) test, the Levin, Lin & Chu (2002) (LLC) test, the residual-based LM test, Breitung's test and the combining p-value test. The most popular unit root testing methods for panel data are the Im, Pesaran & Shin (IPS) (2003) and the Levin, Li & Chu (LLC) (2002) tests, which are used in this study.

6.12.1 LLC test

Levin *et al* (2002) argue that individual unit root tests have limited power against alternative hypotheses which have highly persistent deviations from equilibrium, so they propose a panel unit root test which is more powerful than performing individual unit root tests for each cross-section. The starting point for the LLC test is equation 6.44 with the restriction that all panels share a common autoregressive parameter. The test assumes that the error term is serially correlated, so additional lags of the dependent variable are added to mitigate the problem. The model is thus specified as follows:

$$\Delta y_{it} = \emptyset y_{i,t-1} + z'_{it}\gamma_i + \sum_{j=1}^{p} \theta_{ij}\Delta y_{i,t-j} + u_{it} \quad (6.45)$$

The test assumes that the error term is independently distributed across panels and follows a stationary invertible autoregressive moving-average process for each panel. The null hypothesis of the test is that y_{it} has a unit root that is, non-stationary, and the alternative hypothesis that the time series is stationary (Bresson 2002).

If $\sqrt{N}/T \to 0$, meaning that the time dimension *T* grows more slowly than the cross-sectional dimension *N*, the test should be conducted without panel-specific intercepts or time trends. According to Levine *et al* (2002) such a specification is relevant mostly for microeconomic

data sets. If $N/T \to 0$, meaning that the time dimension grows faster than the cross-sectional dimension, the test should be conducted with panel-specific means or time trends. This should be the approach followed for macroeconomic datasets where *N* is relatively smaller than *T*. The LLC test assumes homogenous first-order autoregressive parameters, which is a major limitation. Maddala & Wu (1999) argued that the assumption of the alternative hypothesis of the LLC test requiring every cross-sectional unit to converge at the same rate rarely holds in empirical analysis. The test also assumes independence across cross-sectional units, which makes it inappropriate if cross-sectional correlation is present (Barbieri, 2006).

6.12.2 IPS test

The LLC test assumes that all panels have a common autoregressive parameter. However, due to cultural and institutional differences, such an assumption is unrealistic, so Im *et al*, (2003) developed an alternative unit root test which assumes that there is heterogeneity for each unit in a dynamic panel and thus corrects for any serial correlation. So the test is flexible and can be used in the presence of residual serial correlation across cross-sectional units (Baltagi, 2005). The equation for the IPS test is as follows:

$$\Delta y_{it} = \emptyset_i y_{i,t-1} + z'_{it}\gamma_i + \varepsilon_{it} \qquad (6.46)$$

where: $\emptyset_i$ is panel-specific. The error term is assumed to be independently distributed normal and is allowed to have heterogenous variances across panels. The null hypothesis is that each series in the panel contains a unit root, while the alternative hypothesis allows for some of the individual series to have unit roots (Baltagi 2005).

Tables 6.4 and 6.5 show the order of integration of the variables in the study. The results in Table 6.4 include an individual intercept only, while those in Table 6.5 contain an individual intercept and trend. The variables are either stationary in levels or at first difference and, due to the different orders of integration, the PMG model is appropriate for the analysis. There are also no variables that are integrated of order two which would affect the results of the ARDL models negatively.

Table 6.4: Unit root tests. Intercept only

	LLC		IPS	
Variable	levels	1st difference	levels	1st difference
CRED	-1.48*	-7.43**	-0.37	-7.24***
GDPC	-1.43*	-7.68***	-6.05***	-14.55***
AGE	-2.16**	-2.97***	1.30	-3.91***
SAV	-1.31*	-14.63***	-2.64***	-14.77***
TRA	-1.36*	-8.31***	-1.43*	-8.92***
GDP	-1.61*	-8.31***	-6.01***	-14.83***
INVS	-0.58	-4.16***	-0.43	-8.13***
GOV	-2.34***	-14.63***	-2.64***	-14.09***
INF	-5.96***	-16.15***	-4.82***	-15.32***
RDEP	-4.86***	-9.74***	-5.76***	-11.17***
FDI	-2.78***	-11.16***	-3.16***	-13.25***
RINT	-2.70***	-9.93***	-4.47***	-12.31***
GDPP	0.06	-5.50***	2.54	-6.13***
DIFF	-2.81***	-7.96***	-5.13***	-11.72***
EXCH	3.04	-5.03***	4.96	-5.75***
CHINN	-2.73***	-5.53***	-2.46***	-7.41***
BA	-1.40*	-5.37**	-0.16	-5.66***
LIQ	-0.75	-3.03***	-0.67	-4.82***
BC	-4.88***	-6.03***	-3.22***	-6.81***
BROAD	-0.51	-4.34***	-0.18	-6.66***
FD index	-1.44*	-3.39***	0.02	-4.53***
FD index2	-5.19***	-5.52***	-4.23***	-5.41***
CA	-0.82	-8.73***	-1.17	-9.14***

Source: Researcher's own computations

Table 6.5: Unit root tests. With trend and intercept

	LLC		IPS	
Variable	levels	1st difference	levels	1st difference
CRED	-3.13***	-6.84***	-1.21	-6.20***
GDPC	0.40	-4.87***	-4.42	-12.78***
AGE	-0.48	-2.79***	0.47	-5.25***
SAV	0.13	-12.39***	-0.95	-13.00***
TRA	-0.25	-6.86***	-0.94	-7.44***
GDP	0.12	-5.66***	-4.92***	-13.08***
INVS	1.37	-2.14**	0.26	-6.18***
GOV	0.41	-1.80**	-1.47*	-10.43***
INF	-7.04***	-14.11***	-5.71***	-13.64***
RDEP	-4.21***	-7.02***	-4.40***	-9.07***
FDI	-3.04***	-9.01***	-4.63***	-11.29***
RINT	-3.36***	-7.52***	-4.03***	-10.26***
GDPP	-0.56	-3.75***	-0.48	-3.51***
EXCH	2.28	-4.20***	-0.51	-3.72***
DIFF	-3.31***	-5.27***	-4.25***	-9.62***
CHINN	-0.38	-6.06***	-0.09	-6.22***
BA	-2.19**	-3.90***	-1.55*	-4.01***
LIQ	-0.38	-4.72***	-1.19	-5.48***
BC	-5.51***	-4.27***	-3.40***	-5.22***
BROAD	-0.42	-2.07**	-0.54	-4.48***
FD index	-2.03**	-2.39***	-0.93	-3.30***
FD index2	-5.01***	-3.60***	-3.39***	-3.58***
CA	0.56	-7.34***	-0.15	-7.39***

Source: Researcher's own computations

6.13 Conclusion

The chapter discussed the methodology used in the study, the estimation techniques and the data. The methodology involves examining the relationship between interest rate liberalisa-

tion and economic growth in SADC countries using the panel data approach, which has the advantages of minimising multicollinearity and the omitted variable bias, and increasing the degrees of freedom (Baltagi, 2005). The channels through which interest rate liberalisation affects economic growth, like savings and investments, financial development and capital flows, are estimated using the PMG technique, which produces more accurate estimates in a dynamic model with a large *T* compared with the GMM, OLS, LSDV and TSLS techniques. The study constructs a financial development index using PCA, based on five indicators of financial development. PCA reduces the number of correlated variables into fewer uncorrelated variables, so mitigating problems associated with multicollinearity.

The link between interest rate liberalisation and financial crises is examined with the use of a logit model due to the binary nature of the dependent variable. The model tests whether interest rate liberalisation increases the probability of financial crises.

Data are obtained from a variety of sources: the IMF, World Bank, Chinn & Ito (2014), Laeven & Valencia (2012) and Caprio & Klingebiel (2003), and cover the period 1990-2015. The variables are either I(0) or I(1), so the PMG model is appropriate for the analysis. The next chapters present the results of the study based on the application of the estimation techniques and the specified models discussed above. Chapter seven presents the results of the relationship between interest rate liberalisation, savings, investments and economic growth.

CHAPTER SEVEN

THE RELATIONSHIP BETWEEN INTEREST RATE LIBERALISATION, SAVINGS, INVESTMENTS AND ECONOMIC GROWTH

7.1 Introduction

According to McKinnon (1973) and Shaw (1973), interest rate liberalisation has a positive effect on economic growth through savings and investments. Higher real deposit rates encourage savings which in turn increase the availability of loanable funds, so boosting investments. Critics of interest rate liberalisation argue that savings are not sensitive to real deposit rates and that higher real interest rates discourage investments by increasing borrowing costs.

This chapter presents the results of the relationship between interest rate liberalisation, savings, investments and economic growth. The link between the variables is examined empirically, based on the models specified in Chapter six, using the PMG estimation technique. The analysis is based on a three-equation specification, the first of which examines the effect of real deposit rate on savings. The second equation surveys the link between savings and investments, while the third model observes the relationship between investments and economic growth. The results of the PMG models are presented along with those of the MG and dynamic fixed effects (DFE) models for comparison purposes.

The chapter starts with a description of the data, which includes stationarity tests and descriptive statistics. After that, the results of the relationship between interest rate liberalisation and savings are analysed. The link between interest rate liberalisation and investments is also surveyed and it indicates whether this link is through savings. Lastly, the link between interest rate liberalisation and economic growth through savings and investments is also analysed.

7.2 Descriptive statistics

Table 7.1 presents the descriptive statistics of the relationship between interest rate liberalisation, savings, investments and economic growth for the period 1990-2015. Savings and investment ratios average 20.46% and 24.86% respectively, which are lower than the targets set by the SADC region. Savings and investments are crucial for higher economic growth and job creation and, as such, targets of 35% for savings and 30% for investments have been set. The averages for the savings and investment ratio in the SADC region are lower than in other emerging countries. According to the IMF (2016), the savings ratio averaged close to 37% in

emerging and developing countries in Asia, 28% in the ASEAN Five countries and just over 31% in the Middle East and North African countries between 1990 and 2015. The investment ratio in emerging and developing Asian countries averages close to 36%, while those in ASEAN and the Middle East and North African countries are 29% and 26% respectively. The GDP growth rate averages just below 4%, which is lower than the target of 7%. The mean for the real deposit rate averages -0.82%, which could be one of the reasons for the low savings ratio.

The major reason for the negative real deposit rate is the long history of high inflation in SADC countries. Inflation averaged 12.49% over the period under consideration – higher than the mean value of the deposit rate. Income growth as measured by GDP per capita growth averages a low 1.91%. Developing countries have had a history of low incomes, which is one of the reasons for low savings rates, as a large proportion of the income is used for subsistence consumption. The mean value for trade as percentage of GDP is close to 96%, indicating high levels of trade openness among SADC countries. Government expenditure and credit to the private sector as a percentage of GDP average 19.77% and 31.76% respectively. The mean values for the age dependency rate and the real interest rate are 76.53% and 7.99% respectively. FDI inflows as a percentage of GDP average 4.08%.

Table 7.1 Descriptive statistics

Variable	mean	maximum	minimum	std. dev.	observations
SAV	20.46	51.05	-3.14	11.40	286
INVS	24.86	69.03	4.56	10.84	286
RDEP	-0.82	15.54	-117.23	10.72	276
AGE	76.53	103.82	40.62	18.59	286
INF	12.59	183.31	-9.62	18.57	281
CRED	31.76	160.12	3.09	36.47	282
TRA	95.78	225.02	33.49	44.94	276
GOV	19.77	47.19	6.71	8.22	277
GDP	3.97	21.02	-12.67	3.61	285
GDPC	1.91	16.96	-15.28	3.60	285
RINT	7.99	52.10	-41.79	10.34	279
FDI	4.08	54.06	-6.90	5.84	285

Source: Researcher's own computations

7.3 Correlation analysis

Covariance analysis is used to measure the strength of correlations between the variables. The most popular methods of testing for correlations are the Spearman's rank order and the Pear-

son correlation coefficient. Spearman's rank order test is selected for this study because it does not make assumptions with regard to the distribution of the variables (Hauke & Kossowski, 2011). Furthermore, unlike the Pearson coefficient, the rank order test can be used without making the assumption that the relationship between the variables is linear (Hauke & Kossowski, 2011).

Table 7.2: Correlation analysis: interest rate liberalisation and savings

Variable	GDP	AGE	RDEP	SAV
GDP	1			
AGE	-0.11*	1		
RDEP	0.01	-0.27***	1	
SAV	0.35***	-0.23***	-0.002	1

Source: Researcher's own computations. Note: (***), and (*) indicate significance at 1% and 10% levels respectively

Tables 7.2 to 7.4 show the results of the correlation analysis. Savings are positively correlated with income growth and significant at the 1% level of significance, which confirms *a priori* expectations. Age dependency is correlated negatively with savings, which is in line with theoretical expectations. The real deposit rate is correlated negatively with savings. However the result is insignificant.

Table 7.3: Correlation analysis: savings and investment

Variable	INVS	SAV	CRED	RINT	FDI
INVS	1				
SAV	0.68***	1			
CRED	0.13**	0.18***	1		
RINT	-0.05	-0.13***	-0.22***	1	
FDI	0.36***	0.07	-0.15**	0.10*	1

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% level of significance respectively.

According to Table 7.3, investments are highly correlated with savings and significant at the 1% level of significance. This is in line with *a priori* expectations, as savings increase the availability of funds for investment purposes. Investments are correlated positively with credit to the private sector. Investments and the real interest rate are correlated negatively, although insignificantly. FDI and investments are correlated positively, which provides initial support for the hypothesis that FDI inflows supplement domestic investments.

Table 7.4: Correlation analysis: investment and economic growth

Variable	GDPG	GOV	INF	INVS	TRADE
GDPG	1				
GOV	-0.02	1			
INF	-0.11*	-0.25***	1		
INVS	0.25***	0.51***	-0.27***	1	
TRA	-0.03	0.46***	-0.20***	0.45***	1

Source: Researcher's own computations. Note: (***) and (*) indicate significance at 1% and 10% levels respectively

According to Table 7.4 the growth rate of GDP is positively correlated with investments. This confirms *a priori* expectations, as investments are regarded as one of the major determinants of economic growth. Inflation and government expenditure are correlated negatively with GDP, with GDP significant at 10%. GDP is negatively correlated with trade, however the result is insignificant. Tables 7.2 to 7.4 show no strong correlations between variables. The correlations are lower than 0.8, which implies that multicollinearity is not a problem, as suggested by Gujarati & Porter (2009).

7.4 Empirical results

This section presents the empirical results of the relationship between interest rate liberalisation, savings, investments and economic growth. The analysis follows that of Fry (1978), Giovannini (1985), De Melo & Tybout (1986), Wirman & Thirlwall (1999), Strestha & Chowdury (2007) and Achy (2003), who use a three-equation specification. The first part of the analysis is on the relationship between interest rate liberalisation and savings. The second and third parts of the section present the results of the relationship between interest rate liberalisation and investments, as well as the effect of investments on economic growth.

7.4.1 Interest rate liberalisation and savings

The results of the relationship between interest rate liberalisation and savings are presented in this section. Estimation of a model using the PMG estimator is preceded by the selection of an appropriate lag length. An ARDL model with appropriate lags overcomes the problems associated with serial correlation and endogeneity. The study uses a single lag, as proposed by Pesaran *et al* (1999), who argue that the coefficients of a model estimated by the PMG estimator are robust to the choice of lag order when T is large.

Table 7.5: ARDL bounds testing results. Dependent variable: Savings

Country	F-stat	critical values					
		1%		5%		10%	
		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
Botswana	11.52***	4.29	5.61	3.23	4.35	2.72	3.77
Lesotho	8.94***	4.29	5.61	3.23	4.35	2.72	3.77
Madagascar	6.61***	4.29	5.61	3.23	4.35	2.72	3.77
Malawi	3.13	4.29	5.61	3.23	4.35	2.72	3.77
Mauritius	2.11	4.29	5.61	3.23	4.35	2.72	3.77
Namibia	5.37***	4.29	5.61	3.23	4.35	2.72	3.77
Seychelles	4.14*	4.29	5.61	3.23	4.35	2.72	3.77
South Africa	7.16***	4.29	5.61	3.23	4.35	2.72	3.77
Swaziland	2.42	4.29	5.61	3.23	4.35	2.72	3.77
Tanzania	2.23	4.29	5.61	3.23	4.35	2.72	3.77
Zambia	8.67***	4.29	5.61	3.23	4.35	2.72	3.77

Source: Researcher's own computations

The PMG estimator is based on the assumption that there is cointegration between variables in the model. The study follows the approach of Pesaran *et al* (1999) which involves testing the existence of a long-run relationship in the individual countries using the ARDL bound testing method prior to estimating the model using the PMG technique. Table 7.5 presents the results of the ARDL bounds testing approach for existence of a level long-run relationship between variables. The test is ideal for this study because it can be used in when variables have different orders of integration. The null of no long-run relationship is rejected in seven countries. The hypothesis is rejected at the 1% level for Botswana, Lesotho, Madagascar, South Africa and Zambia. A long-run relationship is detected in Namibia at the 5% level and Seychelles at the 10% level.

Diagnostic tests were conducted on the ARDL models for individual countries and the results are shown in Table 7.6. Serial correlation is detected in Namibia, Seychelles, South Africa and Zambia, while heteroscedasticity is present only in Botswana and Malawi. Only Madagascar, Malawi and Zambia show evidence of model misspecification. The results indicate that most of the individual ARDL models pass the diagnostic tests, which signals that the

PMG model is adequate. Pesaran *et al* (1999) also suggest that the PMG analysis may proceed if cointegration is detected in most countries in a panel and if most countries pass the diagnostic tests.

Table 7.6: Diagnostic tests. Dependent variable: savings

Country	serial correlation	heteroscedasticity	Ramsey's reset test
Botswana	0.01	4.39**	0.22
Lesotho	0.02	0.33	0.14
Madagascar	1.42	1.02	3.37**
Malawi	0.004	3.64*	7.93***
Mauritius	1.72	1.90	0.05
Namibia	7.50***	0.04	0.46
Seychelles	6.40***	0.11	0.73
South Africa	6.40***	0.33	0.12
Swaziland	1.65	0.08	1.58
Tanzania	0.27	0.14	2.28
Zambia	11.23***	1.97	16.51***

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels of significance respectively.

Table 7.7 reports the results of the PMG, MG and DFE estimation techniques. The adjustment coefficients show the speed adjustment from the short run to the long run equilibrium and, as expected, they are negative and statistically significant at the 1% level in all the models. The adjustment coefficients range from -0.36 in the DFE model to -0.52 in the MG model. So the results confirm *a priori* that the MG estimator error correction indicates faster adjustment compared with the PMG and DFE error correction estimates (Pesaran *et al*, 1999). The Hausman test is used to indicate the superior estimator between the MG and the PMG techniques. The test reveals that the PMG estimator is the most appropriate technique, as the null of homogenous long-run coefficients is not rejected. Imposing homogenous long-run coefficients reduces standard errors and, as such, the PMG estimator has lower standard errors compared with the MG and DFE techniques (Pesaran *et al*, 1999). So the PMG estimator is more efficient and as a result forms the basis for the interpretations of the slope coefficients. Based on the error correction term of the PMG model, short-run disequilibrium is corrected as a speed of 42%.

Table 7.7: Empirical results: PMG, MG and DFE. Dependent variable: Savings

Variable	PMG	MG	Hausman test	DFE
adjustment coefficient	-0.42 (-6.61)***	-0.52 (-8.57)***		-0.36 (-7.58)***
long-run coefficients			2.18 [0.53]	
GDP	1.55 (6.08)***	1.28* (1.74)		1.50 (3.59)***
AGE	0.36 (2.98)***	0.09 (0.17)		0.12 (0.84)
RDEP	0.30 (2.83)***	-0.003 (-0.01)		0.18 (0.94)
short-run coefficients				
d.GDP	-0.23 (-2.49)**	-0.06 (-0.38)		-0.14 (-1.36)
d.AGE	0.26 (0.27)	0.17 (0.13)		-0.45 (-0.70)
d.RDEP	-0.02 (-0.28)	-0.06 (-0.64)		0.03 (0.55)
No of observations	262	262		262
No of countries	11	11		11

Source: Researcher's own computations. Note: (*), (**) and (***) indicate 10%, 5% and 1% significance level, respectively. Figures in parentheses ( ) are T-statistics, figures in parentheses [ ] are p-values.

The long-run slope coefficients are all positive and significant at the 1% level. The real deposit rate has a positive effect on savings. A 1-percentage-point increase in the real deposit rate increases the savings to GDP ratio by 0.3 percentage points. The result lends support to the McKinnon and Shaw hypothesis and squares well with those of Fry (1978), Strestha & Chowdury (2007), Boadi *et al* (2015), Opuku & Ackah (2015), Kargbo (2010) and Mottelle & Masenyetse (2012). The results contradict those of De Melo & Tybout (1986) as well as

Warman & Thirwall (1994), who argued that interest rates have an insignificant effect on savings.

Table 7.8: Empirical results: PMG. Dependent variable: savings

Country	RDEP	AGE	GDP	adjustment
Botswana	0.22 (0.72)	5.54 (2.73)***	-0.71 (-3.93)	-0.82 (-5.97)***
Lesotho	-0.60 (-1.06)	-6.22 (-1.41)	0.48 (0.78)	-0.49 (2.89)***
Madagascar	0.01 (0.14)	-1.29 (1.21)	-0.15 (-1.06)	-0.40 (-3.90)***
Malawi	-0.15 (-1.47)	-1.78 (-0,85)	-0.36 (-1.70)*	-0.57 (-3.22)***
Mauritius	0.30 (2.06)**	1.65 (0.71)	-0.41 (-1.42)	-0.30 (-2.20)**
Namibia	0.01 (0.03)	-2.07 (-0.85)	-0.11 (-0.46)	-0.49 (-3.33)***
Seychelles	0.32 (1.63)	1.27 (0.77)	-0.55 (-1.46)	-0.46 (-2.78)***
South Africa	-0.01 (-0.09)	0.48 (1.26)	-0.03 (-0.35)	-0.06 (-1.23)
Swaziland	-0.07 (-0.23)	-1.57 (0.84)	-0.14 (-0.38)	-0.29 (1.99)**
Tanzania	-0.38 (-2.44)**	3.73 (2.11)**	-0.41 (-1.34)	-0.56 (-4.87)***
Zambia	0.10 (0.42)	3.14 (0.67)	-0.19 (-0.39)	-0.18 (-1.46)

Source: Researcher's own computations. Note: (*), (**) and (***) indicate 10%, 5% and 1% significance level, respectively. Figures in parentheses are T-statistics

Income captured by GDP per capita growth affects savings positively. The income coefficient is significant in all three models. This confirms *a priori* expectations, as higher incomes are expected to increase savings. The result is in line with those of Bandiera *et al* (2000), Kargbo (2010) and Ang & Sen (2011). The PMG coefficient suggests that a percentage-point increase in GDP per capita growth leads to 1.55-percentage-point increases in savings. Age dependency has a positive effect on savings in SADC countries. This is against *a priori* expectations, as higher age dependency rates are associated with lower savings rates (Achy, 2003; Ang & Sen, 2011). A close inspection of the data reveals that a number of countries achieved higher savings rates during the period when age dependency rates were at their highest. A study by Keho (2012) reported that age dependency has a positive and significant influence on savings in Cameroon, Zambia, Kenya, Sierra Leone and Niger. According to these results, income is the most important long-run determinant of savings in SADC countries.

The short-run coefficients which reflect the adjustment of the economy to past shocks are largely insignificant in all the models. The income variable is the only significant coefficient. However it is against *a priori* expectations. According to the result, a percentage-point increase in income decreases the savings-to-GDP ratio by 0.23 percentage points in the short run. A shock to income leads to greater consumption in the short run. Table 7.8 presents the heterogenous short-run results for each country in the study. Most of the heterogenous short-run coefficients are insignificant, as with the homogenous coefficients. The adjustment coefficients are negative and statistically significant in nine of the 11 countries, so confirming the long-run relationships between the variables in the study.

7.4.2 Savings and investments

Prior to applying the PMG technique, ARDL models for individual countries were estimated and the results are presented in Table 7.9.

Table 7.9: ARDL bounds testing results: Dependent variable: investments

Country	**F-stat**	**critical values**					
		1%		**5%**		**10%**	
		I(0)	**I(1)**	**I(0)**	**I(1)**	**I(0)**	**I(1)**
Botswana	7.80***	3.74	5.06	2.86	4.01	2.45	3.52
Lesotho	2.39	3.74	5.06	2.86	4.01	2.45	3.52
Madagascar	13.22***	3.74	5.06	2.86	4.01	2.45	3.52
Malawi	0.78	3.74	5.06	2.86	4.01	2.45	3.52
Mauritius	4.55**	3.74	5.06	2.86	4.01	2.45	3.52
Namibia	0.83	3.74	5.06	2.86	4.01	2.45	3.52
Seychelles	5.31***	3.74	5.06	2.86	4.01	2.45	3.52
South Africa	1.70	3.74	5.06	2.86	4.01	2.45	3.52
Swaziland	0.36	3.74	5.06	2.86	4.01	2.45	3.52
Tanzania	5.72***	3.74	5.06	2.86	4.01	2.45	3.52
Zambia	4.23**	3.74	5.06	2.86	4.01	2.45	3.52

Source: Researcher's own computations

The null of no long-run relationship is rejected in six countries at 10% level of significance. The diagnostic tests presented in Table 7.10 reveal that most of the ARDL models are

adequate. Serial correlation is detected only in five countries, heteroscedasticity is present in only one country, while there is evidence of model misspecification in only two countries.

Table 7.10: Diagnostic tests: Dependent variable: investments

Country	serial correlation test	heteroscedasticity test	Ramsey's reset test
Botswana	2.56	0.01	1.36
Lesotho	13.30***	1.79	0.71
Madagascar	1.62	4.54**	5.93***
Malawi	2.60	0.07	1.51
Mauritius	1.09	0.92	4.19**
Namibia	7.41***	1.65	0.66
Seychelles	0.58	0.47	0.47
South Africa	5.65***	0.53	1.52
Swaziland	9.98***	0.10	2.62*
Tanzania	5.25**	0.16	1.49
Zambia	0.33	1.85	1.61

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels of significance respectively.

The empirical results of the relationship between interest rate liberalisation and investments are shown in Table 7.11. The adjustment coefficients range from -0.18 for the DFE model to -0.48 for the MG estimator. The MG error correction term indicates faster adjustment, as expected. The Hausman test suggests that the PMG model is adequate for the analysis, as the null that there is no difference between the PMG and MG models is not rejected. The real interest rate has a negative but insignificant effect on investments. The result is consistent in all three models, and confirms the findings of Shrestha & Chowdhury (2007), who report an insignificant influence of the real lending rate on investments in Nepal. This finding contradicts the view that higher real interest rates raise borrowing costs and so negatively affect investments, as proposed by Keynesians. Savings have a positive and statistically significant effect on investments in all three models, which confirms theoretical expectations, as savings increase the availability of funds for investment purposes. According to the PMG model, a percentage-point increase in the savings-to-GDP ratio leads to a 0.31-percentage-point increase in the investments-to-GDP ratio. The result is in line with the findings of Athu-

korala (1998), Shrestha & Chowdhury (2007) and Orji *et al* (2014), who found that savings play a crucial role in determining investments.

Table 7.11: Empirical results: PMG, MG and DFE. Dependent variable: investments

Variable	PMG	MG	Hausman test	DFE
adjustment coefficient	-0.29 (-4.18)***	-0.48 (-4.58)***		-0.18 (-4.51)***
long-run coefficients			1.58 [0.81]	
SAV	0.31 (3.09)***	0.31 (1.80)*		0.60 (2.84)***
CRED	0.09 (3.38)***	0.60 (1.40)		0.08 (0.52)
RINT	-0.001 (-0.01)	1.18 (0.94)		-0.16 (-0.74)
FDI	0.01 (0.05)	-0.23 (-0.51)		0.18 (0.53)
short-run coefficients				
d.SAV	0.22 (3.55)***	0.28 (3.25)***		0.20 (3.97)***
d.CRED	0.47 (2.55)**	0.41 (1.57)		0.06 (0.90)
d.RINT	-0.03 (-0.80)	0.02 (0.33)		0.04 (1.03)
FDI	0.29 (2.05)**	0.31 (3.54)***		0.09 (1.49)
No of observations	264	264		264
No of countries	11	11		11

Source: Researcher's own computations. Note: (***) and (**) indicate 1% and 5% significance level, respectively. Figures in parentheses ( ) are T-statistics, figures in parentheses [ ] are p-values.

The significant relationship between savings and investments provides further support for McKinnon's complementary hypothesis, as higher real interest rates (real deposit rates) have a positive effect on investments through higher savings. According to the results, the positive effect of higher deposit rates outweighs the negative effect of higher real lending rates on investments, which supports the findings of Athukorala (1998) and Shrestha & Chowdhury (2007). Financial development has a positive and statistically significant influence on investments in the long run, a result which confirms *a priori* expectations. According to McKinnon (1973) and Levine (1997, 2001) financial development is expected to have a positive effect on investments. The results above imply that the positive effect of higher savings on investments outweighs the negative effect of higher lending rates, which contrasts with the views of Lewis (1992) and Warman & Thirlwall (1994), who argued that the negative effect of higher real interest rates on investments outweighs that of higher deposit rates on savings. FDI inflows have a positive but insignificant effect on investments in the long run, which suggests that foreign investments do not supplement domestic investments in the SADC region.

The homogenous short-run results reveal that savings have a positive and significant effect on investments in all models, while financial development is correlated positively with investments in the PMG model. The real interest rate and financial development variables are both insignificant in the short run, suggesting that shocks to these variables exert no effect on investments in SADC countries. According to the PMG and MG models, FDI inflows are positively related to investments in the short run.

Table 7.12 presents the result of the short-run PMG model, which has differing coefficients for each country. The adjustment coefficients are negatively signed and statistically significant in six countries. The real interest rate has an insignificant short-run effect on investments in all countries with the exceptions of South Africa, Mauritius and Botswana at 10% level. Real interest rates have a positive effect on investments in South Africa, while in Botswana and Mauritius, higher real interest rates rate reduce investments. Credit to the private sector (financial development) has a positive and significant short-run influence on investments in Botswana, Malawi and Tanzania. In Mauritius and Zambia, the coefficient is significant at 10% level. Savings have a positive and statistically significant effect on investments in Madagascar, Malawi, Namibia and Swaziland. FDI inflows boost investments only in Madagascar, Mauritius and Zambia.

Table 7.12: Empirical results: PMG short-run coefficients.

Country	RINT	CRED	SAV	FDI	adjustment
Botswana	-0.20 (-1.72)*	1.52 (3.21)***	0.18 (1.21)	0.35 (1.46)	-0.63 (-4.93)***
Lesotho	0.03 (0.16)	0.14 (0.50)	-0.13 (-1.26)	0.20 (1.67)*	-0.06 (-1.19)
Madagascar	-0.06 (-0.96)	0.64 (1.21)	0.41 (2.71)***	1.31 (5.35)***	-0.17 (-1.93)*
Malawi	-0.03 (-1.05)	0.45 (2.18)***	0.24 (2.89)***	-0.005 (-0.05)	-0.23 (-1.98)**
Mauritius	-0.25 (-1.99)**	0.15 (1.82)*	0.003 (0.03)	0.55 (2.68)**	-0.10 (-1.36)
Namibia	-0.04 (-0.43)	0.02 (0.11)	0.47 (2.60)***	0.28 (1.38)	-0.17 (-0.92)
Seychelles	0.14 (1.23)	-0.33 (-0.77)	0.21 (1.36)	0.03 (0.33)	-0.53 (-2.87)***
South Africa	0.18 (2.49)**	-0.01 (-0.52)	0.28 (0.99)	-0.03 (-0.27)	-0.48 (-2.97)***
Swaziland	0.01 (0.07)	0.13 (0.34)	0.53 (3.77)***	0.04 (0.21)	-0.09 (-0.91)
Tanzania	-0.08 (-0.87)	1.36 (2.70)***	-0.02 (-0.15)	-0.38 (-0.97)	-0.09 (-0.73)
Zambia	-0.03 (-0.27)	1.05 (1.91)*	0.24 (1.83)*	0.80 (2.69)**	-0.61 (-3.41)***

Source: Researcher's own computations. Note: (*), (**) and (***) indicate 10%, 5% and 1% significance level, respectively. Figures in parentheses are T-statistics.

7.4.3 Investments and economic growth

The ARDL bounds testing results presented in Table 7.13 indicate that the null of no long-run relationship is rejected in all countries. The null is rejected at 1% level of significance in Botswana, Madagascar, Malawi, Namibia, Tanzania and Zambia, and at 5% for the remaining countries.

Table 7.14 reports the diagnostic test results which reveal that serial correlation is detected in only two countries, while heteroscedasticity is present in one country. The Ramsey reset test indicates lack of misspecification in all countries with the exception of Botswana and Madagascar. Most of the individual country ARDL models pass the diagnostic tests, which implies that the PMG model is adequate.

Table 7.13: ARDL bounds testing result. Dependent variable: GDP growth

Country	F-stat	critical values					
		1%		5%		10%	
		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
Botswana	9.00***	3.74	5.06	2.86	4.01	2.45	3.52
Lesotho	4.66**	3.74	5.06	2.86	4.01	2.45	3.52
Madagascar	6.64***	3.74	5.06	2.86	4.01	2.45	3.52
Malawi	22.74***	3.74	5.06	2.86	4.01	2.45	3.52
Mauritius	8.62***	3.74	5.06	2.86	4.01	2.45	3.52
Namibia	6.14***	3.74	5.06	2.86	4.01	2.45	3.52
Seychelles	5.01**	3.74	5.06	2.86	4.01	2.45	3.52
South Africa	4.21**	3.74	5.06	2.86	4.01	2.45	3.52
Swaziland	4.38**	3.74	5.06	2.86	4.01	2.45	3.52
Tanzania	15.08***	3.74	5.06	2.86	4.01	2.45	3.52
Zambia	11.22***	3.74	5.06	2.86	4.01	2.45	3.52

Source: Researcher's own computations

Table 7.14: Diagnostic tests. Dependent variable: GDP growth

Country	serial correlation	heteroscedasticity	reset test
Botswana	0.56	0.52	2.90*
Lesotho	1.83	0.53	2.59
Madagascar	0.04	3.00	15.41***
Malawi	1.50	0.07	0.18
Mauritius	7.64**	7.06**	0.01
Namibia	1.96	0.20	0.73
Seychelles	0.19	1.11	0.76
South Africa	0.05	0.79	0.74
Swaziland	1.66	0.02	1.76
Tanzania	2.72*	0.00	0.83
Zambia	0.89	0.06	1.58

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels of significance respectively.

Table 7.15 presents the results of the PMG, MG and DFE models. Based on the Hausman test, the PMG technique is adequate for the analysis. The long-run results suggest that investments have a positive effect on economic growth and the coefficient is significant at the 1% level. A percentage-point increase in the investment-to-GDP ratio increases economic growth by 0.14 percentage points. The result confirms *a priori* expectations, as investments are viewed as one of the main drivers of economic growth. The result provides support for the McKinnon and Shaw hypothesis, as higher real interest rates (real deposit rates) have a positive effect on savings. Savings promote higher investment levels which are then translated to faster economic growth. The results are in line with those of Hye & Wizarat (2013) and Orji *et al* (2015).

Trade has a negative long-run effect on economic growth and the coefficient is significant at the 1% level. The results square well with those of Ahmed (2013) and Yanikkaya (2003), who report that trade openness is detrimental to economic growth in developing countries. According to Ahmed & Suardi (2009), trade has a positive effect on economic growth if the export structure is diversified. However, most SADC countries export mostly primary products and fewer manufactured goods (Hausman, Hwang & Rodrik, 2006).

Government expenditure has a negative and significant influence on economic growth. The results are in line with the findings of Misati & Nyamongo (2012), Gorlach & Le Roux (2015) and Le Roux & Moyo (2015). Government expenditures directed towards consumption, or wasteful expenditure, is detrimental to economic growth. Also, government expenditures could crowd out investments, one of the main drivers of economic growth, by increasing interest rates. Inflation has a negative effect on economic growth, as expected, and the coefficient is significant at the 10% level. The result squares well with those of Ahmed (2013), Misati & Nyamongo (2012) and Owusu & Odhiambo (2015). High inflation is an indicator of macroeconomic instability, which increases uncertainty with regard to savings and investment decisions. SADC countries have had a history of high inflation, which has often hindered economic growth. The pooled short-run coefficients are insignificant in all models, with the exception of inflation in the DFE model, which indicates a positive relationship between inflation and economic growth.

Table 7.15: Empirical results: PMG, MG and DFE. Dependent variable: GDP growth

Variable	PMG	MG	Hausman test	DFE
adjustment coefficient	-0.80 (-8.21)***	-1.09 (-14.56)***		-1.05 (0.06)***
long-run coefficients			1.75 [0.78]	
INVS	0.14 (6.68)***	0.09 (1.46)		0.07 (2.33)**
TRA	-0.02 (-3.77)***	0.02 (0.71)		0.001 (0.08)
GOV	-0.17 (-3.22)***	-0.32 (-3.10)***		-0.08 (-1.13)
INF	-0.02 (-1.94)*	-0.10 (-1.43)		-0.05 (-3.40)***
short-run coefficients				
d.INVS	-0.02 (-0.24)	0.01 (0.14)		0.03 (0.65)
d.TRA	0.04 (0.94)	0.01 (0.20)		-0.03 (-1.51)
d.GOV	-0.01 (-0.09)	0.09 (0.51)		-0.10 (-1.14)
d.INF	0.03 (0.49)	0.09 (1.44)		0.05 (2.81)***
No of observations	260	260		260
No of countries	11	11		11

Source: Researcher's own computations. Note: (*), and (***) indicate 10% and 1% significance levels, respectively. Figures in parentheses ( ) are T-statistics, figures in parentheses [ ] are p-values.

The country-specific short-run coefficients estimated using the PMG estimator are presented in Table 7.16. The adjustment coefficients are negative and statistically significant in all countries. Investments have a negative and statistically significant effect on economic growth

in Botswana and Swaziland. In Madagascar, investments are positively related to economic growth in the short run. Trade has a positive and significant effect on economic growth in Botswana, Madagascar and South Africa. The coefficient is negatively signed and statistically significant in Namibia and Swaziland. Government expenditure has a negative and statistically significant effect on economic growth in Mauritius, while in Swaziland and Zambia the coefficient indicates a positive relationship. Inflation has a positive and significant effect on economic growth in Botswana, Namibia and Zambia, and a negative effect on economic growth in South Africa.

Table 7.16. Empirical results: PMG short-run coefficients

Country	INVS	TRA	GOV	INF	adjustment
Botswana	-0.35 (-2.99)***	0.34 (5.63)***	-0.17 (-0.57)	0.59 (2.96)***	-0.85 (6.07)***
Lesotho	-0.15 (-1.21)	0.003 (0.06)	0.01 (0.04)	-0.08 (-1.54)	-0.31 (-1.71)*
Madagascar	0.38 (2.42)**	0.22 (3.00)***	0.46 (1.28)	-0.09 (-1.45)	-1.22 (-8.21)***
Malawi	-0.30 (-1.10)	-0.09 (-0.95)	-0.40 (-1.69)	0.08 (1.14)	-1.03 (-5.33)***
Mauritius	-0.12 (-0.78)	-0.05 (-1.03)	-1.24 (-2.47)**	0.04 (0.34)	-1.18 (-5.88)***
Namibia	-0.02 (-0.142)	-0.16 (-2.45)**	0.48 (1.63)	0.22 (1.74)*	-0.88 (-5.15)***
Seychelles	0.14 (1.22)	-0.03 (-0.63)	0.19 (0.93)	-0.11 (-1.10)	-0.48 (-2.22)**
South Africa	0.20 (0.80)	0.25 (3.52)***	0.05 (0.11)	-0.33 (-2.00)**	-0.50 (-3.06)***
Swaziland	-0.06 (-2.01)**	-0.02 (-1.70)*	0.14 (1.69)*	-0.02 (-0.48)	-1.06 (-31.84)***
Tanzania	0.13 (1.07)	0.01 (0.21)	-0.01 (-0.08)	-0.01 (-0.13)	-0.41 (-2.24)***
Zambia	-0.02 (-0.21)	-0.001 (-0.02)	0.35 (3.31)***	0.08 (5.14)***	-0.85 (-5.32)***

Source: Researcher's own computations. Note: (*), (**) and (***) indicate 10%, 5% and 1% significance level, respectively. Figures in parentheses are T-statistics.

7.5 Conclusion

The chapter provided an empirical analysis of the effect of interest rate liberalisation on economic growth in SADC countries for the period 1990-2015. The analysis sought to determine whether the effect of interest rate on economic growth is through savings and investments. The PMG, MG and DFE estimators were used in the analysis, involving a three-equation specification. The chapter first examined the effect of higher real deposit rates on savings.

This was followed by the analysis of the relationship between savings and investments, and lastly the effect of investments on economic growth.

The results reveal that higher real deposit rates have a positive and significant effect on savings, in line with the proposition by McKinnon (1973) and Shaw (1973). The substitution effect outweighs the income effect and the result contradicts the views of the Keynesians that savings are not responsive to changes in interest rates. However, based on the results, incomes are the largest determinant of savings.

Savings are crucial for investments in both the long and short run, which confirms theoretical propositions of McKinnon and Shaw. The real interest rate has an insignificant effect on investments in both the long and short run, signalling that the rise in borrowing costs does not play much of a role in determining investments. The result suggests that the effect of higher deposit rates outweighs the negative effect of higher borrowing costs.

Investments are positively related to economic growth in the long run, which confirms *a priori* expectations that investments are one of the main drivers of economic growth. Inflation, government expenditure and trade openness have a negative effect on economic growth. The results imply that interest rate liberalisation has a positive effect on economic growth through savings and investments. Lower interest rates used to boost economic growth result in a decrease in savings and investments, which are the main drivers of long-term growth. The next chapter looks at the effect of interest rates on growth through capital inflows.

CHAPTER EIGHT

THE RELATIONSHIP BETWEEN INTEREST RATE LIBERALISATION, CAPITAL FLOWS AND ECONOMIC GROWTH

8.1 Introduction

Chapter seven revealed that investments are a major driver of economic growth in SADC countries. So policies that boost investment levels are crucial for future economic growth. SADC countries have had a history of low investment levels and, as such, capital inflows are regarded as one way of supplementing or complementing domestic investments. Policies that enhance market size (GDP), improve institutional quality, increase openness, promote financial development, create a stable macroeconomic environment and maintain or increase returns, are crucial in attracting capital inflows like FDI (Walsh & Yu, 2010).

The purpose of this chapter is to examine the effect of interest rate liberalisation on capital inflows. Higher interest rates are an indication of higher returns which may boost capital inflows. Higher foreign interest rates may encourage capital outflows and, as such, the chapter also investigates whether interest rate differentials between SADC countries and US interest rates influence capital flows. The role of capital flows in influencing economic growth is also surveyed. Higher levels of capital inflows encourage technological advancements, which in turn increase productivity and boost employment levels (Borensztein *et al*, 1998, Edrees, 2015).

The chapter is organised as follows: Section two provides a description of the variables used in the chapter. Section three provides the empirical results of the relationship between interest rate liberalisation and capital flows, and section four provides the result of the relationship between capital flows and economic growth. Section five concludes the chapter.

8.2 Descriptive statistics

The descriptive statistics are presented in Table 8.1. These show that the mean for FDI net inflows is 4.08%. FDI inflows have increased over the years, however the levels are lower than those in other developing regions, like Asia. Interest rate differentials average 3.84%, which implies that real interest rates have been higher in SADC countries compared with those in the US on average. The descriptive statistics for the other variables were discussed in Chapter seven and so are not discussed in this chapter.

Table 8.1: Descriptive statistics

Variable	mean	maximum	minimum	std. dev.	obs
CRED	31.76	160.12	3.09	36.47	282
CHINN	-0.24	2.39	-1.89	1.41	275
GDPG	1.91	16.96	-15.28	3.60	285
GDPC	2919.58	15695.90	121.51	3153.22	285
GOV	19.77	47.19	6.71	8.22	277
TRA	95.78	225.02	33.49	44.94	276
INF	12.59	183.31	-9.62	18.57	281
RDEP	-0.82	15.54	-117.23	10.72	276
INVS	24.86	69.03	4.56	10.84	286
EXCH	237.33	2933.51	0.03	542.40	285
FDI	4.08	54.06	-6.90	5.84	285
DIFF	3.84	50.49	-45.67	10.49	286

Source: Researcher's own computations

8.3 Correlation analysis

Correlation analyses are presented on Tables 8.2 and 8.3. FDI and GDP per capita are positively correlated and significant at the 1% level a result which is in line with *a priori* expectations. FDI and the indicators of interest rate liberalisation have insignificant correlations. The correlation between credit to the private sector and FDI inflows is negative and significant, which is against *a priori* expectations. FDI is positively correlated with interest rate differentials. FDI is negatively correlated with inflation, which confirms *a priori* expectations. FDI is positively correlated with GDP growth and significant at the 1% level. This is in line with *a priori* expectations. The correlations between the independent variables are less than 0.8, which indicates that multicollinearity is not a problem.

Table 8.2: Correlation analysis

Variable	FDI	CRED	CHINN	RINT	RDEP	INF	GDPC	DIFF
FDI	1							
CRED	-0.16**	1						
CHINN	0.33***	0.02	1					
RINT	0.09	-0.24***	0.16***	1				
RDEP	-0.08	0.22***	0.17***	0.43***	1			
INF	-0.12*	-0.36***	-0.14**	-0.06	-0.49***	1		
GDPC	0.17***	0.71***	0.37***	-0.23***	0.20***	-0.56***	1	
DIFF	0.14**	-0.19***	0.19***	0.94**	0.37***	-0.14***	-0.17***	1

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

Table 8.3: Correlation analysis

Variable	FDI	GDPG	GOV	INVS	TRA	EXCH
FDI	1					
GDPG	0.16***	1				
GOV	0.17***	-0.03	1			
INVS	0.30***	0.24***	0.43***	1		
TRA	0.28***	0.02	0.46***	0.53***	1	
EXCH	-0.03	0.04	-0.55***	-0.14**	-0.27***	1

Source: Researcher's own computations. Note: (***) and (**) indicate significance at 1% and 5% level of significance respectively.

8.4 Empirical results

The empirical results are presented in this section. The strategy involves two specifications, one examining the effect of interest rate liberalisation on capital flows, the other surveying the effect of capital flows on economic growth. To investigate the relationship between interest rate liberalisation and capital flows, four specifications are estimated. The first specification is a baseline model which does not include the interest rate variables. The other specifications include the different measures of interest rate liberalisations and the interest rate differential variables. ARDL models for the individual countries are estimated, and the bounds and diagnostic tests are reported. The PMG model is then estimated for the panel study.

8.4.1 Interest rate liberalisation and capital flows

The bounds test results are presented in Table 8.4. The bounds test results for the baseline model show that cointegration is present in seven countries. In the model with real interest rates, cointegration is present in nine countries. In the models with the real deposit rate and interest rate differentials, cointegration is detected in eight countries.

Table 8.4: Bounds test results: baseline regression

Country	Baseline model	RINT model	RDEP model	DIFF model
Botswana	4.99**	5.19***	4.28**	4.79**
Lesotho	3.43	3.04	4.95**	3.39
Madagascar	2.21	6.03***	2.74	4.31**
Malawi	2.29	4.45**	3.28	4.20**
Mauritius	8.75***	8.81***	8.55***	6.90***
Namibia	2.60	3.07	2.32	2.68
Seychelles	8.27***	28.95***	7.31***	30.92***
South Africa	8.00***	7.61***	7.32***	7.32***
Swaziland	13.14***	13.99***	18.76***	12.54***
Tanzania	7.30***	6.79***	5.08***	5.92***
Zambia	7.06***	5.53***	16.54***	2.54

Source: Researcher's own computations. Note: (***) and (**) indicate significance at 1% and 5% level of significance respectively.

The individual country diagnostic tests results presented in Table 8.5 reveal that most models are specified correctly, and the error terms are not serially correlated. However, heteroscedasticity is detected in several models, so estimations are conducted using robust standard errors in order to mitigate the problem.

Table 8.5: Diagnostic tests

Model	test	Botswana	Lesotho	Madag	Malawi	Mauritius	Namibia	Seychelles	S Africa	Swazi	Tanzania	Zambia
Baseline	serial correlation	0.07	5.50**	9.84***	0.49	0.60	0.66	1.66	1.09	0.80	0.68	2.41
	heteroscedasticity	1.40	11.65**	18.43***	12.05***	0.96	6.96***	17.23***	12.52***	0.39	1.73	0.03
	RESET test	2.18	1.14	4.14**	4.55	1.21	0.63	2.21	0.04	1.91	2.64*	0.98
RINT	serial correlation	0.21	5.23**	6.58**	1.30	0.17	0.71	1.38	0.97	0.96	0.09	1.01
	heteroscedasticity	1.46	4.18***	14.93***	9.44***	0.05	7.32***	20.31***	12.01***	0.56	0.22	0.58
	RESET test	2.15	3.11*	1.71	14.20***	2.67*	0.08	0.51	1.80	1.43	0.37	0.03
RDEP	serial correlation	0.25	0.02	10.13***	0.35	0.52	0.82	1.72	1.08	0.68	0.08	0.52
	heteroscedasticity	2.73*	2.00	17.26***	11.02***	0.47	8.33***	17.83***	10.55***	0.24	0.08	0.80
	RESET test	0.88	11.03***	3.84**	4.86**	1.10	0.32	1.55	2.13	0.93	2.97*	1.16
DIFF	serial correlation	0.34	4.74**	5.11**	1.24	0.55	0.64	1.49	0.84	0.92	0.23	1.10
	heteroscedasticity	2.36	5.18**	14.65***	9.47***	0.74	8.84***	19.96***	11.68***	0.58	1.43	0.02
	RESET test	0.87	1.59	2.04	14.79***	1.76	0.07	0.51	1.72	1.44	1.02	0.43

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

The long-run results for the PMG model are presented in Table 8.6. Due to the close association between the inflation rate and the real interest rate variables, different specifications are employed for each variable. This is done so that they are not used as regressors in the same model. The homogenous short-run results are all insignificant and so are omitted from the analysis.

Table 8.6: PMG results. Dependent variable: FDI inflows

Variable	PMG1	PMG2	PMG3	PMG4
adjustment coefficient	-0.92 (-6.49)***	-0.78 (-6.94)***	-0.80 (-6.65)***	-0.77 (-6.79)***
long-run coefficients				
GDPC	0.001 (3.73)***	0.001 (5.73)***	0.001 (5.49)***	0.001 (5.60)***
CHINN	0.40 (2.26)**	0.41 (2.53)**	0.51 (3.48)***	0.47 (2.96)***
CRED	-0.06 (-2.26)**	-0.10 (-3.86)***	-0.10 (-3.81)***	-0.10 (-3.90)***
INF	-0.05 (-2.38)**			
RINT		0.07 (1.97)**		
RDEP			0.14 (-3.12)***	
DIFF				0.05 (1.57)
No of obs	255	255	251	255
No of countries	11	11	11	11

Source: Researcher's own computations, Note: (***) and (**) indicate significance at 1% and 5% level of significance respectively.

The adjustment coefficients of the baseline models are negative and statistically significant at the 1% level. The coefficients range from -0.77 to -0.92, indicating the short-run disequilibrium corrected in the long-run ranges from 77% to 92%. GDP per capita is positively related to capital flows and significant at 1% level in all models. Higher GDP per capita levels as a measure of market size encourage capital flows, so the result is in line with *a priori* expectations. The results confirm those of Demirhan & Masca (2008), Verma & Prakash (2011) and Olaberria (2014), who found that GDP has a positive effect on capital flows in developing and emerging economies.

Inflation has a negative effect on capital flows and the coefficient is significant at the 5% level. The result is in line with theoretical expectations, as higher inflation levels imply that there is macroeconomic instability. The result supports the findings of Wesso (2001), Ahmed *et al* (2005) and Aw & Teng (2009). Financial openness and capital flows are positively related, which confirms *a priori* expectations, as capital account restrictions create uncertainty, which discourages capital inflows. The result is in line with those of Ahmed *et al* (2005), Ahmed & Zlante (2013) and Gammoudi & Cherif (2015), who found that capital account liberalisation encourages capital inflows in developing countries. Credit to the private sector as a measure of financial development is negatively related to capital flows, which is against *a priori* expectations. The negative effect of financial development on capital flows could be the result of a rise in bad debts associated with excessive credit to unworthy borrowers. The rise in bad debts causes financial crises, which in turn discourage capital inflows. Also, SADC countries have low levels of institutional quality, and high institutional quality is a requirement if financial development is to encourage capital inflows.

The interest rate liberalisation measures are positively related to capital inflows and both co-efficients are significant. This indicates that the prospect of earning higher returns encourages capital inflows, which supports theoretical expectations. The results are in line with those of Aw & Teng (2009), who concluded that the real interest rate is a significant determinant of FDI inflows in Malaysia, as well as Ahmed & Mayowa (2012), who found that the real deposit rate has a Granger cause effect on FDI inflows in Nigeria. Interest rate differentials have a positive but insignificant effect on capital inflows. This is because the measure of capital flows chosen for this analysis (FDI) is not sensitive to interest rate differentials compared with other forms of capital flows, like portfolio flows. The result confirms the findings of Verma & Prakash (2011) who found that FDI inflows are not sensitive to interest rate differentials in India.

Table 8.7: MG and DFE results

Variable	Baseline regression		RINT equation		RDEP equation		DIFF equation	
	MG	DFE	MG	DFE	MG	DFE	MG	DFE
Adjustment	-1.07 (-9.97)***	-0.67 (-9.44)***	-1.00 (-8.28)***	-0.56 (-9.33)***	-1.03 (-9.07)***	-0.54 (-9.09)***	-1.00 (-8.99)***	-0.55 (-9.38)***
GDPC	0.002 (0.54)	0.001 (1.26)	0.01 (1.20)	0.004 (0.68)	-0.001 (-0.13)	0.004 (0.67)	0.01 (1.33)	0.004 (0.67)
CHINN	6.95 (1.71)*	0.84 (1.36)	0.24 (0.06)	0.82 (1.07)	4.64 (1.30)	0.80 (0.96)	1.15 (0.39)	0.90 (1.18)
CRED	0.38 (1.08)	0.03 (0.46)	-0.57 (1.49)	0.10 (1.13)	0.42 (1.16)	0.09 (1.01)	0.36 (1.23)	0.08 (0.93)
INF	-0.05 (-0.42)	-0.05 (-1.07)						
RINT			-0.34 (-0.88)	0.11 (1.34)				
RDEP					0.44 (1.65)*	0.13 (1.14)		
DIFF							0.05 (1.55)	-0.59 (-0.86)

Source: Researcher's own computations. Note: (***) and (*) indicate significance at 1% and 10% levels respectively.

Table 8.7 presents the long-run result of the MG and DFE models. The results are largely insignificant, which lends support to the hypothesis that the PMG model is superior. Also, the MG model has adjustment coefficients that are equal to one or greater, which is an indication of model instability, so the PMG model is suitable for the analysis.

The short-run heterogenous coefficients for the models with the interest rate liberalisation variables are presented in the appendix. These are largely insignificant, which implies that the relationships between the variables are not a short-run phenomenon. However, the adjustment coefficients for most of the individual countries are negative, are statistically significant and are less than one, so indicating the presence of a long-run relationship between the variables.

8.4.2 Capital flows on economic growth

The bounds test results are presented in Table 8.8, and these show that cointegration is present in all countries except Malawi, where the null of no cointegration is rejected only at the 10% level of significance.

Table 8.8: Bounds test results

Country	**F-stat**	**critical values**					
		1%		**5%**		**10%**	
		I(0)	**I(1)**	**I(0)**	**I(1)**	**I(0)**	**I(1)**
Botswana	20.06***	3.41	4.68	2.62	3.79	2.26	3.35
Lesotho	36.70***	3.41	4.68	2.62	3.79	2.26	3.35
Madagascar	25.33***	3.41	4.68	2.62	3.79	2.26	3.35
Malawi	3.44*	3.41	4.68	2.62	3.79	2.26	3.35
Mauritius	10.05***	3.41	4.68	2.62	3.79	2.26	3.35
Namibia	15.06***	3.41	4.68	2.62	3.79	2.26	3.35
Seychelles	18.29***	3.41	4.68	2.62	3.79	2.26	3.35
South Africa	4.18**	3.41	4.68	2.62	3.79	2.26	3.35
Swaziland	4.15**	3.41	4.68	2.62	3.79	2.26	3.35
Tanzania	9.23***	3.41	4.68	2.62	3.79	2.26	3.35
Zambia	25.02***	3.41	4.68	2.62	3.79	2.26	3.35

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

The diagnostic tests shown in Table 8.9 reveal that serial correlation is detected in one country, heteroscedasticity in five countries and model misspecification in three countries. As with the previous specifications, the models are estimated using robust standard errors to correct for heteroscedasticity.

Table 8.9: Diagnostic tests

Country	serial correlation	heteroscedasticity	Ramsey's reset test
Botswana	2.95*	7.39***	1.87
Lesotho	3.60*	0.38	0.03
Madagascar	4.95**	2.97*	5.63***
Malawi	0.81	15.86***	7.28***
Mauritius	0.63	0.65	0.27
Namibia	0.07	0.64	1.37
Seychelles	1.72	0.62	1.97
South Africa	3.36*	2.13	1.71
Swaziland	0.34	26.97***	6.96***
Tanzania	0.02	5.60**	1.79
Zambia	0.04	6.52**	3.15*

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

The PMG results are presented in Table 8.10. The adjustment coefficient is negative and statistically significant at the 1% level, and implies that 80% of the disequilibrium in the short run is corrected in the long run. Capital inflows have a negative but insignificant effect on economic growth. The findings confirm those of Agbloyor *et al* (2014), who found that capital inflows have a negative effect on economic growth in African countries with under-developed financial markets. Bailliu (2000) also concludes that capital inflows have a positive effect on economic growth in countries with highly developed banking sectors. Edrees (2015) found that FDI flows have a negative effect on economic growth in low- and middle-income sub-Saharan African countries. Capital inflows in SADC countries have not boosted productivity and employment levels significantly as expected.

Table 8.10: PMG, MG and DFE results

Variable	PMG	MG	DFE
adjustment coefficient	-0.80 (-8.61)***	-1.08 (-13.94)***	-1.04 (-17.27)***
long-run coefficients			
FDI	-0.07 (-1.36)	-0.03 (-0.37)	-0.06 (-1.05)
TRA	-0.03 (-5.16)***	0.03 (0.72)	-0.001 (-0.10)
GOV	-0.20 (-3.93)***	-0.36 (-2.07)**	-0.13 (-1.87)*
INVS	0.15 (7.67)***	0.06 (0.89)	0.08 (2.50)**
EXCH	0.002 (3.34)***	-0.33 (-0.88)	0.002 (2.78)***
short-run coefficients			
d.FDI	0.11 (1.34)	0.12 (1.86)*	0.06 (1.34)
d.TRA	0.05 (1.25)	-0.01 (-0.16)	-0.02 (-0.90)
d.GOV	0.04 (0.03)	0.06 (0.29)	-0.07 (-0.78)
d.INV	-0.04 (-0.53)	0.01 (0.13)**	0.01 (0.29)
d.EXCH	-0.37 (-2.97)***	-0.25 (-1.80)*	-0.005 (-1.38)
No of obs	264	264	264
No of countries	11	11	11

Source: Researcher's own computations, Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

There is a possibility that capital inflows crowd out domestic investments, which in turn affects economic growth negatively. And as alluded to by Borensztein *et al* (1998), the effect of FDI inflows on economic growth is dependent on the levels of human capital. In SADC countries, human capital levels are low, which could be one of the explanations for the insignificant effect of FDI on economic growth.

The coefficient of the exchange rate is positively signed and significant at the 1% level, suggesting that a depreciation in the exchange rate has a positive effect on economic growth in the long run. An exchange rate depreciation could boost economic growth by encouraging exports of goods and services. A depreciation of the exchange rate also makes imports expensive, which in turn could increase the consumption of domestically produced goods. This result is in line with the traditional approach to exchange rates (Salvatore 2013). The other coefficients are similar to those found in Chapter seven. Investment is positively related to GDP, while trade and government expenditure have a negative effect on economic growth.

Table 8.11: PMG short-run coefficients

Country	FDI	TRA	GOV	INVS	EXCH	adjust
Botswana	0.24 (1.23)	0.31 (4.26)***	-0.07 (-0.22)	-0.43 (-3.21)***	-0.64 (-0.55)	-0.75 (-4.85)***
Lesotho	-0.13 (-2.16)**	0.03 (0.72)	-0.22 (-1.03)	-0.05 (-0.50)	-1.04 (-2.14)***	-0.35 (-2.45)**
Madagascar	-0.37 (-1.11)	0.22 (-2.95)***	0.48 (1.35)	0.51 (2.82)***	-0.004 (-1.29)	-1.27 (-8.40)***
Malawi	-0.01 (0.09)	-0.03 (-0.33)	-0.39 (-1.54)	-0.42 (-1.52)	0.003 (0.09)	-1.16 (-7.67)***
Mauritius	0.31 (2.00)**	-0.04 (-1.07)	-1.18 (-2.43)**	-0.08 (-0.59)	0.03 (0.21)	-0.98 (-4.28)***
Namibia	0.23 (1.37)	-0.14 (-1.82)*	0.67 (2.09)**	-0.09 (-0.87)	-0.08 (-0.15)	-0.96 (-5.46)***
Seychelles	0.06 (0.85)	-0.05 (-1.10)	0.29 (1.46)	0.17 (1.48)	-0.40 (-0.47)	-0.47 (-2.54)**
South Africa	-0.08 (-0.56)	0.25 (4.00)***	-0.04 (-3.08)***	-0.09 (-0.35)	-0.72 (-2.67)***	-0.51 (-3.35)***
Swaziland	0.03 (0.75)	-0.004 (-0.29)	0.10 (1.35)	-0.09 (-2.85)***	-0.22 (-1.66)*	-1.07 (-36.08)***
Tanzania	0.24 (1.02)	0.01 (0.10)	0.08 (0.44)	0.13 (1.15)	-0.002 (-0.04)	-0.52 (-2.82)***
Zambia	0.67 (4.42)***	0.03 (0.35)	0.33 (3.03)***	-0.01 (-0.12)	-0.98 (-0.83)	-0.75 (-4.71)***

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

The MG and DFE models in Table 8.10 have adjustment coefficients greater than one, which is an indication of model instability. So the PMG model is the superior model. The short-run heterogenous coefficients are presented in Table 8.11. Adjustment coefficients in eight countries are negative, statistically significant and less than one in absolute terms, which is an indication of a stable long-run relationship between the variables.

8.5 Conclusion

The purpose of this chapter was to examine the relationship between interest rate liberalisation and economic growth through capital inflows. Higher real interest rates are expected to increase returns for investors, which in turn encourages capital inflows. Capital inflows like FDI are viewed as one way of supplementing domestic investments, which are a major driver of economic growth. Also, capital inflows promote technological advancements, which enhance productivity and employment levels.

The method of analysis selected was the PMG model which assumes homogenous long-run coefficients and heterogenous short-run coefficients for each country in a panel. The PG model assumes that there is cointegration between the variables and so, ARDL bounds tests are conducted for the individual countries in the sample. The results reveal that there is cointegration in most of the countries, and most models pass the diagnostic tests.

The long-run PMG results showed that domestic real interest rates have a positive effect on capital inflows, which provides support for the interest rate liberalisation hypothesis. However, interest rate differentials between the SADC countries and real US interest rates have a positive but insignificant relationship. Capital inflows are negatively related to inflation and financial development. The negative association between inflation and capital inflows is in line with *a priori* expectations. However the negative relationship with financial development is against theoretical expectations. Financial crises that arise as a result of excessive growth may be the reason for the negative relationship.

Capital inflows have an insignificant effect on economic growth in SADC countries, which is against *a priori* expectations. However, as stated by Borensztein *et al* (1998), the effect of capital inflows on economic growth is dependent on the levels of human capital. SADC countries have low levels of human capital to some extent, which is a possible explanation of the insignificant relationship between capital inflows and economic growth. Also, Agbloyor *et al* (2014) and Bailliu (2000) conclude that capital inflows have a positive effect on economic growth in countries with developed financial markets or banking sectors. The level of

financial development is low in SADC countries, which could be the reason for the insignificant association between capital inflows and economic growth. The next chapter investigates the effect of interest rates on economic growth through financial development. This will shed more light on whether real interest rates have a positive effect on financial development and whether financial development boosts economic growth.

CHAPTER NINE

INTEREST RATE LIBERALISATION, FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH

9.1 Introduction

This chapter presents an empirical analysis of the relationship between interest rate liberalisation, financial development and economic growth in SADC countries. According to the McKinnon and Shaw hypothesis, interest rate liberalisation promotes financial development through a rise in savings and investments in the economy. Shaw (1973) states that a rise in savings encourages financial intermediation, which in turn leads to financial deepening.

The analysis involves a two-equation specification, the first of which examines the effect of savings on financial development. The second model surveys whether financial development promotes economic growth. According to Schumpeter (1912) and Levine (1997), a developed financial system is vital for economic performance through functions like savings mobilisation and capital allocation, exerting corporate governance, diversification and management of risk and easing the exchange of goods and services.

However, financial development coupled with financial instability hinders economic growth (Estranda *et al*, 2010). Banking sector development may result in a surge in bad debts, which in turn affects growth negatively. Due to the unavailability of data, this study focuses on banking sector development and uses measures like credit to the private sector, liquid liabilities, bank credit, commercial bank assets and broad money as proxies for financial development.

Financial development indices are created using the five measures of banking sector development mentioned above. Principal component analysis is the technique used to create the index. The empirical analysis is conducted using the PMG estimator in order to examine the long- and short-run relationships between the variables.

The chapter starts with a description of the data which includes descriptive statistics, stationarity tests, correlation analysis and the creation of the index of financial development. After that, the effect of interest rate liberalisation on growth through savings and financial development is examined.

9.2 Descriptive statistics

Descriptive statistics are presented in Table 9.1. Higher values of the financial development indicators signal greater financial resources available to the private sector to grow and develop. The ratios for the financial development indicators average between 30% and 60% for the SADC region – except for bank credit, which averages just shy of 70%. The most financially developed economies are South Africa, Mauritius and Seychelles and, based on the data, financial development has been on an upward trend in most countries. GDP per capita averages close to $3 000. Countries with higher levels of GDP per capita are Botswana, Mauritius, Seychelles and South Africa. The data indicates that there is a link between GDP per capita and financial development, as the most financially developed countries are those with higher GDP per capita levels.

Table 9.1: Descriptive statistics

Variable	mean	maximum	minimum	std dev	obs
BA	33.49	122.79	4.57	27.60	283
CRED	31.76	160.12	3.09	36.47	282
BROAD	40.29	110.77	10.48	24.85	283
CHINN	-0.24	2.39	-1.89	1.41	275
GDPG	1.91	16.96	-15.28	3.60	285
BC	69.36	137.33	16.88	29.78	285
GDPC	2919.58	15695.90	121.51	3153.22	285
GOV	19.77	47.19	6.71	8.22	277
TRA	95.78	225.02	33.49	44.94	276
INF	12.59	183.31	-9.62	18.57	281
RDEP	-0.82	15.54	-117.23	10.72	276
SAV	20.46	51.05	-3.14	11.40	286
INVS	24.86	69.03	4.56	10.84	286
LIQ	36.78	108.55	11.71	22.68	281
EXCH	237.33	2933.51	0.03	542.40	285

Source: Researcher's own computations

The level of financial openness in the region averages -0.24, indicating relatively low levels of financial openness in SADC countries. A few countries are financially open, like Mauritius, Zambia and Seychelles, but most have low levels of financial openness, as indicated by

the negative scores (Chinn & Ito, 2013). The data signals that there could be a link between financial development and financial openness, as two of the most financially developed countries in the region are also among the most financially open. The exchange rate averages 237.33 to the US dollar with a standard deviation of 542.40, indicating high levels of volatility.

9.3 Correlation analysis

Tables 9.2 and 9.3 present the correlations between the variables. Financial development indicators are highly correlated, which lends support for the construction of the financial development index. Most of the correlations between financial development indicators are greater than 0.8, which is an indication of severe collinearity (Gujarati & Porter, 2009; Stundenmund, 2014).

The financial development indicators are highly correlated with the first financial development indicator (FD index), apart from BC. The correlations between LIQ, BROAD, BA and CRED and FD Index are all greater than 0.91, while that for BC is 0.48. BC is highly correlated with the second financial development index (FD index2). The financial development indicators as well as the indices are positively correlated with RDEP and SAV and are significant at the 1% level. GDP per capita is positively correlated with financial development, which is in line with *a priori* expectations. Inflation is negatively correlated with financial development, which supports theoretical expectations. Financial openness is positively correlated with most of the financial development indicators, except for BC and FD index2.

The financial development indicators, including the indices, are negatively correlated with the growth rate of GDP, which is against *a priori* expectations. This indicates that financial development is associated with a slowdown in economic growth in the SADC region. The exchange rate is positively correlated with GDP growth, although the correlation is insignificant.

Table 9.2: Correlation analysis

	BA	CRED	BROAD	CHINN	SAV	INF	RDEP	GDPC	BC	LIQ	FD index	FD index2
BA	1											
CRED	0.87***	1										
BROAD	0.91***	0.79***	1									
CHINN	0.20***	0.03	0.28***	1								
SAV	0.15**	0.18***	0.22***	0.17***	1							
INF	-0.49***	-0.36***	-0.55***	-0.16**	-0.22***	1						
RDEP	0.27***	0.22***	0.27***	0.17***	-0.01	-0.50***	1					
GDPC	0.81***	0.70***	0.82***	0.39***	0.21***	-0.57***	0.21***	1				
BC	0.44***	0.71***	0.23***	-0.24***	0.19***	-0.03	0.19***	0.70***	1			
LIQ	0.89***	0.75***	0.96***	0.31***	0.20***	-0.49***	0.27****	0.78***	0.21***	1		
FD index	0.97***	0.91***	0.94***	0.18***	0.17***	-0.50***	0.30***	0.81***	0.48***	0.92***	1	
FD index2	-0.002	0.30***	-0.24***	-0.47***	-0.09***	0.19***	0.04	-0.14**	0.81***	-0.27***	0	1

Source: Researcher's own computations

Table 9.3: Correlation analysis

	BA	CRED	BROAD	LIQ	BC	GDPG	GOV	TRA	INV	EXCH	FD index	FD index2
BA	1											
CRED	0.87***	1										
BROAD	0.91***	0.79***	1									
LIQ	0.89***	0.75***	0.96***	1								
BC	0.44***	0.71***	0.23***	0.21***	1							
GDPG	-0.13**	-0.17***	-0.09	-0.09	-0.21***	1						
GOV	0.38***	0.25***	0.42***	0.42***	-0.17***	-0.02	1					
TRA	0.29***	0.28***	0.37***	0.47***	-0.09	-0.03	0.46***	1				
INV	0.20***	0.14**	0.29***	0.28***	0.21***	0.25***	0.51***	0.45***	1			
EXCH	-0.14**	-0.12*	-0.04	-0.07	-0.02	0.03	-0.55***	-0.25***	-0.19***	1		
FD index	0.91***	0.91***	0.94***	0.92***	0.48***	-0.16***	0.36***	0.32***	0.19***	-0.11*	1	
FD index2	-0.002	0.30***	-0.24***	-0.27***	0.81***	-0.20***	-0.20***	-0.36***	-0.36***	-0.11*	0	1

Source: Researcher's own computations

9.4 Financial development indices

Financial development indices are required due to the severe correlations between the financial development indicators. The indices are constructed using principal components analysis (PCA), which is a data reduction technique used to turn correlated variables into uncorrelated components while retaining most of the variation (Jolliffe 2002). Tables 9.4 and 9.5 show the results of PCA. According to table 9.4, the first principal component explains more than 70% of the variation, while the second component explains close to 25% of the variation. The remaining three components explain just below 5% of the variation.

Based on the criteria for selecting the number of principal components, only the first two principal components are retained. These principal components explain over 95% of the total variation and have eigenvalues greater than one. The last three components have eigenvalues less than one and are thus omitted from the analysis. Table 9.5 outlines the proportion of each variable in the five components. The scree plot shown on figure 8.1 also suggests that only the first two components should be retained for the analysis. So two indices are constructed for financial development.

Table 9.4: Principal components

Component	eigenvalue	difference	proportion	cumulative
component 1	3.51294	2.26789	0.7026	0.7026
component 2	1.24506	1.05557	0.2490	0.9516
component 3	0.189487	0.156076	0.0379	0.9895
component 4	0.033411	0.0143122	0.0067	0.9952
component 5	0.190988	.	0.0038	1.0000

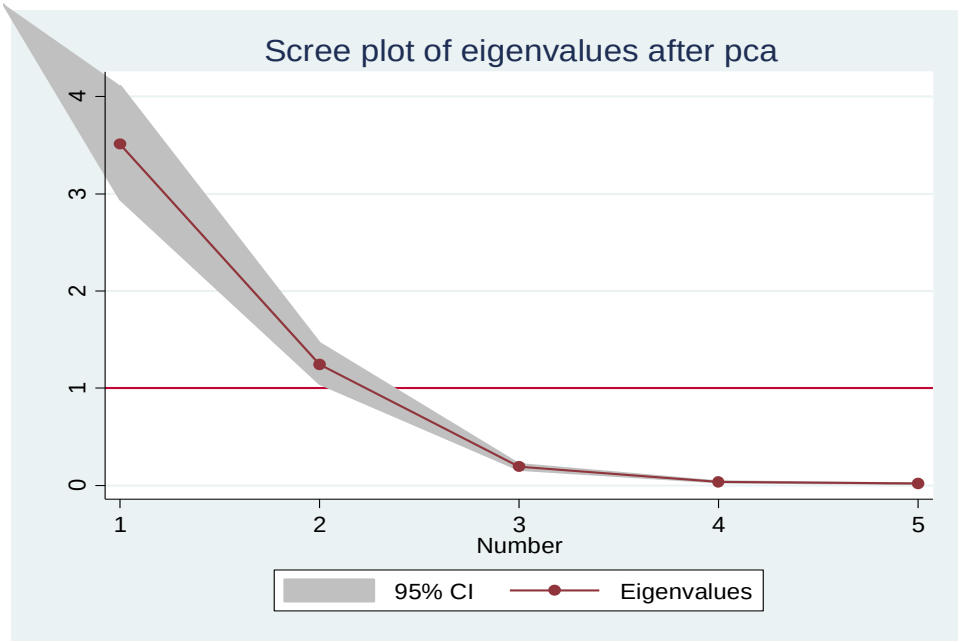
Source: Researcher's own computations

Table 9.5: Eigenvectors

Variable	comp 1	comp 2	comp 3	comp 4	comp 5	unexplained
BROAD	0.4993	-0.2943	-0.0289	0.5029	-0.6406	0
CRED	0.4407	0.4146	-0.7329	0.1257	0.2847	0
BA	0.5253	-0.0747	0.0538	-0.8211	-0.2034	0
LIQ	0.4704	-0.3886	0.3598	0.1915	0.6794	0
BC	0.2436	0.7648	0.5742	0.1425	-0.0755	0

Source: Researcher's own computations

Figure 9.1: Scree plot



Source: Researcher's own computations

9.5 Empirical results

This section presents the results of the relationship between interest rate liberalisation, financial development and economic growth. The first part of the analysis examines the effect of interest rate liberalisation on financial development through savings. The second part of the analysis surveys the effect of financial development on economic growth.

9.5.1 Interest rate liberalisation and financial development

The PMG estimator assumes that there is cointegration between the variables. To test for cointegration, the bounds test approach is employed for the individual countries, in line with Pesaran *et al* (1999). The bounds test results are presented in Table 9.6, where the dependent variables are FD index and FD index2.

According to the bounds test results in Table 9.6, the null of no cointegration is rejected in the cases of Botswana, Madagascar, Malawi, Mauritius, Namibia, Swaziland and Tanzania, implying that there is a long-run relationship between the variables. For Lesotho the cointegration is found only at the 10% level of significance, while for South Africa, Seychelles and Zambia there is no long-run relationship between the variables. The result is puzzling, given that South Africa and Seychelles are two of the most financially developed countries in the SADC region. Financial development for these countries seems to be driven by other vari-

ables in the long run. The bounds test results found when the FD index2 is used as a measure of financial development, show that the null of no cointegration is rejected in Lesotho, Malawi, Seychelles, Swaziland, Tanzania and Zambia at the 5% level of significance. Cointegration is detected in South Africa at the 10% level of significance, while for Botswana, Mauritius, Namibia and Madagascar there is no cointegration.

Table 9.6: Bounds test results

Country	FD index	FD index2
Botswana	5.85***	0.61
Lesotho	3.68*	8.13***
Madagascar	16.07***	3.00
Malawi	14.39***	5.33***
Mauritius	6.32***	1.47
Namibia	8.94***	1.75
Seychelles	1.92	4.89**
South Africa	2.63	3.56*
Swaziland	7.92***	5.56***
Tanzania	33.70***	7.16***
Zambia	2.54	4.44**

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

To check the robustness of the bounds testing results, cointegration tests are conducted using the individual financial development indicators. The results are presented in Table 9.7. Cointegration is found for Madagascar, Malawi, Mauritius, South Africa, Tanzania and Zambia when broad money is used a measure of financial development. Cointegration is present in all countries except for Zambia, Namibia and Seychelles when credit to the private sector is the indicator of financial development. And for Zambia and Namibia, cointegration is found only at the 10% level of significance.

Cointegration is found only for Madagascar, Malawi, Namibia, Tanzania and Zambia when liquid liabilities are used a measure of financial development. When banking assets are used as a measure of financial development, cointegration is present in all countries except South Africa and Seychelles. Cointegration is found for Botswana, Lesotho, Madagascar, Swaziland, Tanzania and Zambia when bank credit is used as a measure of financial development.

Table 9.7: Bounds test results

Country	CRED	BROAD	LIQ	BA	BC
Botswana	4.23**	2.51	1.29	7.88***	7.25***
Lesotho	7.96***	3.07	3.62*	4.09**	7.11***
Madagascar	6.86***	5.63***	6.96***	4.10**	20.80***
Malawi	5.29***	7.50***	6.31***	31.89***	2.74
Mauritius	4.44**	4.80**	3.68*	9.60***	3.64*
Namibia	3.91*	2.21	4.17**	11.00***	3.23
Seychelles	2.64	3.06	3.86*	3.26	3.24
South Africa	5.53***	5.04**	2.39	2.96	2.86
Swaziland	5.24***	0.84	3.27	8.56***	8.72***
Tanzania	16.76***	16.45***	9.76***	19.89***	23.60***
Zambia	3.55*	6.54***	14.00***	7.99***	4.66**

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

Diagnostic tests are conducted on the individual country ARDL models and the results are presented in Tables 9.8 and 9.9. In Table 9.8 the indices are used as measures of financial development, while in Table 9.9 the individual indicators of financial development are used. Serial correlation is present for four countries, heteroscedasticity for two countries, and there is no model misspecification when the FD index is used as a proxy for financial development. When FD index2 is used as an indicator of financial development, serial correlation is present for two countries, heteroscedasticity for two countries and model misspecification for three countries.

When broad money is an indicator of financial development, serial correlation is present for two countries, heteroscedasticity for four countries and model misspecification for four countries. Using credit to the private sector, serial correlation is present for three countries and there is no heteroscedasticity or model misspecification for all countries. There is evidence of serial correlation for four countries, no heteroscedasticity or model misspecification for one country when liquid liabilities are the measure of financial development. Serial correlation is present for four countries, heteroscedasticity and model instability for one country when bank assets are the indicator of financial development. When bank credit is used as a proxy for fi-

nancial development, serial correlation is present for two countries, heteroscedasticity for one and model misspecification for two countries.

Table 9.8: Diagnostic tests. Dependent variable: FD Indices

Country	serial correlation		heteroscedasticity		Ramsey's reset test	
	FD index	FD index2	FD index	FD index2	FD index	FD index2
Botswana	0.03	15.31***	0.25	0.11	0.75	0.80
Lesotho	0.68	4.12**	0.05	0.26	0.17	0.98
Madagascar	0.64	0.29	0.01	9.15***	0.76	4.19*
Malawi	3.95**	0.19	0.57	0.41	1.12	0.96
Mauritius	0.30	0.02	1.35	0.41	0.44	0.57
Namibia	2.60	0.47	0.21	12.92***	5.66*	0.69
Seychelles	4.62**	1.08	0.01	1.32	1.57	0.09
SA	8.79***	0.25	6.29**	1.91	1.00	4.72**
Swaziland	7.18***	1.27	5.29**	0.24	0.51	1.91
Tanzania	2.93*	1.32	2.13	5.09**	0.46	8.51***
Zambia	1.99	1.94	0.50	0.28	0.58	3.86*

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels of significance respectively.

Most of the individual country ARDL models pass the diagnostic tests regardless of the financial development indicator used. So the researcher concludes that the PMG model is adequate for the analysis.

Table 9.9: Diagnostic tests

Variable	test	Botswana	Lesotho	Madagascar	Malawi	Mauritius	Namibia	Seychelles	SA	Swaziland	Tanzania	Zambia
BROAD	serial correlation	0.63	3.19*	0.008	4.49**	1.45	3.21*	0.30	4.56**	1.78	3.91*	3.09*
	heteroscedasticity	4.23**	3.85**	0.05	3.75*	0.03	20.10***	0.89	1.21	0.24	4.75**	0.90
	RESET test	3.10*	4.14**	4.08**	0.17	0.24	14.90***	2.85*	0.20	1.14	1.15	5.71**
CRED	serial correlation	1.50	5.18**	0.68	5.10**	0.20	1.23	0.10	2.52	8.94***	2.49	0.10
	heteroscedasticity	0.86	0.16	0.82	0.06	0.24	0.001	0.12	1.47	2.53	0.77	1.07
	RESET test	1.42	0.81	0.41	1.25	0.60	2.83	1.07	0.87	0.22	0.74	0.39
LIQ	serial correlation	2.63	0.08	1.05	11.10***	1.89	13.91***	8.67***	0.37	0.33	0.69	16.00***
	heteroscedasticity	0.86	0.16	0.82	0.06	0.24	0.001	0.12	1.47	2.53	0.77	1.07
	RESET test	3.58*	0.04	0.36	0.34	0.45	11.27***	1.13	0.92	2.50	0.34	1.19
BA	serial correlation	3.54*	0.20	0.57	0.24	0.006	3.93**	7.40***	3.20*	6.97***	10.88***	0.53
	heteroscedasticity	0.09	2.60	0.02	0.25	0.26	6.41**	1.11	0.57	2.67	1.38	0.31
	RESET test	0.32	0.59	1.65	1.6	0.71	4.72**	0.46	3.39	0.50	0.79	0.88
BC	serial correlation	0.33	2.58	0.50	7.52***	8.70***	1.15	0.04	0.08	0.60	0.04	1.47
	heteroscedasticity	0.16	4.64**	0.76	0.001	0.65	3.21*	0.38	1.68	1.92	0.99	0.64
	RESET test	0.69	4.56**	0.89	0.68	5.66**	2.42	1.65	1.92	0.99	0.64	0.48

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

Table 9.10: Empirical results: PMG, MG and DFE. Dependent variable: FD Index

Variable	PMG	MG	Hausman	DFE
adjustment coefficient	-0.13 (-2.73)***	-0.27 (-3.63)***		-0.05 (-2.18)***
long-run coefficients			3.20 [0.53]	
SAV	0.03 (3.21)***	0.06 (0.83)		0.04 (0.91)
GDPC	0.0002 (4.66)***	0.005 (0.95)		-0.004 (-1.18)
CHINN	-0.63 (-4.32)***	0.89 (1.15)		0.67 (1.42)
INF	-0.04 (-3.87)***	-0.11 (-1.19)		-0.11 (-1.88)*
short-run coefficients				
d.SAV	0.003 (0.25)	0.001 (0.10)		-0.01 (-2.88)***
d.GDPC	-0.0003 (-1.58)	-0.0005 (-1.96)**		-0.0001 (-0.33)
d.INF	-0.003 (-0.25)	-0.05 (-1.97)**		0.001 (0.55)
d.CHINN	0.14 (2.21)**	0.02 (0.41)		0.03 (1.02)
No of observations	252	252		252
No of countries	11	11		11

Source: Researcher's own computations. Note: (*), (**) and (***) indicate 10%, 5% and 1% significance level, respectively. Figures in parentheses ( ) are t-statistics, figures in parentheses [ ] are p-values.

This section presents the results of the PMG, MG and DFE models. The indices of financial development are used as the dependent variables in the first specifications and the results are presented in Tables 9.10 to 9.13. For robustness checks, the individual measures of financial development are used as dependent variables and the results are presented in Table 9.14. The real deposit rate is introduced in the specification as part of the robustness checks. The variables could not be included in the previous specification because of its strong correlation with inflation.

In Table 9.10, the FD index is used as the indicator of financial development. The Hausman test suggests that the PMG model is appropriate for the analysis, as the hypothesis of homogenous long-run coefficients is not rejected. Also, the results of both the MG and the DFE models are largely insignificant, so the interpretation focuses on the results of the PMG model. The adjustment coefficients of all the models have the expected negative signs and are significant at the 1% level, indicating their presence in a long-run relationship. As expected, the MG model shows faster adjustment compared with the PMG and DFE models. Savings has a positive and significant effect on financial development, which supports the McKinnon and Shaw hypothesis that interest rate liberalisation has a positive effect on savings, which in turn promotes financial development. The results are in line with those of Agrawal (2001), Odhiambo (2009, 2010) and Mbulawa (2015), who found that real interest rates have a positive effect on financial deepening in developing countries, including SADC countries. GDP per capita and financial development have a positive and significant relationship in the long run, which confirms *a priori* expectations and squares well with the findings of Mbulawa (2015) and Ayadi *et al* (2013). As a proxy for income and GDP, the coefficient of GDP per capita implies that higher incomes and greater economic activity promote financial development in SADC countries. Higher GDP promotes financial development by encouraging savings and capital accumulation, and also boosts banking activity as more goods and services are produced. Also, GDP per capita can be used as a proxy for institutional quality due to its strong correlation with variables measuring the strength of institutions. This is suggested by La Porta *et al* (1997), Beck *et al* (2003), Ayadi *et al* (2013) and David, Mlachila & Moheeput (2014). This result implies that institutional quality is crucial for financial development.

Financial openness is negatively related to financial development in the long run. This is against *a priori* expectations, as financial openness is expected to increase the availability of funds in the economy and reduce the cost of capital. A possible reason for the negative co-

efficient could be the surge in capital outflows in search of higher returns, which reduces savings and the availability of funds for credit and investment purposes. Also, as advocated by Balagi, Demitriades & Law (2007) and Mbulawa (2015), financial openness has a positive effect on financial development in the presence of higher institutional quality. The level of institutional quality in most SADC countries is low, based on GDP per capita which may possibly be another reason for the negative effect of financial openness on financial development. Inflation has a negative and significant effect on financial development, which confirms theoretical expectations. High inflation rates as measures of macroeconomic instability create uncertainty in the economy and discourage savings by reducing purchasing power. The result confirms the findings of Bittencourt (2008) and Ayadi *et al* (2013), who found that inflation is detrimental to financial development in developing countries.

Table 9.11: PMG short-run estimates

Country	SAV	GDPC	CHINN	INF	adjustment
Botswana	-0.004 (-0.70)	-0.002 (-2.62)***	0.04 (0.92)	-0.01 (-0.90)	0.04 (1.44)
Lesotho	-0.004 (-1.01)	-0.009 (-2.45)**	0.67 (1.63)	0.002 (0.69)	-0.05 (-1.02)
Madagascar	-0.007 (-3.03)***	-0.007 (-2.99)***	0.04 (1.19)	0.002 (2.00)**	-0.16 (-3.64)***
Malawi	-0.008 (-2.36)**	-0.002 (-3.85)***	-0.07 (-0.89)	0.004 (1.81)*	-0.13 (-4.14)***
Mauritius	-0.02 (-1.96)**	0.001 (1.72)*	0.22 (3.22)***	-0.03 (-3.05)***	0.02 (0.91)
Namibia	-0.02 (-2.82)***	0.003 (0.38)	0.41 (2.42)***	-0.01 (-0.84)	-0.40 (-6.33)***
Seychelles	-0.01 (-1.27)	-0.0001 (-0.58)	0.02 (0.10)	-0.01 (-1.31)	-0.05 (-0.70)
South Africa	0.11 (1.48)	0.0001 (-0.88)	-0.03 (-0.24)	0.002 (0.01)	-0.47 (-2.68)***
Swaziland	-0.004 (-1.11)	-0.0002 (-0.03)	0.13 (1.19)	-0.01 (-1.23)	-0.06 (-1.69)*
Tanzania	-0.005 (-1.25)	0.002 (0.66)	0.12 (2.51)**	0.01 (1.87)*	-0.13 (-3.72)***
Zambia	-0.003 (-1.12)	0.0002 (0.94)	0.05 (1.58)	0.005 (1.28)	-0.08 (-2.55)**

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

The homogenous short-run coefficients are insignificant, except for financial openness. According to the results, financial openness has a positive effect on financial development in the short run. However, the PMG model assumes that long-run coefficients are homogenous

while the short-run coefficients are heterogenous or individually specific (Pesaran *et al*, 1999).

Table 9.12: Empirical results: PMG, MG and DFE. Dependent variable: FD index2

Variable	PMG	MG	Hausman	DFE
adjustment coefficient	-0.04 (-1.28)	-0.17 (-2.20)**		-0.14 (-4.91)**
long-run coefficients			6.87 [0.14]	
SAV	0.06 (3.26)***	-0.34 (-0.80)		0.004 (0.29)
GDPC	0.00001 (0.02)	0.005 (0.89)		0.0002 (2.34)**
CHINN	1.30 (4.13)***	0.07 (0.03)		-0.13 (-0.97)
INF	-0.08 (-2.53)**	-0.23 (-0.76)		-0.21 (-1.67)*
short-run coefficients				
d.SAV	-0.001 (-0.19)	0.005 (0.91)		0.003 (1.35)
d.GDPC	0.0002 (0.92)	0.0003 (0.12)		-0.00003 (-0.09)
d.CHINN	0.03 (0.30)	0.002 (0.05)		0.02 (0.55)
d.INF	-0.001 (-0.33)	0.004 (1.67)		0.005 (2.57)**
No of observations	252	252		252
No of countries	11	11		11

Source: Researcher's own computations. Note: (*), (**) and (***) indicate 10%, 5% and 1% significance level, respectively. Figures in parentheses ( ) are t-statistics, figures in parentheses [ ] are p-values.

The individual specific short-run coefficients, presented in Table 9.11, show that the adjustment coefficients are negative and significant in all the countries, except Botswana, Lesotho, Mauritius and Seychelles. The results imply that the effect of interest rate liberalisation on financial development is not a short-run phenomenon, as most of the coefficients are insignificant.

In Table 9.12, FD index2 is used as the measure of financial development. The Hausman test suggests that the PMG model is the best of the three models. However, according to the results, no long-run relationship is detected, as the adjustment coefficient is negative but not significant. The adjustment coefficients for the MG and DFE models are negative and significant, but the coefficients are insignificant. This is not surprising, given that FD index2 captures only 25% of the variation of the individual financial development indicators.

Table 9.13: Short-run estimates

Country	SAV	GDPC	CHINN	INF	adjustment
Botswana	-0.01 (-0.75)	-0.0001 (-1.41)	-0.11 (-1.80)*	-0.002 (-0.14)	-0.01 (-0.76)
Lesotho	-0.001 (-0.22)	-0.001 (-2.04)**	0.97 (1.91)*	0.003 (0.84)	-0.02 (-0.28)
Madagascar	-0.001 (0.11)	-0.0004 (-0.43)	-0.09 (-0.87)	-0.0002 (-0.05)	-0.06 (-2.98)***
Malawi	0.01 (1.62)	0.001 (1.68)*	-0.15 (-1.88)*	0.008 (4.31)***	-0.09 (-2.25)**
Mauritius	-0.01 (-0.83	0.00003 (0.49)	-0.01 (-0.14)	0.01 (0.93)	-0.01 (-0.30)
Namibia	0.03 (2.36)**	-0.0002 (1.28)	-0.20 (0.47)	-0.01 (-0.77)	0.03 (0.38)
Seychelles	-0.01 (-1.31)	0.0001 (1.67)*	0.02 (0.21)	0.01 (1.43)	0.19 (2.57)***
South Africa	-0.04 (-0.85)	-0.0001 (-1.15)	-0.01 (-0.07)	-0.03 (-1.62)	-0.15 (-1.56)
Swaziland	0.004 (0.66)	0.0003 (3.03)***	0.002 (0.01)	0.002 (0.22)	-0.12 (-2.62)***
Tanzania	-0.02 (-2.50)**	0.002 (2.83)***	-0.15 (-1.50)	0.001 (0.13)	-0.20 (-2.94)***
Zambia	-0.005 (-1.00)	0.001 (1.95)*	0.06 (0.96)	-0.002 (-0.20)	-0.01 (-0.95)

Source: Researcher's own computations, Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively

The short-run heterogenous coefficients presented in Table 9.13 further support the idea that there is no long-run relationship between FD index2 and the independent variables. Only four

of the adjustment coefficients for the individual countries are negative and statistically significant. Most of the other short-run coefficients are insignificant.

Table 9.14: PMG models

Variable	Broad	LIQ	CRED	BA	BC
ADJ	-0.18 (-3.28)***	-0.09 (-3.27)***	-0.09 (-1.66)*	-0.10 (-2.33)**	-0.06 (-1.96)**
LR					
SAV	0.32 (3.32)***	1.13 (3.52)***	-0.04 (-0.39)	0.61 (4.07)***	3.00 (4.45)***
GDPC	0.004 (3.78)***	0.004 (3.59)***	0.002 (2.82)***	0.002 (3.01)***	0.03 (4.88)***
CHINN	-5.41 (-3.40)***	5.40 (2.89)***	-9.05 (-5.08)***	-8.86 (-3.86)***	55.28 (3.99)***
INF	-0.18 (-2.83)***	0.03 (0.33)	0.04 (0.70)	-0.57 (-3.30)***	-2.64 (-2.94)***
SR					
d.SAV	0.04 (0.22)	-0.18 (-3.57)***	-0.25 (-1.10)	0.01 (0.09)	-0.08 (0.61)
d.GDPC	-0.007 (-2.13)**	-0.005 (-1.39)	-0.002 (-0.71)	-0.002 (-1.40)	-0.001 (-0.23)
d.INF	-0.05 (-0.57)	-0.05 (-1.14)	-0.18 (-1.36)	-0.04 (0.74)	-0.03 (-0.32)
d.CHINN	1.20 (2.07)**	0.84 (1.20)	2.37 (2.49)**	1.82 (1.89)*	1.05 (0.28)
No of obs	257	254	255	255	257
No of countries	11	11	11	11	11

Source: Researcher's own computations, Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

Tables 9.14 and 9.15 present robustness checks which involve estimating PMG models using each indicator of financial development, as well as adding the real deposit rate in the specification respectively. According to Table 9.14, the adjustment coefficients are negative and

significant at 5% level for all models except the model with CRED used as the measure of financial development, which is only significant at the 10 % level. The coefficients indicate that there is a long-run relationship between the variables. However the adjustment from short-run disequilibrium is slow (ranging from 6% to 18%).

Table 9.15: PMG models

Variable	Broad	LIQ	CRED	BA	BC	FD index	FD index2
ADJ	-0.19 (-3.54)***	-0.18 (-3.18)***	-0.14 (-3.46)***	-0.12 (2.31)**	-0.02 (-0.72)	-0.12 (-2.93)***	0.05 (-1.42)
LR							
SAV	0.45 (4.49)***	0.23 (2.72)***	0.44 (3.28)***	0.35 (4.94)***	7.49 (2.86)***	0.07 (5.29)***	-0.02 (-2.66)***
GDPC	0.005 (5.31)***	0.01 (7.55)***	0.003 (4.26)***	0.01 (13.98)***	0.003 (0.55)	0.0003 (5.04)***	-0.0001 (-0.61)
CHINN	-6.60 (-3.66)***	-0.97 (-0.63)	-7.26 (-4.12)***	-4.82 (-3.06)***	49.06 (1.90)*	-0.84 (-4.73)***	1.63 (4.49)***
RDEP	0.21 (2.14)**	-0.04 (-0.60)	0.43 (3.69)***	0.25 (3.04)***	1.92 (1.73)*	0.05 (4.14)***	0.07 (2.52)**
SR							
d.SAV	0.09 (0.40)	-0.15 (-3.47)***	-0.32 (1.19)	-0.06 (-0.57)	-0.06 (-0.38)	-0.002 (-0.026)	-0.003 (-0.37)
d.GDPC	-0.01 (-2.14)**	-0.01 (-1.77)*	-0.003 (-1.22)	-0.004 (-2.33)**	-0.01 (-1.04)	-0.0004 (-1.87)*	0.0001 (0.62)
d.CHINN	1.23 (2.06)**	1.11 (1.64)*	2.10 (2.31)**	1.77 (1.99)**	2.26 (0.74)	0.14 (2.17)**	0.05 (0.55)
d.RDEP	0.10 (1.61)	0.08 (1.88)*	0.04 (1.16)	0.10 (2.25)**	0.08 (0.95)	0.05 (2.41)**	-0.002 (-0.52)
No of obs	253	249	251	247	251	247	247
No of countries	11	11	11	11	11	11	11

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

Savings have a positive and significant effect on all financial development indicators except credit to the private sector. This is in line with the findings of Odhiambo & Akinboade (2009), who report that interest rate reforms have an insignificant effect on credit to the private sector in Botswana.

GDP per capita is positively related to all the financial development indicators and the coefficient is significant at the 1% level. The results for financial openness are mixed. Financial openness has a negative effect on broad money, credit to the private sector and banking assets in the long run, while its effect on liquid liabilities and bank credit is positive. Inflation has a negative and significant effect on broad money, bank assets and bank credit, while its effect on liquid liabilities and credit is insignificant. Financial openness is positively related to broad money and credit to the private sector in the short run, while most of the other short-run coefficients are insignificant.

In Table 9.15, the real deposit rate is introduced in the specification. The inflation rate is omitted from this model due to its strong correlation with the real deposit rate. The adjustment coefficients for all models are negative and significant, except for when bank credit and FD index2 are the indicators of financial development. The real deposit rate has a positive and significant effect on the financial development indicators in the long run, except for liquid liabilities and bank credit, which are significant only at the 10% level. Furthermore, the real deposit rate is positively correlated with the FD index, as well as banking assets in the short run. The other coefficients mirror those of the previous specifications to a large extent.

9.5.2 Financial development and economic growth

The second part of the analysis examines the effect of financial development on economic growth. The analysis follows a similar approach to the one on interest rate liberalisation and financial development. Firstly, bounds testing is conducted on the individual country ARDLs, together with the diagnostic tests. Secondly, the PMG model will be estimated where the index is used as a proxy for financial development.

Figure 9.16 presents the results of the bounds test, where FD indices are used as indicators of financial development. When FD index is the indicator, the null of no cointegration is rejected at the 1% level in all countries except Malawi, Mauritius and Swaziland, where the null hypothesis is rejected only at the 10% level. Cointegration is detected in all countries at the 1% level when FD index2 is used as a measure of financial development.

Table 9.16: Bounds test results

Country	FD index	FD index2
Botswana	9.50***	13.51***
Lesotho	5.25***	8.45***
Madagascar	28.33***	23.75***
Malawi	3.51*	9.57***
Mauritius	3.35*	9.27***
Namibia	15.88***	4.91***
Seychelles	7.68***	4.80***
South Africa	8.98***	11.16***
Swaziland	3.57*	187.35***
Tanzania	10.42***	10.41***
Zambia	14.32***	12.16***

Source: Researcher's own computations. Note: (***) and (*) indicate significance at 1% and 10% levels respectively.

Table 9.17: Bounds test results

Country	CRED	BROAD	LIQ	BA	BC
Botswana	11.26***	11.45***	16.70***	7.75***	20.47***
Lesotho	49.07***	31.57***	8.50***	5.30***	27.47***
Madagascar	22.91***	9.13***	21.20***	30.99***	26.39***
Malawi	4.24**	4.63**	6.73***	17.32***	5.43***
Mauritius	8.71***	17.48***	4.25**	10.38***	6.44***
Namibia	12.99***	5.56**	16.71***	10.94***	13.28***
Seychelles	8.51***	4.45**	9.79***	5.64***	5.30***
South Africa	5.85***	6.40***	4.78***	4.47**	1.52
Swaziland	4.58**	10.15***	6.53***	5.04***	4.88***
Tanzania	9.72***	6.49***	8.11***	9.46***	8.09***
Zambia	7.93***	10.22***	10.05***	9.41***	8.17***

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

Table 9.17 presents the results of the bound test procedure when the measures of financial development are used individually. Cointegration is present in all countries for every indicator of financial development, with the exception of South Africa when bank credit is a proxy for financial development.

Tables 9.18 and 9.19 present the diagnostic tests for the individual country ARDL models for the different proxies of financial development. In Table 9.18, the indices are used a measure of financial development and, based on the results, serial correlation is detected in three countries, heteroscedasticity in two countries and model misspecification in one country.

Table 9.18: Diagnostic tests: financial development indices

Country	**serial correlation**		**heteroscedasticity**		**Ramsey's reset test**	
	FD index	FD index2	FD index	FD index2	FD index	FD index2
Botswana	2.91*	1.81	0.54	1.80	2.85*	0.17
Lesotho	0.49	6.81***	0.13	0.01	0.11	0.21
Madagascar	0.04	0.01	4.73**	4.39**	27.49***	38.82***
Malawi	0.13	0.01	0.03	0.18	0.35	0.25
Mauritius	0.74	0.10	11.01***	3.98**	3.35*	0.41
Namibia	0.19	9.37***	0.06	2.35	1.28	3.07*
Seychelles	8.28***	1.01	0.19	0.03	0.32	0.42
SA	4.26**	5.08**	0.30	0.06	1.21	0.29
Swaziland	1.11	0.15	0.14	0.71	2.77	1.12
Tanzania	0.26	9.15***	0.09	0.15	3.41**	0.77
Zambia	6.84***	0.51	0.85	1.64	0.39	0.04

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

Table 9.19 shows the diagnostic tests for the individual country ARDL models. Most of the models pass the diagnostic tests, which suggests that the PMG model is suitable for the analysis. Serial correlation is detected for no more than four countries, while heteroscedasticity and model misspecification are detected in two countries at the most in all specifications.

Table 9.19: Diagnostic tests

Variable	test	Botswana	Lesotho	Madagascar	Malawi	Mauritius	Namibia	Seychelles	S Africa	Swaziland	Tanzania	Zambia
BROAD	serial correlation	0.40	16.28***	8.34***	0.47	0.66	3.83*	7.27	4.21**	4.31**	0.65	0.52
	heteroscedasticity	2.87*	1.51	1.00	1.94	1.35	0.001	0.05	0.85	2.98*	0.90	8.42***
	RESET test	0.83	13.80***	17.90***	0.75	3.08*	0.06	0.33	0.22	0.24	0.84	3.37*
CRED	serial correlation	1.17	5.19**	3.01*	6.15**	1.05	2.04	6.14***	5.09***	7.58***	1.26	1.12
	heteroscedasticity	1.09	0.47	5.43***	0.19	7.98***	0.51	2.54	0.85	0.23	0.16	0.71
	RESET test	0.79	1.09	21.71***	1.73	2.91*	1.20	1.00	1.53	0.17	2.39	0.86
LIQ	serial correlation	3.56*	7.12***	0.04	0.004	4.34**	0.001	4.89**	0.03	4.16**	9.34***	1.13
	heteroscedasticity	7.08***	0.11	1.73	0.0001	1.04	0.02	0.99	0.45	0.84	1.22	1.46
	RESET test	6.69***	0.22	13.26***	0.50	1.46	0.02	0.35	0.14	0.14	1.15	1.69
BA	serial correlation	4.95**	0.42	1.43	0.06	2.13	0.77	3.89**	8.31***	0.001	0.26	2.26
	heteroscedasticity	0.29	0.27	5.22**	0.02	4.44***	0.34	0.81	0.13	2.11	0.51	0.06
	RESET test	2.01	0.26	34.33***	0.66	3.45*	0.86	0.31	1.41	40.17***	3.56	2.67
BC	serial correlation	1.53	2.57	0.001	0.09	11.52***	5.20**	7.44***	2.71	0.29	0.19	2.97*
	heteroscedasticity	4.46**	0.20	3.14*	0.1	4.57**	0.001	0.82	0.02	0.53	0.49	1.01
	RESET test	2.93	2.02	19.35***	0.01	2.75	1.78	0.66	0.43	3.64*	3.09	4.34**

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

Table 9.20. PMG, MG and DFE. Dependent variable: GDP

Variable	PMG	MG	Hausman	DFE
ADJ	-0.87 (-10.96)***	-1.04 (-13.35)***		-1.02 (-17.52)***
LR			6.70 [0.24]	
TRA	-0.03 (-4.68)***	-0.04 (-0.09)		-0.01 (-1.34)
GOV	-0.28 (-5.61)***	-0.35 (-3.30)***		-0.09 (-1.34)
INV	0.14 (7.72)***	0.17 (1.91)*		0.05 (1.84)*
EXCH	0.002 (3.70)***	0.12 (0.62)		0.003 (3.31)***
FD index	-0.36 (-2.72)***	-2.89 (-2.74)***		-0.58 (-1.96)**
SR				
d.TRA	0.07 (1.75)*	0.04 (0.81)		0.006 (0.33)
d.GOV	0.07 (0.59)	0.16 (1.21)		-0.18 (-2.04)**
d.INV	-0.12 (-1.66)*	-0.12 (-1.20)		0.003 (0.07)
d.EXCH	-0.72 (-2.74)***	-0.99 (-2.53)**		-0.005 (-1.63)
d.FD Index	-1.84 (-0.89)	0.11 (0.08)		-2.61 (-2.62)***
No of obs	255	255		255
No of countries	11	11		11

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

This section presents the results of the panel data analysis. The results are presented in Tables 9.20 to 9.23, where the measures of financial development are the indices, as well as Tables 9.24 and 9.25, which tests for robustness by using the individual indicators of financial development.

The adjustment coefficient of the PMG model implies that 87% of the disequilibrium in the short run is corrected in the first year, which represents a very quick adjustment. The Hausman test suggests that the PMG model is superior to the MG model, so the interpretation of the results is centred on the PMG model. Also, the adjustment coefficients of the MG and DFE models are greater than one, which is an indication of model instability. So the MG and DFE models are used for comparison purposes. According to the results, financial development has a negative effect on economic growth in the long run in SADC countries. The coefficient of the financial development is negative and significant at 1% level. The result is against theoretical expectations, as a more developed financial system is expected to promote economic growth. A possible explanation of the result is that a number of SADC countries have experienced financial crises caused by bank failures. The stability of a financial system is an alternative channel in which financial development has an effect on economic growth. As such, financial development may have a negative influence on economic growth if financial systems lack stability. The result provides support to the findings of Iheanacho (2016) and Kenza & Eddine (2016), who report a negative correlation between financial development and economic growth in Nigeria and MENA countries respectively. The coefficient of financial development is negative and significant in the MG and DFE models as well. However, the models show signs of instability, as the adjustment coefficients are greater than one in absolute terms.

Trade and government expenditure are negatively related to economic growth in the long run, while investment and the exchange rate have a positive effect on economic growth. The coefficients are significant at the 1% level and are in line with those found in the previous chapters. According to the PMG and MG models, the homogenous short-run coefficient of financial development is insignificant. The coefficient is however, negative and significant in the DFE model. Exchange rate depreciation has a negative effect on economic growth in the short run, based on the PMG and MG results.

Table 9.21. PMG model. Short-run coefficients

Country	TRA	GOV	INV	EXCH	FD index	ADJ
Botswana	0.30 (4.03)***	0.03 (0.08)	-0.39 (-2.98)***	-0.37 (-0.31)	-3.50 (-0.98)	-0.75 (-4.70)***
Lesotho	0.07 (1.60)	-0.16 (-0.65)	-0.25 (-2.20)**	-1.71 (-3.10)***	6.88 (2.89)***	-0.33 (-2.44)***
Madagascar	0.23 (3.30)***	0.32 (1.00)	0.33 (2.21)**	-0.005 (-1.57)	-15.16 (-2.25)**	-1.17 (-7.61)***
Malawi	0.04 (0.37)	-0.35 (-1.39)	-0.54 (-1.91)*	-0.02 (-0.51)	-6.79 (1.23)	-1.10 (-6.96)***
Mauritius	-0.03 (-0.84)	-0.76 (-1.50)	-0.07 (-0.52)	-0.03 (-0.22)	-1.73 (-1.16)	-1.25 (-5.98)***
Namibia	-0.14 (-1.93)*	0.68 (2.26)**	-0.06 (-0.65)	-0.37 (-0.74)	-4.53 (-1.95)*	-0.85 (-4.80)***
Seychelles	0.01 (0.32)	0.28 (1.90)*	0.01 (0.11)	-1.98 (-2.86)***	-7.55 (-4.32)***	-0.66 (-4.42)***
South Africa	0.28 (5.57)***	0.29 (0.81)	-0.21 (-1.06)	-0.80 (-3.92)***	0.60 (0.65)	-0.76 (-6.29)***
Swaziland	-0.01 (-1.22)	0.16 (2.27)**	-0.06 -(2.29)**	-0.28 (-2.29)**	-1.09 (-0.81)	-1.06 (-28.94)***
Tanzania	-0.01 (-0.22)	0.07 (0.42)	1.00 (1.01)	-0.005 (-1.01)	4.59 (1.22)	-0.76 (-4.13)***
Zambia	0.08 (1.30)	0.19 (1.90)*	-0.16 (-2.52)**	-2.29 (-2.59)***	8.05 (3.01)***	-0.91 (-10.06)***

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

Table 9.21 presents the results of the short-run heterogenous coefficients of the PMG model. The adjustment coefficients are negative and significant at 1% level for all countries, which proves that there is a long-run relationship between the variables.

Table 9.22 presents the PMG, MG and DFE models where FD index2 is used as the measure of financial development. The adjustment coefficient is negative and significant, and implies that 92% of the disequilibrium in the short run is corrected in the first year. The Hausman test suggests that the PMG model is the best. FD index2 has a negative but insignificant effect on economic growth.

Table 9.22: PMG, MG and DFE results. Dependent variable: GDP

Variable	PMG	MG	Hausman	DFE
ADJ	-0.92 (-9.90)***	-1.14 (-16.54)***		-1.06 (-17.89)***
LR			0.70 [0.98]	
TRA	-0.03 (-5.56)***	0.003 (0.09)		-0.01 (-0.84)
GOV	-0.25 (-5.13)***	-0.33 (-2.89)***		-0.11 (-1.60)
INV	0.15 (8.89)***	0.15 (1.71)*		0.05 (1.59)
EXCH	0.002 (2.22)**	-0.15 (-0.63)		0.002 (2.49)**
FD index2	-0.06 (-0.21)	-0.06 (-0.06)		-0.09 (-0.18)
SR				
d.TRA	0.07 (1.64)	0.02 (0.44)		-0.001 (-0.04)
d.GOV	0.04 (0.23)	0.08 (0.34)		0.08 (0.34)
d.INV	-0.10 (-1.47)	-0.10 (-1.04)		-0.10 (-1.04)
d.EXCH	-0.52 (-3.11)***	-0.54 (-2.84)		-0.54 (-2.84)***
d.FD index2	1.74 (1.25)	1.77 (1.98)*		1.59 (1.59)
No of obs	255	255		255
No of countries	11	11		11

Source: Researcher's own computations, Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

The results further support the conclusion that financial development has a negative effect on economic growth in the long run in SADC countries. The other coefficients are in line with those found in the specification above.

The short-run heterogenous coefficients are presented in Table 9.23. The individual adjustment coefficients are negative and significant, which indicates that there is a long-run relationship between the variables.

Table 9.23. PMG model: short-run coefficients

Country	TRA	GOV	INV	EXCH	FD index2	ADJ
Botswana	0.32 (4.76)***	-0.13 (-0.39)	-0.47 (-3.67)***	-1.33 (-1.14)	-5.90 (-2.14)**	-0.79 (-5.24)***
Lesotho	0.05 (0.84)	-0.08 (-0.11)	-0.23 (-1.67)*	-1.20 (-1.53)	0.01 (0.01)	-0.28 (-1.87)*
Madagascar	0.21 (2.66)***	0.46 (1.29)	0.42 (2.67)***	-0.03 (-0.92)	-0.69 (0.18)**	-1.32 (-8.45)***
Malawi	-0.001 (-0.01)	-0.48 (-1.72)	-0.33 (-1.13)	-0.01 (-0.22)	-4.01 (-0.69)	-1.17 (-7.46)***
Mauritius	-0.03 (-0.78)	-1.27 (-2.53)**	-0.15 (-1.04)	0.06 (0.40)	-1.47 (0.87)	-1.23 (-5.97)***
Namibia	-0.12 (-1.53)	0.78 (2.40)**	-0.12 (-1.15)	-0.32 (-0.63)	2.81 (1.71)*	-1.10 (-5.98)***
Seychelles	-0.03 (-0.81)	0.42 (2.47)**	0.05 (0.50)	-1.25 (-1.75)*	-10.93 (-3.36)***	-0.77 (-4.34)***
South Africa	0.27 (5.86)***	0.30 (0.93)	-0.13 (-0.63)	-0.79 (-4.00)***	1.59 (1.51)	-0.72 (-6.35)***
Swaziland	-0.001 (-0.04)	0.23 (2.37)**	-0.10 -(2.67)**	-0.15 (-1.10)	1.30 (1.23)	-1.12 (-24.05)***
Tanzania	0.04 (0.72)	0.04 (0.26)	0.06 (0.52)	-0.002 (-0.50)	3.09 (1.85)*	-0.68 (-3.78)***
Zambia	0.03 (0.59)	0.10 (1.19)	-0.13 (-2.30)**	-0.75 (-0.77)	7.16 (3.80)***	-0.91 (-10.93)***

Source: Researcher's own computations, Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

Robustness checks are conducted by using the individual financial development indicators as proxies for financial development in PMG models. The long-run and short-run results are presented in Tables 9.24 and 9.25 respectively. The adjustment coefficients are negative and significant at the 1% level, indicating that there is a long-run relationship between the variables. The coefficients of the individual financial development indicators are negative and significant, which confirms the results obtained when the index is used as a proxy of financial development. The negative coefficient of credit to the private sector confirms the results of

Phakedi (2014) Le Roux & Moyo (2015) and Bara *et al* (2016), who report a negative relationship between credit to the private sector and economic growth in SADC countries. Ayadi *et al* (2013) also report a negative relationship between the variables in Mediterranean countries. Bara *et al* (2016) also report a negative association between bank credit to the private sector and economic growth.

Table 9.24: Long-run PMG model. Dependent variable: GDP

Variable	PMG1	PMG2	PMG3	PMG4	PMG5
ADJ	-0.88 (-9.94)***	-0.85 (-9.20)***	-0.87 (-9.07)***	-0.83 (-8.28)***	-0.94 (-12.42)***
TRA	-0.03 (-5.69)***	-0.03 (-3.83)***	-0.03 (-6.69)***	-0.03 (-4.80)***	0.06 (-0.63)
GOV	-0.23 (-4.38)***	-0.23 (-4.33)***	-0.26 (-5.67)***	-0.26 (-4.95)***	-0.08 (-1.38)
INV	0.14 (7.17)***	0.14 (7.00)***	0.16 (9.18)***	0.15 (7.92)***	0.02 (1.61)
EXCH	0.002 (3.62)***	0.0002 (3.63)***	0.002 (3.26)	0.003 (4.06)***	0.002 (3.77)***
BROAD	-0.003 (-2.55)**				
CRED		-0.02 (-2.11)**			
LIQ			-0.03 (-2.32)**		
BA				-0.02 (-2.56)**	
BC					-0.02 (-2.72)***
No of obs	262	260		258	262
No of countries	11	11	11	11	11

Source: Researcher's own computations, Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

According to Table 9.25, liquid liabilities are negatively related to GDP in the short run and the coefficient is significant at 5% level. Credit to the private sector has a negative but weakly significant coefficient. The result confirms the findings of Iheanacho (2013), who reports a negative correlation between liquid liabilities, credit to the private sector and economic growth in Nigeria. The rest of the financial development indicators are insignificant. A depreciation on the exchange rate affects economic growth negatively in the short run, which is in line with the results above.

Table 9.25: PMG homogenous short-run coefficients. Dependent variable: GDP

Variable	PMG1	PMG2	PMG3	PMG4	PMG5
d.TRA	0.06 (1.48)	0.08 (1.75)*	0.08 (1.92)*	0.06 (1.46)	0.05 (-1.25)
d.GOV	-0.003 (-0.02)	0.03 (0.21)	0.04 (0.28)	0.08 (0.66)	-0.05 (-0.37)
d.INV	-0.06 (-0.83)	-0.05 (-0.78)	-0.12 (-1.38)	-0.11 (-1.38)	0.01 (0.10)
d.EXCH	-0.50 (-2.62)**	-0.38 (-2.79)**	-0.68 (-2.44)**	-0.63 (-2.74)***	-0.26 (-1.57)
d.BROAD	-0.05 (-0.76)				
d.CRED		-0.21 (-1.94)*			
d.LIQ			-0.21 (-2.01)**		
d.BA				-0.25 (-1.30)	
d.BC					0.02 (0.86)
No of obs	262	260		258	262
No of countries	11	11	11	11	11

Source: Researcher's own computations, Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

9.6 Conclusion

The purpose of the chapter was to examine the effect of interest rate liberalisation on economic growth through financial development. The empirical analysis involved two equation specifications, the first of which surveyed the relationship between interest rate liberalisation and financial development through savings. According to the McKinnon and Shaw hypothesis, liberalising interest rates encourages savings, which in turn promote financial development. The effect of financial development on economic growth was observed in the second part of the empirical analysis. Financial development is regarded as one of the crucial determinants of economic growth (Levin 1997).

The analysis was conducted using the PMG estimator, which assumes homogenous long-run and heterogenous short-run coefficients (Pesaran *et al*, 2001). Also, the technique is based on the assumption that there is cointegration between variables in a model. To test for cointegration, individual ARDL models were estimated for each country and the results highlighted that the presence of cointegration in most countries for both equation specifications employed on the study. Most of the individual ARDL models passed the diagnostic tests which provided indication that the PMG models were adequate. The MG and DFE estimators were used for robustness checks.

The indicators of financial development used in the study were broad money, credit to the private sector, liquid liabilities, bank credit and bank assets. Two indices of financial development were constructed using PCA due to high correlation between the individual financial development indicators. The first financial development index, which explains over 70% of the total variation, is highly correlated with all the individual indicators except for bank credit, which is correlated with the second index to a large extent. The second index explains close to 25% of the total variation, while the remaining components explain minimal variation and so were excluded from the analysis.

The results indicated that interest rate liberalisation has a positive effect on financial development through savings, which supports the McKinnon and Shaw hypothesis. A long-run relationship between most of the financial development measures was found. However, a long-run association was not detected between the second index and interest rate liberalisation. The study also found that the long-run effect of financial development on economic growth was negative, which contradicts most of the theories and empirical studies regarding the role of financial development in influencing economic growth. However, it should be noted that

financial development in some SADC countries has caused financial crises, which in turn hinders economic growth. The next chapter will survey the effect of interest rate liberalisation on financial crises in SADC countries, which would shed light on the negative effect of financial development on economic growth.

CHAPTER TEN

INTEREST RATE LIBERALISATION AND FINANCIAL CRISES

10.1 Introduction

In Chapter eight, the effect of interest rate liberalisation on economic growth through financial development was investigated and the results suggested that interest rate liberalisation promotes financial development in the long term. However, financial development has a negative effect on economic growth, which could be a result of the emergence of financial crises. Critics of interest rate liberalisation argue that it increases the likelihood of financial crises by encouraging excessive lending by financial institutions in an attempt to take advantage of high interest rates (Demirgüç-Kunt & Detragiache, 1998; Kaufman, 2000). Others argue that higher interest rates encourage the entry of banks into the financial system, which increases competition, so promoting risky lending practices (Ariss, 2010; Agoraki *et al*, 2011; Hope *et al*, 2013).

Proponents of interest rate liberalisation argue that negative interest rates also encourage excessive risk-taking as banks attempt to earn higher returns, so causing financial crises (Bocutoglu & Ekinci, 2010). Also, interest rate liberalisation provides liquidity buffers which reduce the likelihood of financial crises (Barrell *et al*, 2016).

The purpose of this chapter is to examine the effect of interest rate liberalisation on financial crises for the period 1990-2015. Also, the effect of financial development and institutional quality on financial crises is also investigated. The estimation technique chosen for the analysis is the logit model, due to the binary nature of the endogenous variable. The chapter is organised as follows: Section two provides a description of the data as well as data sources. Section three discusses the empirical results, while Section four concludes the chapter.

10.2 Descriptive statistics

The descriptive statistics and correlation analysis of most of the variables were presented in Chapters 7 and 8 and so are not repeated in this chapter. The other new variable in the chapter besides financial crises, is the current account balance as a percentage of GDP. The variable averages -4.19%, indicating that current accounts have largely been in deficit in the SADC region over the period of the study.

10.3 Empirical results

The empirical strategy involves answering three questions. Firstly, does interest rate liberalisation increase or decrease the likelihood of financial crises? Secondly, what is the role of financial development in causing financial crises? As mentioned earlier, the results of Chapter nine suggest that financial development has a negative effect on economic growth, so this chapter seeks to find evidence of whether this negative effect is because of financial crises. The last question to be answered is whether institutional quality reduces the likelihood of financial crises. Due to the unavailability of data on institutions in SADC, GDP per capita will be used as the proxy for institutional quality, in line with studies like those by Demirgüç-Kunt & Detragiache (1998) and Angkinand *et al* (2010). Also, probabilities of different crises in the sample are estimated. To ensure that the results are robust, the explanatory variables are lagged by one period, which provides a true early warning model (Barrell *et al*, 2016) and to cater for potential endogeneity of the regressors (Demirgüç-Kunt & Detragiache, 1998).

10.3.1 Baseline regression

The baseline regression model includes only four explanatory variables: GDP growth, financial openness, current account balance and the inflation rate. The results are presented in Tables 10.1 and 10.2. The coefficient of inflation is positive and significant at the 5% level, indicating that financial crises are associated with higher levels of inflation. High inflation rates signify macroeconomic instability, which increases uncertainty in the economy, so the result is in line with *a priori* expectations. The result confirms the findings of Demirgüç-Kunt & Detragiache (1998), Ranciere *et al* (2006), Angkinand *et al* (2010) and Hamdi & Jlassi (2014).

Financial openness reduces the likelihood of financial crises, although the coefficient is weakly significant. One of the causes of banking crises is the diminishing of liquidity to meet depositors' needs. So capital inflows may mitigate liquidity problems faced by domestic financial institutions, thus reducing the possibility of banking crises. The result supports the findings of Beju & Ciupac-Ulici (2012), Hamdi & Jlassi (2014) and Barrell *et al* (2016). The finding is against the view that financial openness increases the likelihood of financial crises through an increase in capital outflows.

Table 10.1: Baseline results

Variable	logit	probit	LPM
INF	0.04 (2.94)***	0.03 (3.06)***	0.01 (4.35)***
CHINN	-0.31 (-1.87)*	-0.17 (-1.96)**	-0.02 (-1.62)
GDP	-0.10 (-2.03)**	-0.06 (-2.01)**	-0.01 (-2.14)**
CA	-0.03 (-1.36)	-0.01 (-1.11)	-0.003 (-1.29)
C	-2.36 (-6.61)***	-1.36 (-6.98)***	0.09 (2.34)**
pseudo R-squared	0.13	0.13	
R-squared			0.13
chi-square	28.45***	28.79***	
F-statistic			9.42***
No of observations	265	265	265

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

As expected, GDP growth is negatively signed and significant at the 5% level, indicating that higher economic growth levels are associated with lower crisis probabilities. The result is in line with those of Demirgüç-Kunt & Detragiache (1998), Shehzad & De Haan (2008), Angkinand *et al* (2010), Hamdi & Jlassi (2014), Barrell *et al* (2016) and Enowbi *et al* (2017). The current account balance has the expected negative sign; however the coefficient is insignificant. According to the literature, current account imbalances are one of the precursors of financial crises, so positive current account balances are necessary to reduce the likelihood of financial crises (Barrell *et al*, 2016).

The probit model, and also the linear probability model (LPM), is estimated for robustness checks, and the results mirror those of the logit model to a large extent. However, the financial openness variable is negative and significant at the 5% in the probit model, but insignificant in the LPM.

Table 10.2 shows the marginal effects which measure the probability that each explanatory variable contributes to the likelihood of financial crises. Inflation increases the probability of financial crises by 0.5% in both the logit and probit models. The probability is slightly higher in the LPM. Financial openness reduces the probability of financial crises by 3% in both the logit and probit models, which makes it the most important explanatory variable. GDP growth reduces the probability of financial crises by 1%.

Table 10.2: Marginal effects

Variable	logit	probit	LPM
INF	0.005 (3.06)***	0.005 (3.19)***	0.007 (4.35)***
CHINN	-0.03 (-1.86)*	-0.03 (-1.97)**	-0.02 (-1.62)
GDP	-0.01 (-2.06)**	-0.01 (-2.04)**	-0.01 (-2.14)**
CA	-0.003 (-1.36)	-0.003 (-1.11)	-0.003 (-1.29)

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

10.3.2 Interest rate liberalisation and financial crises

The effect of interest rate liberalisation is introduced in the specification and the results are presented in Table 10.3. Due to the strong links between the inflation rate and interest rate liberalisation measures (real deposit rate and real interest rate), the inflation rate is omitted from the specification. The two measures of interest rate liberalisation are used separately in regression models. The coefficient of the real deposit rate is negative but insignificant, while that of the real interest rate is negative and significant at the 10% level. The results imply that interest rate liberalisation does not directly increase the likelihood of financial crises in SADC countries. The result supports the findings of Barrell *et al* (2013, 2016) who found that liberalisation of the deposit and lending rates adds to the strength of capital in protecting against banking crises. The results provide support to the view that higher interest rates do not result in bank risk-taking behaviour that often causes financial crises. Furthermore, financial repression policies that maintain low real interest rates may increase the likelihood of financial crises rather than cure it. In most SADC countries real interest rates were low during the 1990s, the period in which most financial crises occurred.

The coefficients of the other explanatory variables are similar to those of the baseline model. However, the coefficient of the capital account balance becomes significant at 5% level in the specification with the real interest rate, which implies that after the adoption of interest rate liberalisation, the current account balance significantly reduces the likelihood of financial crises.

Table 10.3: Interest rate liberalisation and financial crises

Variable	logit	logit2
CHINN	-0.30 (-1.78)*	-0.31 (-1.81)*
GDP	-0.10 (-2.22)**	-0.11 (-2.22)**
CA	-0.03 (-1.40)	-0.05 (-2.32)**
RDEP	-0.03 (-1.54)	
RINT		-0.04 (-1.90)*
C	-1.90 (-6.09)***	-1.64 (-4.97)***
pseudo R-squared	0.09	0.10
chi-square	16.64***	21.09***
No of observations	261	264

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

Table 10.4 shows the marginal effects of the explanatory variables, including the interest rate liberalisation measures. The real interest rate reduces the likelihood of financial crises by 0.4%. The current account balance reduces the likelihood of financial crises by 1%. The coefficient of GDP growth suggests that higher economic growth reduces the probability of financial crises by 12% when the real interest rate is introduced into the specification. The coefficient of financial openness still retains its value of 3%.

Table 10.4: Marginal effects

Variable	logit	logit2
CHINN	-0.03 (-1.77)*	-0.03 (-1.86)*
GDP	-0.01 (-2.24)**	-0.12 (-2.26)**
CA	-0.003 (-1.40)	-0.01 (-2.35)**
RDEP	-0.003 (-1.56)	
RINT		-0.004 (-1.92)*

Source: Researcher's own computations. Note: (**) and (*) indicate significance at 5% and 10% levels respectively.

Table 10.5 presents the results of the probit model as well as the LPM for robustness checks. The results mirror those of the logit model to a large extent, as the real interest rate is negatively signed and significant at the 10% and 5% levels for the probit and LPM models respectively. The coefficient of the real deposit rate is negative in both models, but only significant in the LPM specification.

Table 10.5: Probit and LPM models

Variable	probit1	probit2	LPM1	LPM2
CHINN	-0.16 (-1.82)*	-0.16 (-1.85)*	-0.02 (-1.54)	-0.02 (-1.58)
GDP	-0.06 (-2.20)**	-0.06 (-2.21)**	-0.01 (-2.43)**	-0.01 (-2.46)**
CA	-0.01 (-1.27)	-0.02 (-2.14)**	-0.003 (-1.41)	-0.01 (-2.48)**
RDEP	-0.02 (-1.60)		-0.01 (-2.36)**	
RINT		-0.02 (-1.92)*		-0.01 (-2.37)**
constant	-1.08 (-6.41)***	-0.92 (-5.03)***	0.16 (4.88)***	0.20 (5.48)***
pseudo R-squared	0.09	0.10		
R-squared			0.06	0.07
chi-square	16.58***	20.90***		
F-statistic			4.90***	5.74***
No of observatns	261	264	261	264

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

10.3.3 Financial development and financial crises

Literature suggests that excessive bank lending to unworthy borrowers and the subsequent rise in non-performing loans is one of the major causes of financial crises. Banking sector growth, fuelled by rising credit to the private sector, growth in broad money, liquid liabilities and banking assets constitutes one of the measures of financial development as discussed in Chapter nine. According to the McKinnon and Shaw hypothesis, interest rate liberalisation promotes financial development, which in turn increases economic growth. However, the findings of Chapter nine suggest that banking sector development has a negative long-term effect on financial development in the region. So investigating the effect of banking sector development on financial crises is crucial, as the SADC region has experienced a number of

bank failures, which also suggests that financial development might not be growth-enhancing.

Table: 10.6. Financial development and financial crises

Variable	logit1	logit2	logit3	logit4	logit5
INF	0.05 (3.05)***	0.04 (2.54)**	0.05 (2.87)***	0.05 (3.29)***	0.04 (2.55)**
CHINN	-0.31 (-1.85)*	-0.25 (-1.39)	-0.33 (-1.89)*	-0.18 (-1.01)	-0.26 (-1.48)
GDP	-0.10 (-1.98)**	-0.10 (-2.10)**	-0.10 (-2.03)**	-0.09 (-1.67)*	-0.10 (-2.11)**
CA	-0.03 (-1.42)	-0.03 (-1.32)	-0.03 (-1.32)	-0.05 (-1.81)*	-0.03 (-1.33)
CRED	0.01 (1.03)				
LIQ		-0.01 (-0.92)			
BA			0.003 (0.33)		
BC				0.02 (2.58)***	
BROAD					-0.01 (-0.88)
constant	-2.59 (-5.85)***	-1.88 (-3.07)***	-2.47 (-4.71)***	-3.96 (-5.15)***	-1.93 (-3.26)***
pseudo R^2	0.14	0.14	0.13	0.17	0.14
chi-squared	29.77***	29.10***	28.63***	35.88***	29.26***
No of obs	264	264	263	264	265

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

The empirical strategy involves using the five indicators of financial development introduced in Chapter nine as explanatory variables in separate regression specifications, as well as the indices created by principal components analysis. Tables 10.6 to 10.9 present the results of the analysis.

Bank credit to the private sector is positive and significant at the 1% level, meaning that it increases the likelihood of financial crises. The coefficient is in line with *a priori* expectations and confirms the findings of Angkinand *et al* (2010), Hamdi & Jlassi (2014) and Enowbi *et al* (2017). Credit to the private sector and bank assets are positively signed but insignificant, while liquid liabilities and broad money are negative and insignificant.

Table 10.7 presents the marginal effects. The results suggest that bank credit increases the likelihood of financial crises by 0.2%. Table 10.8 shows the effect of the financial development indices on financial crises. The first index of financial development is positively signed but insignificant, while the second index is positive and significant at the 5% level. The result provides support for the proposition that the long-term effect of financial development on economic growth in SADC could be negative because of financial crises.

Table 10.7: Marginal effects

Variable	logit
INF	0.01 (3.46)***
CHINN	-0.02 (-1.01)
GDP	-0.01 (-1.68)*
CA	-0.005 (-1.82)*
BC	0.002 (2.61)**

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

Table 10.8: Financial development and financial crises

Variable	logit1	logit2
INF	0.05 (2.87)***	0.05 (3.11)***
CHINN	-0.33 (-1.90)*	-0.06 (-0.30)
GDP	-0.10 (-2.02)**	-0.09 (-1.73)*
CA	-0.03 (-1.33)	-0.05 (-1.84)*
FD Index	0.04 (0.34)	
FD Index2		0.68 (2.83)***
constant	-2.38 (-6.35)***	-2.61 (-6.46)***
pseudo R-squared	0.13	0.18
chi-square	28.63***	37.58***
No of observations	263	263

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

The marginal effects presented on Table 10.9 suggest that the second financial development index increases the likelihood of financial crises by 7%, making it one of the main drivers of financial crises.

Table 10.11: Marginal effects

Variable	logit
INF	0.005 (3.26)***
Chinn	-0.01 (-0.30)
GDP	-0.01 (-1.75)*
FD Index2	0.07 (2.86)***
constant	-0.005 (-1.85)*

Source: Researcher's own computations. Note: (***) and (*) indicate significance at 1% and 10% levels respectively.

10.3.4 Institutions and financial crises

The role of institutions in reducing the likelihood of financial crises is well documented in the literature (Demirgüç-Kunt & Detragiache 1998). Institutional quality mitigates the negative effects of bank lending by ensuring that less credit is extended to unworthy borrowers. Excessive lending practices are also curtailed, which reduces the likelihood of bank failures. The low quality of institutions in the SADC region has been a cause for concern over the years, so this section attempts to analyse the effect institutional quality has on the probability of financial crises. Due to the unavailability of data on institutions for the period of the study, GDP per capita is used as a proxy, in line with Demirgüç-Kunt & Detragiache (1998), Shehzad & De Haan (2008) and Angkinand *et al* (2010).

Due to the correlation between GDP growth and GDP per capita, GDP growth is omitted from the regression model. The results are presented in Table 10.10; these reveal limited support for the role of institutional quality in reducing financial crises. The coefficient of GDP per capita is negative but significant only at the 10% level. The negative coefficient is in line with the findings of Demirgüç-Kunt & Detragiache (1998), Shehzad & De Haan (2008) and Angkinand *et al* (2010). An interesting point to note is that the coefficients of the selected financial development indicators remain positive and significant. The first financial develop-

ment index becomes significant at 10% level. The low institutional quality in the SADC region means that financial development will most likely be associated with financial crises.

Table 10.10: Institutional quality and financial crises

Variable	logit1	logit2	logit3
INF	0.05 (2.86)***	0.04 (2.70)***	0.04 (2.75)***
CHINN	-0.004 (-0.02)	-0.21 (-1.18)	0.01 (0.07)
GDPP	-0.0002 (-1.76)*	-0.0003 (-1.68)*	-0.0001 (-1.14)
CA	-0.06 (-2.20)**	-0.04 (-1.76)*	-0.06 (2.13)**
BC	0.03 (3.21)***		
FD Index		0.33 (1.76)*	
FD Index2			0.80 (3.11)***
constant	-4.32 (-5.73)***	-2.08 (-4.11)***	-2.65 (-5.96)***
pseudo R-squared	0.17	0.13	0.17
chi-square	36.86***	28.13***	36.09***
No of observations	264	263	263

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels respectively.

10.3.5 Sensitivity analysis

Sensitivity analysis involving the use of lagged explanatory variables was conducted and due to the small sample size, only the first lags are considered. Lagging the regressors provides a true early warning system and deals with issues of endogeneity (Demirgüç-Kunt & Detragiache, 1998; Barrell *et al*, 2016). The results showing the baseline regression, the effect of interest rate liberalisation on financial crises and the role of financial development and institutional quality on financial crises are presented in Tables 10.11 to 10.13 respectively. In the baseline regression, inflation and financial openness retain their respective positive and negative signs, as well as their significance. GDP growth and the current account balance are insignificant.

The introduction of interest rate liberalisation in the specification does not alter the result of financial openness as shown in Table 10.12. The coefficient remains negative and significant.

The other coefficients are similar to those in the baseline regression. The interest rate liberalisation variables are negative but insignificant.

Table 10.11: Sensitivity analysis: baseline model

Variable	logit	probit	LPM
INF	0.03 (2.58)***	0.02 (2.68)***	0.01 (3.38)***
GDP	0.02 (0.37)	0.01 (0.51)	0.02 (0.45)
CA	0.01 (0.22)	0.003 (0.25)	0.001 (0.30)
CHINN	-0.40 (-2.25)**	-0.22 (-2.42)**	-0.03 (-2.28)**
constant	-2.57 (-6.90)***	-1.52 (-7.50)***	0.05 (1.35)
pseudo R-squared	0.07	0.08	
R-squared			0.07
chi-squared	15.39***	16.04***	
F-statistic			4.67***
No of observations	265	265	265

Source: Researcher's own computations. Note: (***) and (**) indicate significance at 1% and 5% levels respectively.

Table: 10.12: Sensitivity analysis: Interest rate liberalisation and financial crises

Variable	logit	probit
GDP	0.02 (0.39)	0.03 (0.56)
CA	-0.01 (0.68)	-0.002 (-0.10)
CHINN	-0.38 (-2.22)**	-0.40 (-2.22)**
RINT	-0.02 (-0.92)	
RDEP		-0.005 (-0.22)
constant	-2.14 (-5.85)***	-2.33 (-6.57)***
pseudo R-squared	0.04	0.03
chi-square	7.57	6.36
No of observations	264	261

Source: Researcher's own computations. Note: (***) and (**) indicate significance at 1% and 10% levels respectively.

The coefficients of financial development represented by bank credit and the second financial development index remain positive and significant, while the coefficient of GDP per capita is negative but insignificant.

Table 10.13: Sensitivity analysis: financial development, institutional quality and financial crises

Variable	logit	probit
INF	0.03 (2.50)**	0.04 (2.59)***
GDPP	-0.0001 (-0.98)	-0.0001 (-1.40)
CA	0.001 (0.33)	-0.001 (-0.05)
CHINN	-0.11 (-0.54)	-0.14 (-0.68)
FD Index2	0.66 (2.68)***	
BC		0.02 (2.76)***
constant	-2.32 (-5.51)***	-3.67 (-5.56)***
pseudo R-squared	0.11	0.12
chi-square	23.70***	24.03***
No of observations	263	264

Source: Researcher's own computations. Note: (***) and (*) indicate significance at 1% and 10% levels respectively.

10.3.6 Crises probabilities

The last part of the empirical analysis involves estimating the probability of financial crises in the sample using the different model specifications in order to determine the predictive power of the logit model. A crisis is correctly predicted if the estimated probability is greater than the ratio of the number of crisis observations to the total number of observations (Demirgüç-Kunt & Detragiache 1998). The frequency of crises in the study is 0.10[6]. The results are presented on tables 10.14 and 10.15. The baseline model correctly classified 22 of the 25 crises, while the models with interest rate liberalisation and financial development indicators both correctly classified 23 crises. A point to note is that the probabilities of financial crises are much higher in the model with financial development indicators, which further reiterates that the largest contributors to financial crises stem from banking sector growth.

[6] 25 crisis start dates divided by 263 observations

Table 10.14: Crises probabilities: Baseline model

Country	Start date	Logit	Probit	LPM
Botswana	1994	0.11	0.12	0.14
Lesotho	1995	0.30	0.26	0.26
	2000	0.05	0.05	-0.01
	2008	0.06	0.07	0.07
Madagascar	1994	0.51	0.50	0.43
	2004	0.13	0.13	0.16
Malawi	1994	0.74	0.71	0.54
Namibia	1996	0.12	0.13	0.13
	1998	0.10	0.11	0.11
	2000	0.12	0.12	0.14
	2008	0.14	0.14	0.15
Seychelles	2008	0.42	0.40	0.42
South Africa	1996	0.11	0.12	0.12
	1998	0.16	0.16	0.17
	2000	0.10	0.11	0.11
	2008	0.17	0.17	0.18
Swaziland	1996	0.12	0.12	0.13
	1998	0.15	0.16	0.16
	2000	0.18	0.19	0.19
	2008	0.19	0.20	0.20
Tanzania	1990	0.33	0.33	0.34
Zambia	1990	0.97	0.97	0.97
	2000	0.15	0.15	0.23
	2008	0.03	0.03	0.04

Source: Researcher's own computations

Table 10.15: Crises probabilities: Interest rate liberalisation model

Country	Start date	Logit	Probit	LPM
Botswana	1994	0.11	0.12	0.13
Lesotho	1995	0.47	0.43	0.36
	1998	0.44	0.40	0.34
	2000	0.11	0.11	0.12
Madagascar	1994	0.38	0.37	0.32
	2004	0.11	0.11	0.13
Malawi	1994	0.62	0.59	0.44
Namibia	1996	0.13	0.14	0.15
	1998	0.09	0.10	0.10
	2000	0.12	0.13	0.14
	2008	0.16	0.17	0.18
Seychelles	2008	0.48	0.47	0.42
South Africa	1996	0.11	0.11	0.12
	1998	0.15	0.16	0.17
	2000	0.13	0.13	0.15
	2008	0.17	0.18	0.19
Swaziland	1996	0.13	0.13	0.14
	1998	0.16	0.16	0.17
	2008	0.19	0.20	0.20
Zambia	1990	0.73	0.70	0.52
	2000	0.11	0.11	0.17
	2008	0.03	0.03	0.02

Source: Researcher's own computations

10.4 Conclusion

The purpose of this chapter was to examine the effect of interest rate liberalisation on the likelihood of financial crises. The empirical strategy involved estimating the effect of real deposit rate and real interest rate on a financial crisis dummy variable. The chapter also investigated whether the negative relationship between financial development and economic growth observed in Chapter nine is because of financial crises. Also, the effect of institutional quality captured by GDP per capita on financial crises was analysed.

The analysis was conducted using the logit model due to the binary nature of the dependent variable. The probit model, as well as the LPM, were used for comparison purposes and these produced results largely similar to those of the logit model.

The empirical results suggest that interest rate liberalisation reduces the likelihood of financial crises. However, only the coefficient of the real interest rate was significant. This implies that higher real interest rates may reduce the risk-taking behaviour of financial institutions and financial repression policies that maintain negative real interest rates might increase the

likelihood of financial crises. Also, interest rate liberalisation may increase the strength of capital in mitigating financial crises.

Inflation increases the probability of financial crises and the result was robust to different specifications. SADC countries have had a history of high inflation rates which have contributed to the cause of financial crises by lowering real interest rates to negative territory and creating macroeconomic instability. GDP growth and financial openness are associated with lower crisis probabilities. Higher economic growth rates reduce uncertainty in an economy, which in turn lowers the likelihood of financial crises as expected, while financial openness boosts liquidity in the domestic economy due to higher capital inflows, which mitigates banking crises.

The results provide support for the hypothesis that financial development increases the likelihood of financial crises. Among the financial development indicators, only bank credit has a positive and significant coefficient. The financial development indices are positively signed, however, only the second index is statistically significant. Institutional quality reduces the likelihood of financial crises, but the coefficient is weakly significant. This could be the result of low levels of institutional quality in the SADC region, which have played a minimal role in mitigating the effects of financial development on financial crises. The next chapter provides a summary of the study as well as policy recommendations.

CHAPTER ELEVEN

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

11.1 Introduction

The purpose of this chapter is to provide concluding remarks on the study. The chapter also provides a summary of the issues discussed as well as policy recommendations. The study examined the channels through which interest rate liberalisation has an effect on economic growth in SADC countries over the period 1990-2015. The channels comprise savings and investment, capital inflows, financial development and financial crises.

The period of the study coincides with the time when most SADC countries liberalised interest rates so as to boost economic growth, as proposed by McKinnon (1973) and Shaw (1973). Most SADC countries introduced financial reforms during the late 1980s to ’90s. Prior to the reforms, the financial systems in most countries were largely controlled by the respective governments. Real interest rates were negative and there was lack of competition in the economies, especially in the banking sector. Financial liberalisation policies had a positive effect on the performance of the banking industries in most of the SADC countries as more banks entered the financial systems and increased the level of competition. Financial reforms also had a positive effect in turning real interest rates from negative to positive territory despite the obstacles of high inflation and increasing savings and investments in several countries.

The period of the study also coincides with the period after the 2008-’09 global financial crises, which prompted most countries to reduce interest rates in an attempt to boost consumption, investment and economic growth. However, the reduction in real interest rates has a negative effect on savings, which are a major driver of investments. Also, capital inflows – which supplement domestic investments – might be curtailed by the reduction in interest rates, as returns for investors are lowered. Financial repression policies, like keeping interest rates low, discourage the development of the financial sector as alluded to by Shaw (1973). Low real interest rates also encourage banks to take more risks in their lending practices in an attempt to earn higher returns, which increases the likelihood of financial crises. And, as put forward by the Austrian school, low real interest rates were one of the major causes of the 2008-’09 global financial crises, and reducing interest rates during a crisis period prolongs the crisis.

The chapter is organised as follows: Section two summarises the issues discussed in the study, including the empirical findings. Section three provides a conclusion on the major

findings of the study while Section four provides policy recommendations. Lastly, Section five discusses areas of future research.

11.2 Summary of issues

This section summarises the issues discussed in the study. It combines the theoretical arguments on interest rate liberalisation with the empirical findings. The estimation technique used for the first three channels in which interest rate liberalisation affects economic growth was the PMG model, which assumes that long-run coefficients are homogenous while short-run coefficients are heterogenous. The effect of interest rate liberalisation on financial crises was estimated using the logit model.

11.2.1 Summary of overview of interest rate liberalisation

The interest rate liberalisation hypothesis was initiated by McKinnon (1973) and Shaw (1973) who argued that financial repression polices that kept real interest rates at negative levels or below equilibrium were responsible for retarding economic growth by discouraging savings and investments. Financial repression encourages savings in unproductive assets, and results in funds being shifted to the informal sector which is not regulated. Savings are one of the most crucial determinants of investments, so financial repression policies reduce the availability of funds for investment purposes. Also, financial repression policies like high reserve requirements and credit rationing also discourage investments. Investments play a crucial role in enhancing economic growth, so policies that retard investments have a negative effect on economic growth.

McKinnon (1973) and Shaw (1973) argued that the real interest rate plays an important role in the accumulation of financial capital, which is necessary for investments. Low or negative interest rates prevent the capital accumulation process and so reduce the amount of investments undertaken. Interest rate liberalisation results in higher real interest rates, which equate the demand for and supply of savings. McKinnon (1973) argued that reforms in interest rates boost savings by increasing the opportunity cost of current consumption. Shaw (1973) put forward the idea that the substitution effect of a rise in interest rates which increases savings, outweighs the income effect. McKinnon (1973) and Shaw (1973) also suggest that interest rate reforms are necessary for encouraging capital inflows which supplement domestic investments, and minimising capital flight.

The McKinnon and Shaw hypothesis received theoretical support from researchers like Kapur (1976), Mathieson (1980), Galbis (1977), Fry (1980) and Mishkin (2001). The hypothesis is also in line with the recommendation made by the Austrian school of thought. Models developed by Kapur (1972), Mathieson (1980), Galbis (1977) and Fry (1980) stress the importance of allowing market forces to determine prices in the financial sector. Also, deposit rates determined by market forces have a significant effect on economic growth by boosting savings and investments. The Austrian school of thought also supports the McKinnon and Shaw hypothesis. The Austrians argue that interest rates should be determined in the market for loanable funds, which equates the demand for to the supply of funds (Oppers, 2002). Interest rates artificially kept below equilibrium result in malinvestments, which increase the likelihood of financial crises.

Critics of the McKinnon-Shaw hypothesis stem from the Neo-Structuralist school of thought as well as the Keynesians, including the New-Keynesians and the Post-Keynesians. The Neo-Structuralists argue that interest rate liberalisation may result in a reduction of funds in the financial system. Banks are subject to reserve requirements, so a shift in funds to the banking sector reduces the supply of funds in the economy. Keynesians suggest that a rise in interest rates and the subsequent increase in savings causes a reduction in aggregate demand in the economy, leading to a decline in economic growth. The New-Keynesians, including Stiglitz & Weiss (1981), Mankiw (1986), Stiglitz (1994) and Arestis & Demetriades (1999), argue that financial markets are prone to market failures due to imperfect information. So government intervention in the market is necessary to prevent financial crises. The Post-Keynesians argue that the McKinnon and Shaw hypothesis omits the role that institutional quality plays in the functioning of the financial sector. Without adequate institutional quality, interest rate liberalisation has a negative effect on economic growth.

11.2.2 Summary of interest rate liberalisation, savings, investments and economic growth

The study examines the channels in which interest rate liberalisation impacts on economic growth. The first channel considered is through savings and investments. This channel is examined using a multiple equation specification, an approach similar to that of Fry (1978), Giovannini (1985), De Melo & Tybout (1986), Wirman & Thirlwall (1999), Achy (2003) and Strestha & Chowdury (2007).

The real deposit rate has a positive effect on savings, which supports the McKinnon and Shaw hypothesis. Savings in the SADC region are responsive to higher real deposit rates, so

interest rate liberalisation plays an important role in mobilising savings. The important determinants for savings are income and the age dependency rate, which have a positive effect on savings. The results imply that income is the most important determinant of savings.

The real lending rate has a negative but insignificant impact on investments. Lending rates are not a significant determinant of savings in the SADC region. Savings have a positive and statistically significant effect on investments. This supports the view that interest rate liberalisation boosts investments through a rise in savings, put forward by McKinnon (1973) and Shaw (1973). The results suggests that the positive effect of higher deposit rates on investments outweighs the negative effect of higher borrowing costs. Financial development captured by credit to the private sector has a positive effect on investments, which suggests that financial reforms that abolish credit rationing have a positive effect on investments.

Investments have a positive and significant effect on economic growth, which confirms that investments are one of the main drivers of economic growth. The other determinants of economic growth, like trade, inflation and government expenditure, are negatively related to economic growth in the long-run.

11.2.3 Summary of interest rate liberalisation, capital flows and economic growth

The second channel in which interest rate liberalisation may affect economic growth is through capital flows. The analysis was conducted using a two-equation specification which involved investigating the effect of interest rates on capital flows as well as the relationship between economic growth and capital flows. The interest rate liberalisation measures are positively related to capital inflows and both coefficients are significant. This indicates that the prospect of earning higher returns encourages capital inflows, which supports theoretical expectations. Interest rate differentials have a positive but insignificant effect on capital inflows. This is because the measure of capital flows chosen for this analysis (FDI) is not sensitive to interest rate differentials compared with other forms of capital flows, like portfolio flows.

The other determinants of capital inflows are financial openness and financial development. Financial openness encourages the inflow of capital, while financial development has a negative effect on capital inflows. This could be the result of financial crises, which usually occur due to a rise in bad debts.

Capital inflows have a negative but insignificant effect on economic growth. Capital inflows in SADC countries have not boosted productivity and employment levels significantly as expected. In this analysis the positive effect of interest rate liberalisation is not realised fully.

11.2.4 Summary of interest rate liberalisation, financial development and economic growth

The analysis estimated the effect of interest rate liberalisation on financial development, as well as the relationship between financial development and economic growth. Five proxies for financial development are used, and to avoid severe collinearity, financial development indices are constructed. Two indices accounting for over 95% of the total variation are constructed using the PCA technique.

The McKinnon and Shaw hypothesis suggests that interest rate liberalisation has a positive effect on savings, which in turn promotes financial development. So savings are used as a channel through which interest rates affect financial development. Savings have a positive effect on the financial development indices, as well as the individual financial development indicators – except for credit to the private sector. Also, the real deposit rate is positively related to most of the financial development indicators, including the indices. GDP per capita, as a proxy for economic activity and institutional quality, promotes financial development in SADC countries. So higher levels of institutional quality are crucial for financial development.

The effect of financial openness on financial development is sensitive to the proxy used. Financial openness boosts liquid liabilities and bank credit, and deters broad money, credit to the private sector and banking assets. Inflation as a measure of macroeconomic instability has a negative effect on financial development.

The analysis suggests that financial development has a negative effect on economic growth in SADC countries in the long run. The stability of a financial system is an alternative channel in which financial development has an effect on economic growth. As such, financial development may have a negative effect on economic growth if financial systems lack stability.

11.2.5 Summary of interest rate liberalisation and financial crises

Interest rate liberalisation also affects economic growth through financial crises. Higher interest rates may encourage excessive risk-taking on the part of banks, which increases the likelihood of financial crises. However, real interest rates below equilibrium may also cause financial crises. The analysis involves regressing a financial crisis dummy variable on interest rate

liberalisation indicators as well as macroeconomic variables. The empirical strategy involved answering three questions: Firstly, does interest rate liberalisation increase or decrease the likelihood of financial crises? Secondly, what is the role of financial development in causing financial crises? Lastly, does institutional quality reduce the likelihood of financial crises?

The results imply that interest rate liberalisation does not directly increase the likelihood of financial crises in SADC countries and support the view that higher interest rates do not result in bank risk-taking behaviour that often causes financial crises. Also, financial repression policies that maintain low real interest rates may increase the likelihood of financial crises rather than cure them. In most SADC countries, real interest rates were low during the 1990s, the period when the most financial crises occurred. High inflation indicates macroeconomic instability, which increases the likelihood of financial crises.

Financial openness reduces the likelihood of financial crises, although the coefficient is weakly significant. One of the causes of banking crises is diminishing of liquidity to meet depositors' needs. So capital inflows may mitigate liquidity problems faced by domestic financial institutions, so reducing the possibility of banking crises. Economic growth is associated with lower crisis probabilities. There is some evidence that current account imbalances increase the likelihood of financial crises.

There is evidence that financial development increases the likelihood of financial crises in SADC countries, although the result is not robust to different indicators of financial development. Bank credit to the private sector and the second financial development index are both associated with higher financial crisis probabilities. There is scant evidence that institutional quality reduces financial crises, possibly due to the low levels of institutional quality in the SADC region. So financial development will most likely be associated with financial crises unless there is an improvement in the levels of institutional quality.

11.3 Conclusion

In conclusion, the study contributes to literature by providing an analysis of the different channels through which interest rate liberalisation impact on economic growth. The results suggest that the interest rate liberalisation hypothesis is beneficial to some extent in SADC countries. The results of the study show that the impact of interest rate reforms on growth differs according to the channel that is investigated. Higher real interest rates may boost economic growth by encouraging savings and investments. And higher real lending and deposit interest rates reduce the likelihood of financial crises, possibly by mitigating risks

taken by banks and adding to the strength of capital in protecting against banking crises. However, the positive effect of interest rate liberalisation on growth through financial development and capital inflows is not realised fully. Interest rate liberalisation has a positive effect on financial development and capital inflows. However the development of the financial sector hinders economic growth. The study constructed financial development indices instead of relying on a single measure of financial development and the results showed that both indices are negatively related to GDP. Capital inflows have a negative but insignificant effect on economic growth.

The study also examines whether interest rate liberalisation increases the likelihood of financial crises. Very few studies have examined this relationship in African countries and therefore, the study contributes to literature by showing that interest rate reforms reduce the likelihood of financial crises. Financial repression policies that maintain artificially low interest rates increases the likelihood of financial crises. On the other hand, the study shows that interest rate liberalisation is associated with financial crises through financial development. SADC countries should exercise caution with regards to financial development policies. Strengthening the quality of the financial system is more crucial than increasing the its size.

A possible explanation for the adverse effect of financial development and capital inflows on economic growth is the low levels of institutional quality, which play a minimal role in protecting against financial crises. The study provided some evidence that institutional quality reduces the likelihood of financial crises. However, the effect is weakly significant. Overall the results imply that the negative effect of interest rate liberalisation through financial crises outweighs the positive impact of higher savings and investments.

11.4 Policy recommendations

The conclusions drawn from the study have policy implications for the SADC region. The main driver of economic growth in the long run is investments, so policies that boost investments like savings are a necessity. Liberalisation of real interest rates is crucial for savings mobilisation, which in turn would enhance investment levels. Policies that reduce interest rates to very low levels may discourage savings, which in turn decreases investment levels. High savings rates would also minimise the dependence of the region on the foreign capital inflows that are required alleviate the shortage of funds for investment purposes.

There is evidence to support the policy of interest rate liberalisation to a limited extent. Interest rate liberalisation has a positive effect on savings, capital inflows and financial development in the long run. Interest rate liberalisation also reduces the likelihood of financial crises directly.

However, there are certain conditions that should be put in place to ensure that the full benefits of interest rate liberalisation are realised. Despite the positive effect of interest rate liberalisation on capital inflows, the study found that the relationship between economic growth and capital inflows is insignificant. Capital inflows have not supplemented domestic investments, nor boosted productivity and employment levels, which could be a result of low levels of human capital. So investment in education, training and research and development is a necessity to increase levels of human capital, which in turn may allow the region to reap the benefits of capital inflows.

The study has shown that financial development has a negative effect on economic growth in SADC countries. Policy-makers should ensure that there is adequate institutional quality, for instance improvements in property rights and a sound prudential framework, to monitor the operation of the financial sector. This would minimise the number of non-performing loans or bad debts, which are a precursor of financial crises.

The study concluded that financial development has a negative effect on economic growth due to financial crises that are associated largely with bank credit. Higher levels of institutional quality would mitigate the negative effect of financial development on financial crises. As shown by the study, institutional quality reduces financial crises. However, due to the low levels of institutional quality in the region, the negative influence of financial development on economic growth will persist. Interest rate liberalisation reduces the likelihood of financial crises, indicating that higher real interest rates are not the direct cause of financial crises. Financial repression policies that maintain low or negative real interest rates may increase the likelihood of financial crises. This was evident during the 2008-'09 global financial crises.

The SADC region should introduce measures to reduce inflation rates. Inflation has a negative effect on domestic and foreign investment, financial development and economic growth. Inflation also increases the likelihood of financial crises in the region.

The study showed that trade openness and government expenditure have a negative effect on economic growth in the long run. Government expenditure has to be confined to areas that will boost economic growth, for instance investment in infrastructure, instead of wasteful act-

ivities that reduce economic growth. Diversifying the export structure should be one of the goals of policy-makers. Trade openness has a positive effect on economic growth in economies with a diversified export structure. Trade openness might be hurting domestic industries in the region, and so having a negative influence on economic growth. Most SADC countries export raw materials that are low in value, but import manufactured goods. This has resulted in negative current account balances, which are detrimental to economic growth and increase the likelihood of financial crises.

11.5 Areas of future research

Due to data limitations the study does not completely cover the channels that interest rates may affect with regard to economic growth. Lack of adequate time series data after the 2008-'09 financial crisis prevented a comparison between pre- and post-crisis periods. Future research should make a comparison between the two periods so as to determine whether the relationship between interest rate liberalisation and economic growth has changed since the onset of that crisis.

Data permitting, the role played by institutional quality on the relationship between interest rate liberalisation and economic growth should be examined extensively. The research provided support for the hypothesis that institutional quality reduces the likelihood of financial crises. However only one proxy of institutional quality was used, which limited the scope of the analysis.

Determining the optimal range of real interest rates in the region would be a worthwhile process. This will provide a benchmark against which policy-makers can make comparisons. Another area of future research is examining the effect of interest rate liberalisation on bank risk-taking and competition. This can also be used to identify whether competition in the banking sector resulting from financial reforms has a positive effect on economic growth. Also, the effects of bank risk-taking and competition on financial crises would determine whether interest rate liberalisation encourages or reduces the likelihood of financial crises through bank risk-taking and banking sector competition.

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ANNEXURES

Annexure 1: Summary of empirical literature

Interest rate liberalisation, savings, investments and economic growth

Variables	Impact	Source
Interest rate liberalisation and savings	Positive	Boskin (1978) Fry (1978) Gupta (1986) Athukorala & Rajapatirana (1993) Athukorala (1998) Boadi *et al* (2015) Opuku & Ackah (2015) Kargbo (2010) Mottelle & Masenyetse (2012) Achy (2003) Shrestha & Chowdhury (2007)
	Insignificant	Giovanini (1983) De Melo & Tybout (1986) Warman & Thirwall (1994) Bayoumi (1993)
Interest rate liberalisation and investments	Positive	Khan & Hasan (1998) Laumas (1990) Orji *et al* (2014) Achy (2003)
	Negative/Insignificant	Rittenberg (1991) Gelb (1986) Warman & Thirwall (1994)
Interest rate liberalisation and economic growth	Positive	Romero-Á vila (2009) Kendall (2000) Achy (2003) Fry (1973)

		Orje *et al* (2014) Obamuyi & Olaranfemi (2011)
	Negative/Insignificant	Owusu & Odhiambo (2015) Hye & Wizarat (2013)
Savings to investments	Positive	
	Negative/insignificant	
Investments to growth	Positive	
	Negative/Insignificant	

Interest rate liberalisation, capital flows and economic growth

Variables	**Impact**	**Source**
Domestic interest rates and capital flows	Positive	Wesso (2001) Verma & Prakash (2011) Ahmed & Zlante (2013) Aw & Tang (2009) Ahmed and Mayowa (2012)
	Negative/Insignificant	Byrne & Feiss (2011) Yang *et al* (2013) Cavallari & d'Addona (2013)

		Khan and Hye (2013) Faroh and Shen (2015)
Foreign interest rates/ interest rate differentials and capital flows	Negative/Insignificant	Calvo & Reinhart (1996) Ahmed *et al* (2005) Byrne & Fiess (2011) Olaberria (2014) Ralhan (2006)
	Positive	Jeanneau & Micu (2012) Brana & Lahet (2008)
Capital flows and economic growth	Positive	Borensztein *et al* (1998) McLean & Strestha (2002) Aizenman & Jinjarak (2011) Agbloyor *et al* (2014) Agrawal (2015)
	Negative/Insignificant	Edrees (2015) Ahmed and Mayowa (2012) Uwubanmwen and Ogiemudia (2016)

Interest rate liberalisation, financial development and economic growth

Variables	**Impact**	**Source**
Interest rate liberalisation and financial development	Positive	Odhiambo (2009a) Odhiambo (2009b) Ahmed (2013) Agrawal (2001) Mbulawa (2015)
Financial development and economic growth	Positive (From financial development to economic growth)	Odhiambo (2009a) Odhiambo (2009b) Ndebbio (2004)

		Habibullah & Eng (2006) Gondo (2009) Cojocaru *et al* (2011) Bittencourt (2010) Kumar (2014) Omaruyi & Ede (2014) Inove & Hamori (2016 Goldsmith (1969) King and Levine (1993) Levine and Zervos (1998) Levine *et al* (2000)
	Positive (bi-directional causality)	Dritsaki & Adamopolous (2004) Ince (2011) Hassan *et al* (2011)
Financial development and economic growth	Positive (From economic growth to financial development)	Odhiambo (2010) Ang & McKibbin (2007) Hassan *et al* (2011)
	Negative/Insignificant	Ijeoma et al (2011) Ayadi et al (2013) Phakedi (2014) Le Roux & Moyo (2015) Bara *et a*l (2016)

Interest rate liberalisation and financial crises

Variables	**Impact**	**Source**
Interest rate liberalisation and financial crises	Positive	Glich & Hutchison (1990) Kiminsky & Reinhart (1999) Demirgüç-Kunt & Detragiache (1998) Ranciere *et al* (2006)

		Misati & Nyamongo (2012) Enowbi et al (2017)
	Negative	Barrell *et al* (2013, 2016) Shehzad & De Hann (2008) Altunbus *et al* (2010) Triki & Maktour (2012) Angkiand *et al* (2010) Hambi and Jlussi (2014)
Bank competition and risk-taking	Positive	Zaghdoudi *et al* (2015) Jiménez, Lopez & Saurina (2007) Yeyati & Micco (2007) Ariss (2010) Agoraki *et al* (2011) Hope *et al* (2013) Cubillas & Gonzalez (2014) Ali *et al* (2015)
	Negative	Uhde & Heimeshoff (2009) Boyd *et al* (2006)

Annexure 2: Unit root tests

CRED

Panel unit root test: Summary
Series: D(CREDP)
Date: 12/04/17 Time: 11:20
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.83921	0.0000	11	246
Breitung t-stat	-5.27556	0.0000	11	235
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.20206	0.0000	11	246
ADF - Fisher Chi-square	76.9615	0.0000	11	246
PP - Fisher Chi-square	207.046	0.0000	11	257

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

BA

Panel unit root test: Summary
Series: D(BA)
Date: 12/04/17 Time: 11:23
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.90398	0.0000	11	243
Breitung t-stat	-3.67473	0.0001	11	232
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.00696	0.0000	11	243
ADF - Fisher Chi-square	56.3483	0.0001	11	243
PP - Fisher Chi-square	86.3439	0.0000	11	256

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

BC

Panel unit root test: Summary
Series: BC
Date: 12/04/17 Time: 11:24
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.51063	0.0000	11	262
Breitung t-stat	1.22779	0.8902	11	251
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.39748	0.0003	11	262
ADF - Fisher Chi-square	49.9403	0.0006	11	262
PP - Fisher Chi-square	19.0023	0.6452	11	273

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

BROAD

Panel unit root test: Summary
Series: D(BROAD)
Date: 12/04/17 Time: 11:24
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.06586	0.0194	11	248
Breitung t-stat	-3.53514	0.0002	11	237
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.48101	0.0000	11	248
ADF - Fisher Chi-square	58.5429	0.0000	11	248
PP - Fisher Chi-square	118.404	0.0000	11	259

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

CHINN

Panel unit root test: Summary
Series: D(CHINN)
Date: 12/04/17 Time: 11:28
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.06484	0.0000	10	220
Breitung t-stat	-7.74995	0.0000	10	210
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-5.93696	0.0000	10	220
ADF - Fisher Chi-square	69.6483	0.0000	10	220
PP - Fisher Chi-square	166.591	0.0000	10	230

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

EXCH

Panel unit root test: Summary
Series: D(EXCHANGE)
Date: 12/04/17 Time: 11:29
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.19527	0.0000	11	252
Breitung t-stat	0.41669	0.6615	11	241
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.71631	0.0001	11	252
ADF - Fisher Chi-square	52.1231	0.0003	11	252
PP - Fisher Chi-square	55.7456	0.0001	11	263

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

FD Index

Panel unit root test: Summary
Series: D(FD_INDEX)
Date: 12/04/17 Time: 11:32
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.38927	0.0084	11	237
Breitung t-stat	-3.27255	0.0005	11	226
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.29580	0.0005	11	237
ADF - Fisher Chi-square	46.9871	0.0015	11	237
PP - Fisher Chi-square	72.8554	0.0000	11	250

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

FD Index2

Panel unit root test: Summary
Series: FD_INDEX2
Date: 12/04/17 Time: 11:32
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.00847	0.0000	11	250
Breitung t-stat	0.36994	0.6443	11	239
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.39197	0.0003	11	250
ADF - Fisher Chi-square	50.9261	0.0004	11	250
PP - Fisher Chi-square	25.1457	0.2902	11	264

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

GDP

Panel unit root test: Summary
Series: D(GDP)
Date: 12/04/17 Time: 11:33
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.66234	0.0000	11	252
Breitung t-stat	-8.42074	0.0000	11	241
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-13.0774	0.0000	11	252
ADF - Fisher Chi-square	161.730	0.0000	11	252
PP - Fisher Chi-square	2200.82	0.0000	11	263

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

GDPC

Panel unit root test: Summary
Series: D(GDPC)
Date: 12/04/17 Time: 11:35
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.87083	0.0000	11	252
Breitung t-stat	-8.30165	0.0000	11	241
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-12.7844	0.0000	11	252
ADF - Fisher Chi-square	157.958	0.0000	11	252
PP - Fisher Chi-square	2218.25	0.0000	11	263

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

GDPP

Panel unit root test: Summary
Series: D(GDPP)
Date: 12/04/17 Time: 11:36
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.75258	0.0001	11	252
Breitung t-stat	0.83975	0.7995	11	241
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.50730	0.0002	11	252
ADF - Fisher Chi-square	52.5001	0.0003	11	252
PP - Fisher Chi-square	69.8250	0.0000	11	263

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

GOV

Panel unit root test: Summary
Series: D(GOV)
Date: 12/04/17 Time: 11:39
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 3
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.79657	0.0362	11	243
Breitung t-stat	-8.63301	0.0000	11	232
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-10.4275	0.0000	11	243
ADF - Fisher Chi-square	126.998	0.0000	11	243
PP - Fisher Chi-square	566.269	0.0000	11	255

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

INF

Panel unit root test: Summary
Series: INF
Date: 12/04/17 Time: 11:42
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.03635	0.0000	11	257
Breitung t-stat	-3.87577	0.0001	11	246
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-5.71467	0.0000	11	257
ADF - Fisher Chi-square	72.7939	0.0000	11	257
PP - Fisher Chi-square	141.030	0.0000	11	269

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

INVS

Panel unit root test: Summary
Series: D(INVS)
Date: 12/04/17 Time: 11:42
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.14169	0.0161	11	253
Breitung t-stat	-6.29512	0.0000	11	242
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.17790	0.0000	11	253
ADF - Fisher Chi-square	76.2166	0.0000	11	253
PP - Fisher Chi-square	205.649	0.0000	11	264

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

LIQ

Panel unit root test: Summary
Series: D(LIQ)
Date: 12/04/17 Time: 11:47
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 3
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.72264	0.0000	11	247
Breitung t-stat	-4.05398	0.0000	11	236
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-5.48478	0.0000	11	247
ADF - Fisher Chi-square	68.4248	0.0000	11	247
PP - Fisher Chi-square	74.7508	0.0000	11	253

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

RDEP

Panel unit root test: Summary
Series: RDEP
Date: 12/04/17 Time: 11:48
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.20911	0.0000	11	252
Breitung t-stat	-4.60162	0.0000	11	241
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.40164	0.0000	11	252
ADF - Fisher Chi-square	57.6308	0.0000	11	252
PP - Fisher Chi-square	67.9790	0.0000	11	263

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

RINT

Panel unit root test: Summary
Series: RINT
Date: 12/04/17 Time: 11:50
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.36452	0.0004	11	256
Breitung t-stat	-3.31581	0.0005	11	245
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.03423	0.0000	11	256
ADF - Fisher Chi-square	53.7289	0.0002	11	256
PP - Fisher Chi-square	342.431	0.0000	11	267

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

SAV

Panel unit root test: Summary
Series: D(SAVINGS)
Date: 12/04/17 Time: 11:51
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-12.3932	0.0000	11	263
Breitung t-stat	-8.98903	0.0000	11	252
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-12.9959	0.0000	11	263
ADF - Fisher Chi-square	156.028	0.0000	11	263
PP - Fisher Chi-square	160.122	0.0000	11	264

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

TRA

Panel unit root test: Summary
Series: D(TRA)
Date: 12/04/17 Time: 11:52
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.86358	0.0000	11	243
Breitung t-stat	-3.83141	0.0001	11	232
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-7.43871	0.0000	11	243
ADF - Fisher Chi-square	92.8378	0.0000	11	243
PP - Fisher Chi-square	242.897	0.0000	11	254

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

CA

Panel unit root test: Summary
Series: D(CURRENT_ACCOUNT)
Date: 12/04/17 Time: 11:54
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.33577	0.0000	11	244
Breitung t-stat	-4.74866	0.0000	11	233
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-7.38639	0.0000	11	244
ADF - Fisher Chi-square	92.7617	0.0000	11	244
PP - Fisher Chi-square	317.664	0.0000	11	255

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

FDI

Panel unit root test: Summary
Series: FDI
Date: 12/04/17 Time: 11:56
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.04053	0.0012	11	263
Breitung t-stat	-4.08353	0.0000	11	252
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.62781	0.0000	11	263
ADF - Fisher Chi-square	61.8854	0.0000	11	263
PP - Fisher Chi-square	233.923	0.0000	11	274

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

DIFF

Panel unit root test: Summary
Series: DIFF
Date: 12/04/17 Time: 12:04
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.30862	0.0005	11	256
Breitung t-stat	-3.71043	0.0001	11	245
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.25043	0.0000	11	256
ADF - Fisher Chi-square	55.3830	0.0001	11	256
PP - Fisher Chi-square	157.613	0.0000	11	267

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

AGE

Panel unit root test: Summary
Series: D(AGE)
Date: 12/04/17 Time: 12:12
Sample: 1990 2015
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 4
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.79301	0.0026	11	255
Breitung t-stat	-0.35227	0.3623	11	244
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-5.25113	0.0000	11	255
ADF - Fisher Chi-square	67.2161	0.0000	11	255
PP - Fisher Chi-square	37.6166	0.0202	11	264

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Annexure 3: PMG regression results

Interest rate liberalisation, savings and economic growth

Interest rate liberalisation and savings

```
xtpmg d.Savings d.AGE d.RDEP d.GDP, lr(l.Savings AGE RDEP GDP) ec(ec5) pmg

Pooled Mean Group Regression

Panel Variable (i): id                          Number of obs      =       262
Time Variable (t): Year                         Number of groups   =        11
                                                Obs per group: min =        19
                                                               avg =      23.8
                                                               max =        25
                                                Log Likelihood     =  -707.484
------------------------------------------------------------------------------
   D.Savings |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ec5          |
         AGE |   .3640346   .1221744     2.98   0.003     .1245772    .6034919
        RDEP |   .3032677   .1070761     2.83   0.005     .0934023     .513133
         GDP |    1.55235   .2554969     6.08   0.000     1.051585    2.053115
-------------+----------------------------------------------------------------
SR           |
         ec5 |   -.418627   .0633581    -6.61   0.000    -.5428067   -.2944473
         AGE |
         D1. |   .2633587   .9935423     0.27   0.791    -1.683948    2.210666
        RDEP |
         D1. |  -.0236136   .0846434    -0.28   0.780    -.1895117    .1422846
         GDP |
         D1. |  -.2346252   .0943509    -2.49   0.013    -.4195497   -.0497008
       _cons |  -4.005273   2.556556    -1.57   0.117    -9.016032    1.005485
------------------------------------------------------------------------------
```

Savings and investments

```
xtpmg d.INVS d.Savings d.CRED d.FDI d.RINT, lr(l.INVS Savings CRED FDI RINT)
ec(ec5) replace pmg

Pooled Mean Group Regression

Panel Variable (i): id                          Number of obs      =       264
Time Variable (t): Year                         Number of groups   =        11
                                                Obs per group: min =        22
                                                               avg =      24.0
                                                               max =        25
                                                Log Likelihood     = -641.2018

------------------------------------------------------------------------------
      D.INVS |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ec5          |
     Savings |   .3078323   .0996946     3.09   0.002     .1124345    .5032301
        CRED |   .0945831    .027944     3.38   0.001     .0398139    .1493523
         FDI |   .0116656   .2206803     0.05   0.958    -.4208598     .444191
        RINT |   -.001246   .0978642    -0.01   0.990    -.1930564    .1905643
-------------+----------------------------------------------------------------
SR           |
         ec5 |  -.2877412   .0687745    -4.18   0.000    -.4225367   -.1529457
     Savings |
          D1. |   .2207955   .0622434     3.55   0.000     .0988008    .3427903
        CRED |
          D1. |   .4657522   .1823961     2.55   0.011     .1082625     .823242
         FDI |
          D1. |   .2856456   .1396622     2.05   0.041     .0119127    .5593784
        RINT |
          D1. |  -.0307719   .0386598    -0.80   0.426    -.1065437    .0449999
       _cons |   3.959973   1.332844     2.97   0.003     1.347648    6.572299
```

Investments and economic growth

```
xtpmg d.GDPG d.INVS d.INF d.GOV d.TRA , lr(l.GDPG INVS INF GOV TRA) ec(ec5) replace
pmg

Pooled Mean Group Regression

Panel Variable (i): id                          Number of obs      =       260
Time Variable (t): Year                         Number of groups   =        11
                                                Obs per group: min =        19
                                                               avg =      23.6
                                                               max =        25
                                                Log Likelihood     =  -539.729
------------------------------------------------------------------------------
      D.GDPG |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ec5          |
        INVS |    .137062   .0205336     6.68   0.000     .0968169     .177307
         INF |  -.0226338   .0116929    -1.94   0.053    -.0455514    .0002839
         GOV |  -.1724526   .0536114    -3.22   0.001    -.2775289   -.0673762
         TRA |  -.0234501   .0062237    -3.77   0.000    -.0356483   -.0112519
-------------+----------------------------------------------------------------
SR           |
         ec5 |  -.7974905   .0971406    -8.21   0.000    -.9878826   -.6070985
        INVS |
         D1. |  -.0157337   .0653316    -0.24   0.810    -.1437814     .112314
         INF |
         D1. |   .0342715    .069405     0.49   0.621    -.1017598    .1703027
         GOV |
         D1. |  -.0133384   .1464239    -0.09   0.927     -.300324    .2736471
         TRA |
         D1. |   .0442594    .047323     0.94   0.350    -.0484921    .1370108
       _cons |   4.940442   .6130691     8.06   0.000     3.738849    6.142035
```

Interest rates liberalisation, capital flows and economic growth

Interest rate liberalisation and capital flows

```
 xtpmg d.FDI d.GDPC d.RInt d.Chinn d.CredP, lr(l.FDI GDPC RInt Chinn CredP) ec(ec5)
replace pmg

Pooled Mean Group Regression

Panel Variable (i): id                          Number of obs      =       255
Time Variable (t): Year                         Number of groups   =        11
                                                Obs per group: min =        21
                                                               avg =      23.2
                                                               max =        24
                                                Log Likelihood     = -581.7971

------------------------------------------------------------------------------
       D.FDI |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ec5          |
        GDPC |   .0012589   .0002199     5.73   0.000     .0008279    .0016899
        RInt |   .0739854   .0375688     1.97   0.049      .000352    .1476189
       Chinn |   .4087581    .161569     2.53   0.011     .0920887    .7254276
       CredP |  -.0963573   .0249632    -3.86   0.000    -.1452842   -.0474303
-------------+----------------------------------------------------------------
SR           |
         ec5 |  -.7775068   .1119569    -6.94   0.000    -.9969383   -.5580753
        GDPC |
         D1. |   .0027204   .0027398     0.99   0.321    -.0026495    .0080903
        RInt |
         D1. |  -.0574213   .0392858    -1.46   0.144    -.1344201    .0195775
       Chinn |
         D1. |  -1.304908   3.262577    -0.40   0.689    -7.699442    5.089626
       CredP |
         D1. |  -.1112359   .1436617    -0.77   0.439    -.3928076    .1703358
       _cons |   1.596278   .5282776     3.02   0.003     .5608729    2.631683
------------------------------------------------------------------------------
```

Capital inflows and economic growth

```
. xtpmg d.GDP d.FDI d.Tra d.Gov d.INVS d.EXC, lr(l.GDP FDI Tra Gov INVS EXC)
ec(ec5) replace pmg

Pooled Mean Group Regression

(Estimate results saved as pmg)

Panel Variable (i): id                          Number of obs      =       264
Time Variable (t): Year                         Number of groups   =        11
                                                Obs per group: min =        21
                                                               avg =      24.0
                                                               max =        25
                                                Log Likelihood     = -545.0185
------------------------------------------------------------------------------
       D.GDP |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ec5          |
         FDI |  -.0690213   .0508626    -1.36   0.175    -.1687102    .0306677
         Tra |  -.0335603   .0064979    -5.16   0.000    -.0462961   -.0208246
         Gov |  -.1970928   .0501059    -3.93   0.000    -.2952986    -.098887
        INVS |   .1498314   .0195361     7.67   0.000     .1115413    .1881215
         EXC |   .0021567    .000645     3.34   0.001     .0008925    .0034209
-------------+----------------------------------------------------------------
SR           |
         ec5 |  -.8006214   .0929595    -8.61   0.000    -.9828186   -.6184241
         FDI |
         D1. |     .11024   .0823822     1.34   0.181    -.0512261    .2717061
         Tra |
         D1. |   .0532525   .0426479     1.25   0.212    -.0303359    .1368409
         Gov |
         D1. |   .0044782   .1504157     0.03   0.976    -.2903311    .2992875
        INVS |
         D1. |  -.0426301    .079882    -0.53   0.594    -.1991961    .1139358
         EXC |
         D1. |   -.369011   .1243024    -2.97   0.003    -.6126391   -.1253828
       _cons |   5.407542   .8040928     6.73   0.000     3.831549    6.983535
------------------------------------------------------------------------------
```

Interest rate liberalisation, financial development and economic growth

Interest rate liberalisation and financial development

```
xtpmg d.pc1 d.GDPpercapita d.Savings d.Inf d.Chinn, lr(l.pc1 GDPpercapita Savings
Inf Chinn) ec(ec5) replace pmg

Pooled Mean Group Regression

(Estimate results saved as pmg)


Panel Variable (i): id                          Number of obs      =       252
Time Variable (t): Year                         Number of groups   =        11
                                                Obs per group: min =        19
                                                              avg =      22.9
                                                              max =        24
                                                Log Likelihood     =  177.6686
------------------------------------------------------------------------------
       D.pc1 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ec5          |
GDPpercapita |   .0001791   .0000385     4.66   0.000     .0001037    .0002545
     Savings |   .0321541   .0100027     3.21   0.001     .0125492    .0517589
         Inf |  -.0433118   .0112021    -3.87   0.000    -.0652675    -.021356
       Chinn |  -.6261899   .1449987    -4.32   0.000    -.9103821   -.3419976
-------------+----------------------------------------------------------------
SR           |
         ec5 |  -.1325184   .0485894    -2.73   0.006    -.2277519   -.0372849
GDPpercapita |
         D1. |  -.0002672   .0001693    -1.58   0.114     -.000599    .0000645
     Savings |
         D1. |   .0027877   .0112201     0.25   0.804    -.0192032    .0247786
         Inf |
         D1. |   -.003181   .0041513    -0.77   0.444    -.0113174    .0049553
       Chinn |
         D1. |   .1447485   .0654027     2.21   0.027     .0165615    .2729355
       _cons |  -.0336277   .0808359    -0.42   0.677    -.1920632    .1248078
------------------------------------------------------------------------------
```

```
xtpmg d.pc2 d.GDPpercapita d.Savings d.Inf d.Chinn, lr(l.pc2 GDPpercapita Savings
Inf Chinn) ec(ec5) replace pmg

Pooled Mean Group Regression

(Estimate results saved as pmg)

Panel Variable (i): id                          Number of obs      =       252
Time Variable (t): Year                         Number of groups   =        11
                                                Obs per group: min =        19
                                                               avg =      22.9
                                                               max =        24
                                                Log Likelihood     =  114.8307
------------------------------------------------------------------------------
       D.pc2 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ec5          |
GDPpercapita |   1.12e-06   .0000737     0.02   0.988    -.0001434    .0001456
     Savings |   .0593592   .0181817     3.26   0.001     .0237237    .0949947
         Inf |  -.0811515   .0320129    -2.53   0.011    -.1438956   -.0184074
       Chinn |   1.300589   .3147388     4.13   0.000     .6837122    1.917466
-------------+----------------------------------------------------------------
SR           |
         ec5 |  -.0403865   .0316507    -1.28   0.202    -.1024206    .0216477
GDPpercapita |
         D1. |   .0002166   .0002364     0.92   0.359    -.0002466    .0006799
     Savings |
         D1. |  -.0010148   .0053575    -0.19   0.850    -.0115153    .0094857
         Inf |
         D1. |  -.0010825    .003238    -0.33   0.738    -.0074289    .0052639
       Chinn |
         D1. |   .0294498   .0974333     0.30   0.762     -.161516    .2204155
       _cons |   .1681817   .0834889     2.01   0.044     .0045465    .3318169
------------------------------------------------------------------------------
```

Financial development and economic growth

```
xtpmg d.GDP d.Gov d.INVS d.Exchange d.pc1 d.Tra, lr(l.GDP Gov Tra INVS pc1
Exchange) ec(ec8) replace pmg

Pooled Mean Group Regression

(Estimate results saved as pmg)

Panel Variable (i): id                          Number of obs      =       255
Time Variable (t): Year                         Number of groups   =        11
                                                Obs per group: min =        17
                                                              avg =      23.2
                                                              max =        25
                                                Log Likelihood     = -493.0074
------------------------------------------------------------------------------
       D.GDP |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ec8          |
         Gov |  -.2760385   .0491623    -5.61   0.000    -.3723948   -.1796822
         Tra |  -.0300539   .0064153    -4.68   0.000    -.0426276   -.0174802
        INVS |   .1422127   .0184168     7.72   0.000     .1061165    .1783089
         pc1 |  -.3579581   .1317274    -2.72   0.007    -.6161391   -.0997772
    Exchange |    .002516   .0006808     3.70   0.000     .0011816    .0038504
-------------+----------------------------------------------------------------
SR           |
         ec8 |  -.8740313   .0797585   -10.96   0.000    -1.030355   -.7177075
         Gov |
         D1. |   .0681795   .1156749     0.59   0.556    -.1585391    .2948981
        INVS |
         D1. |  -.1181139   .0709457    -1.66   0.096    -.2571651    .0209372
    Exchange |
         D1. |  -.7156046   .2608939    -2.74   0.006    -1.226947    -.204262
         pc1 |
         D1. |  -1.837498    2.05895    -0.89   0.372    -5.872966    2.197971
         Tra |
         D1. |   .0734927   .0420993     1.75   0.081    -.0090204    .1560059
       _cons |   7.014346   1.010118     6.94   0.000     5.034552    8.994141
------------------------------------------------------------------------------
```

```
xtpmg d.GDP d.Gov d.INVS d.Exchange d.PC2 d.Tra, lr(l.GDP Gov Tra INVS PC2
Exchange) ec(ec8) replace pmg

Pooled Mean Group Regression

(Estimate results saved as pmg)


Panel Variable (i): id                          Number of obs      =       255
Time Variable (t): Year                         Number of groups   =        11
                                                Obs per group: min =        17
                                                              avg =      23.2
                                                              max =        25
                                                Log Likelihood     = -499.4978
------------------------------------------------------------------------------
       D.GDP |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ec8          |
         Gov |  -.2457497   .0478921    -5.13   0.000    -.3396165   -.1518829
         Tra |  -.0349842   .0062951    -5.56   0.000    -.0473223   -.0226461
        INVS |   .1505626   .0169385     8.89   0.000     .1173638    .1837614
         PC2 |  -.0593686   .2768251    -0.21   0.830    -.6019359    .4831987
    Exchange |    .001605   .0007241     2.22   0.027     .0001857    .0030242
-------------+----------------------------------------------------------------
SR           |
         ec8 |  -.9178801   .0927319    -9.90   0.000    -1.099631   -.7361289
         Gov |
         D1. |   .0384406   .1646349     0.23   0.815     -.284238    .3611192
        INVS |
         D1. |  -.1024451   .0697255    -1.47   0.142    -.2391046    .0342144
    Exchange |
         D1. |  -.5216968   .1676911    -3.11   0.002    -.8503653   -.1930283
         PC2 |
         D1. |   1.739436   1.390384     1.25   0.211    -.9856671    4.464538
         Tra |
         D1. |   .0677963   .0413896     1.64   0.101    -.0133257    .1489184
       _cons |   7.192396   .9266787     7.76   0.000     5.376139    9.008652
------------------------------------------------------------------------------
```

Interest rate liberalisation and financial crises

```
logit Financialcrises RInt Chinn GDP Currentaccount

Logistic regression                             Number of obs     =        264
                                                LR chi2(4)        =      21.09
                                                Prob > chi2       =     0.0003
Log likelihood = -92.743717                     Pseudo R2         =     0.1021

------------------------------------------------------------------------------
Financialcrises |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
          RInt |  -.0381097   .0200973    -1.90   0.058    -.0774997    .0012803
         Chinn |  -.3112432   .1665358    -1.87   0.062    -.6376474     .015161
           GDP |  -.1109662   .0499284    -2.22   0.026    -.2088241   -.0131082
 Currentaccount |  -.0487878   .0210428    -2.32   0.020     -.090031   -.0075446
         _cons |  -1.635174   .3291323    -4.97   0.000    -2.280261   -.9900864
------------------------------------------------------------------------------
```

```
logit Financialcrises RDEP Chinn GDP Currentaccount

Logistic regression                             Number of obs     =        261
                                                LR chi2(4)        =      16.64
                                                Prob > chi2       =     0.0023
Log likelihood = -88.794957                     Pseudo R2         =     0.0857

------------------------------------------------------------------------------
Financialcrises |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
          RDEP |  -.0333502   .0216215    -1.54   0.123    -.0757277    .0090272
         Chinn |   -.300218   .1685778    -1.78   0.075    -.6306245    .0301885
           GDP |  -.1120452   .0505631    -2.22   0.027    -.2111471   -.0129434
 Currentaccount |  -.0311887    .022269    -1.40   0.161    -.0748352    .0124577
         _cons |  -1.906081   .3131459    -6.09   0.000    -2.519836   -1.292326
------------------------------------------------------------------------------
```

```
logit Financialcrises Inf Chinn GDP Currentaccount BC
Logistic regression                             Number of obs     =        264
                                                LR chi2(5)        =      35.88
                                                Prob > chi2       =     0.0000
Log likelihood = -89.042429                     Pseudo R2         =     0.1677
------------------------------------------------------------------------------
Financialcrises |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
            Inf |   .0528221   .0160688     3.29   0.001     .0213279    .0843163
          Chinn |  -.1780677   .1769846    -1.01   0.314    -.5249511    .1688157
            GDP |  -.0852078   .0511278    -1.67   0.096    -.1854165    .0150008
 Currentaccount |  -.0469262   .0259818    -1.81   0.071    -.0978496    .0039972
             BC |   .0189298   .0073409     2.58   0.010     .0045418    .0333178
          _cons |  -3.962254   .7698992    -5.15   0.000    -5.471228   -2.453279
------------------------------------------------------------------------------
```

```
logit Financialcrises Inf Chinn GDP Currentaccount Index2
Logistic regression                             Number of obs     =        263
                                                LR chi2(5)        =      37.58
                                                Prob > chi2       =     0.0000
Log likelihood = -88.041817                     Pseudo R2         =     0.1759
------------------------------------------------------------------------------
Financialcrises |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
            Inf |   .0486178   .0156509     3.11   0.002     .0179425    .0792931
          Chinn |  -.0565809   .1888487    -0.30   0.764    -.4267175    .3135557
            GDP |  -.0887753   .0513278    -1.73   0.084    -.1893759    .0118253
 Currentaccount |  -.0482336   .0262034    -1.84   0.066    -.0995914    .0031242
         Index2 |   .6775385   .2396889     2.83   0.005     .2077569     1.14732
          _cons |  -2.612127   .4043226    -6.46   0.000    -3.404585   -1.819669
------------------------------------------------------------------------------
```